3.7. Agro-Industry and Marketing Plan

3.7.1. Establishment of Agro-industry

Agro-industry is planned to process locally what is produced within the F/S Area, thereby providing more value-added products and ultimately improving overall levels of economic productivity. Agro-industrial facilities to collect of marketable goods and to create sizable labour demands which can absorb surplus labour of small holders, if they are established along the highway near the production areas.

Processing materials are procured from contracted farms at predetermined prices. Cropping arrangements and techniques are directed 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 the collecting period. The capacities of processing plants are planned and operating days (hours) are calculated according to the materials' collection schedule. Quantities of processing materials planned from agricultural and livestock production are shown in Table 3.7-1.

Two industries are planned; that is, an oil extraction and refining plant (Figure 3.7-1) and a combination plant composed of slaughterhouse and cut meat preparation, package, and storage line, for beef and goat/mutton (Figure 3.7-2).

Production of both processing plants is projected as shown in Table 3.7-2. Raw hide material is salt-treated and sent to tanneries outside the Governorate. Olive oil cakes are returned to farmers for supplementary animal feeds.

Table 3.7-1 Material for Processing

Material	Cropping Pattern	Annual Supply Quantity (ton)
Flax Grain	CP-1	1,170
	CP-3	120
	Total	1,290
Safflower Seed	CP-1	1,170
	CP-3	140
	Total	1,310
Sunflower Seed	CP-1	2,110
	CP-3	650
	CP-4	1,080
	Total	3,840
Oil Olive	CP-1	14,100
Oilseed Total		20,460
Cattle Carcass	CP-2	430
	CP-3	600
	CP-4	2,270
	Total	3,300
Sheep, Goat Carcass	CP-1 (Sheep)	940
	CP-1 (goat)	5,460
	Total	6,400
Meat Total		9,700

Figure 3.7-1 Oil Extraction and Refinery Process

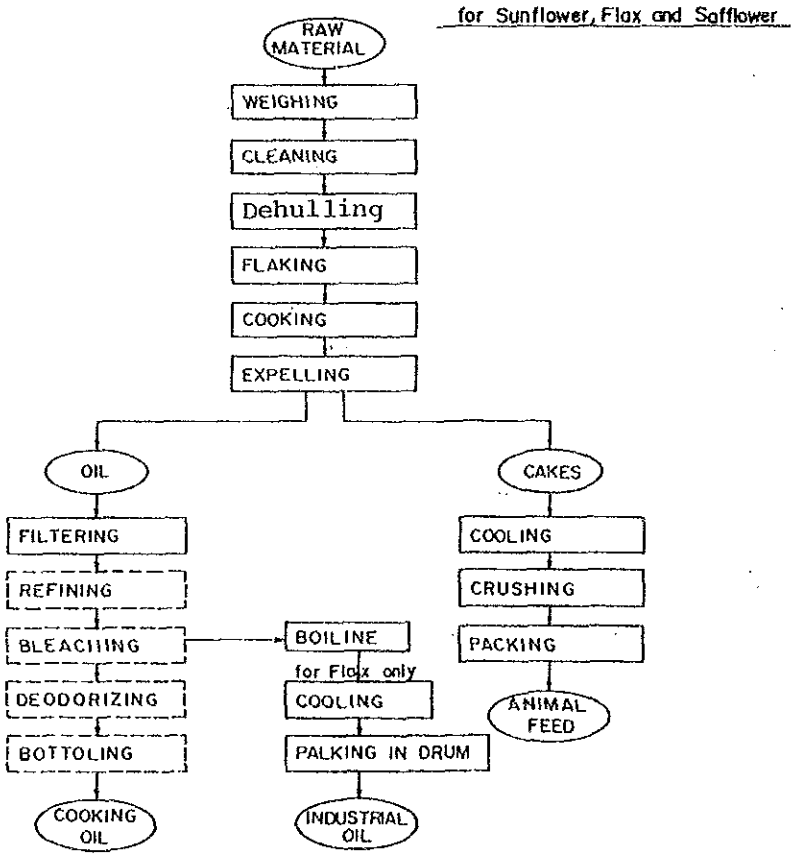


Figure 3.7-2 Slaughtering and Cut Meat Process

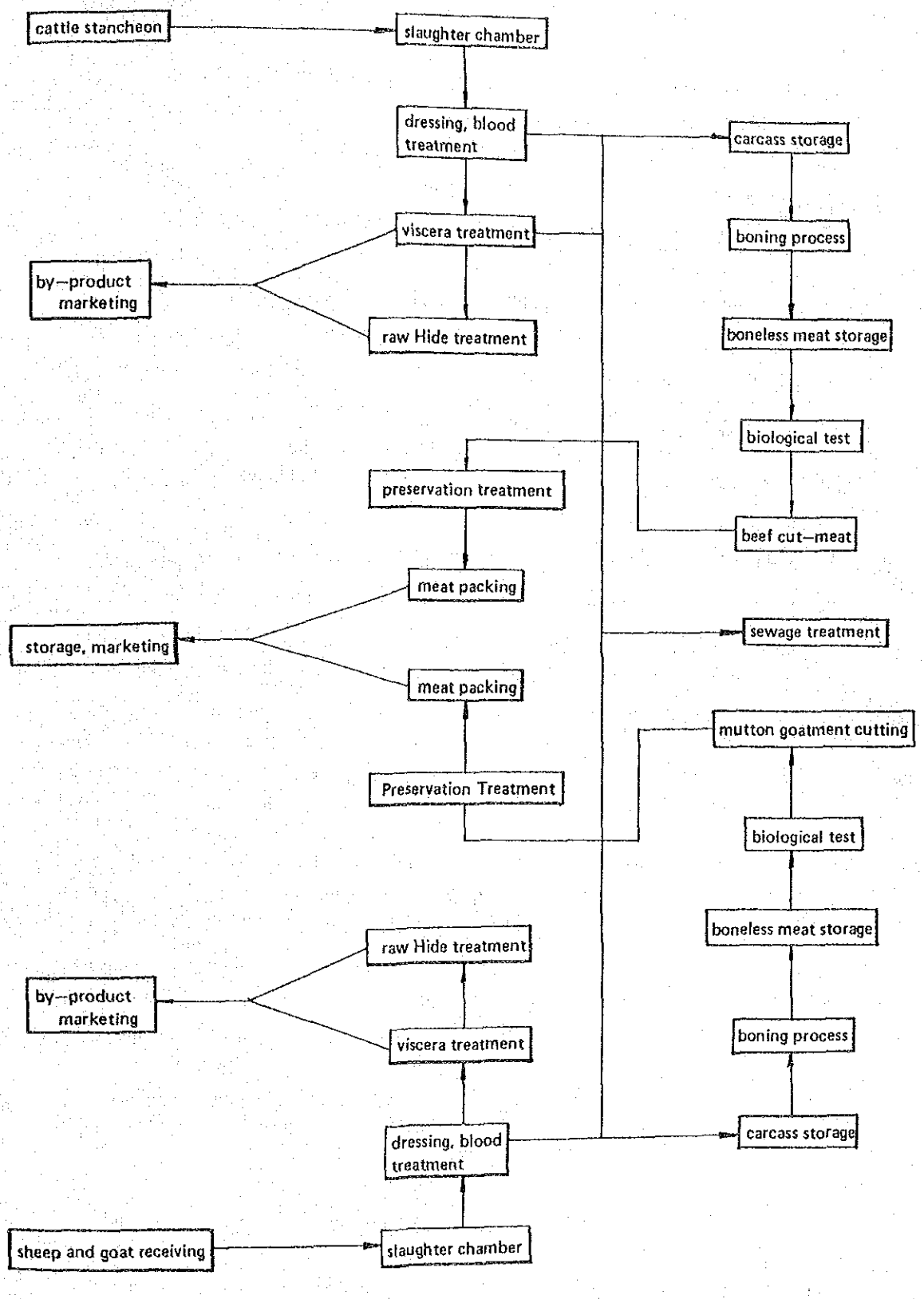


Table 3.7-2 Projected Production in the Processing Sector

Item		At Stabilized Year
Beef		
Liveweight (Ton)		3,370
Cut Meat (Ton)		1,470
Cut Meat (1,000 LE)	(9,000 LE/ton)	13,230
Goats/Sheep Meat		
Liveweight (Ton)		6,400
Cut Meat (Ton)		3,100
Cut Meat (1,000 LE)	(7,500 LE/ton)	23,250
Flax Seed (Ton)		1,290
Boiled Oil (Ton)		420
Boiled Oil (1,000 LE)	(2,280 LE/ton)	958
Safflower Seed (Ton)		1,310
Edible Oil (Ton)		310
Edible Oil (1,000 LE)	(5,200 LE/ton)	1,612
Sunflower Seed (Ton)		3,840
Edible Oil (Ton)		1,280
Edible Oil (1,000 LE)	(2,340 LE/ton)	2,995
Oil Olive Fruit (Ton)		14,100
Olive Oil (Ton)		2,820
Olive Oil (1,000 LE)	(4,800 LE/ton)	13,536

Note: Construction cost of an oil extraction plant is 11,150,000 LE
" " of a slaughterhouse/cut meat plant is 18,862,000 LE

3.7.2. 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 vegetable producting area (Table 3.7-3). 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 3.7-4).

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, projected population for Year 2000 (Figure 3.7-3). Within the demarcated outlet area, population in year 2000, annual per capita consumption of perishable products is 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 F/S 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 (refer to Table 3.7-5).

Figure 3.7-4 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 East and Middle East countries would 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 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.
Processed products	- white cheese, dried figs

For expanding exports in the future, further technical improvement developments 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 East and 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 F/S 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 F/S Area will be planned to use land transport, limiting destinations to Jordan, Saudi Arabia and the Gulf states.

3) Marketing Facility Planning

The annual consumption of processed and marketed products is projected as shown in Table 3.7-6 and the annual marketing quantities of main products from the F/S Area are estimated as shown in Table 3.7-7.

Of the proposed crops for the F/S Area a collective marketing facility is planned especially for vegetables and fruits destined for supermarkets and/or exports. Both vegetable and fruits have large quantities, therefore, it is necessary to market them efficiently.

To meet this purpose, a marketing center, with cargo collection, cleaning, grading and packaging of vegetables and fruits, will be established in the central part of the producing areas. The handling capacity of the marketing center is determined according to marketing period and marketing quantities minus local consumption.

Table 3.7-3 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 *	Projeted Production in El Arish Sheikh Zuwayed and Rafah in year 2000	Markertable Room for the Project Area (not including Exports)
		Present (kg/year)	Year 2000 (kg/year)	(1,000 tons)	(1,000 tons)	(1,000 tons)
Goat/sheep meat	0.90	0.5	1	4	0	4
Gattle 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 (as feed also)	0.96	66	80	324	1	323
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

Table 3.7-4 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				-		
Strowberry		4				-				-		
Mango		-				22				-		
Grape		-				-				0.5		
Citrus		12				-				-		
Guava		-				-				1		
Total Tonnage		153				188				18		
Handling in Ismailiya Central Market	D	J	F	M	A	M	J	J	A	S	O	N
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

Figre 3.7-3 Possible Outlet for Projected Products

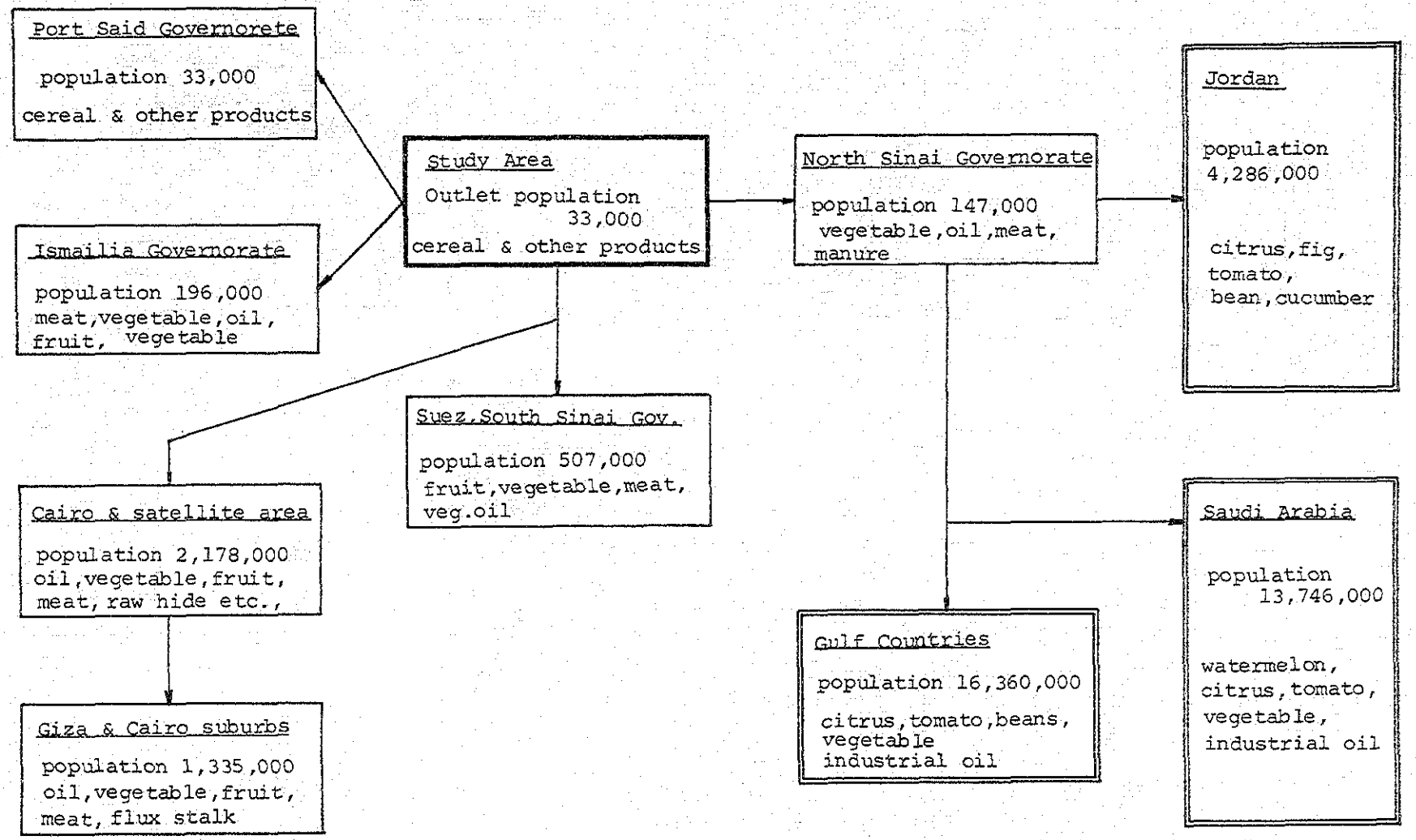
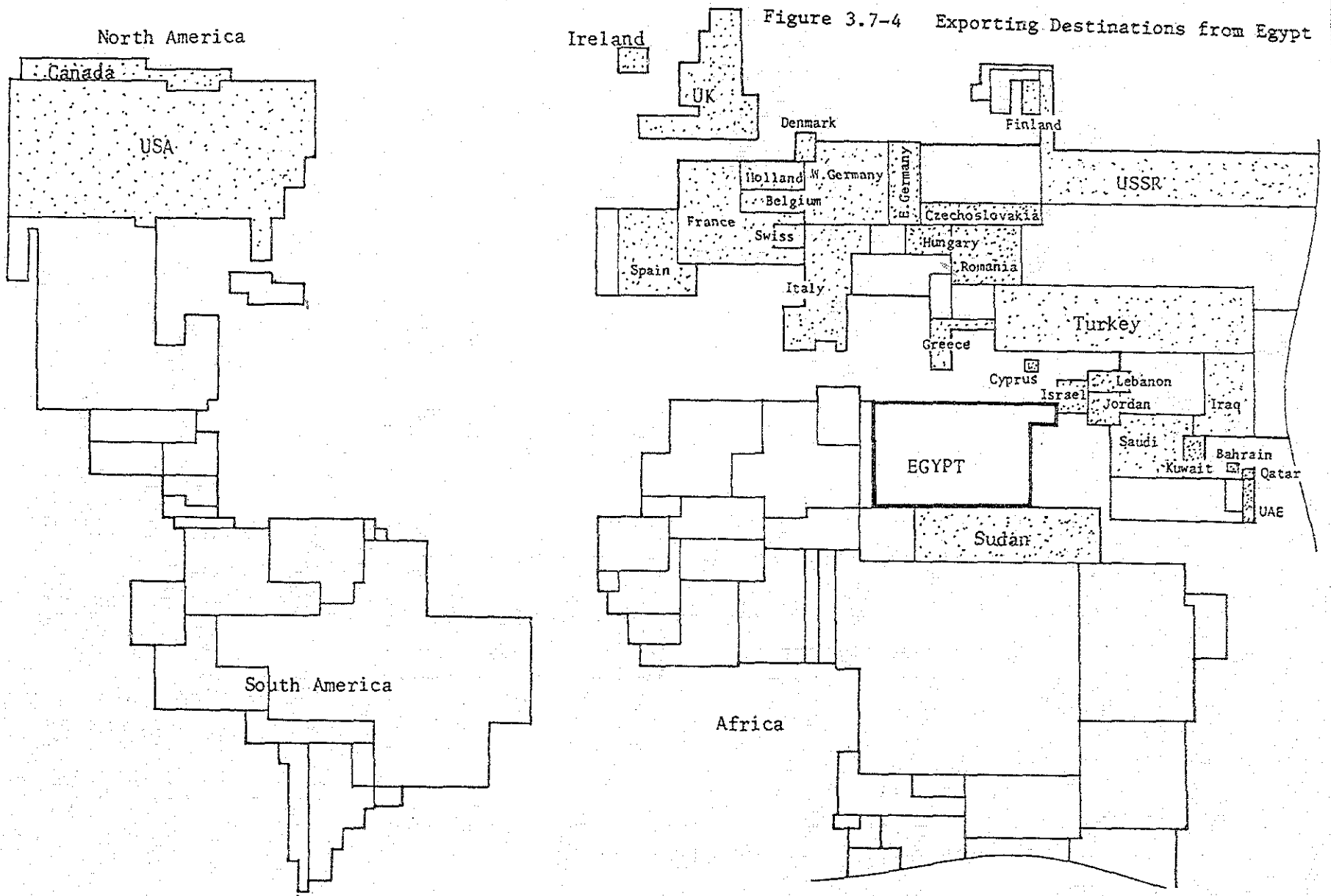


Figure 3.7-4 Exporting Destinations from Egypt



Note. For volume and commodities, refer to Table 3.7-5.

Table 3.7-5 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	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	Quatar	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	2,152	Quatar	46	199	Bahrein	37	179	UAE	33	145
	85	"	1,971	11,659	"	310	1,368	UAE	104	444	Quatar	68	278	Bahrein	26	125
	86	"	3,021	13,937	"	433	1,932	Quatar	114	429	Bahrein	113	469	Lebanon	34	158
	87	"	5,707	17,957	"	1,080	3,576	"	200	647	UAE	104	332	Bahrein	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
	86															
	87	UK	22,208	64,336	Saudi	8,014	33,783	Lebanon	3,155	13,753	Kuwait	1,123	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	413	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	93	231	Saudi	86	229	UAE	27	71	Lebanon	12	34	Quatar	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	Quatar	10	21	UK	5	10
Fresh Cucumber	1984	Kuwait	24	101	Bahrein	15	68	Saudi	13	68	UAE	11	51	Quatar	10	45
	85	Bahrein	7	33	Kuwait	7	26	"	7	28	"	3	16	UK	2	11
	86	Saudi	10	17	UK	5	18	Bahrein	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	15	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	8	"	2	5

-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	Country	V	Q
Fresh Eggplant	1984	Saudi	40	157	Kuwait	19	70	UAE	4	12	Bahrein	3	16	Quatar	3	14
	85	"	34	138	"	19	71	"	4	19	Quatar	3	14	FSS	2	7
	86	"	41	116	"	29	85	"	11	30	"	9	28	Bahrein	4	13
	87	"	24	52	"	17	35	Quatar	5	10	UAE	5	11	Lebanon	3	9
Fresh Okra	1984	Kuwait	29	80	UAE	7	6	Saudi	5	15	Quatar	5	10	FSS	1	2
	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	Bahrein	3	9	FSS	3	4
	85	"	109	467	"	11	40	Spain	11	16						
	86	"	146	359	Kuwait	5	16	UK	3	8	Swiss	2	8			
	87	Kuwait	30	49	Saudi	28	45	USA	13	12	W.Germany	8	15			
Dried Onion	1984	UK	3,576	3,318	W.Germany	793	767	Holland	633	591	Cyprus	181	168	Lebanon	139	115
	85	"	2,826	2,998	"	915	974	"	375	426	Cuba	236	247	Belguim	176	205
	86	"	2,379	2,271	"	1,487	1,411	"	666	825	Belguim	190	214	Japan	98	104
	87	W.Germany	3,697	1,620	UK	2,805	1,257	"	1,644	764	USSR	793	850	Belguim	318	206
Dried Garlic	1984	UK	36	34	Belguim	15	14	Holland	3	2	Swiss	3	3			
	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			
Fresh Garlic	1984	USSR	1,350	3,000	Saudi	464	1,069	Lebanon	111	278	Sudan	106	254	Kuwait	90	215
	85	Saudi	297	772	Kuwait	73	187	Italy	67	180	"	58	140	Lebanon	4	119
	86	"	253	452	Italy	119	218	Lebanon	79	145	Kuwait	77	150	France	76	106
	87	"	519	707	Lebanon	252	323	France	191	347	Italy	162	238	Greece	124	104
Dried Okra	1984															
	85	Swiss	8	8												
	86															
	87	Kuwait	8	5	Saudi	2	1									
Dried Haricot	1984	Lebanon	21	50	FSS	1	1	Joodan	-	1						
	85	FSS	1	1												
	86	Jordan	118	119	France	61	45	Saudi	17	18	Sudan	15	16			
	87	Saudi	500	383	"	274	200	Turkey	233	270	UAE	62	47	Jordan	19	20
Guava	1984	Saudi	404	1,255	Kuwait	120	387	UAE	33	105	Quatar	25	77	Lebanon	11	26
	85	"	448	1,440	"	82	343	"	44	161	"	16	53			
	86	"	580	1,309	"	328	684	"	133	390	"	73	127	UK	27	53
	87	"	550	1,117	"	192	370	"	66	155	"	36	70	"	27	46
Orange	1984	USSR	32,898	102,627	Saudi	10,919	34,063	Czecho.	5,997	12,694	W.Germany	1,353	3,260	UK	755	3,466
	85	"	34,200	95,043	"	12,073	37,644	E.Germany	8,987	16,341	Czecho.	2,709	11,439	W.Germany	772	2,760
	86	"	15,684	23,396	"	11,031	38,399	Czecho.	2,833	9,215	Rumania	617	2,103	Sudan	379	890
	87	"	76,536	66,496	"	17,680	27,975	"	6,659	9,082	Canada	859	909	Belguim	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	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															
	85	Kuwait	0.06	0.05												
	86	"	1.10	1.70	Quatar	0.30	0.50									
	87	Saudi	0.50	0.60												
Fresh Apple	1984															
	85	UAE	0.06	0.02												
	86	Kuwait	0.20	0.08												
	87															
Pomegra-nate	1984	Saudi	210	583	Kuwait	78	209	Quatar	30	92	UAE	21	60	Sudan	9	25
	85	"	191	680	"	41	140	"	16	47	"	15	51			
	86	"	256	671	"	112	240	"	31	66	UK	19	44	France	17	31
	87	"	383	784	"	76	129	UK	27	40	Quatar	14	23	Lebanon	11	20
Water Melon	1984	Saudi	3,775	13,830	Kuwait	1,089	4,307	Lebanon	878	2,801	Quatar	176	780	UAE	115	421
	85	"	3,207	13,056	"	1,019	3,350	Quatar	208	783	Bahrein	52	186	"	52	196
	86	"	4,698	13,311	"	1,911	5,103	Swiss	420	381	Quatar	297	803	Lebanon	145	366
	87	"	4,192	8,138	"	1,288	2,453	Quatar	286	543	France	106	136	Freece	97	151
Hushed Rice	1984	E.Germany	3,147	15,970	Jordan	2,461	9,823	Czecho.	1,736	7,000	Sudan	1,252	6,400	Saudi	840	2,100
	85	Czecho.	1,857	7,200	Saudi	588	2,500	E.Germany	464	2,000	UAE	233	677	Jordan	206	786
	86	Sudan	5,471	15,979	Czecho.	2,796	12,015	Jordan	1,845	7,563	Saudi	428	1,650	E.Germany	295	1,400
	87	Italy	12,277	46,131	Jordan	4,929	19,284	Czecho.	4,462	16,275	Iraq	1,998	4,200	Turkey	1,392	4,991
Groundnut in shell	1984	Italy	606	992	Holland	434	1,146	France	393	429	Saudi	318	512	Spain	105	157
	85	Saudi	386	725	Jordan	311	578	Hungary	79	135	Italy	41	84			
	86	Holland	1,232	2,527	Italy	218	313	Saudi	214	294	Hungary	81	155			
	87	Yugoslavia	353	226	Saudi	282	227	Italy	74	83	Hungary	73	10	Lebanon	54	47
Dates	1984	Lebanon	167	421	Saudi	28	82	Kuwait	27	75	UAE	12	38	Quatar	7	17
	85	"	67	94	"	42	151	"	41	158	"	11	34	"	8	24
	86	Saudi	109	144	Kuwait	92	202	UAE	68	108	Lebanon	57	151	UK	49	106
	87	USSR	943	699	Saudi	86	207	Kuwait	84	146	Finland	56	102	"	45	58
Fresh Strawberry	1984	Saudi	63	46	Kuwait	9	7	Quatar	6	4	France	2	2	FSS	2	1
	85	"	13	21	Quatar	6	9	Kuwait	3	4	UAE	3	5	UK	1	2
	86	"	47	90	"	7	10	UAE	2	2	France	1	2	Kuwait	1	2
	87	Quatar	5	7	Saudi	3	4	Holland	3	2	UAE	2	2	"	2	2

Source: Foreign Trade Computer Center, CAPMAS

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

Table 3.7-6 Projection of Annual Consumption of Products

(Unit: tons/year)

Crop	Products (1,000 ton)	Consumption Within the Area	Consumption Other Governorates	Exports Abroad
Fodder crop	935.2	935.2	0	0
Oilcake	10.8	10.8	0	0
Vegetable Oil	5.5	0.5	5	0
Rice	1.2	1.2	0	0
Wheat	0.6	0.6	0	0
Maize, Groundnut	0.7	0.7	0	0
Vegetables	46.4	7.0	31.6	7.8
Orchard Fruits	45.0	1.7	35.9	7.4
Sheep/Goat Meat	4.6	0.7	3.9	0
Cattle Meat	1.4	0	1.4	0

Table 3.7-7 Estimation of Annual Marketing Quantities of Main Products

(Unit: tons/year)

Produce	CP-1	CP-2	CP-3	CP-4	CP-5	Total
Processing/Marketing						
Packed Sheep/Goal Meat	3,100	-	-	-	-	3,100
Beef Meat	-	130	270	1,070	-	1,470
Packed Sunflower Oil	700	-	220	360	-	1,280
Safflower Oil	270	-	40	-	-	310
Flax Oil	380	-	40	-	-	420
Olive Oil	2,820	-	-	-	-	2,820
Marketing Only						
Packed Orchard Fruits	-	-	7,730	-	20,520	28,250
Tomato	13,160	1,620	1,290	-	-	16,070
French Bean	-	1,150	-	-	-	1,150
Squash	-	1,840	1,290	-	-	3,130
Cucumber	2,350	-	-	-	-	2,350

Note: Markeing = Production at stabilized stage - loss - consumption in the area.

3.8. New-Community Development Plan

3.8.1. Outline of Plan

The development plan for rural villages inclusive of the settlement plan was formulated based on the field survey to cope with the land reclamation plan and the agro-industry development plan. In formulating the new community development plan, the study was focused on the followings;

Distribution of villages
Housing and its layout in villages
Social infrastructure
- Trunk and village roads
- Water supply
- Sewage and refuse treatment
- Electricity supply
- Telecommunications

The villages will be arranged in a hierachy consisting of the following three categories.

Central village: As a central function of the F/S Area, this shall be mainly filled with public facilities, rural industries, marketing and commercial facilities.

Service village: As a mixed function with central village and settlement village, medium-sized facilities shall be arranged.

Settlement village: As the smallest unit of the village consisting of the settled farmers, the basic public utilities for the farmers' daily lives shall be provided.

The farmers shall settle only in the settlement village, and the central village and service village shall provide ample social infrastructure and service facilities for the repair and improvement of existing villages.

For investors, the necessary infrastructure such as water and electricity supply shall be arranged in the investors' complex. In cases where there are existing villages, the settlement villages shall be newly developed next to the existing villages without disturbing the existing villages.

The typical pattern of a new village is described in Figure 3.8-1. The numbers of villages are; one central village, three service villages, and twelve settlement villages.

3.8.2. Construction of New Villages

1) Distribution of Villages

The basic concepts for the distribution of villages are;

- Villages shall be located more than 100 m away from the existing roads, considering safety for farmers, environmental protection against noise, dust, etc., and maintenance of the function of the main roads.
- The maximum distance between the farmers' houses and their farmlands shall be 2.5-3.0 km in order to enhance the efficiency of agricultural work.

The scale of the settlement villages is shown below, divided into 3 types in accordance with their geographical features and forms.

Size	Total number of households	No. of farmers	No. of non-farmers	No. of villages	Notes
Small-sized	300	255	45	2	Graduate
Medium-sized	500	425	75	1	Smallholders
Large-sized	750	640	110	9	Smallholders

Remarks: The number of non-farmers engaged in public services is estimated as approximately 15% of the total number.

The locations of the settlement villages are shown in Figure 3.8-2.

2) Housing Plan

The housing types are divided into 5 types; 2 types according to farming scale in the case of farmers, 3 types according to social class and economy in the case of non-farmers.

Farmers' houses

Small house: For 5 feddan tenure (Smallholder)

Large house: For 10 feddan tenure (Graduate)

Non-farmers' houses

Managers' house : For office managers/directors, doctors, and schoolmasters

Technicians' house: For office workers, skilled workers, teachers, and medical staff

Labourers' house : For unskilled workers, ordinary labourers, shop/storekeepers, and drivers

The basic concepts for the housing plan are as follows.

- The houses shall be single-story, and roofed.
- The basic structure of the houses shall be in a combination of "reinforced concrete column" and "concrete block or brick wall".

- The farmers' houses shall be equipped with basic cores, and be provided with the spaces to be expanded in future. And the breeding spaces for the self-consuming livestocks such as chickens and ducks shall be also secured.

- The non-farmers' houses shall vary in scale of living space and garage space in accordance with their social positions and classes, and be also provided with the spaces to be expanded in future just same as the farmers' houses.

Figure 3.8-3 shows a typical design of housing.

3) Village Plan

In the villages, the public and social facilities are to be arranged in order to enhance the functions of the whole villages.

- The windbreaks of 15 - 17 m wide are to be provided around the villages in order to prevent strong wind from carrying sand dust into the villages, thereby reserving the living environment good.

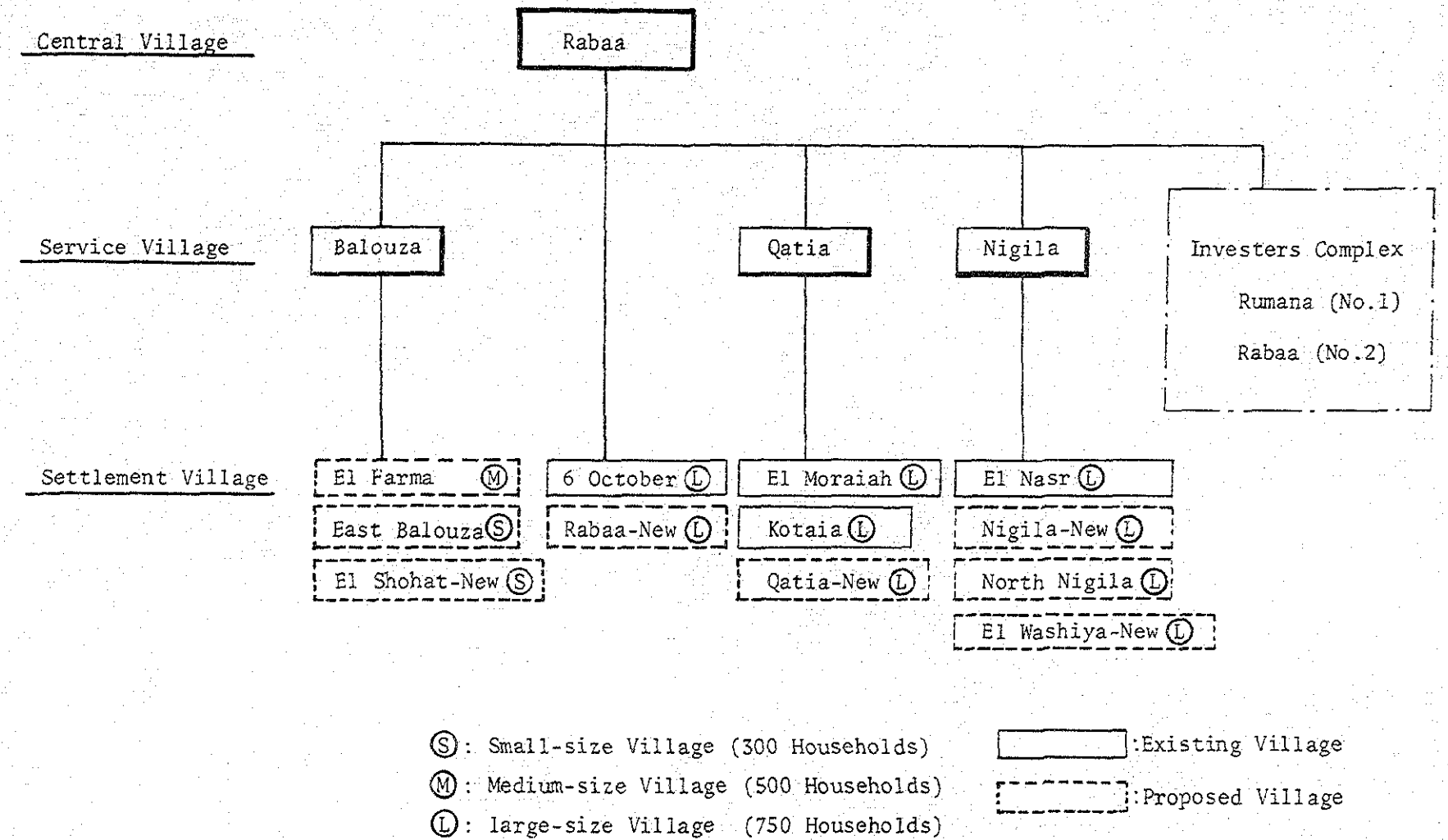
- The mosques, public offices, community centers, cooperative/association offices, health units, markets/shops, etc. are to be arranged in the center of the villages.

- The sewage treatment plants and cemeteries shall be arranged outside the villages.

- In order to enhance the living environment and make spare time utilized effectively, the parks, open spaces, and soccer grounds shall be widely arranged.

Figure 3.8-4 shows a typical layout of a settlement village.

Figure 3.8-1 Type of New Community



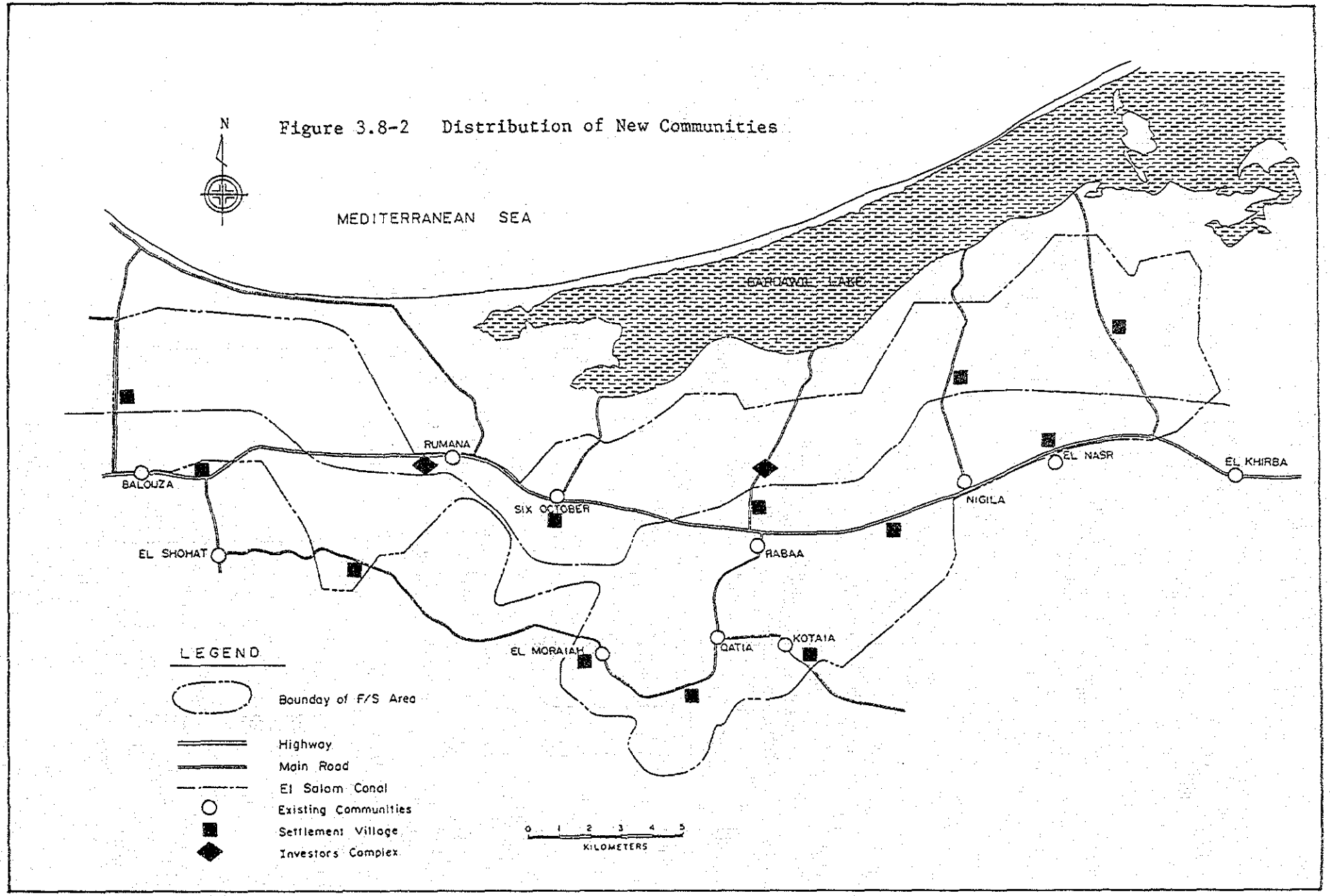
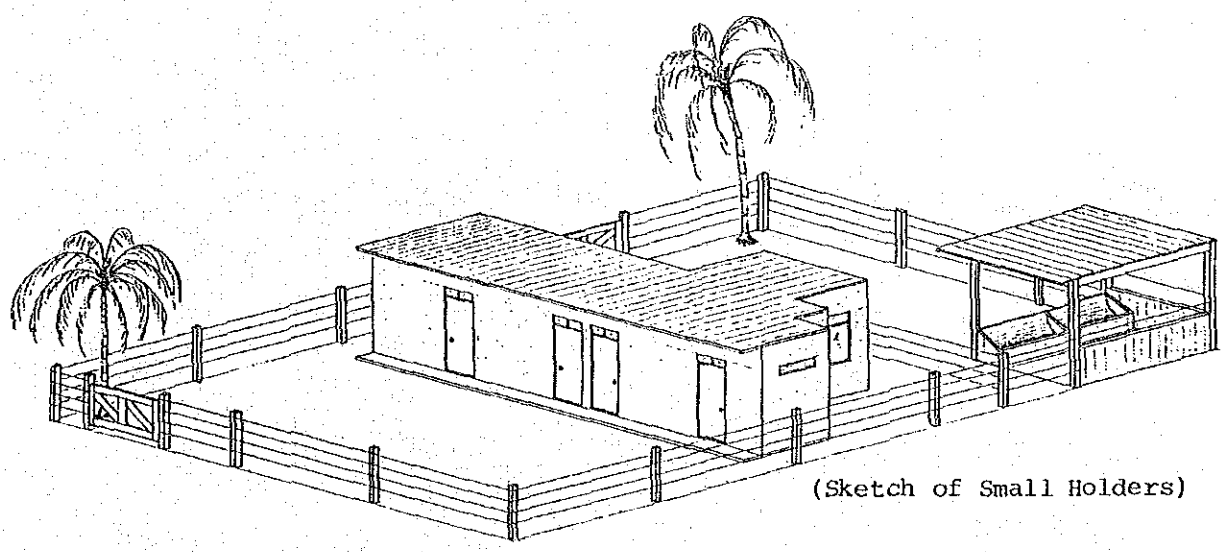


Figure 3.8-2 Distribution of New Communities

Figure 3.8-3 Typical Design of Housing (I)

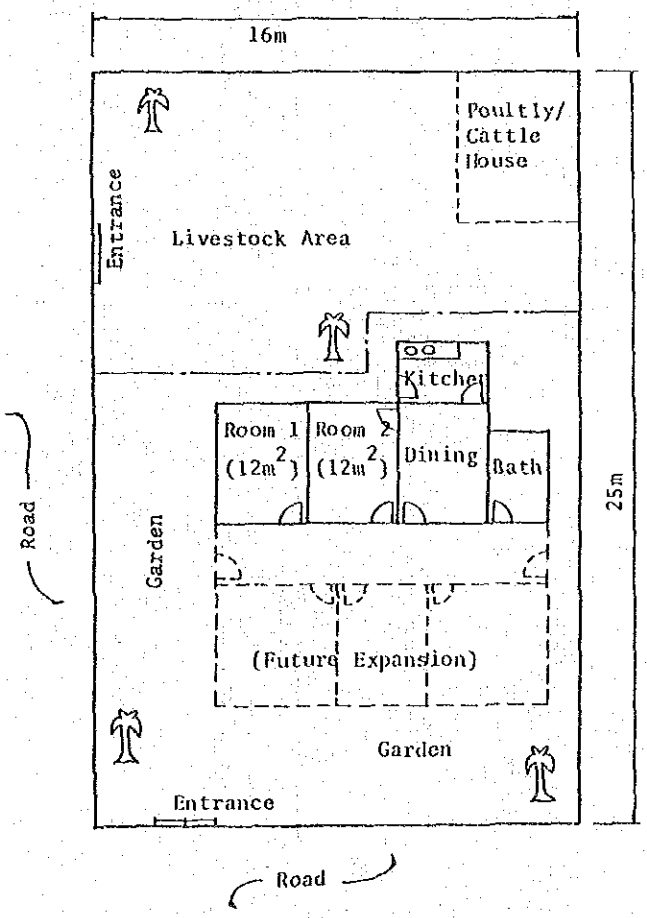


(Sketch of Small Holders)

(Large Farmers House)

Lot Area: $400m^2$

Bldg. Area: $48m^2$



(Small Holders House)

Lot Area: $260m^2$

Bldg. Area: $38m^2$

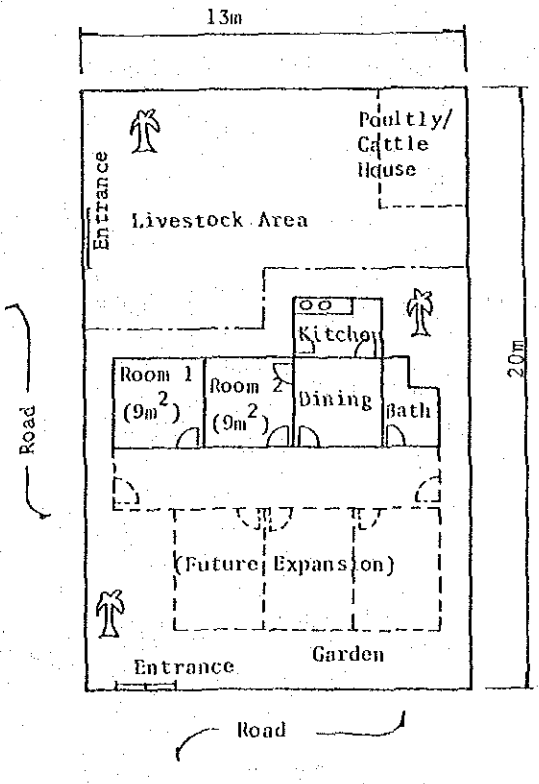


Figure 3.8-3 Typical Design of Housing (II)

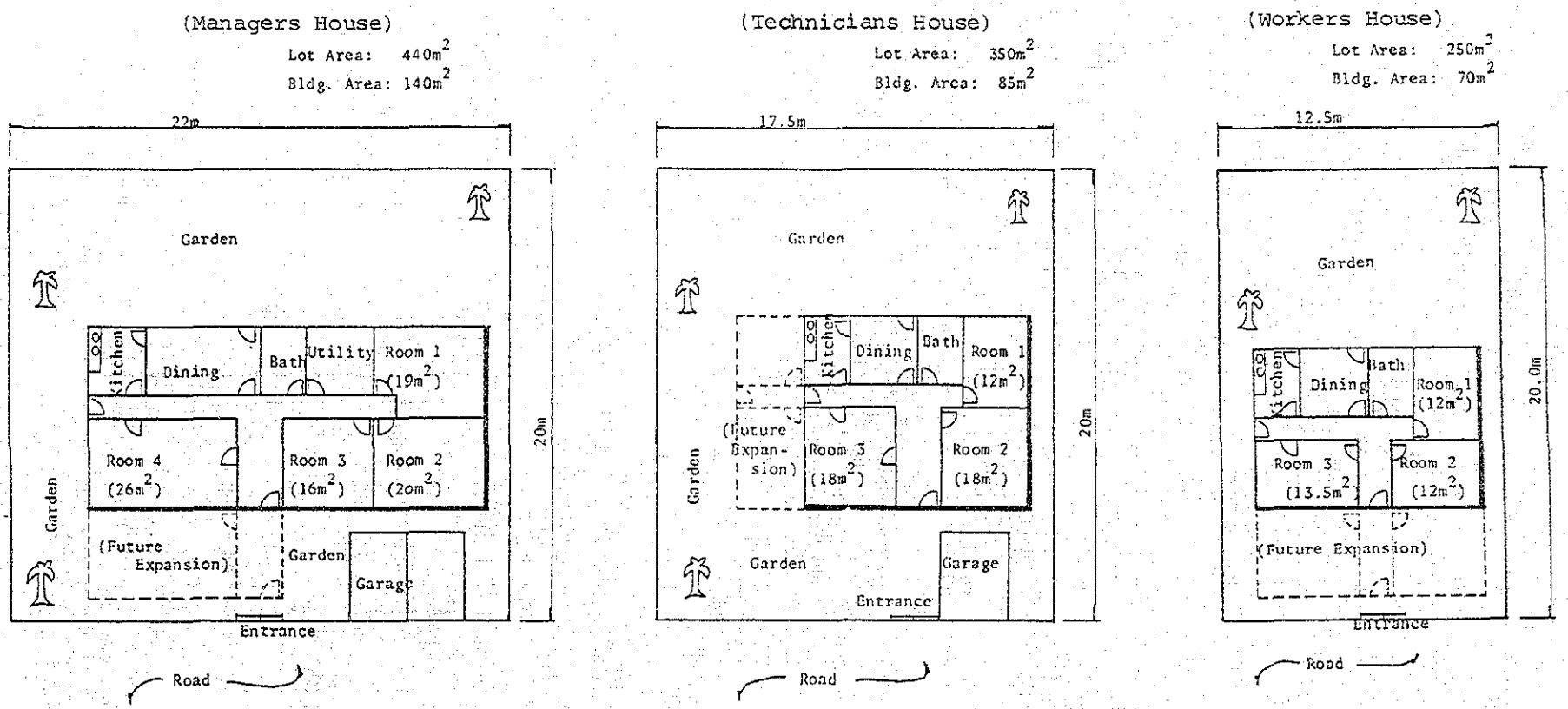
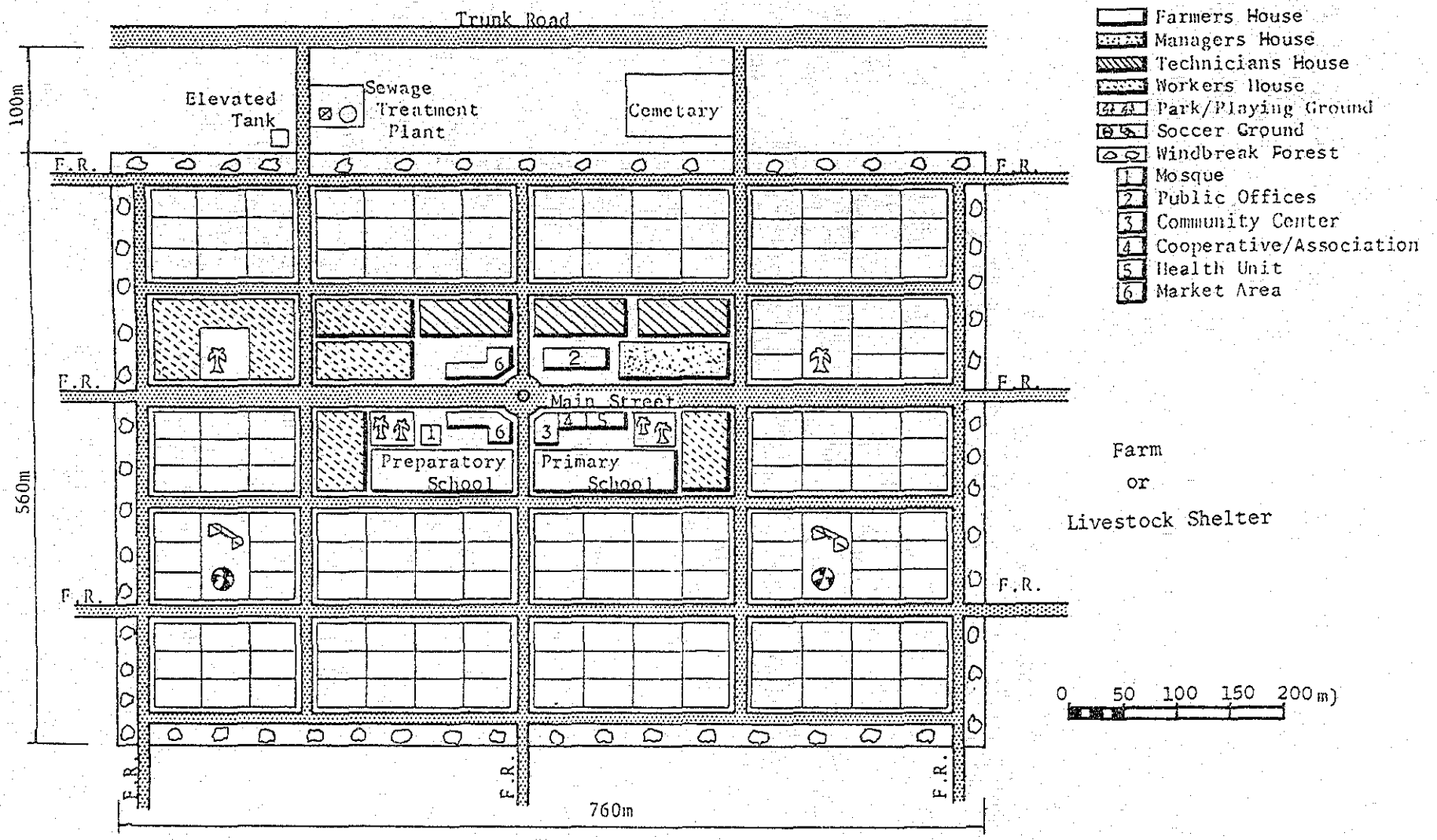
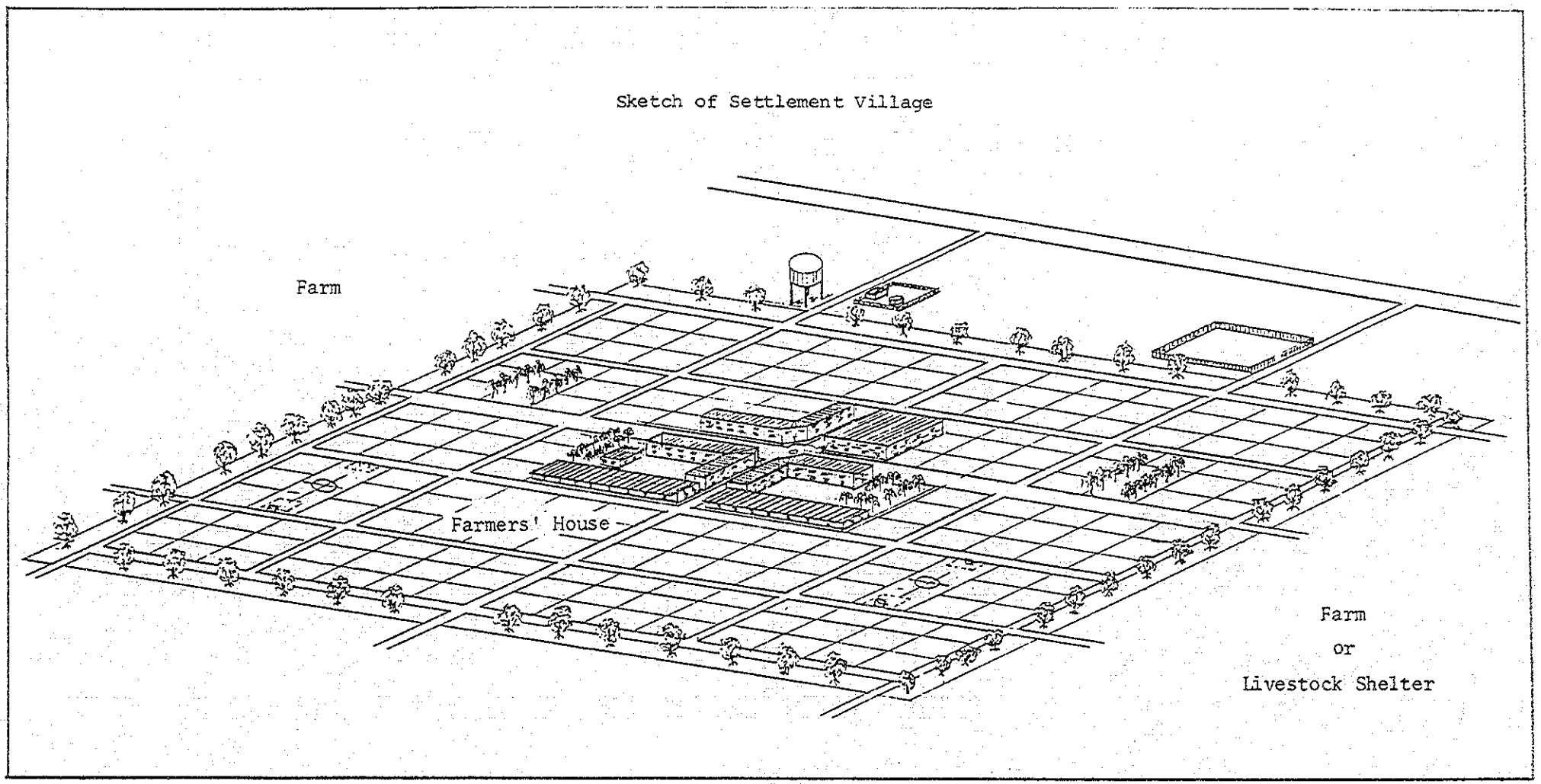


Figure 3.8-4 Typical Layout of Settlement Village

(Large-size Village)
750 Households




Sketch of Settlement Village
Farm
Farmers' House
Farm
or
Livestock Shelter

3.8.3. Social Infrastructure

1) Village Roads

Village roads are divided into the following 3 types:

Main street

- being a main internal through way in the center of the village.
- having a function of access road for all vehicles and inhabitants
- the roadway shall be asphalt paved, with wide sidewalk. A central island with greenery shall separate a respective direction of traffic. Sidewalks shall be bordered with greenery to improve the pedestrians' environment.

Main road

- being the main access roads to the village.
- having the function of a connecting road between villages and between a feeder roads/ farm roads and trunk roads.
- having 2 asphalt lanes per direction, and a sidewalk with greenery.

Local road

- providing access to and within the residential area for smallholders and workers' house.
- having gravel pavement in order to protect the residential area from soot and dust, in consideration of a scarce traffic in a residential area which shall be improved to the asphalt pavement with a 5 cm thickness in future.

Figure 3.8-5 shows a typical illustration of each road type. The operation and maintenance of roads shall be performed by the local government.

2) Potable Water Supply

The dimensions of the potable water supply system are planned as follows:

(1) Since the central and service villages have already been equipped with the water supply systems, the potable water supply systems are projected only for the settlement villages and investors' complexes.

(2) Water demands are forecasted thus;
- For settled farmers, 150 lit/capita/day
- For cattle (cows), 100 lit/head/day
- For goats and sheeps, 10 lit/head/day
- For commercial and public use, 800 lit/1,000 sq.m/day
- For slaughterhouses/cut meat plant, oil extraction plant (including washing fruits and vegetables), 30 cu.m/day

Remarks:
25 percent of the losses and 25 percent of the future expansion are on counted for.

(3) Water resources

Since groundwater is not available, the water will be supplied through a new pipeline (ϕ1,100 mm) planned between El Qantara and El Arish. This pipeline stems from the River Nile, and the treatment plant (ϕ1,100 mm, capacity 45,000 cu.m/day) has already been constructed by SDA.

(4) Service level

Distribute via the pipeline to each individual house. There will also be fire hydrants to be provided along the village roads.

(5) Facilities

- The diameter of the pipeline is designed taking into account the condition that the maximum demand at peak hours is 125 percent of the average demand (in case of an 18-hour supply per day).

- The villages shall be equipped with elevated tanks for the purpose of securing water pressure at the fire hydrants and the pipelines, securing water in cases of emergency, and assuring safety of the facilities. The capacity of the elevated tank is fixed at 50 percent of the total daily demand.

- The transmission pipeline running from the main pipeline (ϕ1,100 mm) to each settlement village shall be made of steel, and its diameter shall be ϕ200 - ϕ400 mm.

- The distribution pipeline in each village shall also be made of steel, and its diameter shall be ϕ150 - ϕ75 mm.

- Total water demand in the F/S Area was estimated as 23,812 cu.m.

Figure 3.8-6 shows the illustration of the arrangement of the transmission pipelines. Operation and maintenance of the facilities shall be run on the water charges from the beneficiaries. This shall be mainly managed by the water supply and drainage management department of the local government.

3) Sewage and Refuse

(1) Sewage Network System

- Since there are sewage network systems in the existing villages except Qatia, a sewerage network system is planned in Qatia.

- The sewage network systems for the settlement villages are planned based on the estimated treatment demand of the projected number of settlement families.

- The potable sewage discharge is forecasted at 80 percent of the water consumption for the domestic use, and as 100 percent of the water consumption for the commercial and public use.

- The residual sludge will be removed and utilized for fertilizers and compost.

The flowchart of the sewage treatment system is shown in Figure 3.8-7.

(2) Sewage pipeline

- The minimum diameter of the sewage pipeline is ϕ200 mm, and the gravity flow system shall be adopted.
- The minimum velocity of flow is estimated as 0.6 m/second, and the depth of the flow is estimated as 50 percent of the caliber of the pipeline.

- The pipeline shall be made of polyvinyl, and the manholes shall be installed at intervals of 30 m.

- Considering the result of the hydrological calculations, the installation incline shall be i = 1/400 - 1/600.

- In order to avoid pollution of groundwater, integrated treatment plant shall be adopted, thereby making the sewage discharge from the domestic use flow into the treatment plant through the underground sewage pipe system.

- The treatment plant shall be of the oxidation pond method, which is simplest and most economical.

- The treated water shall be re-used as irrigation water for windbreak, street trees, and garden. The water will be carried by sprinkler trucks, or spread by hoses.

(3) Refuse

Basic treatment concepts are:

- In Rabaa, one of the central villages located at the edge of the south-east, the refuse treatment plant shall be installed, which is expected to treat all the solid waste disposals collected from all the villages in the F/S Area.

- Inflammable refuses will be treated by small-scale incinerator, and noninflammable refuse will be treated in the reclaimed sites of the plant.

Amount of solid waste disposal

- The estimated amount of solid waste is;

  0.6 kg/capita/day from private households
  0.2 kg/employee/day from commercial/public offices

- The amount of noninflammable refuse is estimated as 20 percent of the total amount of refuses, and the noninflammable refuses will be disposed in the reclaimed parts of the plant.

- According to the calculation, a total of 35.3 tons of inflammable refuse and 8.8 tons of noninflammable refuse will be discharged from the villages per day.

- The operation and maintenance of the sewage treatment systems in the settlement villages and the refuse treatment system in the central village shall be managed by the water supply and drainage management department of the local government together with refuse collecting works.

4) Electricity

Electricity shall be provided for all households through connectors, and the existing electricity service shall be expanded.

- The electric power demand is estimated as follows:

  For households; 1.6 kw/each
  For commercial and public use including street lights;
  100 - 400 kw for the settlement village
  2,000 kw for the investors' complex.

- The electric power source will be newly installed near the Balouza pumping station of the El Salam Canal, which will distribute electricity to each village through a transformer substation.

Figure 3.8-8 shows the power supply transmission line in the Area.

5) Telephone Service

As for telecommunication facilities among the settlement villages, the installation of a telephone circuit is important; particularly essential is the telephone service network connecting the basic facilities such as pumping stations, public facilities, and government and municipal offices. Since there are existing and under-construction telephone circuits in the central and service villages, the additional telephone network system shall be planned in the settlement villages and investors' complex.

The telecommunications system is to be sophisticated employing the telephone cable network system, widely used elsewhere. The number of service lines available is as follows:

25 lines for small-sized settlement villages
30 lines for medium-sized settlement villages
40 lines for large-sized settlement villages
30 lines for investors' complexes

Remarks: The above-mentioned number of lines will be allocated for private use (mainly for managers' households), for public telephone service installed in the telephone station at the center of the village, and for commercial public use (mainly for community service, offices, and etc.)

Consequently, 545 lines are required newly to cover the F/S Area.

6) Public Service Facilities

(1) Settlement village

- Various kinds of public service facilities essentially for the daily life and agro-livestock industries are required in order to maintain and develop the new communities.

- The main facilities to be provided are primary schools, preparatory schools, health units, public offices (police station, post office, telephone office, fire station, etc.), community centers, cooperation/association, mosques, cemeteries, etc.

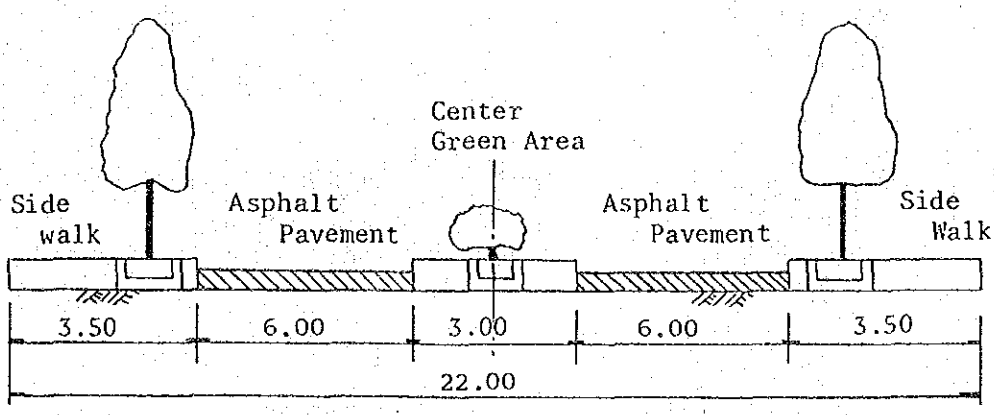
Table 3.8-1 shows the necessary public and social facilities for settlement, service and central villages.

(2) Service/Central villages

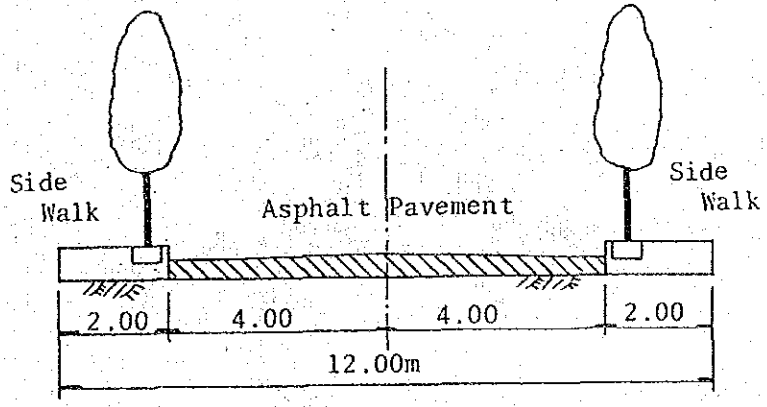
- Since the service and central villages will be in the existing villages, the public service facilities in these villages will be developed with the improvement, restoration, extension, and new installation depending upon the condition of existing facilities.

Numbers of the public and social facilities to be improved or constructed are shown in Table 3.8-2.

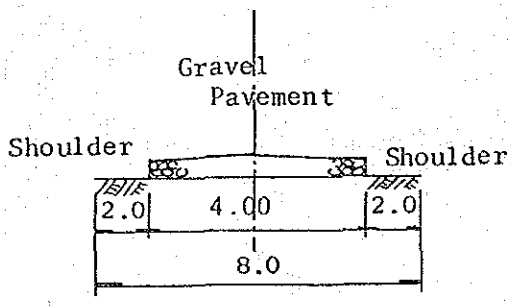
Figure 3.8-5 Standard Village Road



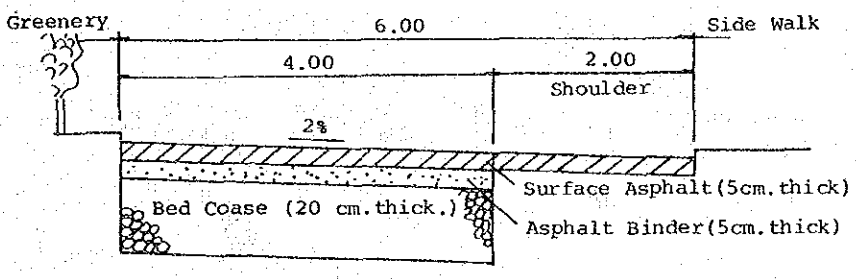
(Main Street)



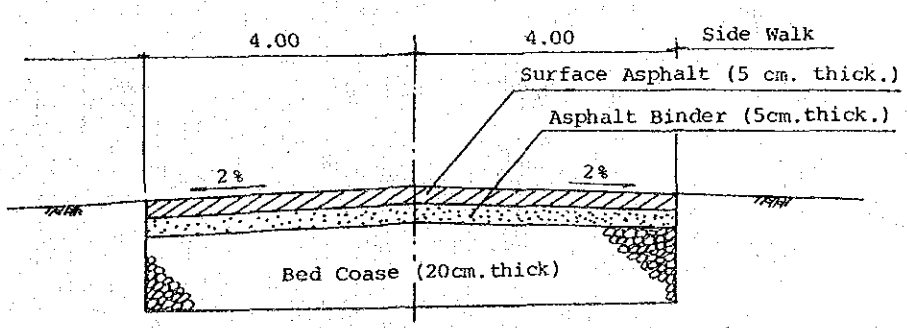
(Main Road)



(Local Road)



(Cross Section of Main Street Pavement)



(Cross Section of Main Road Pavement)

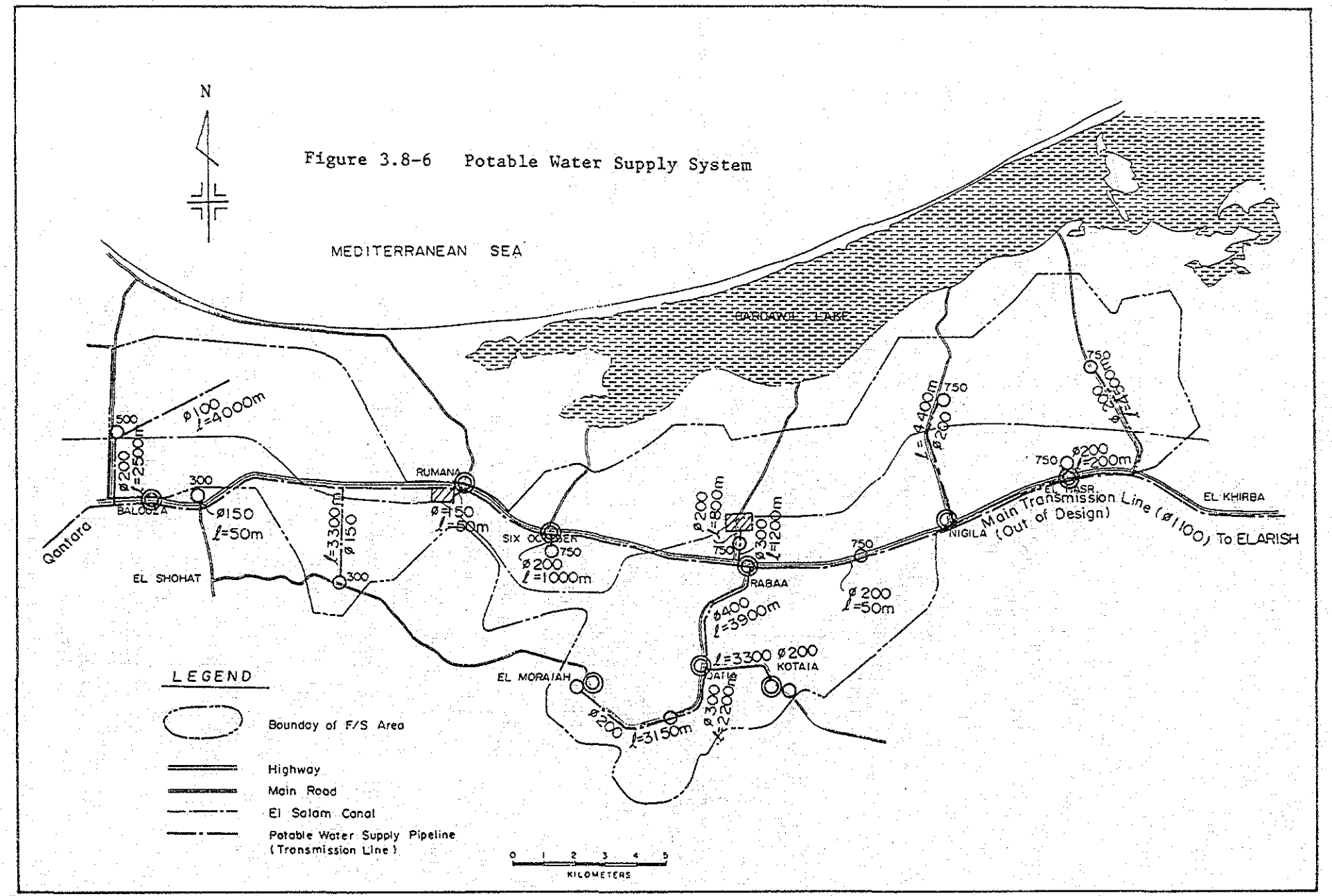
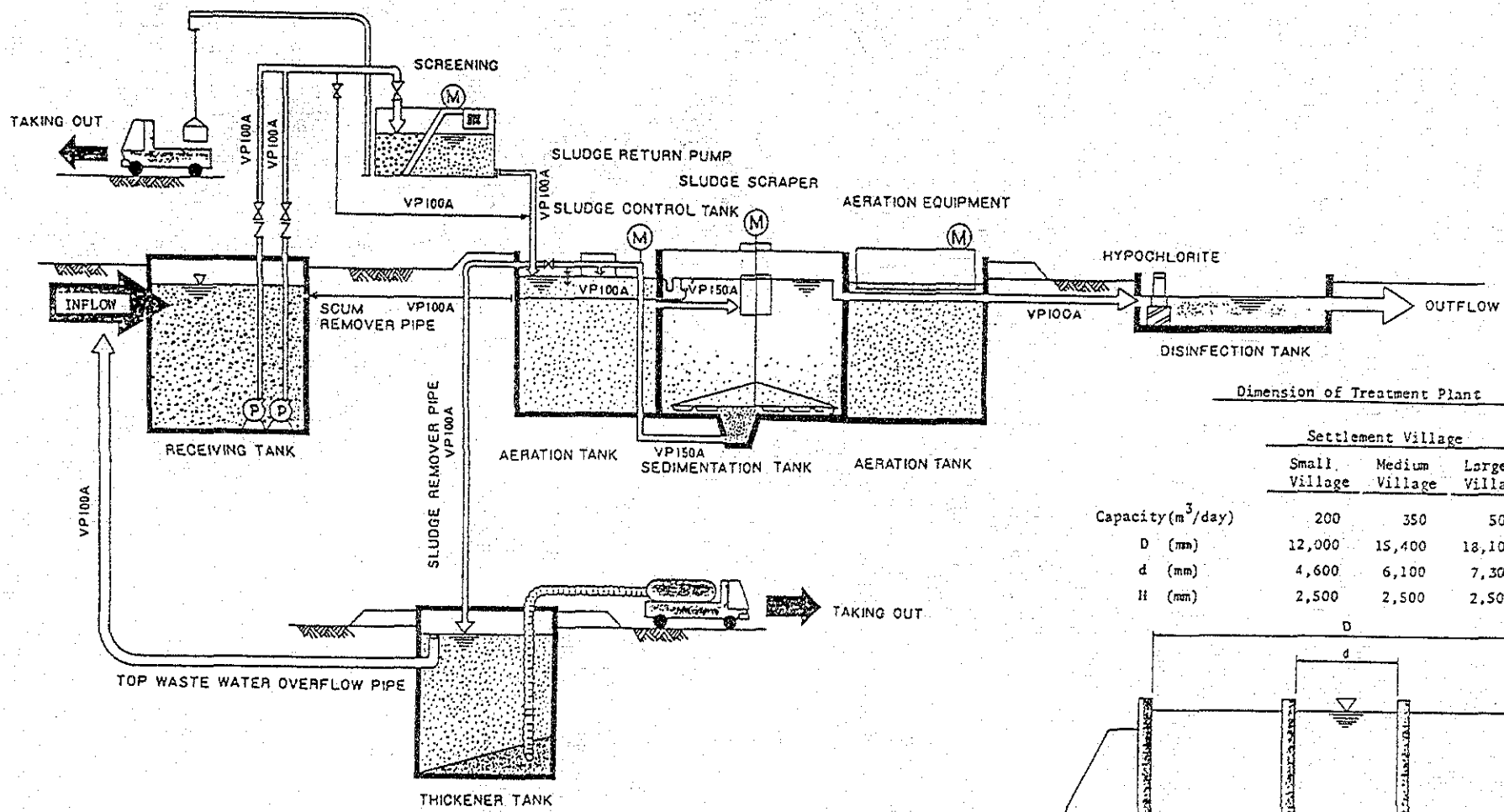


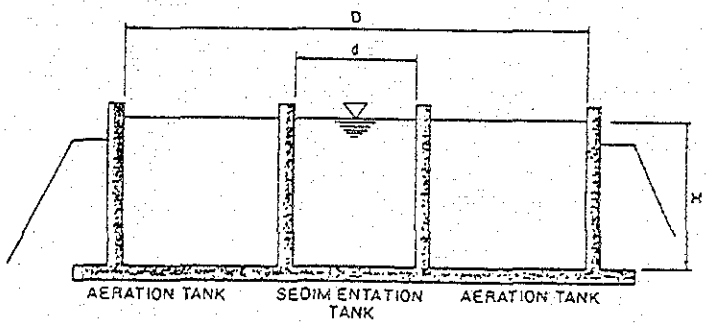
Figure 3.8-6 Potable Water Supply System

Figure 3.8-7 Flow Chart of Sewage Treatment Plant



Dimension of Treatment Plant

	Settlement Village			Service Village
	Small Village	Medium Village	Large Village	(Qatia)
Capacity (m^3/day)	200	350	500	740
D (mm)	12,000	15,400	18,100	18,100
d (mm)	4,600	6,100	7,300	8,000
H (mm)	2,500	2,500	2,500	3,000



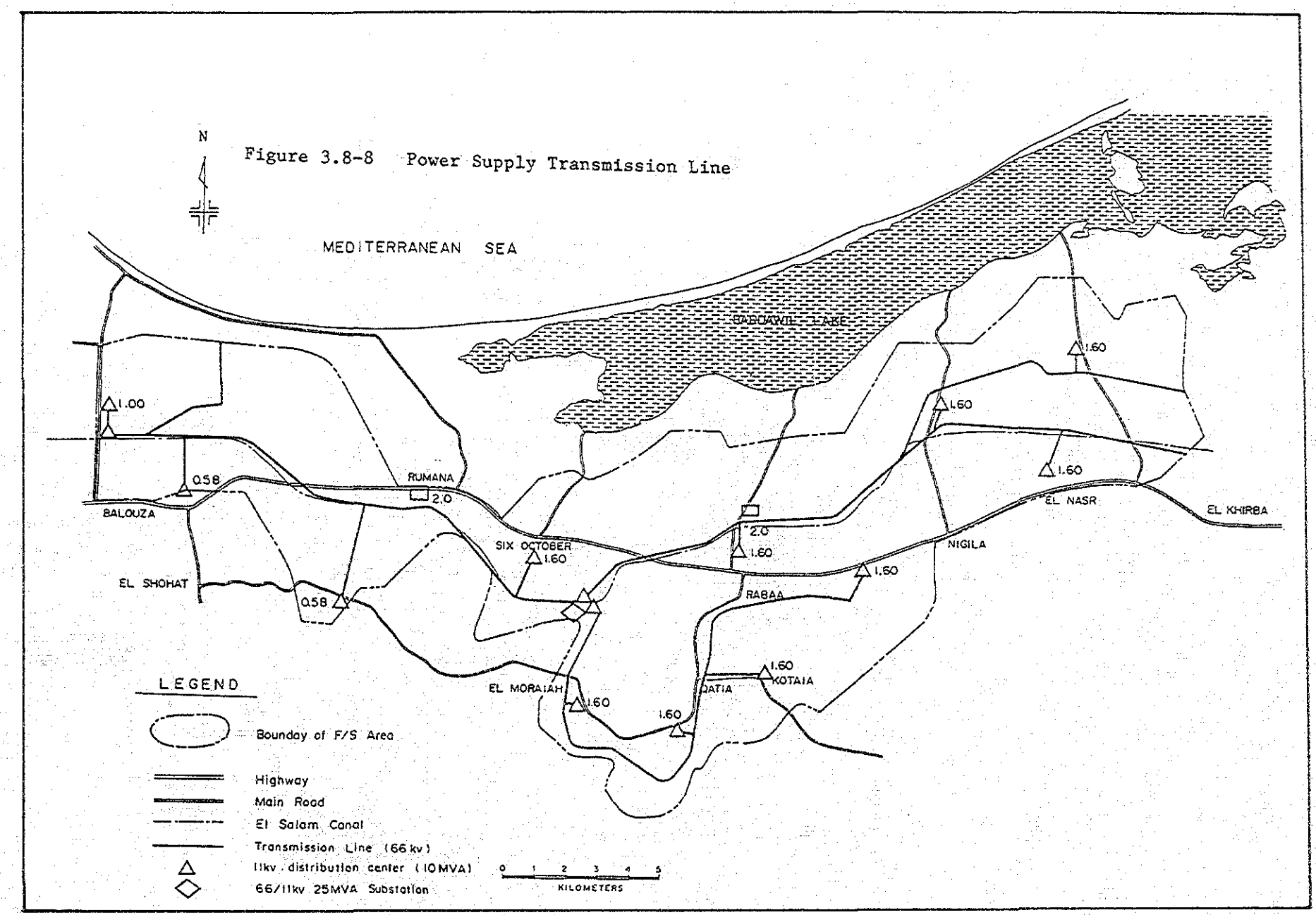


Figure 3.8-8 Power Supply Transmission Line

Table 3.8-1 Public and Social Facilities of Settlement, Service and Central Villages

Name of Facilities	Small Village No. of Bldgs.	Medium Village No. of Bldgs.	Large Village No. of Bldgs.
Primary School	1	1	1
Preparatory School	-	1	1
Health Unit	-	-	1
Police Station	-	-	1
Post Office	1	1	1
Telephone Office	1	1	1
Fire Station	-	-	1
Community Center	1	1	1
Coop./Association Unit	1	1	1
Shops/Stores	2	4	4
Mosque	1	1	1
Cemetary	*	*	*
Sewage Treatment Plant	1	1	1

(* without building)

Name of Facilities	Service Village No. of Bldgs	Central Village No. of Bldgs.
Primary School	2	3
Preparatory School	2	3
Secondary School	-	2
Vocational School	-	1
Rural Health Unit	1	1
Hospital	-	1
Police Station	1	1
Post Office	1	1
Telephone Office	1	1
Fire Station	1	1
Village Council Bldg.	-	1
Youth Center	1	1
Community Center	1	1
Coop./Association Unit	1	1
Shops/Stores	6	10
Workshop	1	1
Mosque	1	1
Cemetary	*	*
Swage Treatment Plant	1	1
Refuse Treatment Plant	-	1
Bank	1	1
Social Sport Club	-	1
Cinema Theater	-	1

(* Without Building)

Table 3.8-2 Numbers of Public and Social Facilities to be Improved/ Constructed

Name of Facilities	Service Village						Central Village	
	Balouza		Qatia		Nigila		Rabaa	
	Improv.	New	Improv.	New	Improv.	New	Improv.	New
Primary School	-	1	-	-	-	1	-	-
Preparatory School	-	-	-	1	-	1	-	2
Secondary School	-	-	-	-	-	-	-	1
Vocational School	-	-	-	-	-	-	1	-
Hospital	-	-	-	-	-	-	-	1
Post Office	-	1	-	1	-	-	-	-
Fire Station	-	1	-	1	-	1	-	1
Village Council Bldg	1	-	1	-	1	-	1	-
Youth Center	-	-	-	-	-	-	-	1
Community Center	-	1	-	1	-	1	-	1
Cooperative/Association Unit	-	1	-	1	-	1	-	1
Workshop	-	1	-	1	-	1	-	1
Cemetary	1	-	1	-	1	-	1	-
Sewage Treatment Plant	-	-	-	1	-	-	-	-
Refuse Treatment Plant	-	-	-	-	-	-	-	1
Social Sport Club	-	-	-	-	-	-	1	-

(Note) Improv. : Improvement
New : Newly establishment

3.9. Agricultural Supporting Services Plan

3.9.1. Necessity of Strengthening Agricultural Supporting Services

F/S Area is situated at desert with particular land and climatic conditions, in which small scale agriculture using groundwater has been managed in 1,300 feddan. Present agriculture has some constraints to be improved in nursery, control and farming management etc.

Considering that the existing cultivated area is only 1,300 feddan which corresponds to 2.5 percent of total F/S Area, it may fairly be said that agricultural development in the F/S Area starts from completely zero. Further, many settlers will come to F/S Area from various regions and their farming experience and techniques will be also different. In order to make settlers success in agriculture in particular conditions of desert area and to achieve regional agricultural development in North Sinai, it is necessary to attach importance to so called "soft" aspect for efficient use of "hard" aspect which is composed of irrigation facilities and reclaimed land, etc. National target of increasing agricultural production and population redistribution will be accomplished by consolidating and strengthening both aspects of hard and soft in keeping well balance.

Components to be strengthened are as follows;

- Strengthening of existing agricultural cooperatives
- Establishment of water user's association
- Supporting for agricultural credit
- Supporting for agricultural technique aspects

3.9.2. Strengthening of Existing Agricultural Cooperatives

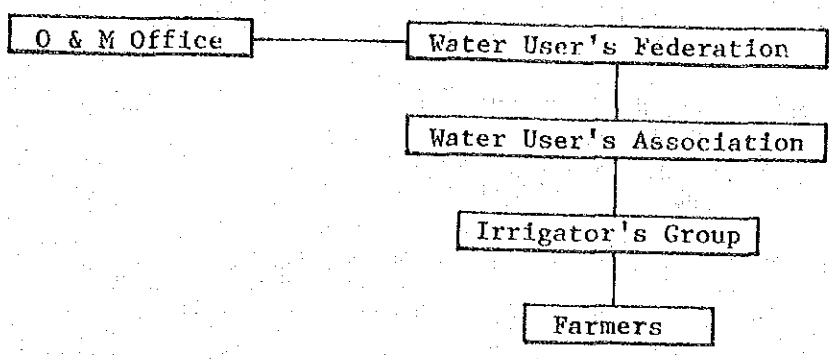
To be strengthened in accordance with expansion of agricultural production is marketing of agricultural products and inputs in group through the cooperatives, not by individual. Ordinarily negotiation or bargaining of products and inputs between dealers and farmers results in disadvantageous for farmers. Therefore bargaining in group should be done through the cooperatives for farmer's advantage. For the purpose, however, cooperative should have leadership for planned production, that is, quality and quantity, and standardizing by keeping connection with agricultural extension office. The cooperative office shall be established in the center of villages in accordance with new community development plan, therefore, daily connection between farmers and cooperatives will be available. Cooperative will also manage marketing center which will be established in the center of F/S Area.

3.9.3. Establishment of Water User's Association

As mentioned above planned production for bargaining in group through cooperatives should be realized, therefore irrigation water has to be distributed timely in accordance with growing stage of crops. For the purpose, farmers have to be organized to realize equitable and timely water distribution. Accordingly, establishment of water user's association is recommended for maintaining terminal irrigation facilities and water management in the irrigation blocks. Settlers are under an obligation to participate in water user's association and have to follow the articles which will be prepared to realize an equitable water distribution.

The water user's association is divided into some irrigator's group, on the other hand, water user's federation as an upper structure will also be organized to control regional water management.

Followings show the structure;



3.9.4. Supporting for Agricultural Credit

Executing agency for agricultural credit is PBDAC and 4,307 village banks (1988) are distributed as a terminal agency in the whole Egypt, however, no village bank in F/S Area. Short-term, medium-term, long-term and seasonal loans are available for individual farmers, cooperatives and companies (refer to Section 2.8.2).

As mentioned in the Section 5.4.2, managing condition of smallholders and graduates will be needy in initial one to four years. Investors who have capital power can manage their own households even in initial needy periods, however, such supporting services as agricultural credit with lower interest rate than six percent and supplying wheat flour at lower price for initial one to five years and also supplying a cattle and sheep/goat etc., specially for small holders including Bedouin and graduates, will be necessary.

Initial farming costs per settled farm are estimated as follows, as the expense for the first year of settlement, by the proposed cropping patterns.

CP-1	(5 feddan)	4,500 LE
CP-2	(5 ")	5,000 "
CP-3	(10 ")	9,000 "
CP-4	(80 ")	155,000 "
CP-5	(80 ")	120,000 "

3.9.5. Supporting for Agricultural Technique Aspects

It may fairly be said that earnest agricultural production in the F/S Area starts from zero. Furthermore, considering that farmers level in farming and particular land conditions of desert, important role of extension services for cropping techniques will renew understanding. The extension of cropping techniques shall be carried out by strengthening existing extension organization and by keeping linkage with the proposed Agricultural Development Center. Training and education for farmers and extension staff will take a long period, however, this kind of extension activities have to be continued persistently to enlighten them.

3.10. Agricultural Development Center Plan

3.10.1. Necessity of Establishing the Center

Present agriculture is managed in a limited area of about 1,300 feddan, in which tomatoes, melons, squash, etc. are watered by drip irrigation, while the remainder of the area is desert. In the near future, irrigated agriculture by sprinkler or drip irrigation method will be practised for vegetable, fruits, and fodder crops and livestock will be also raised. When the El Salam Canal is extended and settlers come to the Area, supporting services should be provided taking into consideration the limited water resource, particular land conditions (desert) and the settlers' knowledge of irrigated agriculture. These supporting services will play an important role in leading to successful integrated rural development.

3.10.2. Objectives of the Center

Present agriculture in the F/S Area can be characterized as extensive one. Damage caused by insects and virus, unsuitable nurseries and uneven quality and size of products are observed, resulting in low yield and low farm gate prices. Therefore, the settlers and agricultural extension workers should be trained concerning irrigation, pest control, farm management, etc., through demonstration and training programmes. For this purpose, the establishment of the Agricultural Development Center is proposed.

3.10.3. Proposed Site for the Center

Existing cultivated areas are observed mainly in Rabaa and Qatia villages in the F/S Area. Particularly in the former, cropping by drip irrigation has been practiced by the settled Bedouin for the last 10 years, therefore, Karama village near Rabaa is considered suitable as a site for the Center.

3.10.4. Time of Establishment

Since it is desired that training for the existing farmers and agricultural extension workers should be done before the El Salam Canal extension, the Center should be established in two stages. The first stage is prior to the extension of the Canal, and the second stage is immediately following the construction of the canal.

In the first stage, the extension activities would be carried out by using groundwater; and El Salam Canal water is used in the second stage.

3.10.5. Components of the Center's Activities

The Center will function as a core for the extension of irrigated agriculture in North Sinai region. The components are as follows:

- Research on suitable and promising crops for the Area
- Establishment of standardized farming techniques for the Area
- Demonstration of irrigated agriculture and farming techniques (model farm)
- Training for settlers and agricultural extension workers (farming techniques and farm management)
- Strengthening of farmers' organization (from individual to group)
- Establishment of feeding standards for livestock raising
- Animal health
- Agro-industries
- Research on sand dune fixation by forestation
- Others

3.10.6. Scale of the Center

Lot	:	50 feddan
Building	:	about 2,500 sq.m (office, laboratory, training room etc.)
Experimental farm	:	about 20 feddan (drip/sprinkler irrigation and crop test etc.)
Vehicles	:	Jeep, Pick-up, Truck, Motorcycle
Agricultural Machinery	:	Tractor (4 wheel, 2 wheel), Sprayer etc.
Wells	:	2 places

After construction of El Salam Canal, the experimental farm will be expanded. Figures 3.10-1 and 3.10-2 show the plan of Center.

Figure 3.10-1 Layout of Agricultural Development Center (1)

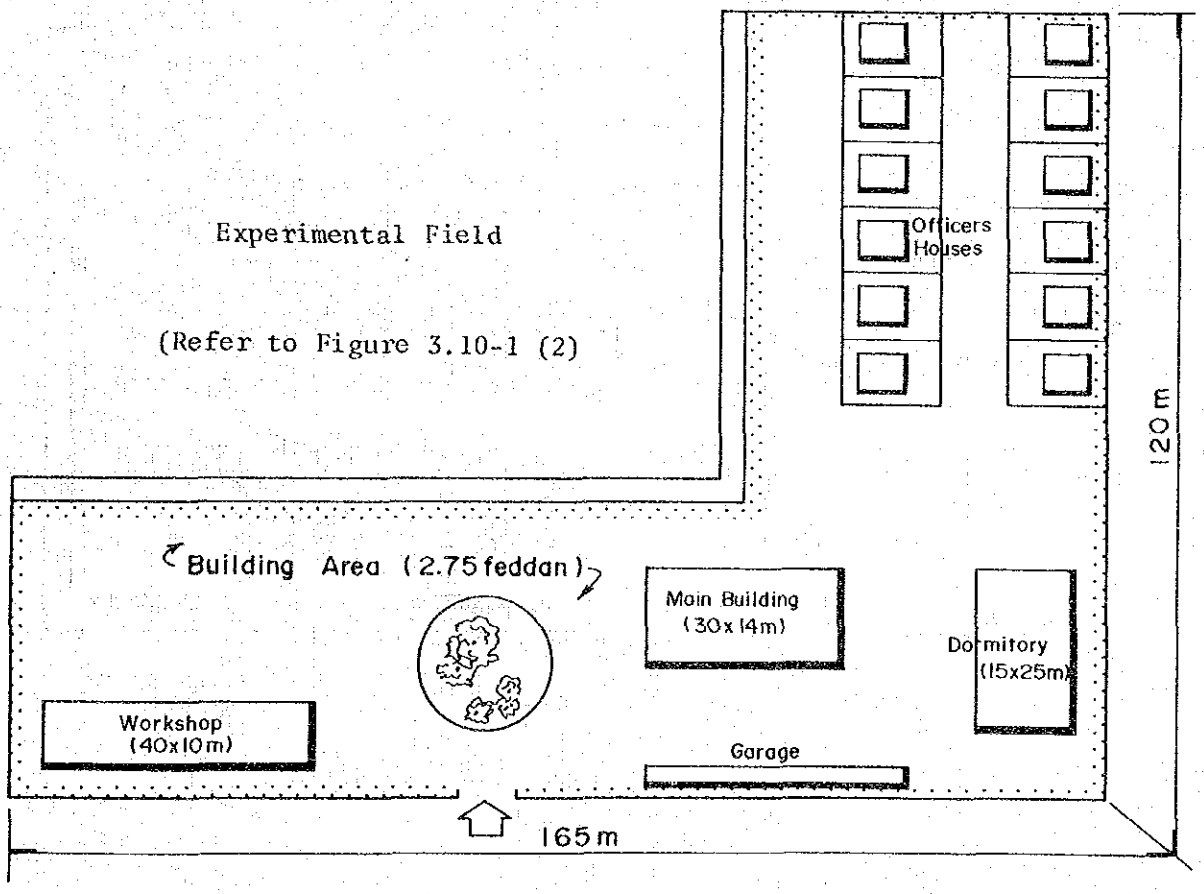


Figure 3.10-1 Layout of Agricultural Development Center (2) Experimental Field

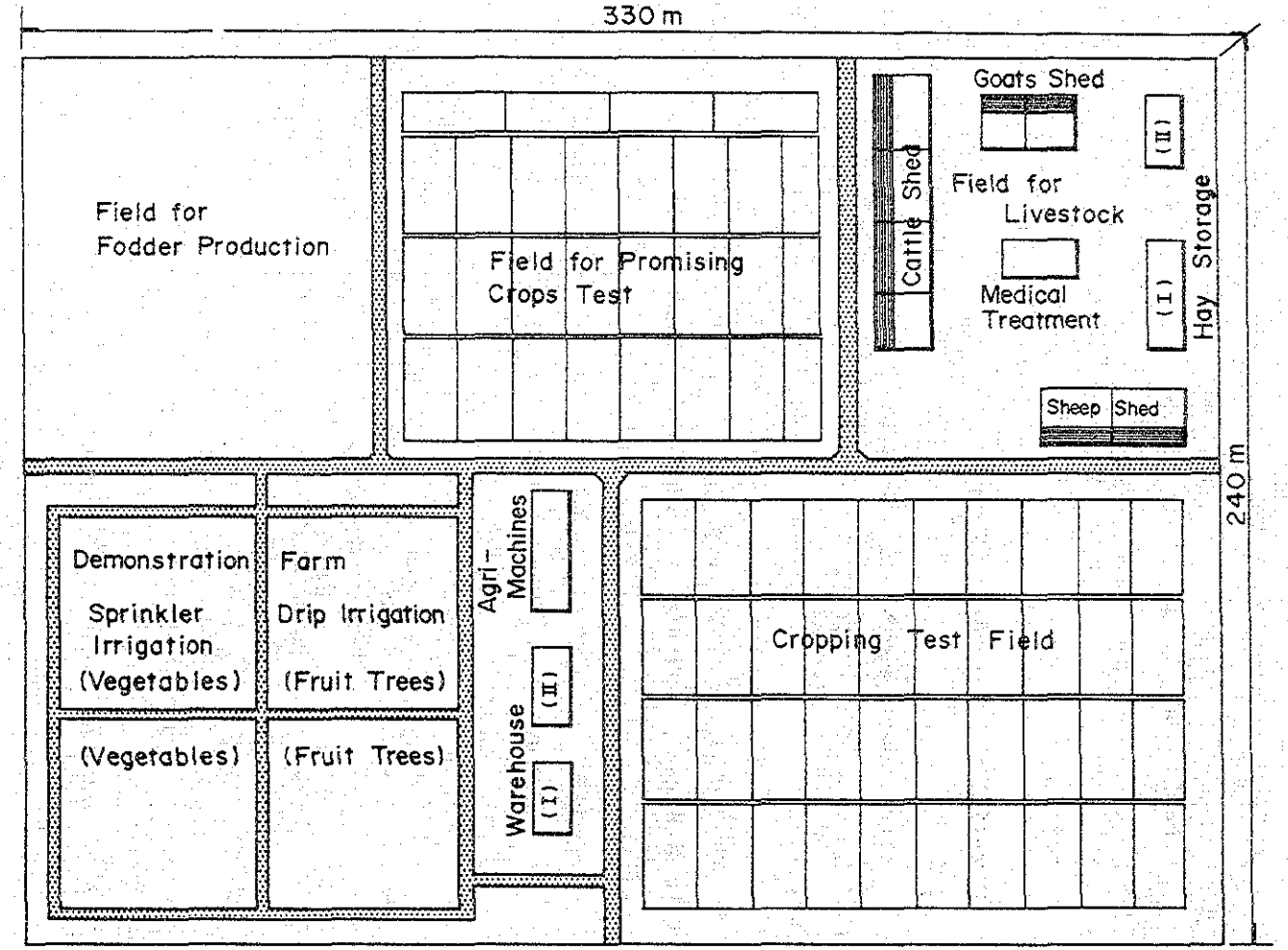
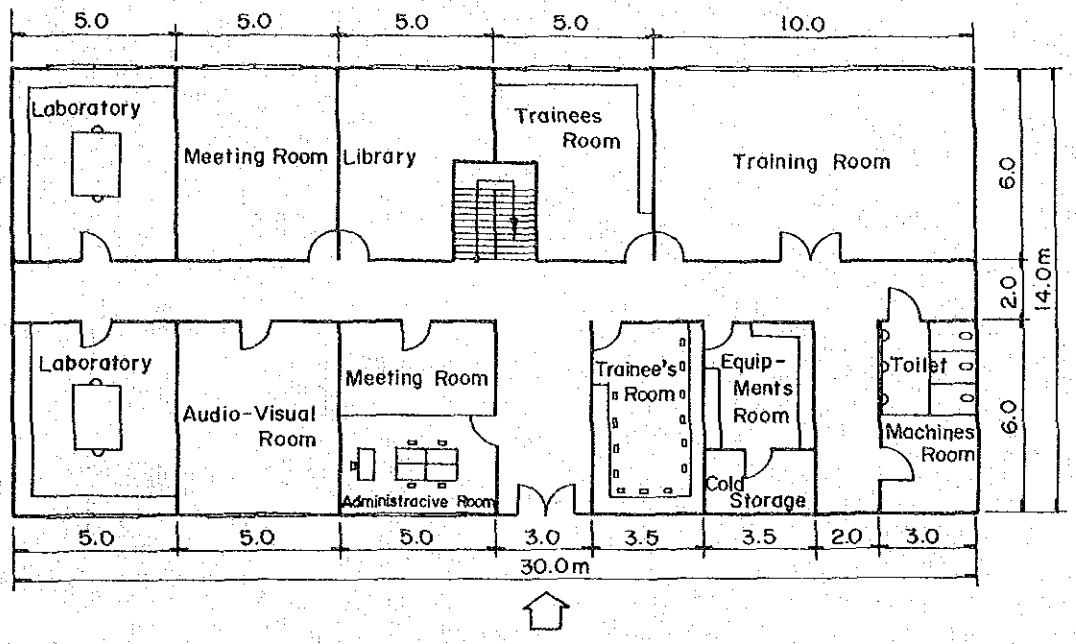
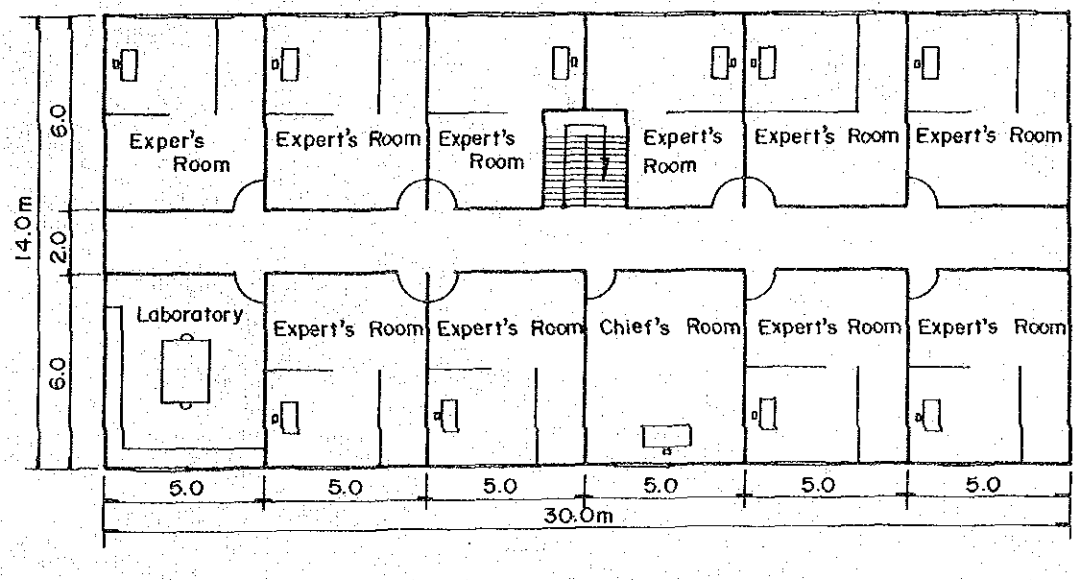


Figure 3.10-2 Floor Plan of Agricultural Development Center.



1st Floor (420m²)



2nd Floor (420m²)

CHAPTER 4. PROJECT IMPLEMENTATION PLAN

4.1. Project Organization

4.1.1. Executing Agency

This project is composed of various fields of subprojects. The following executing agencies will be in charge of these subprojects in line with the specialization each component.

Component	Executing Agency
° Arrangement of infrastructures	MOD (SDA)
° Extension of the El Salam Canal	MPWWR
° Crossing of the Suez Canal by siphon structure	
° Construction of Tina and Balouza pumping stations	
° Construction of branch canals	
° Construction of drainage pumping stations	
° Arrangement of on-farm development	MOA (GARPAD)
° Construction of booster pumping stations along main canals	
° Agricultural land reclamation	
° Construction of new-community	
° Arrangement of marketing facility	
° Arrangement of Agricultural Development Center	

Since the whole project will be mainly planned by MOD, it will manage the coordination among the three executing agencies regarding the construction procedure and the raising of the necessary foreign currencies for the Project by establishing a coordinating committee under its control. This Project is a typical integrated rural development project, therefore, GARPAD/MOA will be the main organization in charge of the debt and repayment of foreign currencies.

In order to obtain the maximum benefits from this Project the positive contribution of the MOA and GARPAD are crucial, especially in the responsibility for foreign loanand its repayment.

Specifically, MOA is required to study the agricultural extension techniques and the agricultural support services including the establishment of the farmers' organization for the settled farmers, so that it can properly plan and effectively implement them.

In this F/S, the agencies concerned for the El Salam Canal extension and land reclamation are clearly demarcated by the Steering Committee. In the case of project implementation, MPWWR shall be responsible for the extention of El Salam Canal, branch irrigation canal works with booster pumping stations and main drainage canals with pumping stations; GARPAD for the land reclamation, irrigation facilities located downstream from the booster pump stations, secondary drainage canals, on-farm facilities, and construction of new-community; MOA for the agricultural extension and supporting facilities; and MOD for the road and water-supply facilities in the construction of new community.

Since the arrangement of infrastructure such as communication facilities, electrification facilities, etc., will encompass various fields, operation coordination by MOD and mutual cooperation among the executing agencies is required for smooth and effective project implementation leading to successful completion.

4.1.2. Coordinating Committee

For the smooth implementation of the Project, a coordinating committee shall be organized, and a project office is to be established.

The coordinating committee shall be organized under the chairmanship of the main ministry with participation of the governmental agencies concerned. The organization of the coordinating committee will be as described below and shown in Figure 4.1-1:

Ministry	Agency of Member Concerned
° MOA	° General Department of Land Development ° GARPAD
° MPWWR	° Project Officer ° Mechanical and Electrical Engineer ° Project Office of the El Salam Canal
° MOD	° Project Officer ° SDA

The functions of the coordinating committee will be as described below:

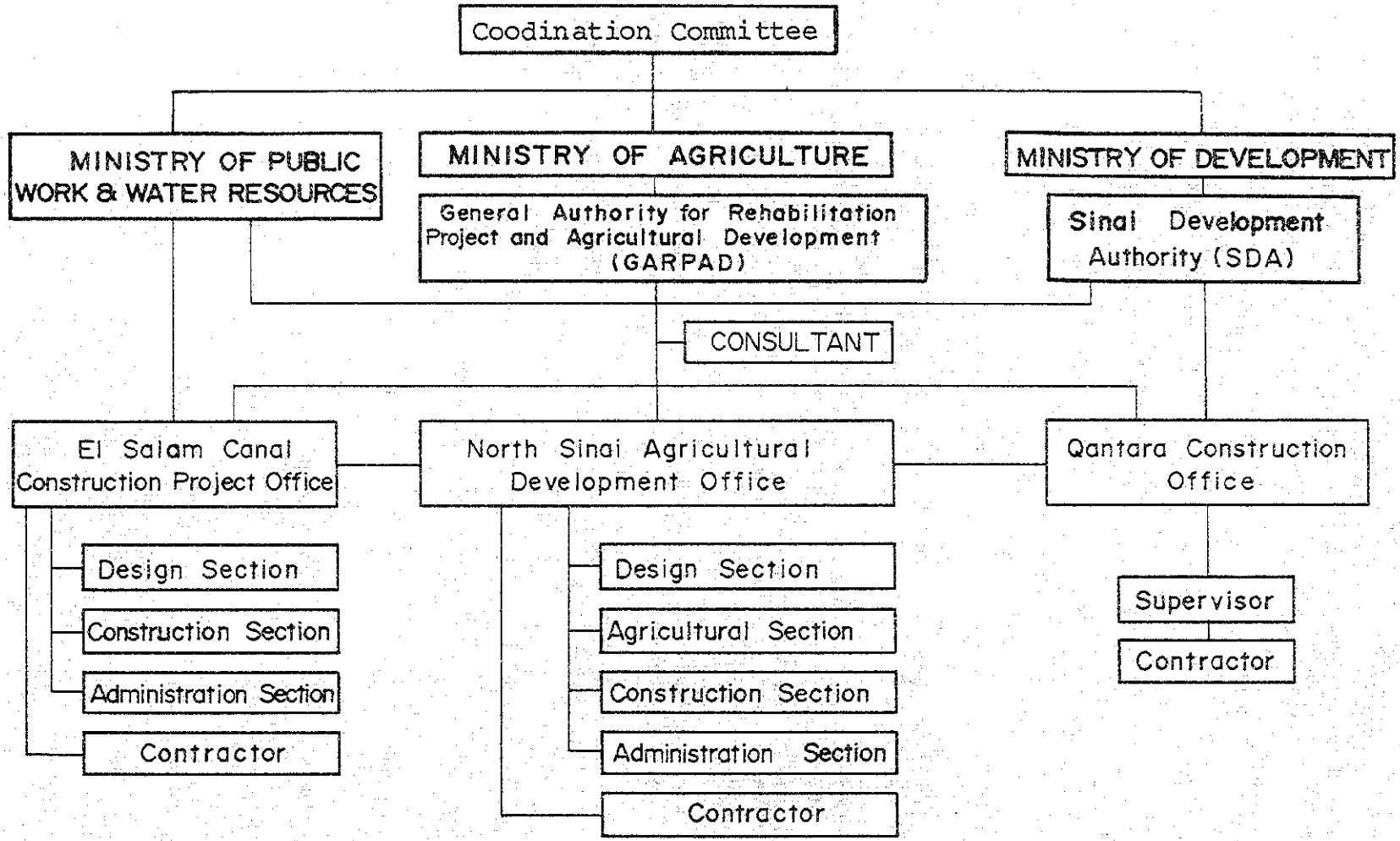
1) Coordination among agencies with regard to the implementation of the project.

2) Overall management and monitoring the progress of the construction work.

3) Final decision making on principal and important matters concerning the implementation of the project.

4) Securing of the project particularly from the financial and funding aspects.

Figure 4·1-1 Organization for Executing Agency



4.2. Construction Schedule

4.2.1. Method of Construction

The construction work shall be carried out on a contract basis hiring contractors through international competitive tendering. The contractors shall be capable and familiar with the construction work of the project, and shall have sufficient experience for the working in Egypt.

The contractors of the siphon structure to cross the Suez Canal, the pumping stations and the inlet from the El Salam Canal which requires the most sophisticated techniques will be specially selected through competitive tendering after nomination of the qualified tenderers through company qualification which examines technical abilities.

The participation of engineering consultants with wide experience and knowledge on this specific technical field will be required for the smooth implementation of the construction works and for technology transfer to the local engineers in its field. These consultants will be in charge of the detailed design and supervision of construction works.

4.2.2. Implementation Schedule

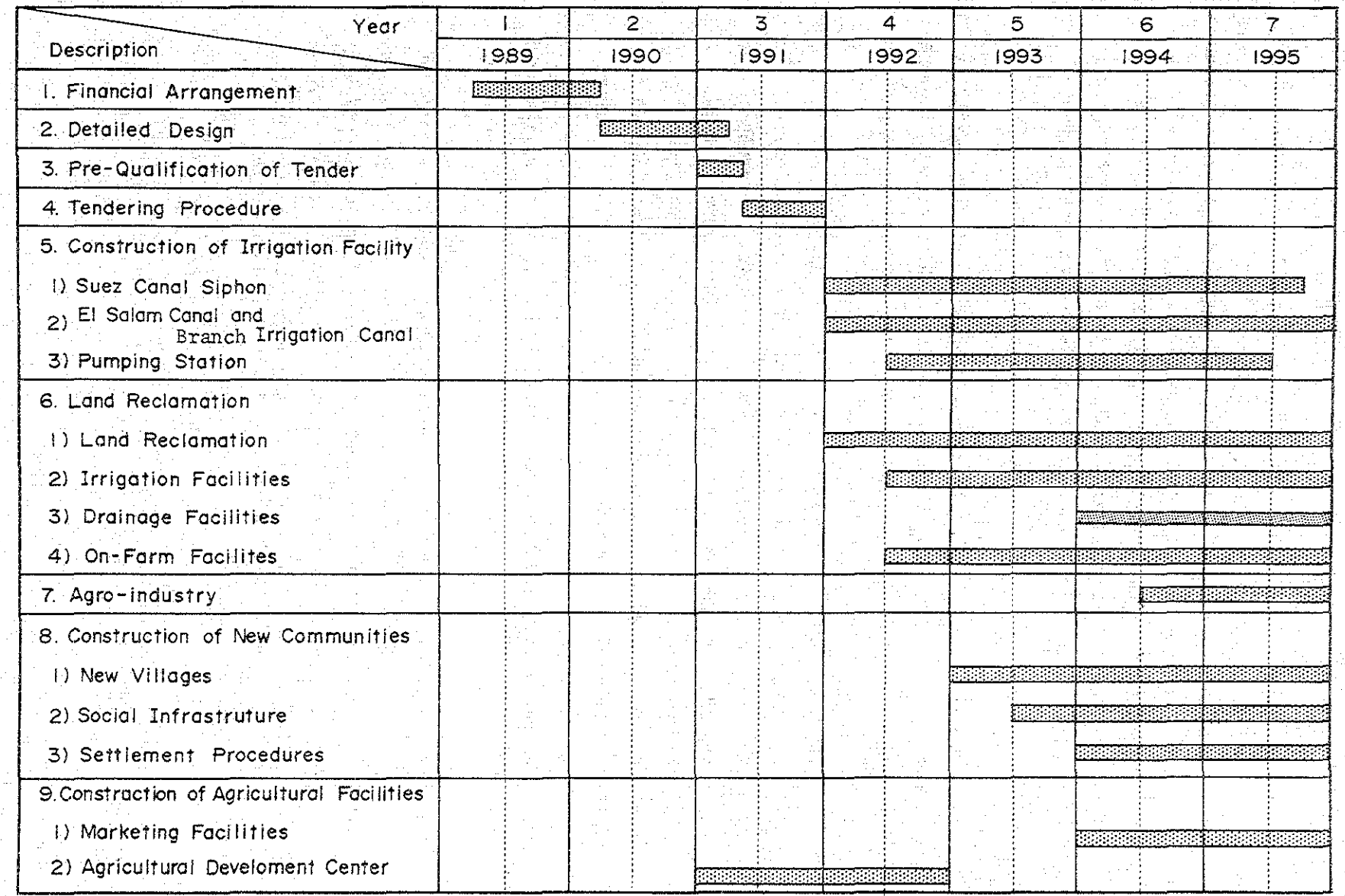
Assuming that financial arrangements for the necessary funding to execute the subproject are carried out by early 1990, the detailed design work could be completed by the end of 1990. The tendering will be divided into two categories; i.e. one for procurement of material and equipment, and the other for construction work.

Actual construction work is targeted to commence in 1992 and completed by 1995, entailing a four-year construction period in total.

The whole construction work will be grouped into four categories, i.e. the construction of irrigation facilities, land reclamation, construction of new-community, and construction of agricultural extension and support facilities.

The implementation schedule for the project is shown in Figure 4.2-1.

Figure. 4·2-1 Project Implementation Schedule



4.3. Consulting Services

Since this Project is composed of various kinds of construction work which require sophisticated techniques, and is related with many ministries and agencies concerned, the consultant shall be a coordinator of the coordination committee in order to smoothly implement the Project which requires sophisticated techniques and foreign currencies.

The consultant shall be selected through competitive tender or nomination considering the evaluation on the sophistication of his techniques regarding siphon, pumping stations, irrigation facilities, and agro-products processing.

The selected consultant shall perform the construction supervision so that it can effectively support the Government of Egypt regarding the detailed design and tender management of the Project and can execute satisfactory construction. Technical transfer to the engineers of Egypt through this Project is also an important role of the consultant.

The consulting services are divided into the following three stages.

Stage I	:	Implementation of Detailed Design and Preparation of Tender Documents
Stage II	:	Assistance for the Government of Egypt on Tender and Contract Management
Stage III	:	Attendance at Construction Supervision, Completion Inspection, and Water-Penetration Inspection

4.4. Operation and Maintenance

4.4.1. Executing Agency

The executing agencies to undertake the operation and maintenance of the facilities and equipment which are constructed or purchased under the project shall be MPWWR, MOA, and SDA, as shown in Figure 4.4-1.

MPWWR shall be responsible for the El Salam Canal, branch irrigation and drainage canals, and pumping stations as well as the check gates to be installed along the branch canals.

MOA will be the key agency after new farmers are settled in the reclamation area and begin farming their new land. The most essential matter in attaining the successful settlement are extension and supporting services to the settlers.

SDA will be responsible for the operation and maintenance of infrastructure, roads, and potable water supply and sewage facilities. Apart from the above three agencies, the North Sinai Governorate will coordinate the other operations and the support for the agency concerned.

The cooperative and water user's association that will be established and managed by the farmers themselves with strong support from the MOA, shall be responsible for the secondary and tertiary canals downstream from the check gates as well as the on-farm facilities.

4.4.2. Operation and Maintenance Costs

The cost for operation and maintenance consists of the following components:

(1) Electricity charges and fuel cost
--- for pumping stations and O/M machinery and vehicles.

(2) Salary and wages ------ for engineers, operators, labourers and administrative staff.

(3) Repair cost ---------- for the irrigation and drainage system, pumping stations, agricultural service facilities and social infrastructures, such as roads, domestic water supply facilities, school buildings, etc.

(4) Administrative cost --- for the O/M office, marketing center and Agricultural Development Center

The operation and maintenance costs for the on-farm facilities will be borne by farmers themselves. The operation and maintenance of the facilities is succeeded by project implementation agencies, MPWWR for the irrigation and drainage facilities and GARPAD/MCA for the on-farm facilities, marketing facilities, agricultural extention services, and the Agricultural Development Center.

The estimated cost for the operation and maintenance is 6.45 million LE per annum as described below:

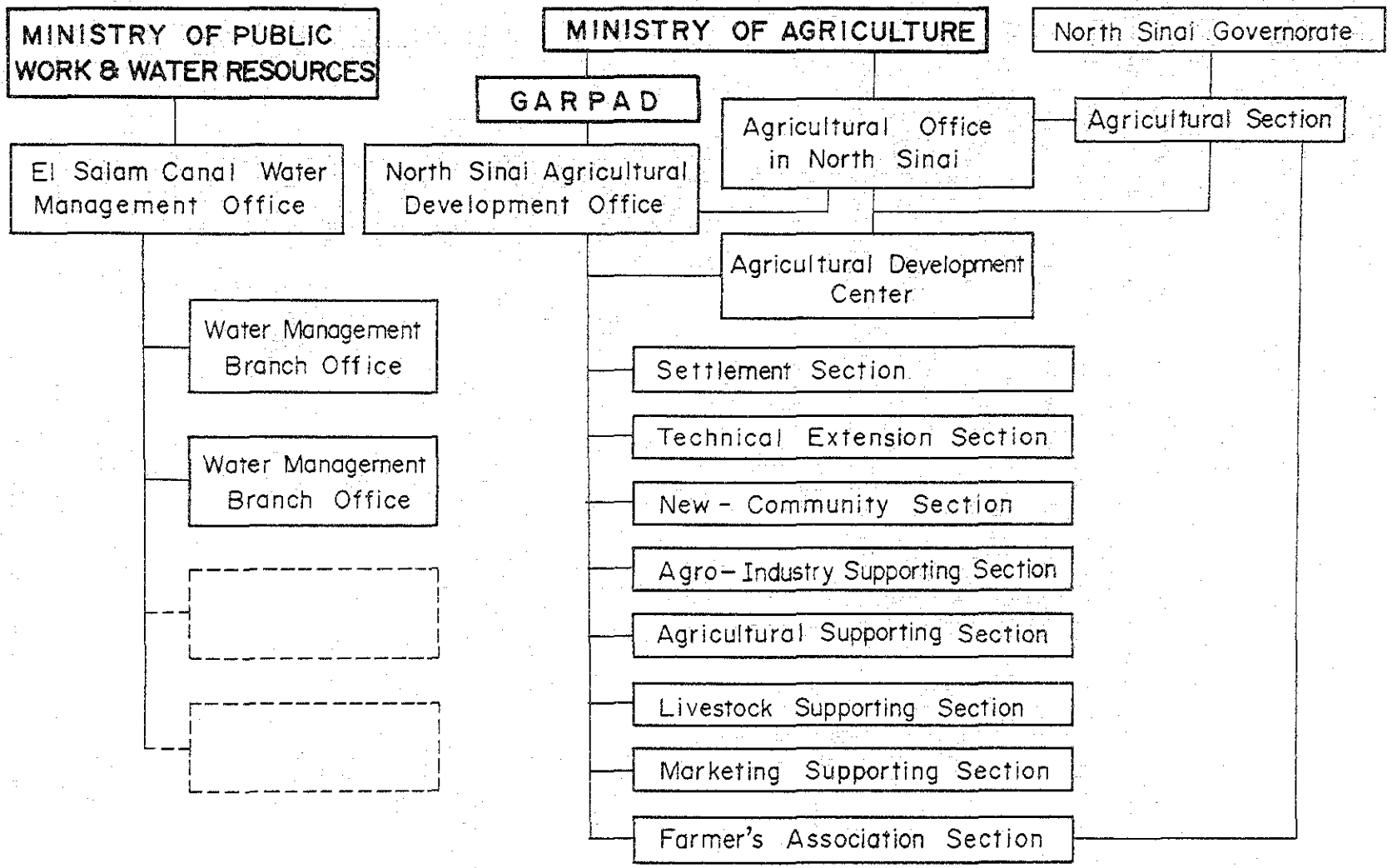
Table 4.4-1 Operation & Maintenance Cost[/*]

(Unit: LE/year)

1. Irrigation Office	
1) Main Office (central office)	346,000
2) Tina Pumping Station	520,000
3) Balouza Pumping Station	1,108,000
4) Maintenance of Irrigation Facilities	790,000
5) Booster Pump Stations (65 places)	1,940,000
6) Drainage Pump Stations (2 places)	200,000
Sub-Total	4,904,000
2. Agricultural Development Center and Extension Services	948,000
3. Social Infrastructure	
1) Road	147,000
2) Water Supply	100,000
3) Sewage Treatment Plant	240,000
4) Refuse Treatment Plant	100,000
5) Others	13,000
Sub-Total	600,000
Total	6,452,000

(*) Breakdown is shown in APPENDIX-M.11

Figure 4.4-1 Organization for Operation and Maintenance



4.5. Construction Cost Estimate

4.5.1. Construction Unit Cost

The current unit prices employed for the estimate the project cost were surveyed as of November 1988 from various sources, i.e., SDA, private contractors in the Area, GARPAD and MPWWR. The unit prices surveyed from those sources varied widely according to the construction conditions of each project. Unit prices for the cost estimates were mainly based on the constructions already underway in the North Sinai area being executed by SDA.

The unit costs, listed in Table 4.5-1, are mentioned with the proportion of foreign and local currencies as applied in other JICA projects in Egypt.

Table 4.5-1. Construction Unit Cost

Description	Unit	Unit Cost (LE)	F.C (%)	L.C (%)
Common Labour	day	8.0	0	100
Skilled Labour	"	15.0	0	100
Operator	"	20.0	0	100
Carpenter (common)	"	15.0	0	100
Mason	"	20.0	0	100
Steel Fixer	"	15.0	0	100
Surveyor	month	1,000.0	0	100
Portland Cement	ton	85.0	50	50
Seawater Cement	"	110.0	50	50
Steel Bar (round)	"	700.0	90	0
Sand	m^3	5.0	0	100
Graded Gravel	"	20.0	0	100
Gravel Filter	"	25.0	0	100
Timber	"	650.0	100	0
Cement Brick (25x12x6)	1,000 pcs	150.0	20	80
Bitumen	ton	140.0		
Gasoline	liter	0.35	10	90
Diesel Oil		0.10	10	90

Note. F.C : Foreign Currency
L.C : Local Currency

4.5.2. Conditions of Costs Estimate

The following assumptions were adopted for estimating the project cost in the F/S.

1) The unit cost consists of five components, i.e., labour cost, material cost, construction equipment cost (depreciation, repair and administration), temporary work cost and contractors' overhead costs (30% of the basic cost).

2) Physical contingency of the cost estimate is set at 10 percent.

3) Price escalation is neglected for foreign currency and set at 12 percent for local currency based on the prevailing rate.

4.5.3. Components of the Project Cost

The project costs which are divided into eight major works consist of the following components;

1) El Salam Canal	:	Siphon under Suez Canal, Tina and Balouza pumping stations, El Salam Canal in Tina plain (24 km), El Salam Canal in sandy area (37 km), Balouza, Rabaa/Qatia, Nigila and other seven branch canals.
2) Drainage Facilities:		Balouza, Rabaa/Qatia main drainage canals and pumping stations.
3) Land Reclamation	:	reclamation, road network, planting, initial leaching.
4) On-Farm Facilities	:	secondary and tertiary canal, branch drainage canals, booster pump and sprinkler and drip irrigation facilities.

5) Social Facilities : housing, public and social facilities, village road, potable water supply, sewage & refuse treatment, electric facilities, telephone facilities.

6) Agriculture Supporting and Marketing Facilities: machinery center, marketing center, livestock mating center, oil processing center, slaughterhouse and cut meat center.

7) Agricultural Development Center: main building, dormitory, workshop, office building, experiment field, agri-machinery

8) Engineering : design, preconstruction, supervision.

4.5.4. Project Costs

The project costs were estimated based on the aforementioned criteria at a total amount of 859 million LE consisting of a foreign currency portion of 447 million LE (25.054 billion Yen) or about 52 percent of the total costs, and a local currency portion of 412 million LE or about 48 percent of the total cost.

The capacities of siphon, Tina and Balouza pumping stations and El Salam Canal were determined to supply enough irrigation water for 203,800 feddan (net) of irrigable land. Therefore, the cost of these facilities will be allocated proportionally in the financial and economic analysis for the F/S Area (41,600 feddan of net irrigable area).

The project cost is summarized in Table 4.5-2 and its disbursement schedule is shown in Table 4.5-3. The breakdown of the project cost estimates is shown in APPENDIX-L.

Table 4.5-2. Summary of Project Cost

(Unit: '000 LE)

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

Note: */ Including a remote control system
**/ Including water resource development (digging well)

10% of contingency is included in items 1 - 5 above.

Table 4.5-3 Disbursement Schedule for the Project Cost

(unit: '000 LE)

	Item	Project Cost Grand Total			Project Year 1990		1991		1992		1993		1994		1995	
		Total	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1.	Civil Works															
1.1	El Salam Canal/ Siphon, Pump Stations	339,705	241,415	98,290					48,280	19,660	72,430	29,480	72,430	29,480	48,275	19,670
1.2	Drainage Facilities	6,796	3,662	3,134									1,830	1,570	1,832	1,564
1.3	Land Reclamation	54,822	32,644	22,178					6,530	4,430	9,790	6,660	9,790	6,660	6,534	4,428
1.4	On-Farm Facilities	118,362	88,771	29,591					8,880	2,960	35,510	11,840	35,510	11,840	8,871	2,951
	Sub-Total (1.1-1.4)	519,685	366,492	153,193					63,690	27,050	117,730	47,980	119,560	49,550	65,512	28,613
2.	Social Facilities	195,000	20,800	174,200							4,160	34,840	8,320	69,680	8,320	69,680
3.	Agriculture Support/ Marketing Facilities	43,120	27,025	16,095									13,512	8,048	13,513	8,047
4.	Agricultural Development Center	20,000	8,577	11,423			4,287	5,713	4,290	5,710						
5.	Engineering Fee	46,500	24,500	22,000	4,900	4,400	4,900	4,400	3,675	3,300	3,675	3,300	3,675	3,300	3,675	3,300
	Total (1-5)	824,305	447,394	376,911	4,900	4,400	9,187	10,113	71,655	36,060	125,565	86,120	145,067	130,578	91,020	109,640
6.	Price Escalation	34,835		34,835		264		680		2,715		7,260		12,327		11,589
	Total	859,140	447,394	411,746	4,900	4,664	9,187	10,793	71,655	38,775	125,565	93,380	145,067	142,905	91,020	121,229

CHAPTER 5. PROJECT JUSTIFICATION

5.1. General

The project is mainly composed of the followings:

- Construction of El Salam Canal
- Irrigation and drainage
- Land reclamation
- Settlement
- Agriculture and livestock development
- Infrastructure
- Agricultural supporting
- Agro-industry

Since the F/S Area is desert with undulation and mobile sand dunes, the possible reclaimed area will be limited. Therefore, amount of agricultural products which will be produced in the Area might not affect largely to the share of domestic production and export. However, considering the situation in Egypt, i.e., severely limited cultivated area (3% of total land), high growth rate of population (2.8%/year) and over centralization of population at urban areas, potential areas which are irrigable have to be developed preferentially. The F/S Area is one such potential areas.

Financial and economic analyses, from the standpoints of the private and national economy were carried out for the project costs, operation and maintenance costs and the benefits. Project costs and benefits were estimated over a 50-year period as the project life using constant prices as of 1988.

5.2. Project Cost

5.2.1. Project Cost

Total project cost for agricultural development was estimated at 402.06 million LE in financial value, which is equivalent to 385.38 million LE in economic value (Table 5.2-1). The project cost of financial base is converted to border price by applying the standard conversion factor. Based on the import/export value, and trade duties for the last three years (1985 - 1987), which were collected in the Foreign Trade Computer Center of CAMPAS, the standard conversion factors (SCF) was estimated at 0.877. As well as SCF, conversion factor of capital goods and consumption goods were also estimated at 0.896 and 0.837, respectively (refer to APPENDIX-M). These conversion factors were applied to the local portion of the project costs.

Annual operation and maintenance cost (O & M cost) after completion of the construction work was estimated at 5.85 million LE on financial base and 5.13 million LE on an economic base.

The total project cost of water conveyance facilities estimated in the previous Chapter should be allocated for the F/S Area by the ratio of water requirements because the capacity of such facilities includes those of total land reclamation areas proposed as follows:

Siphon	: 17.2/88.7 = 0.194
Tina Pumping St.	: do
Balouza Pumping St.	: 15.8/38.6 = 0.409
El Salam Canal	: 17.2/88.7 -- 17.2/40.1 (Tina Plain)
	: 15.8/38.6 (Sandy Area)
Agricultural Development Center	: 41,600/203,800 = 0.204 (by net irrigable area)

Table 5.2-1. Financial and Economic Project Cost

(Irrigation/Drainage, Land Reclamation, On-Farm, Supporting Services)

(unit: 1,000 LE)

Year	Construction Cost for Agriculture		Construction Cost for Infrastructure		Total	
	Financial	Economic	Financial	Economic	Financial	Economic
1990	9,300	8,759	-	-	9,300	8,759
1991	11,400	10,711	-	-	11,400	10,711
1992	58,885	56,356	-	-	58,885	56,356
1993	111,295	107,015	39,000	34,715	150,295	141,730
1994	132,855	127,585	78,000	69,429	210,855	197,014
1995	78,328	74,958	78,000	69,429	156,328	144,387
Total	402,063	385,384	195,000	173,573	597,063	558,957

Note: Price escalation is not included in the financial project cost.

5.2.2. Sunk Cost and Allocated Cost

In principle, economic analysis is to be done based on additional cost and additional benefit, therefore, invested amounts of the El Salam Canal in the west of Suez Canal since 1981/82 were considered as sunk cost, therefore not taken into account in the project cost for project evaluation. However, EIRR in case of including allocated amount to the F/S Area out of the aforesaid invested cost is also estimated as a case study.

According to MPWWR, financial source for Phase I of El Salam Canal project were 100 million LE as local currency and ¥4,436 million as Yen loan. Out of these amounts, Yen loan has been spent for pumps and equipments for Hussinia and South Port Said areas, which have no concern of the North Sinai area (refer to Table 5.2-2).

In the El Salam Canal project, irrigation water for newly reclaimed land is planned to mixed with the Nile water and drained water from both of the El Sirw and Bahr Hadous drainage canals.

Water intake at the Damietta Barrage is 110 cu.m/sec and drained water from the two drainage canals is 100 cu.m/sec, therefore, 210 cu.m/sec in total.

Out of 210 cu.m, 110 cu.m/sec has been planned to irrigate Hussinia and South Port Said areas but water requirement was reduced from 110 cu.m/sec to 70cu.m/sec because of reducing the reclaimed land in North Hussinia area in 1979. Remaining 140 cu.m/sec can be utilized for irrigating east of Suez Canal, however, according to the present study, water requirement for M/P Land Reclamation Area (203,800 feddan in net) was estimated at 88.66 cu.m/sec (refer to following table). Therefore, ratios in water share for east and west of Suez Canal can be accounted at 56 percent (88.66/158.66) for east and 44 percent (70/158.66) for west, respectively.

Water Requirement

Area	Gross Area (fed.)	Net Area (fed.)	Gross Water Requirement (MCM)	Gross Water Requirement at Peak (cu.m/s)
West of F/S Area	130,400	105,800	970.8	48.61
F/S Area	53,400	41,600	341.3	17.21
Hod Abu Samara	14,000	11,200	111.2	4.38
East of F/S Area	56,900	45,200	389.8	18.46
Total	254,700	203,800	1,813.1	88.66

Accordingly, 83 million LE out of present worth value of 148 million LE shown in Table 5.2-2 will be shared to the east of Suez Canal as follows;

148 million LE x 0.56 = 83 million LE

Therefore, share to F/S Area is;

83 million LE x 41,600 fed/203,800 fed.
= 17 million LE

Project evaluation was carried out, including allocated cost and pumps and equipment cost which will be constructed west of Suez Canal for irrigating the F/S Area, and project cost of the F/S Area.

Table 5.2-2. Invested Amount for Construction Works at the West of Suez Canal

(1) Construction Works (Local Currency)

Year	LC (million LE) *	Price Escalation (1988 = 1.0)	Present Worth Value (million LE)
1981/82	3.8	2.372	9.014
1982/83	4.0	2.169	8.676
1983/84	20.3	1.873	38.022
1984/85	10.6	1.700	18.020
1985/86	18.1	1.502	27.186
1986/87	11.0	1.281	14.091
1987/88	9.0	1.132	10.188
1988/89	11.1	1.000	11.000
1989/90	10.0	1.000	10.000
1990/91	2.1	1.000	2.100
Total	100.0		148.297

Note: * means the data from MPWWR

(2) Pump Stations (Foreign Currency)

	Million Japanese Yen
Pump Cost	3,220.8
Electric Equipments	993.0
Control Panel etc.	55.8
Training Cost	22.5
Supervising Cost	143.7
Total	4,435.8

Note: These pump stations shall be used for irrigation Hussinia and South Port Said areas.

	Million Japanese Yen	Rate (Yen/LE)	Million LE	Price Escalation (1988=1.0)	Present Worth Value (million LE)
1981/82	577	281	2.053	2.372	4.870
1982/83	608	301	2.020	2.169	4.381
1983/84	3,085	287	10.749	1.873	20.133
Total	4,270		14.822		29.384

(3) Total of Present Worth Value (million LE)

	Construction Works (LC)	Pumps (FC)	Total
1981/82	9.014	(4.870)	9.014
1982/83	8.676	(4.381)	8.676
1983/84	38.022	(20.133)	38.022
1984/85	18.020	-	18.020
1985/86	27.186	-	27.186
1986/87	14.091	-	14.091
1987/88	10.188	-	10.188
1988/89	11.000	-	11.000
1989/90	10.000	-	10.000
1990/91	2.100	-	2.100
Total	148.297	(29.384)	148.297

Note: Cost for pump shall be spent for Hussinia and south Port Said areas.

5.3. Project Benefit

5.3.1. Agricultural Production Benefits

In view of the national economy, implementation of the Project will generate both direct and indirect benefit. Project benefits can be divided into two, namely tangible benefits and intangible benefits. The crops production benefits which are tangible and expressed in monetary terms shall be applied to the comparative study with project costs. In other words, the Project includes such components as extension of the El Salam Canal, consolidation of irrigation systems, land reclamation, and supporting services etc., therefore, an increase of cropping acreage can be expected, resulting from Project implementation.

The incremental crop benefit of the Project is expected as shown in Table 5.3-1.

5.3.2. Other Benefits

In addition to the above-mentioned tangible benefits, the following benefits are expected to be realized with Project implementation.

- The Project will become a model for irrigated agriculture in other areas of Egypt, which are similar to the F/S Area in land conditions.
- The Project will improve the farmers' living standards through an increase in farm income. The increase in farm income resulting from increases in agricultural income means the increase in consumption and saving. Strengthening the farm family economy will improve the villagers' living standards in terms of quantity and quality (nutrition, education, health, etc.).
- To ensure good use of irrigation water, it will be necessary to establish Water User's Associations to include all the beneficiary farmers. These cooperative systems will certainly improve communication among farmers, influencing the technical upgrading of crop cultivation and farm management of the farmers around the F/S Area.

- Many villagers will be employed not only in the construction period and O & M period but also in farm for vegetable and fruit cultivation.

- The improved marketing road network will also function as a connecting road network among the villages and between villages and urban areas for various purposes such as communication of employees and students, public services, and commerce. It will benefit not only the farmers but also the entire population of the F/S Area, thereby improving the social and economical environment.

- The implementation of the Project is of effective socioeconomic development type, not only for promoting rural welfare but also alleviating the disparities in living standards among the regions.

Table 5.3-1 Incremental Crop Benefit of the Project

Without Project

Crops	Planted Area (feddan)	NPV (LE/fed)	Total NPV (1,000LE)
Squash	44	402	18
Tomatoes	266	1,111	296
Water melon	765	88	67
Cantaloupe	505	1,575	795
Cucumber	66	3,080	203
Olive	132	557	74
Fig	61	1,407	86
Orange	68	3,067	209
Guava	85	986	84
Grape	14	1,182	17
Dates	702	1,835	1,288
Goat	3,174 head		378
Sheep	1,680 head		252
Chicken	27,900 birds		56
Total			3,823

With Project

Cropping Pattern	Total NPV (1,000LE)
CP-1	32,422
CP-2	4,536
CP-3	7,699
CP-4	1,925
CP-5	11,312
Total	57,894
Incremental Benefit	54,071

Note. NPV: Net Production Value
Details are shown in APPENDIX-M.

5.4. Economic Efficiency of the Project

5.4.1. Comparison of Costs and Benefits

1) Economic Internal Rate of Return

Economic analysis of the Project was made by employing the Internal Rate of Return (IRR) method. IRR is a rate that makes the present worth of costs and benefits for the project life equal to zero. The Economic Internal Rate of Return (EIRR) of the Project was estimated at 8.9 percent (Table 5.4-1). Meanwhile, EIRR including social infrastructure and agro-industries, was estimated at 6.3 percent.

EIRR of the Project is not as high as the economic index. However, agriculture is the main economic activity in Egypt, and the implementation of the Project will contribute to make effective use of limited cultivable land and water resources, and to correct the differences in living standards among the regions, and also to promote the redistribution of population in the country.

On the other hand, construction cost which have been invested since 1981/82 in the west of Suez Canal is considered as sunk cost, however, EIRR in case of including allocated costs to the F/S Area out of the aforesaid invested costs was estimated at 8 percent.

As regards the proposed agro-industries, the FIRR was calculated at 55% for oil extracting and refinery plant, and 28% for slaughterhouse and cut meat plant (refer to APPENDIX-H).

2) Sensitivity Analysis

An analysis has been carried out to test the sensitivity of the rate to parameters other than those considered probable in the initial calculation. The parameters employed are increase and reduction in benefits, delay in benefits, increase in project costs, and combinations of these parameters.

Sensitivity Analysis

Alternative	EIRR	EIRR in case of 10% increase in capital cost
1. Proto-type	8.9	8.1
2. 10% increase in benefit	9.7	8.7
3. 10% reduction in benefit	7.9	7.3
4. Five-year delay in benefits	8.1	7.5
5. Combination of 3. and 4.	7.3	6.7
6. Including Social Infrastructures	6.3	5.7

5.4.2. Farm Budget Analysis

1) Farm Budget Analysis

Farm budget analysis was made for three types, that is, smallholders, graduates, and investors according to the proposed farming types.

Farm Income with Project

(unit: feddan, LE/year)

Items	Smallholders		Graduates	Investors	
	CP-1	CP-2	CP-3	CP-4	CP-5
1. Net Cultivated Area	4.89	4.43	9.78	78.24	78.24
2. Gross Income	12,389	15,081	25,361	81,099	263,132
3. Net Agricultural Income	7,485*	11,610*	12,244*	29,638	112,383
4. Farm Household Income	9,835*	13,770*	16,024*	29,638	112,383

Note: CP; Cropping Pattern
* ; Including production cost of family labour

Implementation of this project will produce the above-mentioned farm household income, however, agricultural extension services for vegetables, livestock, and fruit cropping will be necessary, mainly for smallholders and graduates in order to realize the targets.

2) Farm Income and Cost Recovery

The costs to be charged to the beneficiaries are those of terminal irrigation facilities and land reclamation together with O & M costs. Among the costs, land reclamation costs (1,317 LE/fed) are charged only to investors. Meanwhile, farmer pay only operation and maintenance costs of drainage and irrigation facilities.

Therefore, farmer's financial burden amounts to the following;

On-farm facility cost

118,362,000 LE / 41,600 fed. = 2,800 LE/fed.

Operation and maintenance cost (as water charge)

5,852,000 LE / 41,600 fed. = 141 LE/fed.

Land reclamation cost (only to investors)

54,822,000 LE / 41,600 fed. = 1,317 LE/fed.

The following tables (Table 5.4-2) show the estimated farm income and burdens for each farming type (CP-1 - CP-5).

As for agricultural loans, 80 percent of the necessary costs will be credited for smallholders and graduates according to articles of PBDAC. For investors, it is tentatively assumed that 50 percent of the necessary capital costs will be borrowed from the bank. And it is also assumed that the annual interest rate will be 6 percent with a 5-year grace period and 30-year amortization for land, and a 5-year grace period and 10 year amortization for on-farm facilities.

As a results of estimates, it is forecasted that farm household balance of smallholders and graduates will be negative for an initial 4-year period assuming that 3,500 LE is necessary to maintain an acceptable family living standard, annually. For two types of investor, deficit will arise for an initial stage because of purchasing costs of land. After 10 years for CP-4 (livestock farming) and 5 years for CP-5 (fruits farming) as well, farm household balance will improve annually.

Under the above-mentioned situation, it is considered that investors who have capital power can manage their own farm and household even during an initial period of deficit but strong supporting services such as loans at lower interest rates than 6 percent and, wheat supply at lower prices, and also cattle and sheep/goats supply should alleviate any difficulty.

Table 5.4-1 Internal Rate of Return PROJECT COST AND BENEFITS , EGYPT, NORTH SINAI DEVELOPMENT PROJECT , PROTO-TYPE

(UNIT : MILLION LE.)

YEAR	PROJECT COST			BENEFITS	RETURN	PRESENT WORTH VALUE BY DISCOUNT RATE					
						6 %		8 %		10 %	
	CAPITAL	O & M	TOTAL			(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 1990	8.8	0.0	8.8	0.0	-8.8	7.4	0.0	7.0	0.0	6.6	0.0
4 1991	10.7	0.0	10.7	0.0	-10.7	8.5	0.0	7.9	0.0	7.3	0.0
5 1992	56.4	0.0	56.4	0.0	-56.4	42.1	0.0	38.4	0.0	35.0	0.0
6 1993	107.0	0.0	107.0	0.0	-107.0	75.4	0.0	67.4	0.0	60.4	0.0
7 1994	127.6	0.0	127.6	0.0	-127.6	84.9	0.0	74.5	0.0	65.5	0.0
8 1995	75.0	3.0	78.0	10.8	-67.2	48.9	6.8	42.1	5.8	36.4	5.0
9 1996	0.0	5.1	5.1	16.8	11.7	3.0	9.9	2.6	8.4	2.2	7.1
10 1997	0.0	5.1	5.1	24.3	19.2	2.8	13.6	2.4	11.3	2.0	9.4
11 1998	0.0	5.1	5.1	31.9	26.8	2.7	16.8	2.2	13.7	1.8	11.2
12 1999	0.0	5.1	5.1	39.0	33.9	2.5	19.4	2.0	15.5	1.6	12.4
13 2000	0.0	5.1	5.1	44.9	39.8	2.4	21.1	1.9	16.5	1.5	13.0
14 2001	0.0	5.1	5.1	48.1	43.0	2.3	21.3	1.7	16.4	1.3	12.7
15 2002	0.0	5.1	5.1	50.9	45.8	2.1	21.2	1.6	16.0	1.2	12.2
16 2003	0.0	5.1	5.1	52.4	47.3	2.0	20.6	1.5	15.3	1.1	11.4
17 2004	0.0	5.1	5.1	53.1	48.0	1.9	19.7	1.4	14.4	1.0	10.5
18 2005	0.0	5.1	5.1	54.1	49.0	1.8	19.0	1.3	13.5	0.9	9.7
19 2006	0.0	5.1	5.1	54.1	49.0	1.7	17.9	1.2	12.5	0.8	8.8
20 2007	0.0	5.1	5.1	54.1	49.0	1.6	16.9	1.1	11.6	0.8	8.0
21 2008	0.0	5.1	5.1	54.1	49.0	1.5	15.9	1.0	10.7	0.7	7.3
22 2009	0.0	5.1	5.1	54.1	49.0	1.4	15.0	0.9	10.0	0.6	6.6
23 2010	0.0	5.1	5.1	54.1	49.0	1.3	14.2	0.9	9.2	0.6	6.0
24 2011	0.0	5.1	5.1	54.1	49.0	1.3	13.4	0.8	8.5	0.5	5.5
25 2012	0.0	5.1	5.1	54.1	49.0	1.2	12.6	0.7	7.9	0.5	5.0
26 2013	0.0	5.1	5.1	54.1	49.0	1.1	11.9	0.7	7.3	0.4	4.5
27 2014	0.0	5.1	5.1	54.1	49.0	1.1	11.2	0.6	6.8	0.4	4.1
28 2015	0.0	5.1	5.1	54.1	49.0	1.0	10.6	0.6	6.3	0.4	3.8
29 2016	0.0	5.1	5.1	54.1	49.0	0.9	10.0	0.5	5.8	0.3	3.4
30 2017	0.0	5.1	5.1	54.1	49.0	0.9	9.4	0.5	5.4	0.3	3.1
31 2018	0.0	38.6	38.6	54.1	15.5	6.3	8.9	3.6	5.0	2.0	2.8
32 2019	0.0	5.1	5.1	54.1	49.0	0.8	8.4	0.4	4.6	0.2	2.6
33 2020	0.0	5.1	5.1	54.1	49.0	0.7	7.9	0.4	4.3	0.2	2.3
34 2021	0.0	5.1	5.1	54.1	49.0	0.7	7.5	0.4	4.0	0.2	2.1
35 2022	0.0	5.1	5.1	54.1	49.0	0.7	7.0	0.3	3.7	0.2	1.9
36 2023	0.0	5.1	5.1	54.1	49.0	0.6	6.6	0.3	3.4	0.2	1.8
37 2024	0.0	5.1	5.1	54.1	49.0	0.6	6.3	0.3	3.1	0.1	1.6
38 2025	0.0	5.1	5.1	54.1	49.0	0.6	5.9	0.3	2.9	0.1	1.4
39 2026	0.0	5.1	5.1	54.1	49.0	0.5	5.6	0.3	2.7	0.1	1.3
40 2027	0.0	5.1	5.1	54.1	49.0	0.5	5.3	0.2	2.5	0.1	1.2
41 2028	0.0	5.1	5.1	54.1	49.0	0.5	5.0	0.2	2.3	0.1	1.1
42 2029	0.0	5.1	5.1	54.1	49.0	0.4	4.7	0.2	2.1	0.1	1.0
43 2030	0.0	5.1	5.1	54.1	49.0	0.4	4.4	0.2	2.0	0.1	0.9
44 2031	0.0	5.1	5.1	54.1	49.0	0.4	4.2	0.2	1.8	0.1	0.8
45 2032	0.0	5.1	5.1	54.1	49.0	0.4	3.9	0.2	1.7	0.1	0.7
46 2033	0.0	5.1	5.1	54.1	49.0	0.3	3.7	0.1	1.6	0.1	0.7
47 2034	0.0	5.1	5.1	54.1	49.0	0.3	3.5	0.1	1.5	0.1	0.6
48 2035	0.0	5.1	5.1	54.1	49.0	0.3	3.3	0.1	1.3	0.1	0.6
49 2036	0.0	5.1	5.1	54.1	49.0	0.3	3.1	0.1	1.2	0.0	0.5
50 2037	0.0	5.1	5.1	54.1	49.0	0.3	2.9	0.1	1.2	0.0	0.5
TOTAL	385.5	250.7	636.2	2157.5	1521.3	321.5	456.3	273.4	301.6	236.3	207.3

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.42 (6%), 1.10 (8%), 0.88 (10%)
INTERNAL RATE OF RETURN (IRR) = 8.9 %

Table 5.4-2. Estimated Balance of Farm (1)

CP - 1 : Smallholder
Gross Area : 5.00 feddan
Net Area : 4.89

(unit: LE)

Year	Net Farm Income	Burden to Farm: On-Farm Facility Cost	Land Cost	O & M Cost	Total	Balance
1995	2,360	-	-	587	587	1,773
1996	3,541	-	-	587	587	2,954
1997	4,918	-	-	587	587	4,331
1998	6,196	-	-	587	587	5,609
1999	7,475	-	-	587	587	6,888
2000	8,261	1,132	-	587	1,719	6,542
2001	8,950	1,132	-	587	1,719	7,231
2002	9,294	1,132	-	587	1,719	7,575
2003	9,540	1,132	-	587	1,719	7,821
2004	9,648	1,132	-	587	1,719	7,929
2005	9,835	1,132	-	587	1,719	8,116
2006	9,835	1,132	-	587	1,719	8,116
2007	9,835	1,132	-	587	1,719	8,116
2008	9,835	1,132	-	587	1,719	8,116
2009	9,835	1,132	-	587	1,719	8,116
2010	9,835	-	-	587	587	9,248
2011	8,035	-	-	587	587	9,248

O & M Cost 141 LE/fed. x 4.89 fed. = 689 LE/year
On-farm facility 2,845 LE/fed. x 4.89 fed. = 13,912 LE

Loan (Interest rate 6%/year, 80% of necessary cost,PBDAC)
For on-farm facility 13,912 LE x 0.8 = 11,130 LE

Table 5.4-2. Estimated Balance of Farm (2)

CP - 2 : Smallholder
Gross Area : 5.00 feddan
Net Area : 4.43

(unit: LE)

Year	Net Farm Income	Burden to Farm				Balance
		On-Farm Facility Cost	Land Cost	O & M Cost	Total	
1995	1,377	-	-	532	532	845
1996	2,479	-	-	532	532	1,947
1997	4,131	-	-	532	532	3,599
1998	6,197	-	-	532	532	5,665
1999	8,537	-	-	532	532	8,005
2000	10,328	1,022	-	532	1,554	8,774
2001	11,567	1,022	-	532	1,554	10,013
2002	12,668	1,022	-	532	1,554	11,114
2003	13,219	1,022	-	532	1,554	11,665
2004	13,495	1,022	-	532	1,554	11,941
2005	13,770	1,022	-	532	1,554	12,216
2006	13,770	1,022	-	532	1,554	12,216
2007	13,770	1,022	-	532	1,554	12,216
2008	13,770	1,022	-	532	1,554	12,216
2009	13,770	1,022	-	532	1,554	12,216
2010	13,770	-	-	532	532	13,238
2011	13,770	-	-	532	532	13,238

O & M Cost 141 LE/fed. x 4.43 fed. = 625 LE/year
On-farm facility 2,845 LE/fed. x 4.43 fed. = 12,603 LE

Loan (Interest rate 6%/year, 80% of necessary cost, PBDAC)
For on-farm facility 12,603 LE x 0.8 = 10,083 LE

Table 5.4-2. Estimated Balance of Farm (3)

CP - 3 : Graduate
Gross Area : 10.00 feddan
Net Area : 9.78

(unit: LE)

Year	Net Farm Income	Burden to Farm				Balance
		On-Farm Facility Cost	Land Cost	O & M Cost	Total	
1995	1,763	-	-	1,174	1,174	589
1996	3,205	-	-	1,174	1,174	2,031
1997	5,128	-	-	1,174	1,174	3,954
1998	7,692	-	-	1,174	1,174	6,518
1999	10,255	-	-	1,174	1,174	9,081
2000	12,338	2,265	-	1,174	3,439	8,899
2001	13,941	2,265	-	1,174	3,439	10,502
2002	14,902	2,265	-	1,174	3,439	11,463
2003	15,383	2,265	-	1,174	3,439	11,944
2004	15,704	2,265	-	1,174	3,439	12,265
2005	16,024	2,265	-	1,174	3,439	12,585
2006	16,024	2,265	-	1,174	3,439	12,585
2007	16,024	2,265	-	1,174	3,439	12,585
2008	16,024	2,265	-	1,174	3,439	12,585
2009	16,024	2,265	-	1,174	3,439	12,585
2010	16,024	-	-	1,174	1,174	14,850
2011	16,024	-	-	1,174	1,174	14,850

O & M Cost 141 LE/fed. x 9.78 fed. = 1,379 LE/year
On-farm facility 2,845 LE/fed. x 9.78 fed. = 27,824 LE

Loan (Interest rate 6%/year, 80% of necessary cost, PBDAC)
For on-farm facility 27,824 LE x 0.8 = 22,259 LE

Table 5.4-2. Estimated Balance of Farm (4)

CP - 4 : Investor
Gross Area : 80.00 feddan
Net Area : 78.24 "

(unit: LE)

Year	Net Farm Income	Burden to Farm				Balance
		On-Farm Facility Cost	Land Cost	O & M Cost	Total	
1995	1,778	-	-	9,389	9,389	-7,611
1996	3,557	-	-	9,389	9,389	-5,832
1997	6,520	-	-	9,389	9,389	-2,869
1998	10,373	-	-	9,389	9,389	984
1999	16,005	-	-	9,389	9,389	6,616
2000	20,747	11,278	3,643	9,389	24,310	-3,563
2001	24,600	11,278	3,643	9,389	24,310	290
2002	27,267	11,278	3,643	9,389	24,310	2,957
2003	28,364	11,178	3,643	9,389	24,310	4,054
2004	28,986	11,178	3,643	9,389	24,310	4,676
2005	29,638	11,178	3,643	9,389	24,310	5,328
2006	29,638	11,178	3,643	9,389	24,310	5,328
2007	29,638	11,278	3,643	9,389	24,310	5,328
2008	29,638	11,278	3,643	9,389	24,310	5,328
2009	29,638	11,278	3,643	9,389	24,310	5,328
2010	29,638	-	3,643	9,389	13,032	16,606
2011	29,638	-	-	1,174	13,032	16,606

Land purchasing 80 fed. x 1,317 LE/fed. = 105,360 LE
O & M Cost 141 LE/fed. x 78.24 fed. = 11,032 LE/year
On-farm facility 2,845 LE/fed. x 78.24 fed. = 222,593 LE

Loan (Interest rate 6%/year, 50% of necessary cost)
For land 105,360 LE x 0.5 = 52,680 LE
For on-farm facility 222,593 x 0.5 = 111,296 LE

Table 5.4-2. Estimated Balance of Farm (5)

CP - 5 : Investor
Gross Area : 80.00 feddan
Net Area : 78.24 "

(unit: LE)

Year	Net Farm Income	Burden to Farm: On-Farm Facility Cost	Burden to Farm: Land Cost	Burden to Farm: O & M Cost	Burden to Farm: Total	Balance
1995	-	-	-	9,389	9,389	-9,389
1996	-	-	-	9,389	9,389	-9,389
1997	3,371	-	-	9,389	9,389	-6,018
1998	7,867	-	-	9,389	9,389	-1,522
1999	20,229	-	-	9,389	9,389	10,840
2000	41,582	11,278	3,643	9,389	24,310	17,272
2001	69,677	11,278	3,643	9,389	24,310	45,367
2002	92,154	11,278	3,643	9,389	24,310	67,644
2003	103,954	11,178	3,643	9,389	24,310	84,703
2004	109,013	11,178	3,643	9,389	24,310	88,073
2005	112,383	11,178	3,643	9,389	24,310	88,073
2006	112,383	11,178	3,643	9,389	24,310	88,073
2007	112,383	11,278	3,643	9,389	24,310	88,073
2008	112,383	11,278	3,643	9,389	24,310	88,073
2009	112,383	11,278	3,643	9,389	24,310	88,073
2010	112,383	-	3,643	9,389	13,032	99,351
2011	112,383	-	-	1,174	13,032	99,351

Land purchasing 80 fed. x 1,317 LE/fed. = 105,360 LE
O & M Cost 141 LE/fed. x 78.24 fed. = 11,032 LE/year
On-farm facility 2,845 LE/fed. x 78.24 fed. = 222,593 LE

Loan (Interest rate 6%/year, 50% of necessary cost)
Land 105,360 LE x 0.5 = 52,680 LE
On-farm facility 222,593 x 0.5 = 111,296 LE