

APPENDICES

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A.1. Statistics on Whole Egypt

Table A.1-1. Population

	Population (1,000)	Remarks
1977	38,794	
1978	39,767	
1979	40,889	
1980	42,126	
1981	43,322	
1982	44,506	
1983	45,755	
1984	47,191	
1985	48,503	
1986	49,897 (100)	Urban (44%), Rural (56%)
1987	51,329	

Annual increase from 1977 to 1986: 2.8%

Total Egyptian abroad in 1986: 2,250,000 person

Source: Statistical Yearbook, 1988, CAPMAS

Table A.1-2. Working Status

	(unit: 1,000)					
	1978	1979	1980/81	1981/82	1982/83	1983/84
Agriculture	4,135.0	4,165.0	4,200.0	4,237.5	4,285.7	4,324.3
Industry	1,278.1	1,332.0	1,429.5	1,462.7	1,535.8	1,612.6
Petroleum	18.9	19.2	20.2	24.5	26.0	27.6
Electricity	51.9	52.7	63.0	64.2	68.7	73.5
Construction	538.0	629.2	657.0	664.1	697.2	752.9
Transport/ communication	448.6	452.0	459.8	452.1	461.1	470.3
Trade & Finance	1,093.9	1,125.5	1,206.5	1,175.7	1,211.1	1,247.4
Housing	146.5	155.1	166.0	171.3	178.2	185.3
Public Utilities	60.0	64.0	64.1	66.2	69.5	73.0
Others	3,566.4	2,833.2	3,173.2	2,396.6	3,736.3	4,109.1
Total	10,337.3	10,827.8	11,439.1	10,714.9	12,269.6	12,876.8

Source: Ministry of Planning

Table A.1-3. Development of Labour by Sector
(Unit: 1,000 persons)

	1979	1981/82	1982/83	1983/84
All Sectors;	10,827.8 (100.0)	10,714.9 (100.0)	12,269.6 (100.0)	12,876.8 (100.0)
Commodity Sectors:				
All Commodities	6,198.1	6,453.0	6,613.4	6,790.9
Agriculture	4,165.0 (38.4)	4,237.5 (39.5)	4,285.7 (34.7)	4,324.3 (33.6)
Industry	1,332.0 (12.3)	1,462.7 (13.7)	1,535.8 (12.5)	1,612.6 (12.5)
Petroleum	19.2 (0.2)	24.5 (0.2)	26.0 (0.2)	27.6 (0.2)
Electricity	52.7 (0.5)	64.2 (0.6)	68.7 (0.6)	73.5 (0.6)
Construction	629.2 (5.8)	664.1 (6.2)	697.2 (5.7)	752.9 (5.8)
Service Sectors:				
All Servicers	4,629.7	4,261.9	5,656.2	6,085.9
Transportation &	452.0 (4.2)	452.1 (4.2)	461.1 (3.8)	470.3 (3.7)
Communication	1,125.5 (10.4)	1,175.7 (11.0)	1,211.1 (9.9)	1,247.4 (9.7)
Finance and Trade	155.1 (1.4)	171.3 (1.6)	178.2 (1.5)	185.3 (1.4)
Housing	64.0 (0.6)	66.2 (0.6)	69.5 (0.6)	73.0 (0.6)
Public Utilities	2,833.1 (26.2)	2,396.6 (22.4)	3,736.3 (30.5)	4,109.9 (31.9)
Other Services				

Source: Statistical Yearbook, 1988, CAPMAS.

Table A.1-4. Population Increase in Greater Cairo

	1976	1986
Cairo City	5,074,016 (100)	6,052,836 (119)
Giza City	1,230,446 (100)	1,870,508 (152)
Markaz El-Giza	94,169 (100)	127,789 (136)
Shobra El-Khiema City	394,223 (100)	710,794 (180)
Metropolitan Total	6,792,854 (100)	8,761,927 (129)

Source: CAPMAS

Table A.1-5. Labour Force (1986)

	Employed	Unemployed	Total
Urban	5,477,159 (84)	1,026,739 (16)	6,503,898 (100)
Rural	6,189,102 (86)	984,618 (14)	7,173,720 (100)
Total	11,666,261 (85)	2,011,357 (15)	13,677,618 (100)

Note: Labour force; 6 years and over

Source: Statistical Yearbook, 1988

Table A.1-6. Land Use in Egypt (1980)

	Area (1,000 ha)	%	Remarks
Total Land	100,145	(100.0)	
Cultivated Land	2,855	2.9	Irrigated
Grassland	0	0	
Forest	2	0	
Others	97,288	97.1	

Source: Production Yearbook 1981, FAO

Table A.1-7. Land Ownership (1984)

	<u>Land Owners</u> (1,000)	<u>Area Owned</u> (1,000 fed.)	<u>Land Owners</u> (%)	<u>Area Owned</u> (%)
Less than 5 fed.	3,288	2,904	95.3	53.5
5 fed.	86	576	2.5	10.6
10 fed.	46	589	1.3	10.8
20 fed.	23	621	0.7	11.4
50 fed.	6	407	0.2	7.5
100 fed.	2	335	0.1	6.2
Total	3,451	5,432	100.0	100.0

Source: Statistical Yearbook, CAMPAS

Table A.1-8. Land Reclamation by Type

(Unit: 1,000 fed.)

	<u>Reclaimed</u> <u>Land (1952-</u> <u>67/68)</u>	<u>68/69</u>	<u>69/70</u>	<u>70/76</u>	<u>71/72</u> <u>to</u> <u>86/87</u>	<u>Reclaimed</u> <u>Land 1952</u> <u>to 1986/87</u>
Land Reclamation	371.8	45.1	21.0	24.5	-	462.4
Nubian Immigration Lands	38.8	-	-	-	-	38.8
Tahrir Province	148.8	-	-	-	-	148.8
Kuta, Kom Oshim and Abis	36.1	-	-	-	-	36.1
Waste Land	76.7	-	-	-	-	76.7
Deserts	149.2	-	-	-	381.9	531.1
Total	821.4	45.1	21.0	24.5	381.9	1,293.9

Source: Statistical Yearbook, CAPMAS

Table A.1-9. Export of Some Principal Commodities

	1981	1982	1983	1984	1985	1986	1987	Change in % (1981 - 1987)
(unit: 1,000 LE)								
<u>Agricultural Products</u>								
Cotton Raw	319,964	286,021	308,775	340,062	248,983	308,441	272,129	-15.0
Sugarcane, Refined	10,422	6,172	5,572	-	8	21	-	-
Oranges	32,980	36,835	50,660	53,473	60,565	30,893	104,634	217.3
Rice	29,825	8,129	4,955	15,761	3,596	11,262	27,752	-7.0
Potatoes	17,928	28,762	21,436	25,569	18,856	15,337	36,304	102.5
<u>Other Products</u>								
Petroleum Oil, Crude	1,230,530	1,211,240	1,070,660	1,030,511	1,402,039	798,009	786,199	-36.1
Cotton Yarn	108,603	86,625	137,142	154,350	154,555	223,534	651,438	499.8
Cotton Fabrics	23,524	15,802	28,311	37,701	42,198	65,600	141,505	501.5
Petroleum Shale Oils Other Than Crude	85,741	96,618	98,516	31,229	130,569	39,807	96,584	12.6
Unraught Aluminium	77,803	46,237	5,823	1,753	-	41	-	-
Aluminium Bars, Rods, Angle Shapes, and Sections	14,413	34,708	61,064	90,757	103,034	114,234	236,602	1,541.6
Clothing Manufactured	15,717	15,555	14,338	18,188	17,822	26,507	70,215	346.7

Source: Statistical Yearbook, CAPMAS

Table A.1-10 Import of Some Principal Agricultural Commodities

(unit: 1,000 LE)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Wheat	169,001	174,340	308,890	531,202	492,235	347,638	375,865	342,518	436,668	571,952
Wheat Flour	74,799	68,419	71,720	250,819	192,187	205,588	271,909	213,297	181,327	229,419
Maize	37,974	31,346	71,739	219,864	210,101	142,034	174,186	145,162	135,843	231,856
Meat Chilled/Frozen	34,610	49,495	118,739	208,619	157,023	97,326	193,478	175,636	217,364	349,337
Dairy Products	49,019	49,171	78,106	150,852	117,233	158,718	165,742	170,503	158,641	300,818
Sugar Refined	40,628	34,862	84,742	164,419	98,302	54,670	54,998	43,782	116,627	163,108
Total	406,031	407,633	733,936	1,525,775	1,267,081	1,005,974	1,236,178	1,090,898	1,246,470	1,846,490

Source: Statistical Yearbook, CAPMAS

Table A.1-11 Balance of Trade

(Unit: 1,000 LE)

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87
Export	679,754	1,287,813	2,132,178	2,262,982	2,184,122	2,250,295	2,197,933	2,599,941	2,053,959	3,046,010
Import	2,632,180	2,686,212	3,401,999	6,187,486	6,354,517	7,192,657	7,536,068	6,973,061	8,051,432	11,357,837
Surplus/	-1,952,426	-1,398,399	-1,269,821	-3,924,504	-4,170,395	-4,942,362	-5,338,135	-4,373,120	-5,997,473	-8,311,827
Deficit										

Source: Statistical Yearbook, CAPMAS

Table A.1-12 Gross Domestic Production (Unit: Million LE at 1981/82 price)

Average Annual Growth Rate (1974-79)	1981/82	1982/83	1983/84	1984/85	Annual Growth Rate			
					1982/83	1983/84	1984/85	
Agriculture	2.8 %	3,932 (20)	4,090 (19)	4,258 (18)	4,394 (17)	4.0	4.1	3.2
Industry/Mining	6.9	2,670	2,995	3,260	3,584	12.2	8.8	9.9
Petroleum	34.8	2,668	3,092	3,536	3,911	15.9	14.4	10.6
Electricity	14.0	128	141	163	179	10.6	15.4	9.5
Construction	13.2	1,055	1,108	1,179	1,224	4.0	6.4	3.8
Transport/Commun.	21.1	1,358	1,595	1,827	1,933	17.5	14.6	5.8
Suez Canal	139.2	642	662	656	608	3.2	0.9	7.3
Trade/Finance/Insur.	12.8	4,023	4,539	4,787	5,216	12.8	5.5	9.0
Social Services	5.1	3,622	3,869	4,182	4,562	6.8	8.1	9.1
Total	-	20,098 (100)	22,091 (100)	23,848 (100)	25,611 (100)	9.9	8.0	7.4

Source: Second Five-Year Plan, 1988

Table A.1-13 Import/Export and Food Self-Sufficiency

(Unit: 1,000 tons,%)

	1974		1981	
	Exp/Import	Self-Sufficiency	Exp/Import	Self-Sufficiency
Food:				
Wheat	-3,200	36.8	-5,878	24.8
Rice	136	111.2	25	101.7
Maize	-388	86.6	-1,300	71.1
Sugar	-23	96.0	-580	53.2
Broadbean	-10	92.5	-90	69.8
Lentil	-13	81.2	-85	5.6
Cooking Oil	-151	49.7	-355	31.6
Exporting Crops:				
Cotton	232	211.0	165	149.6
Onion	104	150.0	40	117.0
Groundnuts	7.4	12.6	7.5	18.0
Fruit/Vegetables:				
Citrus	162	120.3	140	114.0
Potatoes	100	118.2	145	113.6
Tomatoes	2	100.1	3	100.1
Animal Products:				
Red Meat	-1	99.7	-125	73.3
Poultry	-1	99.2	-60	62.8
Fishes	-19	92.4	-130	53.6
Milk	-138	92.5	-1,150	62.2

Source: Arab Republic of Egypt Issues of Trade Strategy and Investment Planning, World Bank

Table A.1-14 Index of Wholesale and Consumer Prices

	Wholesale Prices (1965/66 = 100)	Consumer Prices (1965/66 = 100)
1981	308.9	301.2
1982	337.7	345.8
1983	391.1	401.4
1984	430.9	469.9
1985	487.8	532.4
1986	572.1	652.5
1987	650.2	781.0

Source: Central Bank of Egypt

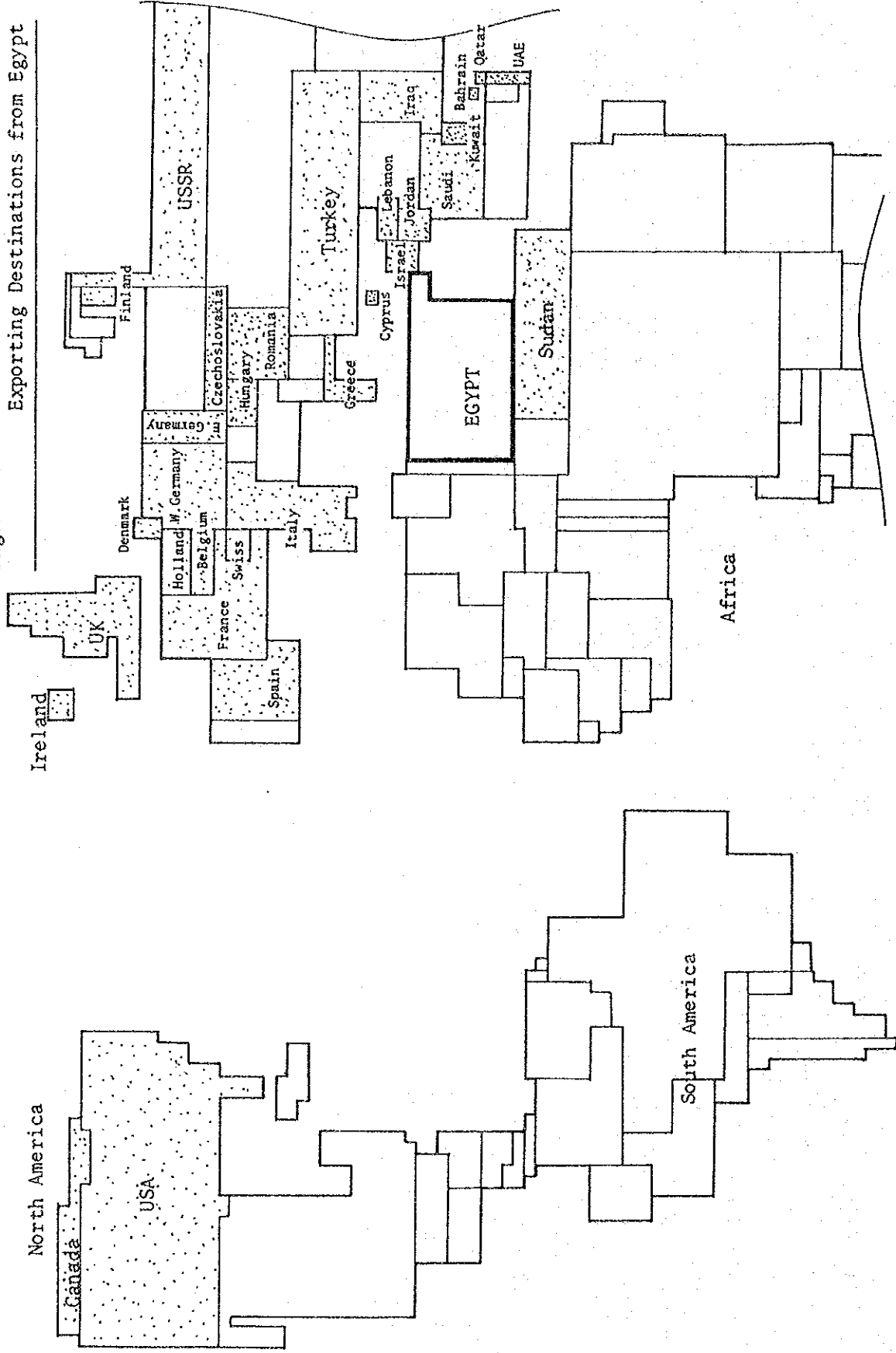
Table A.1-15 Index of Wholesale Prices by Item
(1965/66 = 100)

Item	1965/66	1981	1982	1983	1984	1985	1986	1987
All Items	100.0	308.9	337.7	391.1	430.9	487.8	572.1	650.2
Agricultural Crops	100.0	372.3	402.9	498.7	561.1	657.7	829.4	786.1
Poultry and Fish	100.0	449.4	533.1	661.0	747.4	811.4	864.4	995.3
Inedible Animal Products	100.0	372.5	396.3	441.7	471.6	507.5	541.6	579.2
Foodstuff and Beverages	100.0	356.5	404.0	488.4	552.0	587.4	642.0	767.2
Tobacco and Related Products	100.0	138.4	144.7	151.0	168.0	206.0	249.0	275.0
Yarn, Textile	100.0	237.5	246.6	255.2	266.7	301.6	354.6	443.0
Hide, Tanned	100.0	201.7	265.4	265.4	265.4	373.2	415.8	512.8
Household Appliances	100.0	159.7	167.8	173.7	186.3	210.4	222.1	240.1
Petroleum and Fuel	100.0	240.1	255.0	272.6	284.2	352.2	414.1	524.6
Wood	100.0	478.5	483.1	483.8	503.7	560.9	606.1	886.7
Paper	100.0	415.4	423.8	451.1	490.6	613.3	645.2	530.4
Construction Material	100.0	462.3	556.2	558.5	616.7	690.1	744.6	750.5
Medicine	100.0	183.2	193.3	211.7	211.7	211.7	310.4	771.2
Chemical Material	100.0	200.9	224.9	232.7	234.6	244.3	257.3	344.4
Metal and Related Products	100.0	319.5	351.2	369.1	408.1	448.6	458.5	268.2
Machinery and Implements	100.0	263.3	266.1	266.1	266.1	290.9	321.9	489.1
Transportation Equipment	100.0	287.8	320.9	351.4	361.0	399.7	486.6	338.7

Source: Statistical Yearbook, CAPMAS

A.2. Detail Statistics on Export and Import
of Agricultural Products

Figure A.2-1. Exporting Destinations from Egypt



Note. For volume and commodities, refer to Table A.2-2

Table A.2-1. Foreign Trade by Region

(Unit: Million LE)

Region	1985			1986			1987		
	Imports	Exports	Balance	Imports	Exports	Balance	Imports	Exports	Balance
Arab Countries	249.1 (3.6)	152.1 (5.1)	-117.0 (2.7)	251.1 (5.1)	145.0 (7.0)	-108.1 (1.8)	355.7 (5.0)	255.7 (8.5)	-82.0 (1.0)
Eastern Europe	1,254.0 (18.0)	649.7 (25.0)	-604.3 (15.8)	1,555.7 (19.3)	588.8 (28.7)	-964.9 (16.1)	1,854.7 (16.3)	764.6 (25.1)	-1,090.1 (15.1)
Western Europe	5,106.6 (44.6)	1,113.1 (42.8)	-1,993.5 (45.6)	5,314.7 (41.1)	704.0 (34.3)	-2,610.7 (43.5)	5,180.0 (45.7)	1,206.2 (39.6)	-5,973.8 (47.9)
Asia	716.4 (10.5)	490.6 (18.9)	-225.8 (5.2)	906.2 (11.5)	385.7 (18.7)	-522.5 (8.7)	1,534.5 (15.5)	427.8 (14.0)	-1,106.5 (15.3)
African Countries	28.1 (0.4)	0.6 (0.0)	-27.5 (0.6)	30.5 (0.4)	4.9 (0.2)	-25.6 (0.4)	61.2 (0.5)	2.6 (0.1)	-58.6 (0.7)
North America	981.5 (14.1)	25.1 (1.0)	-956.4 (21.9)	1,286.5 (16.0)	64.1 (3.1)	-1,222.4 (20.4)	1,637.8 (14.4)	256.4 (8.4)	-1,381.4 (16.6)
South America	126.2 (1.8)	8.7 (0.3)	-117.5 (2.7)	148.8 (1.8)	4.2 (0.2)	-144.6 (2.4)	33.2 (0.3)	- (-)	-33.2 (0.4)
Central America	23.5 (0.3)	18.0 (0.7)	-5.5 (0.1)	28.5 (0.4)	- (-)	-28.5 (0.5)	150.6 (1.1)	2.3 (0.1)	-128.3 (1.5)
Oceania	240.8 (3.4)	0.1 (-)	-240.7 (5.5)	291.9 (3.6)	0.1 (-)	-291.8 (4.9)	288.2 (2.5)	2.4 (0.1)	-285.8 (3.4)
Other Regions	246.8 (3.5)	161.8 (6.2)	-85.0 (1.9)	259.8 (3.0)	161.1 (7.8)	-78.7 (1.3)	502.1 (2.7)	129.9 (4.5)	-172.2 (2.1)
All Regions	6,973.0(100.0)	2,599.8(100.0)	-4,373.2(100.0)	8,051.5(100.0)	2,053.9(100.0)	-5,997.6(100.0)	11,357.8(100.0)	3,045.9(100.0)	-8,311.9(100.0)

Note : Re-exports are included.

Source: Statistical Yearbook, CAPMAS.

Table A.2-2. Export by Country

Crops	Year	(1)		(2)		(3)		(4)		(5)	
		Count.	V	Count.	V	Count.	V	Count.	V	Count.	V
Sheep	1984	-	-	-	-	-	-	-	-	-	-
	1985	-	-	-	-	-	-	-	-	-	-
	1986	-	-	-	-	-	-	-	-	-	-
	1987	Saudi	107	32	-	-	-	-	-	-	-
Goats	1984	Saudi	5,502	1,874	-	-	-	-	-	-	-
	1985	"	3,974	1,629	USSR	21	0.1	-	-	-	-
	1986	"	2,804	1,080	UAE	37	190	-	-	-	-
	1987	"	5,379	866	"	458	122	-	-	-	-
Fish (Frozen/Chilled)	1984	Holland	203	50	FSS	73	20	Lebanon	56	26	Greece
	1985	Israel	107	51	Holland	98	33	Italy	48	14	FSS
	1986	Italy	2,494	461	Holland	134	35	FSS	39	9	Israel
	1987	"	1,796	275	Sudan	343	200	Holland	177	31	Spain
	1984	FSS	12	1	-	-	-	-	-	-	-
Shrimp (Chilled/Frozen)	1985	"	20	2	Cyprus	0.3	0.06	-	-	-	-
	1986	"	13	1	Italy	12	1	Spain	5	0.5	-
	1987	"	12	1	Cyprus	0.9	0.08	-	-	-	-
	1984	Kuwait	42	15	Saudi	39	16	UAE	37	15	Qatar
White Cheese	1985	Saudi	380	252	UAE	74	32	Kuwait	63	35	"
	1986	"	1,154	550	Kuwait	330	147	UAE	85	45	"
	1987	"	1,575	463	"	337	114	"	244	74	"
	1984	Saudi	1,379	6,270	Kuwait	455	2,152	Qatar	46	199	Bahrain
	1985	"	1,971	11,659	"	310	1,368	UAE	104	444	Qatar
Fresh Tomato	1986	"	3,021	13,937	"	433	1,932	Qatar	114	429	Bahrain
	1987	"	5,707	17,957	"	1,080	5,576	"	200	647	UAE
	1984	UK	15,276	74,087	Lebanon	4,209	22,969	Saudi	2,969	17,396	Jordan
	1985	"	9,950	64,566	Saudi	4,156	28,096	Lebanon	2,176	16,567	Kuwait
Fresh Onion	1986	-	NA	-	-	-	-	-	-	-	-
	1987	UK	22,208	64,336	Saudi	8,014	33,783	Lebanon	3,155	13,753	Kuwait
	1984	USSR	2,105	9,244	Italy	724	3,389	France	517	1,932	Lebanon
	1985	"	3,650	12,765	"	557	3,278	Lebanon	463	2,129	France
	1986	"	2,967	11,900	"	759	4,326	France	533	2,817	Holland
Fresh Garlic	1987	"	11,915	15,962	France	1,921	5,298	Saudi	1,719	4,433	Italy
	1984	USSR	1,350	3,000	Saudi	464	1,069	Lebanon	111	278	Sudan
	1985	Saudi	297	772	Kuwait	73	187	Italy	67	180	"
	1986	"	253	452	Italy	119	218	Lebanon	79	145	Kuwait
Fresh Cauliflower	1987	"	519	707	Lebanon	252	323	France	191	347	Italy
	1984	Italy	11	50	FSS	1	4	Kuwait	0.1	0.5	-
	1985	FSS	0.7	2	Saudi	0.5	2	Jordan	0.2	0.3	-
	1986	Saudi	1.5	8	FSS	0.6	1	UK	0.8	2.5	-
Fresh Cabbage	1987	"	1.2	3	Qatar	1	2.1	FSS	0.7	1.7	-
	1984	FSS	2.4	9.2	Kuwait	0.7	2.9	UK	0.7	2.6	-
	1985	Saudi	3.7	3.0	FSS	2.1	6.8	Kuwait	0.8	3.2	UAE
	1986	"	2.4	11.2	FSS	1.2	3.4	UK	0.5	1.9	-
	1987	"	2.0	5.6	FSS	1.1	2.7	Kuwait	0.8	1.5	-

(Continued) 1/4

Crops	Year	(1)		(2)		(3)		(4)		(5)						
		Count	V	Count	V	Count	V	Count	V	Count	V					
Fresh Turnip	1984	Saudi	0.5	2.6	FSS	0.06	0.2	-	-	-	-					
	1985	France	4	21	Saudi	2	27	-	-	-	-					
	1986	Saudi	0.3	1.4	FSS	0.08	0.4	Bahrain	0.03	0.4	-					
	1987	"	0.2	1.2	Kuwait	0.2	0.4	-	-	-	-					
	1984	Saudi	5	22	FSS	1	7	-	-	-	-					
Fresh Carrot	1985	"	7	35	Kuwait	1	5	FSS	0.9	6.2	-					
	1986	Lebanon	1.2	6	Saudi	1	8	-	-	-	-					
	1987	Saudi	10	30	Kuwait	0.9	2.2	FSS	0.8	4.3	-					
Fresh Radish	1984	"	-	-	-	-	-	-	-	-	-					
	1985	Saudi	0.04	0.2	-	-	-	-	-	-	-					
	1986	Kuwait	0.2	0.8	-	-	-	-	-	-	-					
Fresh Salad Beet Root	1987	Saudi	0.4	1.5	UAE	0.07	0.2	-	-	-	-					
	1984	FSS	0.7	2.3	-	-	-	-	-	-	-					
	1985	Denmark	425	7,235	FSS	0.6	2.2	-	-	-	-					
Fresh Haricot	1986	Saudi	0.6	2.6	"	0.5	1.6	-	-	-	-					
	1987	Holland	1.9	7	"	0.5	1.9	-	-	-	-					
	1984	Holland	1,871	5,829	Saudi	707	2,675	UAE	255	945	Kuwait	146	587			
Fresh Kidney	1985	"	936	3,402	Saudi	784	3,249	"	229	974	"	97	392			
	1986	"	2,851	8,494	"	1,106	3,152	"	458	1,302	"	185	486			
	1987	"	3,372	7,181	"	524	1,174	"	265	628	Swiss	161	299			
Fresh Pea	1984	Saudi	0.3	0.7	-	-	-	-	-	-	-	-	-			
	1985	"	-	-	-	-	-	-	-	-	-	-	-			
	1986	Saudi	0.16	0.72	UAE	0.08	0.24	-	-	-	-	-	-			
Fresh String Bean	1984	Saudi	160	556	UK	67	171	UAE	51	174	Kuwait	35	92	Holland	14	41
	1985	"	168	663	"	74	195	"	45	176	"	19	74	Quatar	11	40
	1986	"	118	583	UAE	79	227	UK	68	168	"	25	73	"	16	42
	1987	UK	150	254	Saudi	135	209	UAE	110	210	"	35	59	"	17	54
	1984	Kuwait	93	231	Saudi	86	229	UAE	27	71	Lebanon	12	34	Quatar	8	21
Fresh Cucumber	1985	Saudi	71	289	Kuwait	67	286	UAE	25	100	"	11	36	"	5	19
	1986	Kuwait	60	224	Saudi	54	205	UAE	27	106	"	13	48	"	7	26
	1987	"	97	205	"	56	125	"	47	96	Quatar	10	21	UK	5	10
	1984	Kuwait	24	101	Bahrain	15	68	Saudi	13	68	UAE	11	51	Quatar	10	45
	1985	Bahrain	7	35	Kuwait	7	26	"	7	28	"	5	16	UK	2	11
Fresh Courgettes	1986	Saudi	10	17	UK	5	18	Bahrain	5	14	-	-	-	-	-	-
	1987	UK	16	20	W.Germany	14	22	"	5	6	Denmark	5	6	-	-	-
	1984	Saudi	43	191	Kuwait	16	78	UAE	13	52	UK	9	40	FSS	2	10
	1985	Kuwait	23	93	UK	19	81	Saudi	13	59	UAE	6	25	-	-	-
	1986	UK	49	191	Kuwait	14	54	"	10	37	"	2	10	FSS	2	6
Fresh Eggplant	1987	"	85	201	"	28	69	"	10	27	W.Germany	3	8	"	2	5
	1984	Saudi	40	157	Kuwait	19	70	UAE	4	12	Bahrain	3	16	Quatar	3	14
	1985	"	34	138	"	19	71	"	4	19	Quatar	3	14	FSS	2	7
	1986	"	41	116	"	29	85	"	11	30	Quatar	9	28	Bahrain	4	13
	1987	"	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
	1985	"	15	45	Saudi	4	10	FSS	1	1	-	-	-	-	-	-
	1986	"	64	70	UK	16	20	Saudi	7	8	UAE	5	5	-	-	-
1987	"	38	36	Saudi	24	14	UK	11	9	-	-	-	-	-	-	

(Continued) 2/6

Crops	Year	(1)		(2)		(3)		(4)		(5)						
		Count.	Q	Count.	Q	Count.	Q	Count.	Q	Count.	Q					
Green Pepper	1984	Saudi	148	584	France	12	29	Italy	4	5	Bahrain	5	9	FSS	5	4
	1985	"	109	467	"	11	40	Spain	11	16	"	"	"	"	"	"
	1986	"	146	359	Kuwait	5	16	UK	3	8	Swiss	2	8	"	"	"
	1987	Kuwait	50	49	Saudi	28	45	USA	15	12	W.Germany	8	15	"	"	"
	1984	Irish	737	670	UAE	52	237	Kuwait	12	54	Qatar	5	24	Saudi	5	20
Other Fresh Vegetables	1985	France	128	127	UAE	85	560	UK	53	151	Kuwait	22	67	Qatar	11	45
	1986	UAE	164	518	Kuwait	28	83	Qatar	26	67	UK	17	67	Saudi	16	40
	1987	"	137	277	UK	65	133	"	41	86	Kuwait	28	54	"	25	59
	1984	Kuwait	892	1,012	UAE	229	235	Saudi	101	106	Qatar	95	98	Canada	52	51
	1985	"	719	845	UAE	98	93	Canada	94	101	Saudi	89	105	Qatar	77	87
Preserved Vegetables	1986	"	937	1,025	Saudi	684	621	Qatar	174	153	USA	130	123	UAE	102	93
	1987	"	1,528	816	Saudi	1,134	732	"	176	113	Canada	174	93	USA	164	115
	1984	UK	5,576	3,518	W.Germany	793	767	Holland	633	591	Cyprus	181	168	Lebanon	139	115
	1985	"	2,826	2,998	"	915	974	"	375	426	Cuba	236	247	Belgium	176	205
	1986	"	2,379	2,271	"	1,487	1,411	"	666	825	Belgium	190	214	Japan	98	104
Dried Onion	1987	W.Germany	3,697	1,620	UK	2,805	1,257	"	1,644	764	USSR	795	850	Belgium	218	206
	1984	UK	36	34	Belgium	15	14	Holland	3	2	Swiss	3	3	"	"	"
	1985	"	225	281	France	66	90	"	10	10	USA	4	5	"	"	"
	1986	"	126	155	Italy	13	7	Saudi	8	5	"	"	"	"	"	"
	1987	"	206	118	UAE	14	16	Denmark	13	6	Italy	12	10	"	"	"
Dried Garlic	1984	Swiss	8	8	"	"	"	"	"	"	"	"	"	"	"	"
	1985	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
	1986	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
	1987	Kuwait	8	5	Saudi	2	0.8	"	"	"	"	"	"	"	"	"
	1984	Holland	103	106	USA	80	78	Lebanon	42	41	Belgium	34	46	France	28	52
Other Dried Vegetables	1985	E.Germany	48	70	UK	47	48	Holland	45	58	France	24	53	Lebanon	17	19
	1986	USA	94	76	France	44	48	"	32	28	UK	17	18	Australia	16	11
	1987	"	189	92	Holland	70	53	Singapore	67	125	E.Germany	57	52	UK	57	33
	1984	FSS	0.008	0.020	"	"	"	"	"	"	"	"	"	"	"	"
	1985	Sudan	8	30	"	"	"	"	"	"	"	"	"	"	"	"
Dried Bean	1986	UAE	247	1,055	"	"	"	"	"	"	"	"	"	"	"	"
	1984	Lebanon	21	50	FSS	0.5	0.7	Jordan	0.4	1.0	"	"	"	"	"	"
	1985	FSS	1.0	1.0	"	"	"	"	"	"	"	"	"	"	"	"
	1986	Jordan	118	119	France	61	45	Saudi	17	18	Sudan	15	16	"	"	"
	1987	Saudi	500	383	France	274	200	Turkey	233	270	UAE	62	47	Jordan	19	20
Dried Kidney	1984	FSS	0.3	0.5	"	"	"	"	"	"	"	"	"	"	"	"
	1985	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
	1986	Saudi	3	4	FSS	1.1	0.9	"	"	"	"	"	"	"	"	"
	1987	"	10	10	Jordan	5	5	Kuwait	4	2	Qatar	2	2	"	"	"
	1984	FSS	0.4	0.5	"	"	"	"	"	"	"	"	"	"	"	"
Dried Pea	1985	FSS	0.6	0.8	"	"	"	"	"	"	"	"	"	"	"	"
	1986	"	0.2	0.2	"	"	"	"	"	"	"	"	"	"	"	"
	1987	Qatar	0.3	0.3	"	"	"	"	"	"	"	"	"	"	"	"
	1984	FSS	0.2	0.2	"	"	"	"	"	"	"	"	"	"	"	"
	1985	"	0.04	0.06	"	"	"	"	"	"	"	"	"	"	"	"
Lentil	1986	"	0.07	0.08	"	"	"	"	"	"	"	"	"	"	"	"
	1987	Qatar	2	4	"	"	"	"	"	"	"	"	"	"	"	"

(Continued) 5/6

Crops	(1)		(2)		(3)		(4)		(5)							
	Year	Count	Q	V	Count	Q	Count	V	Count	V						
Sweet Potato	1984	France	186	665	Lebanon	134	539	UK	599	126	472	Kuwait	45	185		
	1985	Saudi	167	805	France	152	486	UK	441	90	278	"	40	234		
	1986	"	270	1,033	"	207	410	Kuwait	410	156	281	UAE	33	123		
	1987	UK	366	1,035	"	324	692	Saudi	875	285	184	"	45	117		
Fresh Dasheen	1984	Saudi	161	675	Lebanon	57	244	Kuwait	148	37	84	Quatar	5	22		
	1985	"	138	610	Kuwait	48	141	Lebanon	154	28	117	"	-	-		
	1986	"	206	832	"	76	262	"	260	58	107	Quatar	14	45		
	1987	"	197	489	"	72	190	UAE	90	39	265	"	14	52		
Stuffed Dates																
1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
1987	UK	0.1	0.2													
Other Dates	1984	Lebanon	167	421	Saudi	28	82	Kuwait	75	27	38	Quatar	7	17		
	1985	"	67	94	"	42	151	"	158	41	34	"	8	24		
	1986	Saudi	109	144	Kuwait	92	202	UAE	108	68	151	UK	49	106		
	1987	USSR	945	699	Saudi	86	146	Finland	146	84	102	UK	45	58		
Mango	1984	Saudi	65	74	Lebanon	39	57	Kuwait	25	19	19	Bahrain	8	9		
	1985	"	46	101	Kuwait	19	51	UAE	17	15	2	-	-			
	1986	"	70	51	"	52	35	Bahrain	30	9	7	UAE	8	7		
	1987	Kuwait	65	46	Saudi	65	44	"	21	53	19	UK	14	12		
Guava	1984	Saudi	404	1,255	Kuwait	120	387	UAE	105	55	77	Lebanon	11	26		
	1985	"	448	1,440	"	82	343	UAE	161	44	16	53	-	-		
	1986	"	580	1,309	"	328	684	"	390	133	127	UK	27	53		
	1987	"	550	1,117	"	192	370	"	155	66	70	"	27	46		
Fresh Banana	1984	FSS	8	8	Saudi	0.6	0.8									
	1985	"	6	5	"	0.09	0.08									
	1986	"	5	5	-	-	-									
	1987	Saudi	20	38	FSS	7	4									
Orange	1984	USSR	32,898	102,627	Saudi	10,919	34,065	Czecho.	5,997	12,694	W.Germany	1,553	3,260	UK	755	5,466
	1985	"	34,200	95,043	"	12,073	37,644	E.Germany	8,987	16,341	Czecho.	2,709	11,459	W.Germany	772	2,760
	1986	"	15,684	23,396	"	11,031	38,398	Czecho.	2,835	9,215	Rumania	617	2,105	Sudan	379	890
	1987	"	76,536	66,496	"	17,680	27,975	"	6,659	9,082	Canada	839	909	Belgium	513	919
Mandarine	1984	Saudi	3	9	FSS	2	5	Kuwait	2	1	2	-	-	-		
	1985	Kuwait	4	16	Sudan	4	47	Saudi	15	3	15	FSS	2	5		
	1986	Sudan	15	41	Saudi	7	51	-	-	-	-	-	-	-		
	1987	USSR	43,301	43,883	E.Germany	10,239	12,027	Finland	180	60	180	-	-	-		
Sweet Lemon	1984	-	-	-	-	-	-	-	-	-	-	-	-	-		
	1985	Saudi	11	36	-	-	-	-	-	-	-	-	-	-		
	1986	-	-	-	-	-	-	-	-	-	-	-	-	-		
	1987	Saudi	5	8	UAE	0.5	1.4									
Fresh Fig	1984	-	-	-	-	-	-	-	-	-	-	-	-	-		
	1985	Kuwait	0.06	0.05	-	-	-	-	-	-	-	-	-	-		
	1986	"	1.1	1.7	Quatar	0.5	0.5									
	1987	Saudi	0.5	0.6	-	-	-	-	-	-	-	-	-	-		
Dried Fig	1984	Saudi	2.1	1.1												
	1985	-	-	-	-	-	-	-	-	-	-	-	-	-		
	1986	-	-	-	-	-	-	-	-	-	-	-	-	-		
	1987	-	-	-	-	-	-	-	-	-	-	-	-	-		

(Continued) 4/6

Crops	(1)		(2)		(3)		(4)		(5)	
	Year	Count	Y	Q	Count	V	Q	Count	V	Q
Fresh Apple	1984	-	-	-	-	-	-	-	-	-
	1985	UAE	0.06	0.02	-	-	-	-	-	-
	1986	Kuwait	0.2	0.08	-	-	-	-	-	-
	1987	-	-	-	-	-	-	-	-	-
Fresh Pear	1984	FSS	4	3.6	Kuwait	4	4	Sudan	3	8
	1985	Saudi	11	40	Sudan	5	13	FSS	2	2
	1986	FSS	2	1.0	Sudan	0.7	1.8	-	-	-
	1987	Saudi	9	19	FSS	3	1	Kuwait	2	3
Fresh Quinces	1984	-	-	-	-	-	-	-	-	-
	1985	Kuwait	0.08	0.04	-	-	-	-	-	-
	1986	-	-	-	-	-	-	-	-	-
	1987	France	3	3	Saudi	1	0.6	-	-	-
Fresh Apricot	1984	Saudi	47	86	Kuwait	9	15	UAE	5	9
	1985	"	26	62	UAE	7	17	Kuwait	4	8
	1986	"	106	110	Kuwait	10	12	UAE	9	10
	1987	"	48	36	"	4	3	"	3	5
Fresh Peach	1984	FSS	0.4	0.3	Saudi	0.2	0.4	-	-	-
	1985	"	0.6	0.4	-	-	-	-	-	-
	1986	Saudi	18	20	UK	2	2	UAE	2	2
	1987	"	51	60	Qatar	6	10	Kuwait	2	3
Fresh Plum	1984	Saudi	45	81	Kuwait	8	18	UAE	8	18
	1985	"	12	23	UAE	4	8	Kuwait	3	5
	1986	"	202	201	"	37	43	Bahrain	19	19
	1987	"	91	74	Kuwait	23	14	UAE	9	6
Fresh Cherry	1984	Saudi	0.07	0.1	-	-	-	-	-	-
	1985	-	-	-	-	-	-	-	-	-
	1986	UK	0.2	0.1	-	-	-	-	-	-
	1987	-	-	-	-	-	-	-	-	-
Fresh Strawberry	1984	Saudi	63	46	Kuwait	9	7	Qatar	6	4
	1985	"	13	21	Qatar	6	9	Kuwait	3	4
	1986	"	47	90	"	7	10	UAE	2	2
	1987	Qatar	5	7	Saudi	5	4	Holland	5	2
Pomegranate	1984	Saudi	210	583	Kuwait	78	209	Qatar	30	92
	1985	"	191	680	"	41	140	"	16	47
	1986	"	256	671	"	112	240	"	31	66
	1987	"	583	784	"	76	129	UK	27	40
Water Melon	1984	Saudi	3,775	13,830	Kuwait	1,089	4,307	Lebanon	878	2,801
	1985	"	5,207	13,056	"	1,019	3,350	Qatar	208	783
	1986	"	4,698	13,311	"	1,911	5,103	Swiss	420	381
	1987	"	4,192	8,138	"	1,288	2,455	Qatar	286	543
Other Fresh Fruit	1984	Kuwait	21	30	Saudi	5	13	UAE	5	14
	1985	Saudi	12	29	Kuwait	10	47	Qatar	6	22
	1986	"	87	99	"	42	59	UK	11	17
	1987	"	129	275	"	85	112	"	19	34
Wheat	1984	-	-	-	-	-	-	-	-	-
	1985	Sudan	1,810	7,495	-	-	-	-	-	-
	1986	-	-	-	-	-	-	-	-	-
	1987	-	-	-	-	-	-	-	-	-

(Continued) 5/6

Table A.2-3. Import (CIF)

	1985			1986			1987			1988		
	V	Q	P	V	Q	P	V	Q	P	V	Q	P
Buffalo	2,788	3,379	825	979	887	1,104	589	309	1,906	-	-	-
Cow Oxen	20,736	21,111	982	18,603	20,109	1,509	4,783	3,169	1,509	164	39	4,205
Sheep	2,005	2,726	736	1,619	1,800	899	6,232	5,830	1,627	-	-	-
Goats	-	-	-	-	-	-	-	-	-	188	18	10,444
Hens, fowls	24	0.5	48,000	-	-	-	20	0.2	100,000	25	0.1	250,000
Poultry	22	2	11,000	-	-	-	817	9	90,778	3	0.1	30,000
Live Animal for Food	18	2	9,000	6	0.8	7,500	-	-	-	126	69	1,826
Fish (Chilled/Frozen)	23,800	75,310	524	34,175	103,205	551	51,278	93,989	545	31,274	47,432	659
Sardine	33	59	559	-	-	-	-	-	-	-	-	-
Fish (Salted/Dried)	713	204	3,495	537	385	1,402	309	259	1,193	422	300	1,407
Shrimp	-	-	-	-	-	-	-	-	-	554	150	3,693
Fresh Milk	103	66	1,561	11	3	3,667	-	-	-	-	-	-
Other Milk	5	2	2,500	-	-	-	26	7	3,714	0.7	0.5	2,333
Sweetened Powder Milk	22,699	11,300	2,009	23,889	12,326	1,938	20,273	7,913	2,562	5,701	2,400	2,375
Powder Milk	15,444	12,394	1,246	18,102	11,441	1,582	52,495	21,366	2,457	11,522	6,155	1,872
Preserved Sweetened Milk	980	1,044	938	549	670	819	-	-	-	-	-	-
Other Preserved Milk	1,136	1,086	1,046	-	-	-	1,919	393	4,883	6	0.9	6,667
Butter for Retail Sale	5,034	2,427	1,250	3,508	2,622	1,338	7,069	3,103	2,278	2,369	892	2,656
Other Butter	20,872	13,554	1,540	22,803	13,677	1,567	45,931	23,245	1,976	48,404	20,497	2,362
Fat	44,078	34,005	1,296	56,260	43,298	1,299	88,450	43,569	2,030	88,611	33,013	2,684
White Cheese	12,759	13,305	959	5,116	3,201	1,398	31,526	19,388	1,626	13,449	5,899	2,280
Other Cheese (Edam, Gouda)	54,860	24,847	1,403	22,517	10,846	2,058	29,897	11,677	2,560	7,986	2,081	5,838
Other Cheese	4,650	5,327	1,398	4,261	1,914	2,226	8,536	3,110	2,745	7,507	2,213	3,392
Egg for Sprout	17,462	7,077	2,467	3,240	1,178	2,500	14,577	5,575	4,077	5,014	561	5,373
Other Egg	16	6	2,667	15	6	2,500	-	-	-	679	527	1,288
Dried Egg/Egg Yolk	345	277	1,245	32	10	3,200	115	61	1,885	46	10	4,600
Fresh Tomato	-	-	-	4	31	129	-	-	-	-	-	-
Fresh Potato	-	-	-	55	499	106	6	23	261	-	-	-
Fresh Garlic	-	-	-	-	0.05	500	-	-	-	-	-	-
Fresh Artichokes	6	7	857	98	146	671	-	-	-	-	-	-
Fresh Pea	-	-	-	0.06	0.3	200	-	-	-	-	-	-
Fresh Courgettes	0.3	2	150	-	-	-	-	-	-	-	-	-
Other Fresh Vegetables	0.5	2	250	-	-	-	0.4	0.8	500	-	-	-
Preserved Vegetables	12	8	1,500	11	6	1,833	148	375	395	3	0.8	3,750
Dried Vegetables	-	-	-	5	5	600	-	-	-	-	0.9	0.06
Dried Bean for Sowing	117	373	314	124	430	288	-	-	-	-	-	-
Other Dried Bean	118	148	797	1,085	1,564	694	14,502	21,186	685	-	-	-
Dried Haricot	30	33	909	-	-	-	-	-	-	-	-	-
Dried Kidney	-	-	-	-	-	-	38	45	844	-	-	-
Dried Chick Pea	51	150	340	-	-	-	-	-	-	-	-	-
Other Dried Leguminous	5	8	635	14	25	560	230	353	652	262	394	665
Elmuyahot Root	-	-	-	-	-	-	35	110	318	-	-	-
Sweet Potato	2	8	250	-	-	-	0.1	0.3	533	-	-	-
Root of Pomegranate	21	10	2,100	99	24	4,125	-	-	-	-	-	-
Fresh Dashen	3	12	250	-	-	-	-	-	-	-	-	-
Root/Tuber	4	13	308	-	-	-	0.1	0.3	335	-	-	-
Other Dates	2,260	3,201	706	3,677	6,650	555	2,053	2,341	877	2,378	2,399	991
Flakes Coconut	1,952	1,959	1,017	243	235	1,034	2,232	2,022	1,104	515	302	1,705
Other Coconut	9	36	250	-	-	-	30	22	1,364	-	-	-
Indian Almond	43	11	3,909	-	-	-	-	-	-	-	-	-

(Continued)

	1985			1986			1987			1988		
	V	Q	P	V	Q	P	V	Q	P	V	Q	P
Fresh Pineapple	-	-	-	30	20	1,500	41	24	1,708	-	-	-
Mangoes	-	-	-	0.2	0.5	400	-	-	-	-	-	-
Fresh Banana	520	984	325	-	-	-	-	-	-	-	-	-
Orange	-	-	-	-	-	-	20	25	80	-	10	900
Lemon	0.1	0.5	500	-	-	-	1	2	500	-	-	-
Dried Figs	1,102	1,476	747	-	-	-	517	840	615	-	-	-
Resin	1,723	2,224	775	240	399	602	526	852	617	89	40	2,225
Fresh Nuts	-	-	-	-	-	-	12	2	6,000	271	3	90,333
Almond in Shell	545	446	1,222	-	-	-	717	411	1,745	137	19	7,211
Shelled Almond	277	121	2,289	239	45	5,311	1,182	202	5,703	534	75	7,315
Walnuts in Shell	567	518	1,095	-	-	-	348	418	835	-	-	-
Shelled Walnuts	77	36	2,139	49	11	4,455	394	150	2,827	36	5	7,200
Hazel Nuts in Shell	955	615	1,553	-	-	-	575	168	3,411	153	22	6,955
Shelled Hazelnuts	880	477	1,845	731	205	5,566	1,579	618	2,555	1,502	174	8,632
Pistachio in Shell	19	11	1,727	-	-	-	106	13	8,154	-	-	-
Shelled Pistachio	0.2	0.04	5,000	-	-	-	67	9	7,444	-	-	-
Shelled Pine Nuts	-	-	-	-	-	-	12	2	6,000	-	-	-
Fresh Apple	540	180	5,000	-	-	-	-	-	-	-	-	-
Fresh Apricot	-	-	-	-	-	-	0.8	0.8	1,000	62	9	6,889
Fresh Plum	-	-	-	-	-	-	1	0.9	1,111	-	-	-
Other Stone Fruit	13	4	3,250	-	-	-	-	-	-	-	-	-
Pomegranate	0.1	0.5	200	-	-	-	0.3	1	300	-	-	-
Water Melon	0.7	5	235	-	-	-	-	-	-	-	-	-
Dried Plum	55	53	1,038	7	6	1,167	199	253	787	-	-	-
Dried Apricot	21	13	1,615	-	-	-	250	152	1,645	59	10	5,900
Dried Cherry	7	10	700	-	-	-	-	-	-	-	-	-
Green Coffee	12,578	5,701	2,206	11,038	5,086	5,577	24,300	5,183	4,688	9,072	1,962	4,624
Coffee Roasted/Ground	2,647	811	3,264	1,107	269	4,115	4,681	498	9,400	1,634	158	11,841
Coffee Substitutes	2	0.1	20,000	-	-	-	109	9	12,111	-	-	-
Wheat	583,608	5,843,013	152	560,296	4,014,954	140	578,734	3,802,624	152	328,265	1,662,825	197
Barley	-	-	-	498	4,510	110	-	-	-	-	-	-
Maize	184,738	584,953	316	194,717	1,562,257	125	231,855	1,550,771	150	89,520	391,869	228
Husked Rice	-	-	-	-	-	-	500	1,250	400	-	-	-
Other Husked Rice	-	-	-	-	-	-	0.2	0.7	286	-	-	-
Broken Rice	-	-	-	-	-	-	0.7	0.2	5,500	-	-	-
Grain Sorghum	-	-	-	-	-	-	29	54	557	-	-	-
Other Cereals	5	18	278	27	40	675	46	54	852	-	-	-
Wheat Flour	265,402	1,436,058	185	207,911	1,306,618	159	247,312	1,373,780	180	107,670	399,369	270
Maize Flour	-	-	-	-	-	-	-	-	-	0.4	0.9	444
Other Cereal Flour	231	1,060	218	-	-	-	-	-	-	-	-	-
Meal of Wheat	-	-	-	4,688	20,131	235	6,895	16,769	411	5,143	13,182	238
Flaked Wheat	-	-	-	73	251	291	1,054	5,227	527	764	1,595	479
Other Cereal Groats	1,178	6,561	185	1,858	7,652	243	6,506	24,092	270	1,943	4,316	450
Flour of Leguminous	-	-	-	-	-	-	-	-	-	4	1	4,000
Flour, Meal Flake of Potato	-	-	-	-	-	-	1,025	10,055	102	-	-	-
Groundnut in Shell	-	-	-	-	-	-	0.4	0.4	1,000	-	-	-
Shelled Groundnut	-	-	-	-	-	-	98	45	2,178	-	-	-
Soybean	1,121	5,000	224	25,740	104,454	246	18,307	54,883	534	8,259	18,680	442
Other Oil Seeds	-	-	-	6	4	1,500	-	-	-	9	4	2,250
Safflower	-	-	-	-	-	-	114	63	1,810	-	-	-
Soybean Oil	5,056	4,865	628	5,454	6,805	802	1,674	5,045	550	16,264	29,475	552
Sunflower Oil	62,595	111,757	560	120,805	265,086	456	85,027	224,049	380	63,089	120,499	524
Rape Oil	-	-	-	-	-	-	5,021	8,411	359	14	7	2,000

(Continued)

	1985			1986			1987			1988		
	V	Q	P	V	Q	P	V	Q	P	V	Q	P
Maize Oil	5,425	6,158	881	4,389	5,655	1,201	2,024	1,293	1,565	3,475	1,509	2,303
Palm Kernel Oil	6,757	9,831	687	7,158	11,342	629	8,198	12,925	634	16,222	18,791	863
Linseed Oil	969	1,830	530	6,178	9,573	645	7,350	9,620	754	1,511	2,149	703
Sesame Oil	-	-	-	24	14	1,714	49	21	2,333	4	0.2	20,000
Castor Oil for Medicin	59	60	983	69	54	1,278	-	-	-	-	-	-
Other Castor Oil	86	90	956	354	452	783	524	464	1,129	283	114	2,482
Sausage	50	50	1,000	-	-	-	-	-	-	-	-	-
Preserved Meat of Swine	-	-	-	-	-	-	1,596	512	3,117	1,127	240	4,696
Preserved Meat of (Sheep	17,572	10,114	1,737	30,632	15,251	2,009	26,006	9,925	21,620	17,140	4,188	4,093
Preserved Meat of (Bovine	-	-	-	-	-	-	-	-	-	-	-	-
Other preserved Meat	103	79	1,303	466	249	1,871	1,605	527	3,046	-	-	-
Olive preserved in Vinegar	22	60	367	-	-	-	-	-	-	-	-	-
Mushroom preserved in Vinegar	30	33	909	-	-	-	70	67	1,045	-	-	-
Olive not preserved in Vinegar	10,708	15,160	706	6,901	10,750	642	287	288	997	-	-	-
Olive not in Vinegar	-	-	-	-	-	-	84	97	866	-	-	-
Tomato/Tomato paste not in Vinegar	11,958	17,054	701	15,414	19,887	775	21,127	18,413	1,147	2,674	1,569	1,704
Other Vegetables not in Vinegar	487	1,053	462	17	7	2,429	-	-	-	-	-	-
Frozen Fruits	-	-	-	1	0.8	1,250	-	-	-	-	-	-
Fruits with Sugar	-	-	-	-	-	-	61	11	5,545	220	96	2,292
Apricot paste	1,606	980	1,639	79	55	1,436	1,703	1,236	1,378	74	16	4,625
Other Fruits paste	27	6	4,300	-	-	-	-	-	-	-	-	-
Date paste	10	1	10,000	-	-	-	-	-	-	-	-	-
Grape Juice	-	-	-	-	-	-	35	71	495	-	-	-
Apple Juice	0.5	0.4	750	0.5	2	150	9	27	333	-	-	-
Other Fruits Juice	64	90	711	40	13	3,077	282	274	1,029	-	-	-
Tomato Sauce	147	259	568	252	182	-	147	20	7,350	-	-	-
Seasonings	8	6	1,333	35	10	-	86	51	1,686	36	3	12,000
Meat/poultry Liquid Soup	1,829	875	2,090	980	469	-	-	-	-	-	-	-
Other Cheese	-	-	-	-	-	-	2,179	1,037	2,101	-	-	-
Nitrogen	44	25	1,760	15	9	1,667	31	2	15,500	37	1	37,000
Phosphorus	54	28	1,928	269	77	5,494	281	54	5,204	458	53	8,264

Note : P: Price : LE/ton
V: Value : 1,000 LE
Q: Quantity: tons

Source: Foreign Trade Computer Center, CAPMAS.

A.3. Second Five-Year Plan

Table A.3-1. Expected Gross Domestic Product (GDP)

(Unit: Billion LE)

Sectors	1986/87	1991/92
Agriculture	8.6	10.4
Industry & Mining	6.9	10.4
Petroleum & Products	1.7	1.9
Electricity	0.5	0.7
Construction	2.1	2.6
Transport, Communication & Suez Canal	3.8	4.8
Trade, Finance & Insurance	9.6	12.6
Tourism	0.4	0.7
Housing Utilities	0.8	1.4
Social & Personal Services	1.8	2.4
Government Services	4.6	6.0
GDP at Cost Value	40.8	54.1
Net Indirect Taxes	3.2	4.0
GDP at Market Value	44.1	58.1

Source: Summary of the Second Five-Year Plan (1987/88-1991/92)

A.4. Statistics on North Sinai Governorate

Table A.4-1. Population by Markaz

(Unit: Persons)

	1982	1986	Annual Increase
El Arish	54,017	67,638	5.8 %
Bir El Abd	20,821	27,389	7.1
El Hassana	15,728	13,111	-4.4
Nekhel	3,510	4,654	7.3
Sheikh Zuwayid	19,255	24,382	6.1
Rafah	23,332	34,331	10.1
Total	136,663	171,505	5.8

Source: Population Census, 1986, CAPMAS

Table A.4-2. Population by Age Groups

(Unit: %)

	1982			1986		
	Urban	Rural	Total	Urban	Rural	Total
Less than 12 years	35.2	38.4	37.9	35.4	40.0	36.5
12 - 64 years	62.7	58.7	58.4	61.9	55.3	61.1
More than 64 years	2.1	2.9	3.7	2.7	4.7	2.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Population Census, 1986. CAPMAS

Table A.4-3. Ratio of Population by Urban and Rural (1986)

(Unit: %)

Markaz	Urban		Rural	
El Arish	100.0	(64.0)	-	(-)
Bir El Abd	11.6	(4.5)	88.4	(34.3)
El Hassana	6.3	(1.2)	93.7	(18.0)
Nekhel	42.9	(2.4)	57.1	(3.2)
Sheikh Zuwayid	25.5	(8.2)	74.5	(23.9)
Rafah	48.9	(19.7)	51.1	(20.6)
Total	-	(100.0)	-	(100.0)

Source: Population Census, 1986, CAPMAS

Table A.4-4. Land Tenure - Individual Farms (1981/82)

Land Less	Farm Size/Farm Household (feddan)											Above		
	0-1	1-2	2-3	3-4	4-5	5-7	7-10	10-15	15-20	20-30	30-50	100	Total	
No. of Farm Household	2,795 (29.3)	1,383 (14.5)	936 (9.8)	835 (8.8)	576 (6.0)	896 (9.4)	413 (4.3)	579 (6.1)	332 (3.5)	331 (3.5)	274 (2.9)	134 (1.4)	47 (0.5)	9,531 (100.0)
Acreage (feddan)	0 (0)	1,141 (1.9)	1,991 (3.4)	2,596 (4.4)	2,353 (4.0)	4,764 (8.1)	3,207 (5.5)	6,305 (10.7)	5,185 (8.8)	7,293 (12.4)	9,398 (16.1)	7,603 (13.0)	6,859 (11.7)	58,695 (100.0)

Source: Agricultural statistics 1981/82, North Sinai

Table A.4-5. Agricultural Production in North Sinal Governorate (1982)

	Planted Area (fed)	Production (tons)	Value (1,000 LE)
<u>Field Crops</u>			
Horse Beans	10,037	4,820	361
<u>Vegetable (Winter)</u>			
Tomato	380	6,840	1,710
<u>Vegetable (Summer)</u>			
Tomato	307	7,675	1,151
Pepper	115	920	230
Cucumber	273	2,730	228
<u>Vegetable (Nili)</u>			
Tomato	160	3,520	704
<u>Fruits</u>			
Citrus	710	5,680	568
Olive	2,730	2,730	819
Dates	NA	75,137	2,765

Source: Bulltin of Agricultural Income, 1983, CAPMAS

Table A.4-6. Household Ratio Supplied Water and Electric (1986)

(Unit: %)

	Rural/Urban	Water	Electric
El Arish	Urban	98.9	92.0
Bir El Abd	Urban	-	81.8
	Rural	41.8	64.6
El Hassana	Urban	-	16.6
	Rural	0.1	0.7
Nekhel	Urban	-	13.0
	Rural	-	8.4
Sheikh Zuwayid	Urban	90.0	74.5
	Rural	84.8	26.3
Rafah	Urban	98.9	71.1
	Rural	11.9	4.2
Total	Urban	89.6	83.3
	Rural	35.4	28.0

APPENDIX B. Soil

B.1.	Previous Soil Survey	B-1
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B.3.	Land Capability Classification	B-3
B.4.	Soil Characteristics	B-6

B.1. Previous Soil Survey

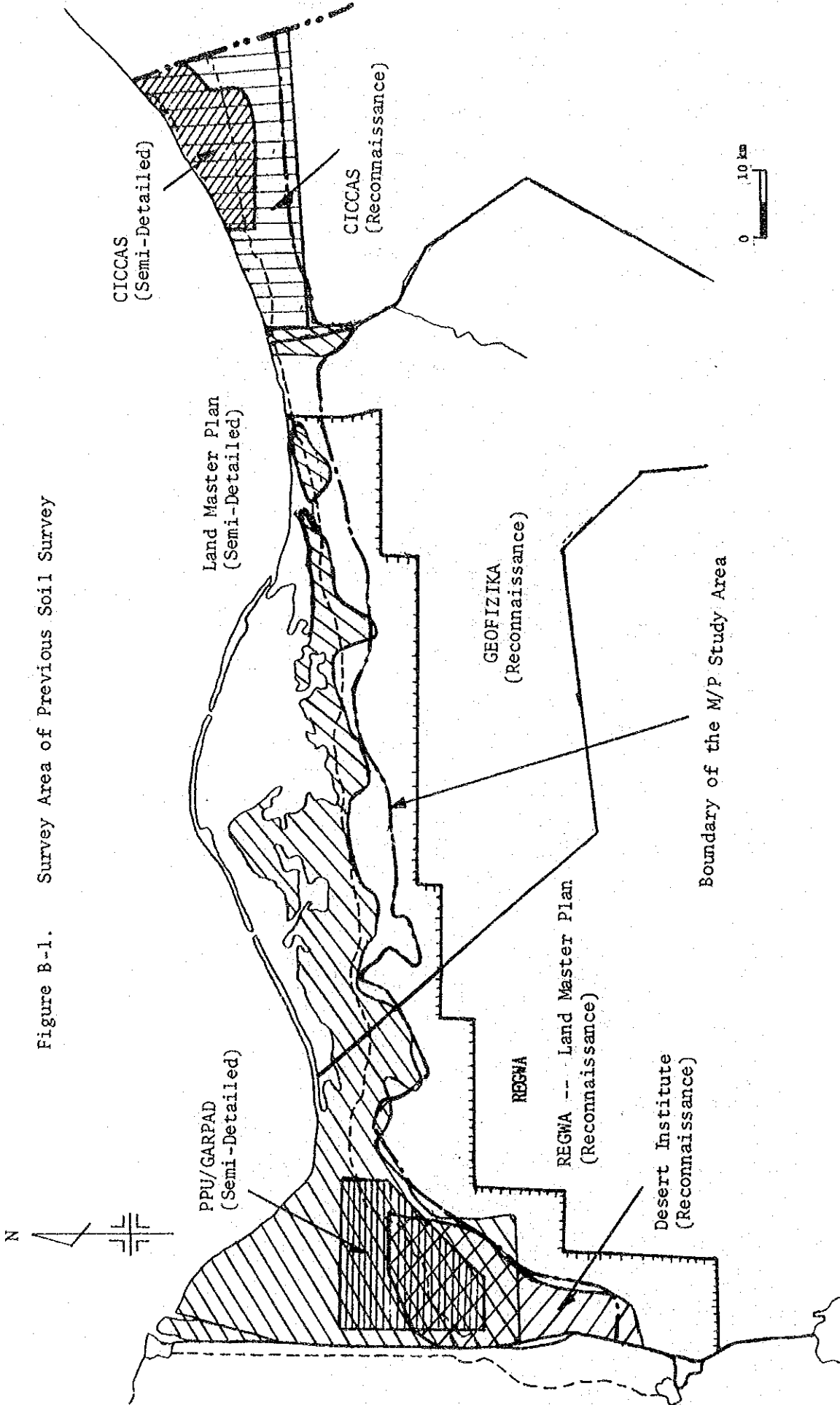


Figure B-1. Survey Area of Previous Soil Survey

B.2. Soil Classification

Table B-1 Classification of Soils of North Sinai Region according to Soil Taxonomy

Order	Sub - order	Great group	Subgroup	Family	Mapping units
Entisols	Psamments	Torripsamments	Typic Torripsamments	1 - Siliceous, thermic, <2% slope	- Coarse textured soils having deep water table > 100cm.
				2 - Siliceous, thermic, 2 - 6% slope	- Coarse textured soils having moderately deep water table (75 - 100 cm).
				3 - Siliceous, thermic, 6 - 15% slope	- Coarse textured soils with clay or loamy intercalations. - Coarse textured soils with clay substratum. - Coarse textured soils with clay surface.
	Aquepts	Psammaquepts	Typic psammaquepts	1 - Siliceous, thermic, <2% slope	- Coarse textured soils having shallow water table (< 50 cm).
				2 - Siliceous, thermic, 2 - 6% slope	- Coarse textured soils having moderately shallow water table (50 - 75 cm).
				1 - Fine loamy, mixed, thermic, <2% slope 2 - Fine loamy, mixed, thermic, 2 - 6% slope 3 - Coarse loamy, mixed, thermic, <2% slope 4 - Coarse loamy, mixed, thermic, 2 - 6% slope 5 - Clayey, mixed, <2% slope. 6 - Clayey, montmorillonitic, <2% slope	- Loamy soils having moderately shallow water table (50 - 75 cm). - Fine textured soils having shallow water table (< 50 cm). - Fine textured soils having moderately shallow water table (50 - 75 cm).
Orthents	Torriorthents	Typic Torriorthents	1 - Fine loamy, mixed, thermic, <2% slope	- Deep loamy soils	
			1 - Siliceous, thermic, <2% slope 2 - Fine loamy, mixed, thermic, <2% slope 3 - Fine loamy, mixed, thermic, 2 - 6% slope 4 - Coarse loamy, mixed, thermic, <2% slope 5 - Clay, montmorillonitic, thermic, 2 - 6% slope	- Loamy soils having deep water table (> 100 cm). - Loamy soils having moderately deep water table (75 - 100 cm). - Fine textured soils having deep water table (> 100 cm). - Fine textured soils having deep water table (> 100 cm), with sand substratum. - Fine textured soils having moderately deep water table (75 - 100 cm).	
			1 - Fine loamy, mixed (calcareous), thermic, <2% slope 2 - Fine loamy, mixed (calcareous), thermic, 2 - 6% slope	- Deep loamy soils.	
Aridisols	Calcorthids	Typic Calcorthids	1 - Fine loamy, mixed (calcareous), thermic, <2% slope 2 - Fine loamy, mixed (calcareous), thermic, 2 - 6% slope	- Deep loamy soils.	

Source : Modified from GARPAD (1984) Semi-Detailed Soil Survey of North Sinai, REGWA.

B.3. Land Capability Classification

Table B-2. Land Management Classification

In the land management classification the soils on lacustrine to Nile alluvium are classified into Category Ia, the sandy soils into Category IV because of their predominantly undulating topography, and coarse sandy soils into Category V, whilst stony soils, high-dune lands and some sandy lands at about sea level have been rated as unsuitable.

The detailed specifications for the land management categories identified in the Sinai area are as follows:

Ia - This subcategory deals with the coastal lake bed clays which have shallow water table and are mostly very saline. Drainability is very poor to poor. Drains are relatively costly. The reclamation period including the initial leaching requires 2-5 years. In the first stage of reclamation rice, barley and berseem could be planted followed by cotton, wheat and sugarbeet. In the final stage of reclamation the land is suitable for other field crops, some vegetables and a limited number of fruit trees e.g. peaches and guava. Traditional food irrigation could be used. The land could be given preferably to smallholders or used as family farms but commercial farms are possible.

IV - This category includes undulating sandy soils. They have an available moisture content of 5-10% by volume and good drainability. They are suitable for legumes, oil and fodder crops, special vegetables and fruit trees e.g. citrus and mango. A proper fertilization management is required, sprinklers may be used for the irrigation of field and fodder crops. Drip system could be applied for some vegetables and fruit trees. Commercial or estate farms are preferable for this category but family farms are possible.

V - This category includes coarse sands to gravelly sandy soils. Available moisture content is less than 5 cm/m. They are flat to undulating soils with excessive drainability. The land is suitable for specific fruit trees e.g. citrus, a limited number of field and fodder crops and vegetables. Proper fertilization management is required. The land should be irrigated preferably by sprinklers or drip systems. They are suitable for commercial or estate farms.

Table B-3.

Land capability classification for irrigated agriculture (modified USBR system to fit Egyptian soils) ^{1/} (1)

	Very good Arable Class 1		Good Arable Class 2a		Good arable after intensive leaching Class 2b ^{2/}		Arable Class 3		Limited Arable Class 4		Non Arable Class 6	
	loam to clayloam	n.a.	sandy loam to friable clay	n.a.	clay	loamy sand to sand	loamy sand to sand	inland clay to coarse sand	n.a.	< 50	> 50	< 2
Gravel content (%) (by volume)	> 15	n.a.	> 15	n.a.	> 15	5 - 10	> 2	> 75	> 100	< 75	< 100	> 15
Available moisture (cm/m)	moderate	moderate	moderate	low	moderate to high	low to very high	Impermeable					
Permeability	> 200 none	> 200	> 150	> 200	> 100	> 100	> 75	> 100	> 75	< 75	< 100	> 15
Depth: to gravel (cm)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Depth: to impervious layer (cm)	0 - 10	0 - 10	0 - 4	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10
Salinity: Initial salt content is not considered as a permanent limitation												
Carbonate content (%)												
sandy soil	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
loamy to clayey soil	0 - 10	0 - 10	0 - 4	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10
Gypsum content (%) ^{3/}												
sandy soil	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
loamy to clayey soil	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5
Drainability	easy	easy to average	easy to average	difficult	difficult	average	average	easy to difficult	easy to difficult	easy to difficult	easy to difficult	very difficult or excessive (in coastal areas)
Surface: relief	flat	flat to gently undulating	flat to gently undulating	flat	flat	flat to undulating	flat to undulating	flat to rolling	flat to rolling	flat to rolling	flat to rolling	hilly
" slope (%)	< 2	< 5	< 5	< 2	< 2	< 5	< 5	< 15	< 15	< 15	< 15	> 16
Rock outcrops	none	none	none	none	none	none	none	few	few	few	few	common to abundant
Erosion hazard (water and/or wind)	none to slight	slight to moderate	slight to moderate	none to slight	none to slight	moderate to high	moderate to high	slight to high	slight to high	slight to high	slight to high	very high

Notes: Class 5: Lands requiring further surveys not applicable.

^{1/} Land Capability Classification based on the available profiles descriptions (average depth (150 cm)).

^{2/} Special class for Egyptian Delta soils.

^{3/} Gypsum contents above 20% have no serious agricultural restrictions: however special measurements must be considered for structures.

Table B-4. Examples of limitations (type and degree) in land capability classification of the USDA

Examples of limitations (type & degree)	Capability Classes							
	I	II	III	IV	V	VI	VII	VIII
Climatic	Nil	Slight	Moderate	Moderate	Have climatic limitations	Severe	Severe	Very severe
Susceptibility to erosion	Very low	Moderate	High	Severe	Severe	Severe	Severe	Excessive
Overflow hazard	Very low	Occasional	Frequent	Frequent	Frequent	Excessive	Excessive	Excessive
Past erosion hazard	Very low	Low	Severe	Severe	Severe	Severe	Severe	Very severe
Wetness	Very low	Low to moderate	Some continuing water logging after drainage	Excessive	Excessive	Excessive	Excessive	Excessive
Permeability of sub-soil	Adequate	Adequate	Very slow					
Slope	Level	Very gently sloping	Moderately steep	Steep	May be level	Steep slope	Very steep	Very steep
Structure & workability	Favourable	Somewhat unfavourable	Moderately unfavourable	Unfavourable	Unfavourable	Unfavourable	Unfavourable	Unfavourable
Salt or sodium hazard	Slight	Slight to Moderate	Severe	Severe	Severe to very severe	Very severe	Very severe	Extremely severe
Water holding capacity	Adequate	Low	Low	Low	Low	Very low	Very low	Extremely low
Depth to bedrock	Deep to very deep	Shallow	Shallow	Stony, shallow rooting zone	Stony, shallow rooting zone	Very shallow	Very shallow	Rocky
Response to fertilizers	Very high	High	Low	Low	Very low	Very low	Very low	Very low

B.4. Soil Characteristics

Table B-5. Characteristics of Major Soils

Deep Coarse-textured Soils (sandy soils)

Limitation	1.1 shallow water table (w.t. <50cm)	1.2 moderately shallow water table (w.t. 50-75cm)	1.3 moderately deep water table (w.t. 75-100cm)	1.4 deep water table (w.t. >100cm)	1.5 with loamy or clayey intercalations	1.6 with clayey substratum	1.7 with clayey surface (w.t. >100cm)
Topography of the terrain	Almost flat	Flat to rolling	Flat to undulating	Flat to undulating	Undulating	Flat to slightly undulating	Flat to slightly undulating
Slope	Flat to gently sloping	Flat to sloping	Flat to gently sloping	Flat to gently sloping	Flat to gently sloping	Flat to gently sloping	Flat to gently sloping
Wetness	not feasible to correct	difficult to correct	feasible to correct	feasible to correct	feasible to correct	feasible to correct	feasible to correct
Infiltration	Moderate	Rapid	Very rapid	Very rapid	Rapid	Rapid	Moderately rapid
Permeability to subsoil	Moderate to Mod. slow	Moderate to rapid	Moderate to very rapid	Rapid	Rapid	Moderate	Moderately rapid
Salinity	Extremely high	Extremely high	Extremely high	Low (non saline to slightly saline)	low to extremely high	slightly to strongly affected	moderately to strongly affected
Sodicity	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Texture surface	sand	sand	sand	sand	sand	sand to loamy sand	clay
" subsurface	sand	sand	sand	sand	sand	lacustrine clay	sand
Structure: surface	single grains	single grains	single grains	single grains	single grains	single grains	fine subangular blocky
" subsurface	single grains or massive	single grains to massive	single grains to massive	single grains to massive	single grains to massive	angular to subangular blocky	single grains
Workability	good	good	good	good	good	good	good to moderate
Available water capacity	very low, 4 to 5%	very low	very low	very low	very low to low	very low in surface	high in surface and low downwards
Soil Fertility	very low	very low	very low	very low	very low	very low, boron adequate	very low
Susceptibility to erosion	-----	-----	-----	-----	-----	-----	-----
Mineralogy	siliceous	siliceous	siliceous	siliceous	siliceous	siliceous	siliceous
Degree of limitations (single or in combination)	Very Severe	Very Severe	Severe	Severe	Severe	Severe	Severe
Kinds of limitation	Wetness not feasible to correct	Wetness, difficult to correct, moisture retention	moisture retention, fertility, salinity	moisture retention, fertility	moisture retention, sometimes salinity, fertility	moisture retention, sometimes salinity, fertility	Salinity
Capability classification	V	IV	IV	IV	IV	IV	IV

Moderately coarse to moderately fine-textured soils (loamy soils)

Limitations	2.1 moderately shallow water table (w.t. 50-75cm)	2.2 moderately deep water table (w.t. 75-100cm)	2.3 deep loamy soils outwash plains (w.t. > 100cm)	2.4 deep loamy soils of alluvial terraces (w.t. > 100cm)	2.5 Wadi El Arish flood plain (w.t. > 100cm)
Topography of the terrain	undulating	flat to slightly undulating	almost flat	fairly flat surface of different elevations	fairly flat
Slope	Sloping to gently sloping	flat to gently sloping	flat to gently sloping	almost flat	flat with very gentle slope
Wetness	very severe	severe	nil	nil	nil
Infiltration	Mod. slow	Mod. slow	Mod. slow	Mod. slow	Mod. slow
Permeability of subsoil	Mod. slow	Mod. slow	Mod. slow	Mod. slow	Mod. slow
Salinity	strongly affected	strongly affected with salt crust	strongly affected, few non-saline	non-saline to extremely saline	low to high
ESP (sodicity)	< 15	mostly < 15	< 15	< 15	< 15
Texture : surface	Sandy clay loam to sandy loam	mostly silty loam	sandy loam to sandy clay loam	coarse (sandy to LS) loamy	sandy loam to loam
Structure: surface	weak fine to medium subangular blocky	weak fine to medium medium subangular blocky	moderate medium subangular to angular blocky	single grains moderate medium subangular blocky	weak to moderate medium subangular blocky
Workability	good	good	good	good	good
Available water capacity	(adequate, low to high) 8-21%	8-18% (adequate)	(adequate) 11-15%	adequate	adequate
Soil fertility	low	low	low, adequate for boron	low, phosphorous fixation	low (8-10)
Susceptibility to erosion	----- slight to moderate -----	----- slight to moderate -----	----- slight to moderate -----	aeolian deposition	Mixed (calcareous)
Mineralogy	Mixed	Mixed	Mixed	Mixed (calcareous)	Mixed (calcareous)
Cation exchange capacity (me/100g)	very high (38.5 to 41)	very high (35-42)	high (25) to very high (42)	moderate (13-18)	low (8-10)
Degree of limitations (single or in combination)	very severe	very severe	severe	salinity easily to be removed severe	severe
Capability classification	IV	III	III	III	III

Desert Alluvial fine-textured Soils (mostly located at Tina plain)

Limitations	3.1. with shallow water table (< 50cm)	3.2. moderately shallow water table (50-75cm)	3.3. moderately deep water table (75-100cm)	3.4. deep fine textured soils (w.t. >100cm)	3.5. with sandy substratum (w.t. >100cm)
Topography of the terrain	flat to almost flat	almost flat to slightly undulating	flat to slightly undulating	almost flat to slightly undulating	Almost flat to slightly undulating
Slope	flat	Flat to gentle	Flat to gentle	Flat to gentle	Flat to gentle
Wetness	very severe	very severe	severe to very severe	feasible to improve	feasible to improve
Infiltration rate	slow	slow	slow	slow	moderately slow
permeability of subsoil	slow	slow	slow	slow	moderately slow
Salinity	salt crust on surface extremely saline	extremely saline	extremely saline with salt crust	extremely saline, salt crust	extremely saline
ESP (sodicity)	< 15	10-19%	7-21%	High 8.5 to 19%	alkali 14-25%
Texture surface					
" subsurface	Clay	Clay	Clay	silty clay	clay within profile control
Structure surface	moderate medium	moderate medium	moderate medium to coarse	medium to coarse	medium to coarse subangular
" subsurface	subangular blocky	subangular blocky	coarse subangular blocky	subangular blocky	blocky in clay, single grain in sandy substratum
Workability	poor	poor	poor	moderate	moderate
Available water capacity	very high	very high 16-29%	very high 21-26%	very high 19-42%	very high
Soil fertility	adequate to P and B	Low, adequate for B	Low, adequate for B	Low, adequate for B	adequate for P and B
Susceptibility to erosion	-----	Slight	-----	-----	-----
Mineralogy	Montmorillonitic	Montmorillonitic	Montmorillonitic	Montmorillonitic	Montmorillonitic
Cation exchange capacity (me/100g)	very high (31-45)	very high (35-43)	very high (25-40)	very high (25-47)	very high
Degree of limitations (single or in combinations)	very severe	very severe	very severe	severe	severe
Capability classification	V	IV	III	III	III

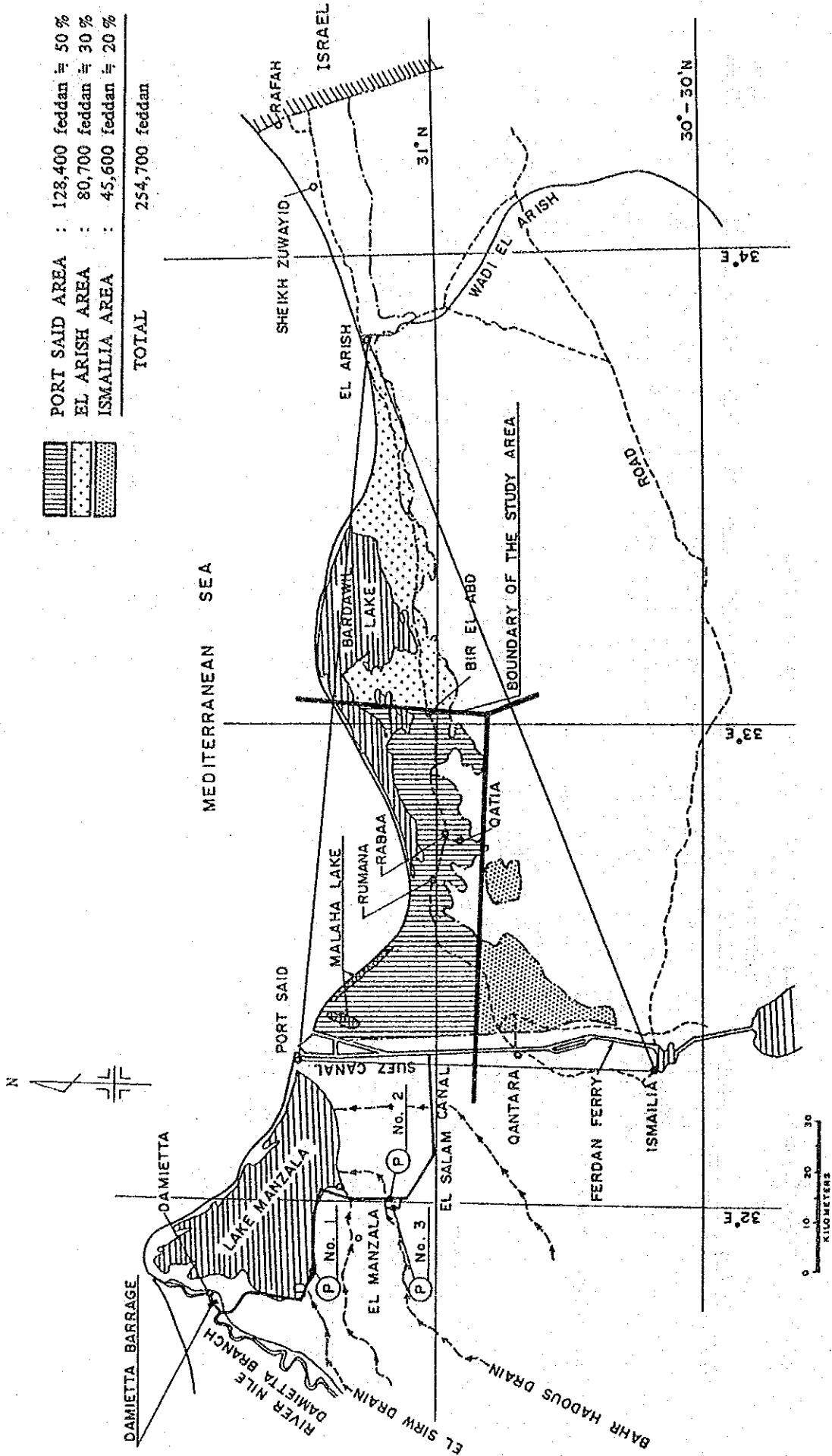
APPENDIX C. Irrigation and Drainage

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Table C-1 Mean Climatic Characteristics in M/P Land Reclamation Area

Item	Location	Weighting Factor	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total (Mean)
Mean daily temperature (°C)	Port Said	0.5	14.2	14.7	16.4	18.7	21.8	25.0	26.6	27.3	26.1	24.3	20.6	16.0	(21.1)
	Ismailia	0.3	14.0	15.2	16.8	20.2	24.0	26.6	29.0	29.1	26.8	24.0	20.0	15.6	(21.8)
	El Arish	0.2	13.6	13.9	16.0	18.7	21.6	24.7	26.2	27.0	25.6	23.2	19.7	15.5	(20.5)
	Project Area		14.0	14.7	16.4	19.2	22.4	25.4	27.2	27.8	26.2	24.0	20.2	15.8	
Mean relative humidity (%)	Port Said	0.5	71	68	66	69	69	70	71	71	68	68	70	71	(69)
	Ismailia	0.3	59	62	46	38	42	50	53	53	51	56	59	60	(51)
	El Arish	0.2	70	69	67	67	68	74	74	75	71	73	71	66	(70)
	Project Area		67.2	66.4	60.2	59.3	59.5	62.0	65.3	66.4	63.5	65.4	66.9	66.7	
Mean wind speed (m/sec)	Port Said	0.5	4.8	5.1	5.9	5.5	4.9	4.6	4.4	3.9	3.9	4.1	4.4	4.4	(4.7)
	Ismailia	0.3	2.9	2.6	3.7	3.5	3.3	3.3	3.5	2.8	2.8	2.3	2.2	2.5	(3.0)
	El Arish	0.2	2.5	2.9	3.0	2.5	2.4	2.4	2.3	2.1	2.2	2.0	2.1	2.4	(2.4)
	Project Area		3.77	3.91	4.66	4.30	3.92	3.77	3.71	3.21	3.23	3.14	3.28	3.46	
Precipitation (mm)	Port Said	0.5	13.5	11.7	8.8	3.7	2.2	0	0	0	0.2	6.3	8.9	18.0	73.3
	Ismailia	0.3	6.6	1.6	7.4	1.3	3.5	0	0	0	0	2.3	7.7	2.9	33.3
	El Arish	0.2	20.3	17.1	12.8	6.1	3.2	0	0	0.2	0.6	6.0	16.2	22.2	104.7
	Project Area		12.8	9.8	9.2	3.5	2.8	0	0	0	0.2	5.0	10.0	14.3	67.6
Ratio actual/max. sunshine hours (%)	Port Said	0.5	67.0	71.0	67.9	70.0	78.0	83.2	84.2	86.0	91.6	81.3	72.0	66.8	(76.2)
	Ismailia	0.3	67.0	72.0	72.0	72.0	77.0	89.0	88.0	87.0	84.0	80.0	74.0	70.0	(78.0)
	El Arish	0.2	64.0	59.0	63.0	64.0	73.0	83.0	81.0	79.0	73.0	70.0	68.0	66.0	(70.0)
	Project Area		66.4	68.9	68.2	69.4	76.7	84.9	84.7	84.9	85.6	78.7	71.8	67.6	
Piche evaporation (mm)	Port Said	0.5	140	154	192	186	202	213	220	217	216	217	180	143	2,280
	Ismailia	0.3	133	146	223	306	313	354	326	291	231	186	138	140	2,787
	El Arish	0.2	112	112	140	141	152	147	149	152	156	149	120	112	1,642
	Project Area		132	143	191	213	225	242	238	226	209	194	155	136	2,304

Figure C-1 Estimation of Weighing Factor for Calculation of Mean Climatic Characteristics by Thiessen Method



C.2. Crop Evapotranspiration

Table C-2 Calculation Method of Reference Crop Evapotranspiration (ET_o)

Modified Penman Method

$$ET_o = C \{ W R_n + (1 - W) \cdot f(u) \cdot (e_a - e_d) \}$$

where,

W : weighting factor which depends on temperature and altitude; Values of W are given in Table 8 and 9 presented in FAO Irrigation and Drainage Paper No.24 (1977).

R_n: net radiation in equivalent evaporation in mm/day;

$$R_n = R_{ns} - R_{nl}$$

$$R_{ns} = (1 - 0.25) R_s$$

$$R_s = (0.25 + 0.50 n/N) R_a$$

$$R_{nl} = f(t) \cdot f(e_d) \cdot f(n/N)$$

R_{ns}: shortwave radiation in mm/day

R_{nl}: longwave radiation in mm/day

R_s : Solar radiation in mm/day

R_a : extra-terrestrial radiation,
R_a values are given in Table 10 presented in
FAO Irrigation and Drainage Paper No.24 (1977)

n : actual bright sunshine hour

N : maximum possible bright sunshine hour

f(t), f(e_d), f(n/N): Values of the function f(t), f(e_d) and f(n/N) are given in Tables 13, 14 and 15 presented in FAO Irrigation and Drainage Paper No.24 (1977), respectively.

f(u): wind related function,

$$f(u) = 0.27 (1 + U/100)$$

U : total wind run in km/day at 2 m height

e_a : mean saturation water vapour pressure in mbar as function of mean air temperature; Values of e_a are given in Table 5 presented in FAO Irrigation and Drainage Paper No.24 (1977).

e_d : mean actual water vapour pressure in mbar,

$$e_d = e_a \times RH_{mean}/100$$

RH_{mean}: mean relative humidity in percentage

- c : adjustment factor to compensate for the effect of day and night weather conditions; Values for c are given in Table 16 presented in FAO Irrigation and Drainage Paper No.24 (1977).

Blaney - Griddle Method

$$E_{To} = C \{ P(0.46 \cdot T + 8) \}$$

where,

- E_{To} : reference crop evapotranspiration in mm/day for the month considered
- T : mean daily temperature in °C over the month considered
- P : mean daily percentage of annual daytime hours obtained from Table 1 presented in FAO Irrigation and Drainage Paper No.24 (1977) for a given month and latitude
- C : adjustment factor which depends on minimum relative humidity, sunshine hours and daytime wind estimates; Figure 1 presented in FAO Irrigation and Drainage Paper No.24 (1977) can be used to estimate E_{To} graphically using calculated values of p (0.46·T + 8)

Radiation Method

$$E_{To} = C \cdot (W \cdot R_s)$$

where,

- R_s: solar radiation in mm/day
- W : weighting factor which depends on temperature and altitude
- c : adjustment factor; The relationship between E_{To} and W·R_s is shown in Figure 2 presented in FAO Irrigation and Drainage Paper No.24 (1977)

Table C-3 Calculation of ETo by Modified Penman Method

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total (Mean)
Mean daily temperature: T , °C	14.0	14.7	16.4	19.2	22.4	25.4	27.2	27.8	26.2	24.0	20.2	15.8	
Mean relative humidity: RH mean, %	67.2	66.4	60.2	59.3	59.5	62.0	65.3	66.4	63.5	65.4	66.9	66.7	
Mean wind speed : km/day	326	338	403	372	339	326	321	277	279	271	283	299	
Ratio actual/max. sunshine hours: n/N	66.4	68.9	68.2	69.4	76.7	84.9	84.7	84.9	85.6	78.7	71.8	67.6	
Saturation water vapour pressure: ea, mbar	16.1	16.7	18.7	22.3	27.1	32.5	36.1	37.4	34.0	29.8	23.7	18.0	
Actual water vapour pressure : ea - ed, mbar	10.8	11.1	11.3	13.2	16.1	20.2	23.6	24.8	21.6	19.4	15.9	12.0	
Wind function : $f(u)$	5.3	5.6	7.4	9.1	11.0	12.3	12.5	12.6	12.4	10.4	7.8	6.0	
Weighting factor : (1-W)	1.15	1.18	1.36	1.27	1.19	1.15	1.14	1.02	1.02	1.00	1.03	1.08	
Weighting factor : (W)	0.39	0.38	0.36	0.33	0.29	0.26	0.24	0.23	0.25	0.27	0.32	0.36	
Extra-terrestrial radiation : Ra mm/day	0.61	0.62	0.64	0.67	0.71	0.74	0.76	0.77	0.75	0.73	0.68	0.64	
Solar radiation : Rs mm/day	8.6	10.5	13.0	15.1	16.5	17.0	16.8	15.7	13.8	11.4	9.3	8.1	
Net shortwave radiation : Rns	5.01	6.24	7.68	9.01	10.45	11.47	11.31	10.59	9.36	7.33	5.66	4.76	
Effect of temperature on Rnl : $f(t)$	3.76	4.68	5.76	6.76	7.84	8.60	8.48	7.94	7.02	5.50	4.25	3.57	
Effect of vapour pressure on Rnl : $f(ed)$	13.5	13.6	13.9	14.4	15.1	15.8	16.1	16.3	15.9	15.4	14.6	13.8	
Effect of ratio n/N on Rnl : $f(n/N)$	0.195	0.193	0.192	0.180	0.163	0.142	0.126	0.121	0.136	0.146	0.165	0.188	
Net longwave radiation : Rnl	0.698	0.720	0.714	0.725	0.790	0.864	0.862	0.864	0.873	0.808	0.746	0.708	
Net radiation : Rn	1.84	1.89	1.91	1.88	1.94	1.94	1.75	1.70	1.89	1.82	1.80	1.84	
Adjustment factor : c	1.92	2.79	3.85	4.88	5.90	6.66	6.73	6.24	5.13	3.68	2.45	1.73	
($RH_{max} \approx 60\%$, $U_{day} \approx 3$ m/s, $U_{day}/U_{night} \approx 1$)	0.833	0.866	0.905	0.940	0.964	0.981	0.978	0.966	0.946	0.895	0.851	0.826	
Reference crop evap. : ETo mm/day	2.96	3.67	5.51	6.66	7.70	8.44	8.35	7.50	6.63	4.92	3.61	2.84	(5.75)
Reference crop evap. : ETo mm/month	92	103	171	200	239	253	259	233	199	153	108	88	2,098

Table C-4 Calculation of ETo by Blaney-Criddle Method

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total (Mean)
Mean daily temperature : T, °C	14.0	14.7	16.4	19.2	22.4	25.4	27.2	27.8	26.2	24.0	20.2	15.8	
Mean daily percentage of annual daytime hours: P	0.24	0.25	0.27	0.29	0.31	0.32	0.31	0.30	0.28	0.26	0.24	0.23	
P(0.46 T + 8)	3.47	3.69	4.20	4.88	5.67	6.10	6.36	6.24	5.61	4.95	4.15	3.51	
Ratio actual/max. sunshine hours: n/N	66.4	68.9	68.2	69.4	76.7	84.9	84.7	84.9	85.6	78.7	71.8	67.6	
	≈70	≈70	≈70	≈70	≈70	≈90	≈90	≈90	≈90	≈70	≈70	≈70	
Reference crop evap. : ETo mm/day	2.96	3.27	3.98	4.93	6.04	7.58	7.99	7.80	6.80	5.03	3.91	3.01	(5.28)
(RHmin = 20-50%, U 3.5 m/s)	92	92	123	148	187	227	248	242	204	156	117	93	1,929

Table C-5 Calculation of ETo by Radiation Method

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total (Mean)
Solar radiation : RS, mm/day	5.01	6.24	7.68	9.01	10.45	11.47	11.31	10.59	9.36	7.33	5.66	4.76	
Weighting factor : W (W-Rs)	0.61	0.62	0.64	0.67	0.71	0.74	0.76	0.77	0.75	0.73	0.68	0.64	
	3.06	3.87	4.92	6.04	7.42	8.49	8.60	8.15	7.02	5.35	3.85	3.05	
Reference crop evap. : ETo, mm/day	2.89	3.72	4.79	5.94	7.36	8.45	8.57	8.10	6.95	5.23	3.70	2.88	(5.73)
(RHmin: low-medium, U = 2 - 5 m/s)	90	104	148	178	228	254	266	251	209	162	111	89	2,090

Table C-6 Reference Crop Evapotranspiration

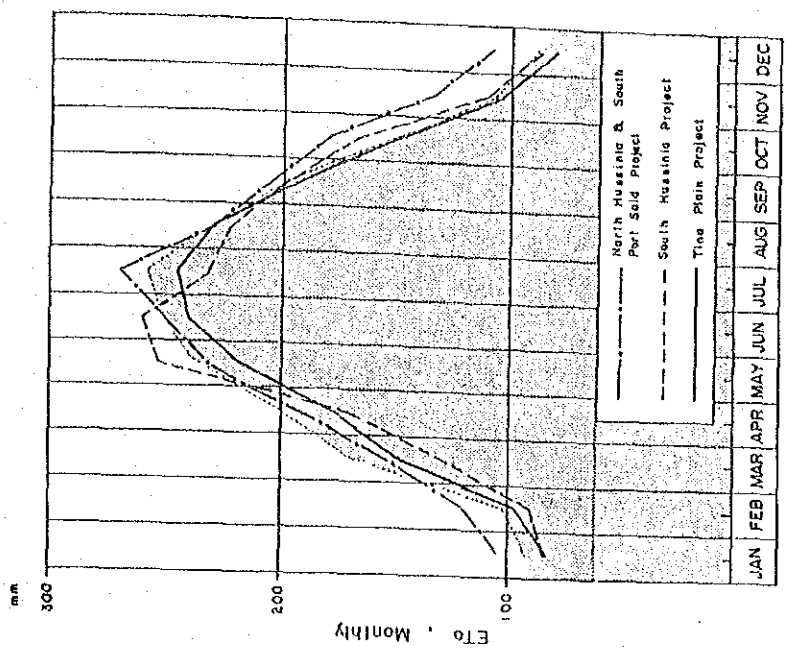
METHOD	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	REMARKS
<u>(1) M/P Land Reclamation Area (climatic data : Port Said, Ismailia & El Arish)</u>														
Blaney Criddle	92	92	123	148	187	227	248	242	204	156	117	93	1,929	
Penman	92	103	171	200	239	253	259	233	199	153	108	88	2,098	adopted
Radiation	90	104	148	178	228	254	266	251	209	162	111	89	2,090	
<u>(2) North Hussinia & South Port Said Project (climatic data : Port Said) 1/</u>														
Blaney Criddle	105	120	155	192	233	252	270	229	204	180	135	109	2,184	
Penman	105	123	198	228	273	285	292	257	219	186	126	93	2,375	
Radiation	90	108	149	180	223	246	284	223	186	152	103	87	2,074	
<u>(3) South Hussinia (climatic data : Mansura) 2/</u>														
Blaney Criddle	84	90	130	171	254	261	233	223	198	167	111	87	2,009	
Penman	87	108	161	204	254	267	245	226	192	152	105	84	2,083	
Radiation	74	92	136	174	229	243	236	226	189	143	99	74	1,915	
<u>(4) Tina Plain Development Project (climatic data : Port Said & Ismailia) 3/</u>														
Blaney Criddle	81	95	127	153	195	213	223	233	210	152	105	84	1,871	
Penman	83	97	150	177	219	241	246	231	193	150	104	80	1,871	
Radiation	78	98	142	172	222	248	260	243	205	154	101	78	2,001	
<u>(5) North Sinai Project (climate data : Port Said, Ismailia, El Arish, Rafah, El Maghara and El Ausayima) 4/</u>														
Penman	92	105	163	196	235	257	261	242	202	157	114	91	2,115	

1/ Source : Report on Feasibility Study for The North Hussinia Valley & South Port Said Agricultural Development Project, JICA, June 1984

2/ Source : Report on Feasibility Study for The South Hussinia Valley Agricultural Development Project Phase II, JICA, May 1984

3/ Source : Status Report No. 2 on Feasibility Study for Tina Plain Development Project, PPU - GARFAD, June 1987

4/ Source : PPU (GARFAD)



ETo for M/P Land Reclamation Area

Table C-7. Crop Coefficients

CROPS	CF	CROP COEFFICIENTS IN MONTHS FROM FIRST PLANTING											
		1	2	3	4	5	6	7	8	9	10	11	12
1. BARLEY	1.00	0.20	0.50	0.90	1.10	0.20							
2. BERSEEM	1.00	0.50	0.75	0.75	0.75								
3. FLAX	1.00	0.50	0.70	0.95	1.00	0.20							
4. PEAS - GREEN	1.00	0.40	0.60	0.90	1.05								
5. POTATO	1.00	0.30	0.80	1.05	0.80								
6. FODDER BEET	1.00	0.40	0.60	0.90	1.05	1.05	0.90						
7. WHEAT	1.00	0.40	0.70	0.90	1.05	0.20							
8. SQUASH	1.00	0.50	0.75	0.90	0.50								
9. SQUASH	1.00	0.50	0.75	0.90	0.50								
10. CUCUMBER	1.00	0.50	0.75	0.90	0.70								
11. SAFFLOWER	1.00	0.40	0.70	0.95	1.05	0.20							
12. TOMATO	1.00	0.50	0.70	0.95	1.00	0.80	0.30						
13. TOMATO	1.00	0.50	0.70	0.95	1.00	0.80	0.30						
14. TOMATO	1.00	0.50	0.70	0.95	1.00	0.80	0.30						
15. FRENCH BEAN	1.00	0.50	0.80	0.95	1.00	0.10							
16. GROUNDNUT	1.00	0.30	0.60	0.80	0.95	0.80	0.20						
17. MAIZE - FODDER	1.00	0.30	0.80	0.75	0.70	0.80							
18. PEPPER	1.00	0.50	0.80	0.95	0.90	0.90							
19. RICE	1.00	0.90	1.10	1.10	1.15	1.15	0.10						
20. SUNFLOWER	1.00	0.40	0.70	1.05	0.20								
21. SUNFLOWER	1.00	0.40	0.70	1.05	0.20								
22. CANTALOUPE	1.00	0.40	0.75	0.95	0.65								
23. NAPIER GRASS	1.00	0.40	0.80	1.00	0.60	0.80							
24. SORDAN	1.00	0.30	0.80	1.00	0.60	0.80							
25. ALFALFA	1.00	0.85	0.95	1.00	1.00	0.95	0.95	0.59	0.59	0.59	0.59	0.95	0.95
26. ALFALFA	1.00	0.85	0.95	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.59	0.95	0.95
27. APPLE	0.80	0.00	0.00	0.70	0.75	0.80	0.85	0.85	0.80	0.80	0.75	0.65	0.00
28. FIG	0.80	0.00	0.00	0.50	0.70	0.80	0.90	0.85	0.05	0.75	0.70	0.50	0.00
29. GRAPE	0.80	0.00	0.00	0.40	0.60	0.65	0.70	0.70	0.65	0.55	0.45	0.35	0.00
30. GUAVA	0.80	0.75	0.75	0.70	0.70	0.65	0.65	0.65	0.65	0.65	0.70	0.70	0.70
31. OLIVE	0.80	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
32. ORANGE	0.80	0.75	0.75	0.80	0.80	0.70	0.65	0.65	0.65	0.65	0.70	0.70	0.70

CF : CORRECTION FACTOR FOR PERCENT GROUND COVER IN DRIP SYSTEM

C.3. Field Irrigation Requirements

Table C-8 Field Irrigation Requirement (CP-1)

(FARM AREA = 40.0 ha)

CROPS	AREA PLANTED	JAN	FEB	MAR	APR	MAY	JUN
	(ha)	(m)	(m)	(m)	(m)	(m)	(m)
FLAX	4.0	3496.0	4120.0	1368.0	0.0	0.0	0.0
POTATO	1.0	736.0	0.0	0.0	0.0	0.0	0.0
FOODER BEET	12.0	9936.0	12978.0	21546.0	21600.0	0.0	0.0
CUCUMBER	1.0	828.0	721.0	0.0	0.0	0.0	0.0
SAFFLOWER	4.0	3496.0	4326.0	1368.0	0.0	0.0	0.0
TOMATO	4.0	0.0	0.0	0.0	0.0	4780.0	7084.0
FRENCH BEAN	2.0	0.0	0.0	0.0	0.0	2390.0	4048.0
SUNFLOWER	4.0	0.0	0.0	0.0	0.0	0.0	4048.0
CANTALOUPE	2.0	0.0	0.0	0.0	0.0	1912.0	3795.0
HAPIER GRASS	4.0	0.0	0.0	0.0	0.0	3824.0	8096.0
SORDAN	4.0	0.0	0.0	0.0	0.0	2868.0	8096.0
ALFALFA	6.0	4692.0	5871.0	10260.0	12000.0	13623.0	14421.0
ALFALFA	4.0	3128.0	3914.0	6840.0	8000.0	0.0	0.0
OLIVE	8.0	3532.8	3955.2	6566.4	7680.0	9177.6	9715.2
TOTAL	60.0	29844.8	35885.2	47948.4	49280.0	38574.6	59303.2
m/month/feddan		313.4	376.8	503.5	517.4	405.0	622.7
m/day/feddan		10.1	13.5	16.2	17.2	13.1	20.8
l/sec/feddan		0.117	0.156	0.185	0.200	0.151	0.240
m/month/ha		746.1	897.1	1198.7	1232.0	964.4	1482.6
m/day/ha		24.1	32.0	38.7	41.1	31.1	49.4
l/sec/ha		0.279	0.371	0.448	0.475	0.360	0.572

(FARM AREA = 40.0 ha)

CROPS	AREA PLANTED	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	(ha)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
FLAX	4.0	0.0	0.0	0.0	0.0	2160.0	2464.0	13608.0
POTATO	1.0	0.0	0.0	0.0	459.0	864.0	924.0	2993.0
FOODER BEET	12.0	0.0	0.0	0.0	0.0	5184.0	6336.0	77579.8
CUCUMBER	1.0	0.0	0.0	0.0	0.0	540.0	660.0	2749.0
SAFFLOWER	4.0	0.0	0.0	0.0	0.0	1728.0	2464.0	13382.0
TOMATO	4.0	9842.0	9320.0	6368.0	1836.0	0.0	0.0	39230.0
FRENCH BEAN	2.0	4921.0	4660.0	398.0	0.0	0.0	0.0	16417.0
SUNFLOWER	4.0	7252.0	9786.0	1592.0	0.0	0.0	0.0	22678.0
CANTALOUPE	2.0	4921.0	3029.0	0.0	0.0	0.0	0.0	13657.0
HAPIER GRASS	4.0	10360.0	5592.0	6368.0	0.0	0.0	0.0	34240.0
SORDAN	4.0	10360.0	5592.0	6368.0	0.0	0.0	0.0	33284.0
ALFALFA	6.0	9168.6	8248.2	7044.6	5416.2	6156.0	5016.0	101916.4
ALFALFA	4.0	0.0	0.0	0.0	3610.8	4104.0	3344.0	32940.8
OLIVE	8.0	9945.6	8947.2	7641.6	5875.2	4147.2	3379.2	80563.1
TOTAL	60.0	66770.1	55174.4	35780.2	17197.2	24883.2	24587.2	485227.5
m/month/feddan		701.1	579.3	375.7	180.6	261.3	258.2	5094.9
m/day/feddan		22.6	18.7	12.5	5.8	8.7	8.3	
l/sec/feddan		0.262	0.216	0.145	0.067	0.101	0.096	
m/month/ha		1669.3	1379.4	894.5	429.9	622.1	614.7	12130.7
m/day/ha		53.8	44.5	29.8	13.9	20.7	19.8	
l/sec/ha		0.623	0.515	0.345	0.161	0.240	0.229	

Table C-9 Field Irrigation Requirement (CP-2)

(FARM AREA = 30.0 ha)

CROPS	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
		(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
BERSEEM	10.0	6900.0	7725.0	12825.0	15000.0	17925.0	0.0
FODDER BEET	5.0	4140.0	5407.5	8977.5	9000.0	0.0	0.0
WHEAT	10.0	6440.0	9270.0	17955.0	4000.0	0.0	0.0
SQUASH	5.0	2300.0	3862.5	7695.0	5000.0	0.0	0.0
TOMATO	5.0	0.0	0.0	0.0	0.0	0.0	6325.0
FRENCH BEAN	5.0	0.0	0.0	0.0	0.0	5975.0	10120.0
RICE	10.0	0.0	0.0	0.0	0.0	21510.0	27830.0
NAPIER GRASS	2.5	0.0	0.0	0.0	0.0	2390.0	5060.0
SORDAN	5.0	0.0	0.0	0.0	0.0	3585.0	10120.0
TOTAL	57.5	19780.0	26265.0	47452.5	33000.0	51385.0	59455.0
<i>m/month/feddan</i>		276.9	367.7	654.3	462.0	719.4	832.4
<i>m/day/feddan</i>		8.9	13.1	21.4	15.4	23.2	27.7
<i>l/sec/feddan</i>		0.103	0.152	0.248	0.178	0.269	0.321
<i>m/month/ha</i>		559.3	875.5	1581.7	1100.0	1712.8	1981.8
<i>m/day/ha</i>		21.3	31.3	51.0	36.7	55.3	66.1
<i>l/sec/ha</i>		0.246	0.362	0.591	0.424	0.639	0.765

(FARM AREA = 30.0 ha)

CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
		(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
BERSEEM	10.0	0.0	0.0	0.0	0.0	5400.0	6600.0	72375.0
FODDER BEET	5.0	0.0	0.0	0.0	0.0	2160.0	2640.0	32325.0
WHEAT	10.0	0.0	0.0	0.0	0.0	0.0	3520.0	41185.0
SQUASH	5.0	0.0	0.0	0.0	0.0	0.0	0.0	18857.5
TOMATO	5.0	9065.0	11067.5	9950.0	6120.0	1620.0	0.0	44147.5
FRENCH BEAN	5.0	12302.5	11650.0	995.0	0.0	0.0	0.0	41042.5
RICE	10.0	28490.0	26795.0	22885.0	1530.0	0.0	0.0	129639.8
NAPIER GRASS	2.5	6475.0	3495.0	3980.0	0.0	0.0	0.0	21400.0
SORDAN	5.0	12950.0	6990.0	7960.0	0.0	0.0	0.0	41605.0
TOTAL	57.5	69282.4	59997.5	45770.0	7650.0	9180.0	12760.0	441976.9
<i>m/month/ha</i>		970.0	840.0	640.8	107.1	128.5	178.6	6187.7
<i>m/day/ha</i>		31.3	27.1	21.4	3.5	4.3	5.8	
<i>l/sec/ha</i>		0.362	0.314	0.247	0.040	0.050	0.067	
<i>m/month/ha</i>		2309.4	1999.9	1525.7	255.0	306.0	425.3	14732.6
<i>m/day/ha</i>		74.5	64.5	50.9	8.2	10.2	13.7	
<i>l/sec/ha</i>		0.862	0.747	0.589	0.095	0.118	0.159	

Table C-10 Field Irrigation Requirement (CP-3)

(FARM AREA = 30.0 ha)

CROPS	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
		(m)	(m)	(m)	(m)	(m)	(m)
FLAX	1.5	1311.0	1545.0	513.0	0.0	0.0	0.0
PEAS - GREEN	1.5	1449.0	0.0	0.0	0.0	0.0	0.0
FODDER BEET	6.0	4968.0	6489.0	10773.0	10800.0	0.0	0.0
SQUASH	1.5	1242.0	772.5	0.0	0.0	0.0	0.0
SAFFLOWER	1.5	1311.0	1622.2	513.0	0.0	0.0	0.0
TOMATO	1.5	1311.0	1545.0	2052.0	900.0	0.0	0.0
GROUNDNUT	1.5	0.0	0.0	0.0	0.0	1075.5	2277.0
MAIZE - FODDER	1.5	0.0	0.0	0.0	0.0	1075.5	3036.0
PEPPER	1.5	1242.0	1390.5	0.0	0.0	0.0	0.0
SUNFLOWER	4.5	0.0	0.0	0.0	0.0	0.0	4554.0
NAPIER GRASS	1.5	0.0	0.0	0.0	0.0	1434.0	3036.0
SORDAN	3.0	0.0	0.0	0.0	0.0	2151.0	6072.0
ALFALFA	1.5	1173.0	1467.7	2565.0	3000.0	3405.7	3605.2
ALFALFA	1.5	1173.0	1467.7	2565.0	3000.0	0.0	0.0
APPLE	3.0	0.0	0.0	2872.8	3600.0	4588.8	5161.2
FIG	3.0	0.0	0.0	2052.0	3360.0	4588.8	5464.8
GRAPE	3.0	0.0	0.0	1641.6	2880.0	3728.4	4250.4
ORANGE	3.0	1656.0	1854.0	3283.2	3840.0	4015.2	3946.8
TOTAL	42.0	16836.0	18153.7	28830.6	31380.0	26062.9	41403.4
<i>m/month/feddan</i>		235.7	254.2	403.6	439.3	364.9	579.6
<i>m/day/feddan</i>		7.6	9.1	13.0	14.6	11.8	19.3
<i>l/sec/feddan</i>		0.088	0.105	0.151	0.169	0.136	0.224
<i>m/month/ha</i>		561.2	605.1	961.0	1046.0	868.8	1380.1
<i>m/day/ha</i>		18.1	21.6	31.0	34.9	28.0	46.0
<i>l/sec/ha</i>		0.210	0.250	0.359	0.404	0.324	0.532

(FARM AREA = 30.0 ha)

CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
		(m)	(m)	(m)	(m)	(m)	(m)	(m)
FLAX	1.5	0.0	0.0	0.0	0.0	810.0	924.0	5103.0
PEAS - GREEN	1.5	0.0	0.0	0.0	918.0	972.0	1188.0	4527.0
FODDER BEET	6.0	0.0	0.0	0.0	0.0	2592.0	3168.0	38790.0
SQUASH	1.5	0.0	0.0	0.0	0.0	810.0	990.0	3814.5
SAFFLOWER	1.5	0.0	0.0	0.0	0.0	648.0	924.0	5016.2
TOMATO	1.5	0.0	0.0	0.0	0.0	810.0	924.0	7542.0
GROUNDNUT	1.5	3108.0	3320.2	2388.0	459.0	0.0	0.0	12627.7
MAIZE - FODDER	1.5	2913.7	2446.5	2388.0	0.0	0.0	0.0	11859.7
PEPPER	1.5	0.0	0.0	0.0	1147.5	1296.0	1254.0	6330.0
SUNFLOWER	4.5	8158.5	11009.2	1791.0	0.0	0.0	0.0	25512.7
NAPIER GRASS	1.5	3885.0	2097.0	2388.0	0.0	0.0	0.0	12840.0
SORDAN	3.0	7770.0	4194.0	4776.0	0.0	0.0	0.0	24963.0
ALFALFA	1.5	2292.1	2062.0	1761.1	1354.0	1539.0	1254.0	25479.1
ALFALFA	1.5	0.0	0.0	0.0	1354.0	1539.0	1254.0	12352.8
APPLE	3.0	5283.6	4473.6	3820.8	2754.0	1684.8	0.0	34239.6
FIG	3.0	5283.6	4753.2	3582.0	2570.4	1296.0	0.0	32950.8
GRAPE	3.0	4351.2	3634.8	2626.8	1652.4	907.2	0.0	25672.8
ORANGE	3.0	4040.4	3634.8	3104.4	2570.4	1814.4	1478.4	35238.0
TOTAL	42.0	47086.2	41625.4	28626.1	14779.8	16718.4	13358.4	324860.4
<i>m/month/feddan</i>		659.2	582.8	400.8	206.9	234.1	187.0	4548.0
<i>m/day/feddan</i>		21.3	18.8	13.4	6.7	7.8	6.0	
<i>l/sec/feddan</i>		0.246	0.218	0.155	0.077	0.090	0.070	
<i>m/month/ha</i>		1549.5	1387.5	954.2	492.7	557.3	445.3	10828.7
<i>m/day/ha</i>		50.6	44.8	31.8	15.9	18.6	14.4	
<i>l/sec/ha</i>		0.586	0.518	0.368	0.184	0.215	0.166	

Table C-11 Field Irrigation Requirement (CP-4)

(FARM AREA = 25.0 ha)

CROPS	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
		(m)	(m)	(m)	(m)	(m)	(m)
BARLEY	5.0	4140.0	5665.0	1710.0	0.0	0.0	0.0
FODDER BEET	5.0	4140.0	5407.5	8977.5	9000.0	0.0	0.0
MAIZE - FODDER	5.0	0.0	0.0	0.0	0.0	3585.0	10120.0
SUNFLOWER	5.0	0.0	2060.0	5985.0	10500.0	2390.0	0.0
SORDAN	5.0	0.0	0.0	0.0	0.0	3585.0	10120.0
ALFALFA	10.0	7820.0	9785.0	17100.0	20000.0	22705.0	24035.0
ALFALFA	5.0	3910.0	4892.5	3550.0	10000.0	0.0	0.0
TOTAL	40.0	20010.0	27810.0	42322.5	49500.0	32265.0	44275.0
<i>m/month/feddan</i>		336.2	467.2	711.0	831.6	542.1	743.8
<i>m/day/feddan</i>		10.8	16.7	22.9	27.7	17.5	24.3
<i>l/sec/feddan</i>		0.126	0.193	0.265	0.321	0.202	0.287
<i>m/month/ha</i>		800.4	1112.4	1692.9	1980.0	1290.6	1771.0
<i>m/day/ha</i>		25.8	39.7	54.6	66.0	41.6	59.0
<i>l/sec/ha</i>		0.299	0.440	0.632	0.764	0.482	0.683

(FARM AREA = 25.0 ha)

CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
		(m)	(m)	(m)	(m)	(m)	(m)	(m)
BARLEY	5.0	0.0	0.0	0.0	0.0	1080.0	2200.0	14795.0
FODDER BEET	5.0	0.0	0.0	0.0	0.0	2160.0	2640.0	32325.0
MAIZE - FODDER	5.0	9712.5	8155.0	7960.0	0.0	0.0	0.0	39532.5
SUNFLOWER	5.0	0.0	0.0	0.0	0.0	0.0	0.0	20935.0
SORDAN	5.0	12950.0	6990.0	7960.0	0.0	0.0	0.0	41605.0
ALFALFA	10.0	15281.0	13747.0	11741.0	9027.0	10260.0	8360.0	169860.5
ALFALFA	5.0	0.0	0.0	0.0	4513.5	5130.0	4180.0	41176.0
TOTAL	40.0	37943.5	28892.0	27661.0	13540.5	18630.0	17380.0	360228.7
<i>m/month/feddan</i>		637.5	485.4	464.7	227.5	313.0	292.0	6051.8
<i>m/day/feddan</i>		20.6	15.7	15.5	7.3	10.4	9.4	
<i>l/sec/feddan</i>		0.238	0.181	0.179	0.085	0.121	0.109	
<i>m/month/ha</i>		1517.7	1155.7	1106.4	541.6	745.2	695.2	14409.2
<i>m/day/ha</i>		49.0	37.3	36.9	17.5	24.8	22.4	
<i>l/sec/ha</i>		0.567	0.431	0.427	0.202	0.287	0.260	

Table C-12 Field Irrigation Requirement (CP-5)

(FARM AREA = 10.0 ha)

CROPS	AREA PLANTED	JAN	FEB	MAR	APR	MAY	JUN
	(ha)	(m)	(m)	(m)	(m)	(m)	(m)
APPLE	4.0	0.0	0.0	3830.4	4800.0	6118.4	6881.6
FIG	2.0	0.0	0.0	1368.0	2240.0	3059.2	3643.2
GRAPE	2.0	0.0	0.0	1094.4	1920.0	2485.6	2833.6
GUAVA	1.0	552.0	618.0	957.6	1120.0	1242.8	1315.6
ORANGE	1.0	552.0	618.0	1094.4	1280.0	1338.4	1315.6
TOTAL	10.0	1104.0	1236.0	8344.8	11360.0	14244.4	15989.6
	m/month/feddan	46.4	51.9	350.5	477.1	598.3	671.6
	m/day/feddan	1.5	1.9	11.3	15.9	19.3	22.4
	l/sec/feddan	0.017	0.021	0.131	0.184	0.223	0.259
	m/month/ha	110.4	123.6	834.5	1136.0	1424.4	1599.0
	m/day/ha	3.6	4.4	26.9	37.9	45.9	53.3
	l/sec/ha	0.041	0.051	0.312	0.438	0.532	0.617

(FARM AREA = 10.0 ha)

CROPS	AREA PLANTED	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	(ha)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
APPLE	4.0	7044.8	5964.8	5094.4	3672.0	2246.4	0.0	45652.8
FIG	2.0	3522.4	3168.8	2388.0	1713.6	866.0	0.0	21967.2
GRAPE	2.0	2900.8	2423.2	1751.2	1101.6	604.8	0.0	17115.2
GUAVA	1.0	1346.8	1211.6	1034.8	856.8	604.8	492.8	11353.6
ORANGE	1.0	1346.8	1211.6	1034.8	856.8	604.8	492.8	11746.0
TOTAL	10.0	16161.6	13980.0	11303.2	8200.8	4924.8	985.6	107834.6
	m/month/feddan	678.8	587.2	474.7	344.4	206.8	41.4	4529.1
	m/day/feddan	21.9	18.9	15.8	11.1	6.9	1.3	
	l/sec/feddan	0.253	0.219	0.183	0.129	0.080	0.015	
	m/month/ha	1616.2	1398.0	1130.3	820.1	492.5	98.6	10783.5
	m/day/ha	52.1	45.1	37.7	26.5	16.4	3.2	
	l/sec/ha	0.603	0.522	0.436	0.306	0.190	0.037	

C.4. Project Irrigation Supply

Table C-13 Project Irrigation Supply (CP-1)

(FARM AREA = 40.0 ha)								
CROPS	PROJECT EFFICIENCY	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
			(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
FLAX	0.64	4.0	5462.5	6437.5	2137.5	0.0	0.0	0.0
POTATO	0.64	1.0	1150.0	0.0	0.0	0.0	0.0	0.0
FODDER BEET	0.64	12.0	15525.0	20278.1	33665.6	33750.0	0.0	0.0
CUCUMBER	0.64	1.0	1293.7	1126.6	0.0	0.0	0.0	0.0
SAFFLOWER	0.64	4.0	5462.5	6759.4	2137.5	0.0	0.0	0.0
TOMATO	0.64	4.0	0.0	0.0	0.0	0.0	7468.7	11068.7
FRENCH BEAN	0.64	2.0	0.0	0.0	0.0	0.0	3734.4	6325.0
SUNFLOWER	0.64	4.0	0.0	0.0	0.0	0.0	0.0	6325.0
CANTALOUPE	0.64	2.0	0.0	0.0	0.0	0.0	2987.5	5929.7
HAPIER GRASS	0.64	4.0	0.0	0.0	0.0	0.0	5975.0	12650.0
SORDAN	0.64	4.0	0.0	0.0	0.0	0.0	4481.2	12650.0
ALFALFA	0.64	6.0	7331.2	9173.4	16031.2	18750.0	21285.9	22532.8
ALFALFA	0.64	4.0	4887.5	6115.6	10687.5	12500.0	0.0	0.0
OLIVE	0.73	8.0	4839.4	3418.1	8995.1	10520.5	12572.1	13308.5
TOTAL		60.0	43951.9	55308.7	73654.4	75520.5	58504.8	90789.6
m/month/feddan			482.5	580.7	773.4	793.0	614.3	953.3
m/day/feddan			15.6	20.7	24.9	26.4	19.8	31.8
l/sec/feddan			0.180	0.240	0.289	0.306	0.229	0.368
m/month/ha			1148.8	1382.7	1841.4	1888.0	1462.6	2289.7
m/day/ha			37.1	49.4	59.4	62.9	47.2	75.7
l/sec/ha			0.429	0.572	0.687	0.728	0.546	0.876

(FARM AREA = 40.0 ha)								
CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
		(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
FLAX	4.0	0.0	0.0	0.0	0.0	3375.0	3850.0	21262.5
POTATO	1.0	0.0	0.0	0.0	717.2	1350.0	1443.7	4660.9
FODDER BEET	12.0	0.0	0.0	0.0	0.0	8100.0	9900.0	121219.5
CUCUMBER	1.0	0.0	0.0	0.0	0.0	843.7	1031.2	4295.3
SAFFLOWER	4.0	0.0	0.0	0.0	0.0	2700.0	3850.0	20909.4
TOMATO	4.0	15378.1	14562.5	9950.0	2868.7	0.0	0.0	61296.8
FRENCH BEAN	2.0	7689.1	7281.2	621.9	0.0	0.0	0.0	25651.5
SUNFLOWER	4.0	11331.2	15290.6	2487.5	0.0	0.0	0.0	35434.4
CANTALOUPE	2.0	7689.1	4732.8	0.0	0.0	0.0	0.0	21339.0
HAPIER GRASS	4.0	16187.5	8737.5	9950.0	0.0	0.0	0.0	53500.0
SORDAN	4.0	16187.5	8737.5	9950.0	0.0	0.0	0.0	52006.2
ALFALFA	6.0	14325.9	12887.8	11007.2	8462.8	9618.7	7837.5	159244.2
ALFALFA	4.0	0.0	0.0	0.0	5641.9	6412.5	5225.0	51470.0
OLIVE	8.0	13624.1	12256.4	10467.9	8048.2	5681.1	4629.0	110360.3
TOTAL	60.0	102412.4	84486.3	54434.5	25738.8	38081.1	37766.5	742648.6
m/month/feddan		1075.3	887.1	571.6	270.3	399.9	396.5	7797.8
m/day/feddan		34.7	28.6	19.1	8.7	13.3	12.8	
l/sec/feddan		0.401	0.331	0.221	0.101	0.154	0.148	
m/month/ha		2560.3	2112.2	1360.9	643.5	952.0	944.2	18566.2
m/day/ha		82.6	68.1	43.4	20.8	31.7	30.5	
l/sec/ha		0.956	0.789	0.525	0.240	0.367	0.353	

Table C-14 Project Irrigation Supply (CP-2)

(FARM AREA = 30.0 ha)

CROPS	PROJECT EFFICIENCY	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
			(m)	(m)	(m)	(m)	(m)	(m)
BERSEEM	0.60	10.0	11500.0	12875.0	21375.0	25000.0	29875.0	0.0
FODDER BEET	0.60	5.0	6900.0	9012.5	14962.5	15000.0	0.0	0.0
WHEAT	0.60	10.0	10733.3	15450.0	29925.0	6666.7	0.0	0.0
SQUASH	0.60	5.0	3833.3	6437.5	12825.0	8333.3	0.0	0.0
TOMATO	0.60	5.0	0.0	0.0	0.0	0.0	0.0	10541.7
FRENCH BEAN	0.60	5.0	0.0	0.0	0.0	0.0	9958.3	16866.7
RICE	0.60	10.0	0.0	0.0	0.0	0.0	35850.0	46383.3
NAPIER GRASS	0.60	2.5	0.0	0.0	0.0	0.0	3983.3	8433.3
SORDAN	0.60	5.0	0.0	0.0	0.0	0.0	5975.0	16866.7
TOTAL		57.5	32966.6	43775.0	79067.4	55000.0	85641.6	99091.6
m/month/feddān			461.5	612.8	1107.2	770.0	1199.0	1387.3
m/day/feddān			14.9	21.9	35.7	25.7	38.7	46.2
l/sec/feddān			0.172	0.253	0.413	0.297	0.448	0.535
m/month/ha			1098.9	1459.2	2636.2	1833.3	2854.7	3303.1
m/day/ha			35.4	52.1	85.0	61.1	92.1	110.1
l/sec/ha			0.410	0.603	0.984	0.707	1.066	1.274

(FARM AREA = 30.0 ha)

CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
		(m)	(m)	(m)	(m)	(m)	(m)	(m)
BERSEEM	10.0	0.0	0.0	0.0	0.0	9000.0	11000.0	120624.7
FODDER BEET	5.0	0.0	0.0	0.0	0.0	3600.0	4400.0	53875.0
WHEAT	10.0	0.0	0.0	0.0	0.0	0.0	5866.7	68641.6
SQUASH	5.0	0.0	0.0	0.0	0.0	0.0	0.0	31429.2
TOMATO	5.0	15108.3	18445.8	16583.3	10200.0	2700.0	0.0	73579.1
FRENCH BEAN	5.0	20504.2	19416.7	1658.3	0.0	0.0	0.0	68404.1
RICE	10.0	47483.3	44658.3	38141.6	2550.0	0.0	0.0	215066.4
NAPIER GRASS	2.5	10791.7	5825.0	6633.3	0.0	0.0	0.0	35666.6
SORDAN	5.0	21583.3	11650.0	13266.7	0.0	0.0	0.0	69341.6
TOTAL	57.5	115470.7	99995.6	76283.2	12750.0	15300.0	21266.6	736628.2
m/month/feddān		1616.6	1399.9	1068.0	178.5	214.2	297.7	80312.8
m/day/feddān		52.1	45.2	35.6	5.8	7.1	9.6	
l/sec/feddān		0.604	0.523	0.412	0.067	0.083	0.111	
m/month/ha		3849.0	3333.2	2542.8	425.0	510.0	708.9	24554.3
m/day/ha		124.2	107.5	84.8	13.7	17.0	22.9	
l/sec/ha		1.437	1.244	0.981	0.159	0.197	0.265	

Table C-15 Project Irrigation Supply (CP-3)

(FARM AREA = 30.0 ha)

CROPS	PROJECT EFFICIENCY	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
			(m)	(m)	(m)	(m)	(m)	(m)
FLAX	0.64	1.5	2048.4	2414.1	801.6	0.0	0.0	0.0
PEAS - GREEN	0.64	1.5	2264.1	0.0	0.0	0.0	0.0	0.0
FODDER BEET	0.64	6.0	7762.5	10139.1	16832.8	16875.0	0.0	0.0
SQUASH	0.64	1.5	1940.6	1207.0	0.0	0.0	0.0	0.0
SAFFLOWER	0.64	1.5	2048.4	2534.8	801.6	0.0	0.0	0.0
TOMATO	0.64	1.5	2048.4	2414.1	3206.2	1406.2	0.0	0.0
GROUNDNUT	0.64	1.5	0.0	0.0	0.0	0.0	1680.5	3557.8
MAIZE - FODDER	0.64	1.5	0.0	0.0	0.0	0.0	1680.5	4743.7
PEPPER	0.64	1.5	1940.6	2172.7	0.0	0.0	0.0	0.0
SUNFLOWER	0.64	4.5	0.0	0.0	0.0	0.0	0.0	7115.6
NAPIER GRASS	0.64	1.5	0.0	0.0	0.0	0.0	2240.6	4743.7
SORDAN	0.64	3.0	0.0	0.0	0.0	0.0	3360.9	9487.5
ALFALFA	0.64	1.5	1832.8	2293.4	4007.8	4687.5	5321.5	5635.2
ALFALFA	0.64	1.5	1832.8	2293.4	4007.8	4687.5	0.0	0.0
APPLE	0.73	3.0	0.0	0.0	3935.3	4931.5	6286.0	7070.1
FIG	0.73	3.0	0.0	0.0	2811.0	4602.7	6286.0	7486.0
GRAPE	0.73	3.0	0.0	0.0	2248.8	3945.2	5107.4	5822.5
ORANGE	0.73	3.0	2268.5	2539.7	4497.5	5260.3	5500.3	5406.6
TOTAL		42.0	25987.2	28008.1	43150.4	46396.0	37463.7	61066.8
<i>m/month/feddan</i>			363.8	392.1	604.1	649.5	524.5	854.9
<i>m/day/feddan</i>			11.7	14.0	19.5	21.7	16.9	28.5
<i>l/sec/feddan</i>			0.136	0.162	0.226	0.251	0.196	0.330

<i>m/month/ha</i>	866.2	935.6	1438.3	1566.5	1248.8	2035.6
<i>m/day/ha</i>	27.9	33.3	46.4	51.6	40.3	67.9
<i>l/sec/ha</i>	0.323	0.386	0.537	0.597	0.466	0.785

(FARM AREA = 30.0 ha)

CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
		(m)	(m)	(m)	(m)	(m)	(m)	(m)
FLAX	1.5	0.0	0.0	0.0	0.0	1265.6	1443.7	7973.4
PEAS - GREEN	1.5	0.0	0.0	0.0	1434.4	1518.7	1856.2	7073.4
FODDER BEET	6.0	0.0	0.0	0.0	0.0	4050.0	4950.0	60609.3
SQUASH	1.5	0.0	0.0	0.0	0.0	1265.6	1546.9	5960.2
SAFFLOWER	1.5	0.0	0.0	0.0	0.0	1012.5	1443.7	7841.0
TOMATO	1.5	0.0	0.0	0.0	0.0	1265.6	1443.7	11784.4
GROUNDNUT	1.5	4856.2	5187.9	3731.2	717.2	0.0	0.0	19730.8
MAIZE - FODDER	1.5	4552.7	3822.7	3731.2	0.0	0.0	0.0	18530.8
PEPPER	1.5	0.0	0.0	0.0	1793.0	2025.0	1959.4	9890.6
SUNFLOWER	4.5	12747.6	17202.0	2798.4	0.0	0.0	0.0	39863.7
NAPIER GRASS	1.5	6070.3	3276.6	3731.2	0.0	0.0	0.0	20062.5
SORDAN	3.0	12140.6	6553.1	7462.5	0.0	0.0	0.0	39004.7
ALFALFA	1.5	3581.5	3222.0	2751.8	2115.7	2404.7	1959.4	39811.1
ALFALFA	1.5	0.0	0.0	0.0	2115.7	2404.7	1959.4	19301.2
APPLE	3.0	7237.8	6128.2	5234.0	3772.6	2307.9	0.0	46903.5
FIG	3.0	7237.8	6511.2	4906.8	3521.1	1775.3	0.0	45138.0
GRAPE	3.0	5960.5	4979.2	3598.4	2263.6	1242.7	0.0	35168.2
ORANGE	3.0	5534.8	4979.2	4252.6	3521.1	2485.5	2025.2	48271.2
TOTAL	42.0	69919.9	61861.9	42198.2	21254.3	25024.0	20587.7	482917.6
<i>m/month/feddan</i>		978.9	866.1	590.8	297.6	350.3	288.2	6760.8
<i>m/day/feddan</i>		31.6	27.9	19.7	9.6	11.7	9.3	
<i>l/sec/feddan</i>		0.365	0.323	0.228	0.111	0.135	0.108	
<i>m/month/ha</i>		2330.7	2062.1	1406.6	708.5	834.1	686.3	16097.3
<i>m/day/ha</i>		75.2	86.5	46.9	22.9	27.8	22.1	
<i>l/sec/ha</i>		0.870	0.770	0.543	0.265	0.322	0.256	

Table C-16 Project Irrigation Supply (CP-4)

(FARM AREA = 25.0 ha)

CROPS	PROJECT EFFICIENCY	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN	
			(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	
BARLEY	0.64	5.0	6448.7	8851.6	2671.9	0.0	0.0	0.0	
FODDER BEET	0.64	5.0	6448.7	8449.2	14027.3	14062.5	0.0	0.0	
MAIZE - FODDER	0.64	5.0	0.0	0.0	0.0	0.0	5601.6	15812.5	
SUNFLOWER	0.64	5.0	0.0	3218.7	9351.6	16406.2	3734.4	0.0	
SORDAN	0.64	5.0	0.0	0.0	0.0	0.0	5601.6	15812.5	
ALFALFA	0.64	10.0	12218.7	15289.1	26718.7	31250.0	35476.6	37554.7	
ALFALFA	0.64	5.0	6109.4	7644.5	13359.4	15625.0	0.0	0.0	
TOTAL		40.0	31265.6	43453.1	66128.9	77343.7	50414.0	69179.6	
			m ³ /month/feddan	525.3	730.0	1111.0	1299.4	847.0	1162.2
			m ³ /day/feddan	16.9	26.1	35.8	43.3	27.3	38.7
			l ³ /sec/feddan	0.196	0.302	0.415	0.501	0.316	0.448
			m ³ /month/ha	1250.6	1738.1	2645.2	3093.7	2016.6	2767.2
			m ³ /day/ha	40.3	62.1	85.3	103.1	65.1	92.2
			l ³ /sec/ha	0.467	0.718	0.988	1.194	0.753	1.068

(FARM AREA = 25.0 ha)

CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	
		(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	
BARLEY	5.0	0.0	0.0	0.0	0.0	1687.5	3437.5	23117.2	
FODDER BEET	5.0	0.0	0.0	0.0	0.0	3375.0	4125.0	50507.3	
MAIZE - FODDER	5.0	15175.6	12742.2	12437.5	0.0	0.0	0.0	61769.5	
SUNFLOWER	5.0	0.0	0.0	0.0	0.0	0.0	0.0	32710.9	
SORDAN	5.0	20234.4	10921.9	12437.5	0.0	0.0	0.0	65007.8	
ALFALFA	10.0	23876.6	21479.7	18345.3	14104.7	16031.2	13062.5	265407.2	
ALFALFA	5.0	0.0	0.0	0.0	7052.3	8015.6	6531.2	64337.5	
TOTAL	40.0	59286.7	45143.7	43220.3	21157.0	29109.4	27156.2	562857.7	
		m ³ /month/feddan	996.0	758.4	726.1	355.4	489.0	456.2	9456.0
		m ³ /day/feddan	32.1	24.5	24.2	11.5	16.3	14.7	
		l ³ /sec/feddan	0.372	0.283	0.280	0.133	0.189	0.170	
		m ³ /month/ha	2371.5	1805.7	1728.8	846.3	1164.4	1086.2	22514.3
		m ³ /day/ha	76.5	58.2	57.6	27.3	38.8	35.0	
		l ³ /sec/ha	0.885	0.674	0.667	0.316	0.449	0.406	

Table C-17 Project Irrigation Supply (CP-5)

(FARM AREA = 10.0 ha)

CROPS	PROJECT EFFICIENCY	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN	
			(m)	(m)	(m)	(m)	(m)	(m)	
APPLE	0.73	4.0	0.0	0.0	5247.1	6575.3	8381.4	9426.8	
FIG	0.73	2.0	0.0	0.0	1874.0	3068.5	4190.7	4990.7	
GRAPE	0.73	2.0	0.0	0.0	1499.2	2630.1	3404.9	3881.6	
GUAVA	0.73	1.0	756.2	846.6	1311.8	1534.2	1702.5	1802.2	
ORANGE	0.73	1.0	756.2	846.6	1499.2	1753.4	1833.4	1802.2	
TOTAL		10.0	1512.3	1693.1	11431.2	15561.6	19512.9	21903.5	
			m/month/feddan	63.5	71.1	480.1	653.6	819.5	919.9
			m/day/feddan	2.0	2.5	15.5	21.8	26.4	30.7
			l/sec/feddan	0.024	0.029	0.179	0.252	0.306	0.355
			m/month/ha	151.2	169.3	1143.1	1556.2	1951.3	2190.4
			m/day/ha	4.9	6.0	36.9	51.9	62.9	73.0
			l/sec/ha	0.056	0.070	0.427	0.600	0.729	0.845

(FARM AREA = 10.0 ha)

CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	
		(m)	(m)	(m)	(m)	(m)	(m)	(m)	
APPLE	4.0	9650.4	8171.0	6978.6	5030.1	3077.3	0.0	62538.0	
FIG	2.0	4825.2	4340.8	3271.2	2347.4	1183.6	0.0	30092.0	
GRAPE	2.0	3973.7	3319.5	2398.9	1509.0	828.5	0.0	23445.5	
GUAVA	1.0	1844.9	1659.7	1417.5	1173.7	828.5	675.1	15552.9	
ORANGE	1.0	1844.9	1659.7	1417.5	1173.7	828.5	675.1	16090.4	
TOTAL	10.0	22139.2	19150.7	15483.8	11234.0	6744.3	1350.1	147718.7	
		m/month/feddan	929.8	804.3	650.3	471.8	283.3	56.7	6204.2
		m/day/feddan	30.0	25.9	21.7	15.2	9.4	1.8	
		l/sec/feddan	0.347	0.300	0.251	0.176	0.109	0.021	
		m/month/ha	2213.9	1915.1	1548.4	1123.4	674.6	135.0	14771.9
		m/day/ha	71.4	61.8	51.6	36.2	22.5	4.4	
		l/sec/ha	0.827	0.715	0.597	0.419	0.260	0.050	

Table C-18 Peak Project Irrigation Supply

Cropping Pattern	Small-holder (sandy)	Small-holder (clay)	Graduate	Investor (live-stock)	Investor (fruit)	TOTAL
Peak Project Irrigation Supply- JUL (lit/sec/feddan)	CP-1 0.421	CP-2 0.634	CP-3 0.383	CP-4 0.391	CP-5 0.364	
(1) South Tina Plain (1)		9,000 (5.71)				9,000 ^{1/} (5.71) ^{2/}
(2) North Tina Plain		16,700 (10.59)				16,700 (10.59)
(3) South Tina Plain (2)	7,000 (2.95)	3,800 (2.41)	16,100 (6.17)	14,700 (5.75)		41,600 (17.28)
(4) South Qantara East	3,100 (1.31)		15,200 (5.82)			18,300 (7.13)
(5) Kathib El Agramia				20,200 (7.90)		20,200 (7.90)
(6) F/S Area	23,500 (9.89)	1,800 (1.14)	4,600 (1.76)	6,000 (2.35)	5,700 (2.07)	41,600 (17.21)
(7) Hod Abu Samara				11,200 (4.38)		11,200 (4.38)
(8) Bir El Abd				8,000 (3.13)		8,000 (3.13)
(9) Tofaha	3,300 (1.39)					3,300 (1.39)
(10) South Salmana	7,300 (3.07)					7,300 (3.07)
(11) North Salmana	9,600 (4.04)					9,600 (4.04)
(12) Misfaq			4,000 (1.53)			4,000 (1.53)
(13) El Hazar	2,800 (1.18)			2,200 (0.8)		5,000 (2.04)
(14) El Midan	4,400 (1.85)			3,600 (1.41)		8,000 (3.26)
TOTAL	61,000	31,300	39,900	65,900	5,700	203,800 (88.66)

Note: ^{1/} Net Cultivable Area in feddan.
^{2/} Peak Project Irrigation Supply in m³/sec.

Table C-19 Project Irrigation Supply for M/P Land Reclamation Area

CROPPING PATTERN	NET CULTIVABLE AREA (FEDDAN)	PROJECT IRRIGATION SUPPLY (1000 CU.M)					
		JAN	FEB	MAR	APR	MAY	JUN
CP - 1	61000.0	30904.1	37193.8	49536.3	50791.6	39345.9	61058.9
CP - 2	31300.0	15167.2	20139.7	36388.1	25306.0	39405.1	45593.6
CP - 3	39900.0	15241.4	16427.0	25308.7	27210.8	21973.9	35816.0
CP - 4	65900.0	36348.1	50512.3	76875.6	89911.9	58608.2	80418.4
CP - 5	5700.0	380.0	425.5	2873.4	3911.8	4904.7	5505.6
TOTAL	203800.0	98040.8	124698.3	190982.1	197132.1	164237.7	228392.4
	(CU.M/SEC)	36.6	51.5	71.3	76.1	61.3	88.1

CROPPING PATTERN	NET CULTIVABLE AREA (FEDDAN)	PROJECT IRRIGATION SUPPLY (1000 CU.M)											
		JUL	AUG	SEP	OCT	NOV	DEC	TOTAL					
CP - 1	61000.0	68872.9	56818.8	36611.0	17312.7	25613.6	25395.8	499455.1					
CP - 2	31300.0	53129.6	46007.7	35099.8	5866.4	7039.7	9783.9	338926.4					
CP - 3	39900.0	41011.0	36285.3	24751.6	12468.0	14675.8	12074.1	283243.4					
CP - 4	65900.0	68918.2	52477.5	50242.5	24591.9	53836.3	31566.7	654307.5					
CP - 5	5700.0	5564.9	4813.7	3892.0	2823.7	1695.5	339.3	37130.3					
TOTAL	203800.0	237496.4	196402.8	150596.7	63062.7	82860.9	79159.9	1813058.0					
	(CU.M/SEC)	88.7	73.3	58.1	23.5	32.0	29.6						

NOTE :

THE FIGURES OF PROJECT IRRIGATION SUPPLY IN THIS TABLE INCLUDE IRRIGATION WATER FOR WIND BREAK.

PROJECT IRRIGATION SUPPLY = ET(CROP) / EP X 1.05
 ET(CROP) : REFERENCE CROP EVAPOTRANSPIRATION
 EP : PROJECT EFFICIENCY

Table C-20 Project Irrigation Supply for Western Area of Suez Canal

Unit	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
<u>1/</u> m ³ /day/gross feddan	20.0	25.2	21.9	8.2	9.2	28.2	44.6	41.6	23.6	11.8	15.4	17.0	
m ³ /month/gross fedd.	620.0	705.6	678.9	246.0	285.2	846.0	1,382.6	1,289.6	708.0	365.8	462.0	527.0	8,116.7
Irrigation Water Requirement of Western Area of Suez Canal (gross area : 185,000 feddan)													
MCM	114.7	130.5	125.6	45.5	52.8	156.5	255.8	238.6	131.0	67.7	85.5	97.5	1,501.7
cu. m/sec	42.8	53.9	46.9	17.6	19.7	60.4	95.5	89.1	50.5	25.3	33.0	36.4	(Mean) 47.6

1/ Source : Report on Feasibility Study for The North Houssinia Valley & South Port Said Agricultural Development Project, JICA, June 1984

C.5. Permanent Leaching Requirement

Table C-21 Estimation of Permanent Leaching Requirement

Water requirements for permanent leaching can be calculated by the formula;

$$\text{Surface irrigation: LR1} = \frac{\text{ECiw}}{5 \text{ ECe} - \text{ECiw}} \cdot \frac{100}{f}$$

$$\text{Sprinkler or drip irrigation: LR2} = \frac{\text{ECiw}}{2 (\text{maxECe})} \cdot \frac{100}{f}$$

Where : LR1,2 = leaching requirement as a percentage of the irrigation water requirement

ECiw = electrical conductivity of irrigation water in mS/cm.
810 ppm = 1.3 mS/cm (1 mS/cm = 640 ppm)

ECe = permissible soil salinity in terms of EC of the saturation extract, mS/cm
(see FAOs Irrigation and Drainage Paper No.29)

f = leaching efficiency,
0.5 for surface irrigation
1.0 for sprinkler or drip irrigation

Crop	ECe ^{1/}	maxECe ^{2/}	LR1	LR2
Rice	3.8	11.5	14.7	5.6
Wheat	7.4	20.0	7.3	3.3
Sorghum	5.1	18.0	10.7	3.6
Soyabean	5.5	10.0	9.9	6.5
Beets	5.1	15.0	10.7	4.3
Tomato	3.5	12.5	16.0	5.2
Cucumber	3.3	10.0	17.1	6.5
Cantaloupe	3.6	16.0	15.6	4.1
Alfalfa	3.4	15.5	16.6	4.2
Vetch	3.9	12.0	14.3	5.4
Berseem	3.2	19.0	17.7	3.4
Olive	3.8	14.0	14.7	4.6
Grape	2.5	12.0	23.2	5.4
Peach	2.3	6.5	25.5	10.0

Notes: 1/ ECe corresponding to 10% yield loss presented in FAOs Paper No. 29

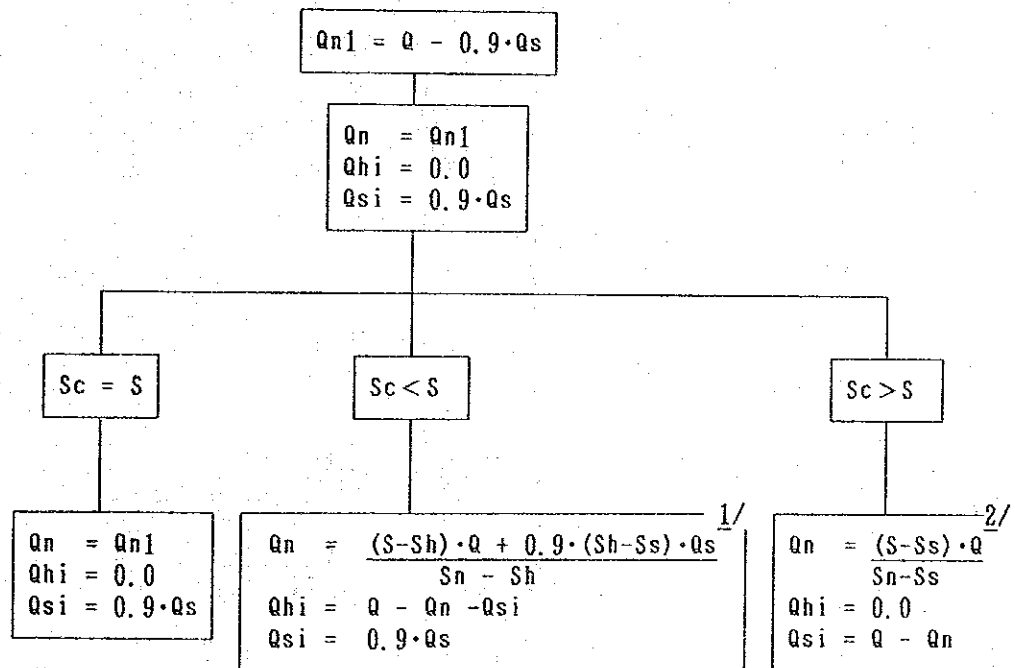
2/ ECe corresponding to 100% yield loss presented in FAOs Paper No. 29

C.6. Water Sources and Quality

Table C-22 Calculation Procedure of Required Amounts of Water from Nile River, Hadous Drain and El Sirw Drain

Calculation Procedure

- Q : Required irrigation water, cu.m/sec,
 Q_n : Water amount to be taken from Nile river, cu.m/sec,
 Q_h : Discharge of Hadous drain, cu.m/sec,
 Q_{hi} : Water amount to be taken from Hadous drain ($Q_{hi} \leq 0.8 \cdot Q_h$), cu.m/sec,
 Q_s : Discharge of El Sirw drain, cu.m/sec,
 Q_{si} : Water amount to be taken from El Sirw drain ($Q_{si} \leq 0.9 \cdot Q_s$), cu.m/sec,
 S : Upper limit of salinity of irrigation water, ppm,
 S_n : Salinity of Nile water, ppm,
 S_h : Salinity of drainage water of Hadous drain, ppm,
 S_s : Salinity of drainage water of El Sirw drain, ppm, and
 S_c : Salinity of irrigation water ($S_c \leq S$), ppm,
 $S_c = (Q_n \cdot S_n + Q_{hi} \cdot S_h + Q_{si} \cdot S_s) / Q$



$1/$ $Q_{si} = 0.9 \cdot Q_s$
 $S \cdot Q = Q_n \cdot S_n + Q_{hi} \cdot S_h + 0.9 \cdot Q_s \cdot S_s$
 $Q = Q_n + Q_{hi} + 0.9 \cdot Q_s$

$Q_n = \frac{(S - S_h) \cdot Q + 0.9 \cdot (S_h - S_s) \cdot Q_s}{S_n - S_h}$

$2/$ $Q_{hi} = 0.0$
 $S \cdot Q = Q_n \cdot S_n + Q_{si} \cdot S_s$
 $Q = Q_n + Q_{si}$

$Q_n = \frac{(S - S_s) \cdot Q}{S_n - S_s}$

Table C-23 Discharge and Salinity Data of Hadous Drain and El Sirw Drain

		JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1985														
EL SIRW	Q	37.94	27.07	44.42	39.98	46.76	64.93	75.99	77.02	70.95	48.98	46.96	44.30	625.30
	S	2035	960	1318	1017	870	947	960	979	915	902	819	1024	
BAHR HADOUS	Q	183.45	88.43	0.00	155.87	153.00	173.32	249.91	271.32	278.02	243.45	172.94	217.91	2350.64
	S	1695	1785	0	1215	1427	1638	1606	1440	1375	1375	1459	1375	
TOTAL	Q	221.39	115.50	44.42	195.85	199.76	238.25	325.90	348.34	348.97	292.43	219.90	262.21	2975.94
1986														
EL SIRW	Q	37.12	25.91	40.33	43.66	49.53	56.21	70.68	67.33	73.00	54.73	45.57	41.61	605.68
	S	1375	2118	1030	992	966	1152	1184	1004	934	857	857	2400	
BAHR HADOUS	Q	186.54	103.65	170.74	177.65	150.64	162.63	245.88	230.33	282.05	247.21	194.54	195.27	2347.13
	S	1625	2796	1587	1382	1484	1836	1715	1779	1593	1337	1401	1260	
TOTAL	Q	223.66	129.56	211.07	221.31	200.17	218.84	316.56	297.66	355.05	301.94	240.11	236.88	2952.81
1987														
EL SIRW	Q	37.13	20.55	47.86	42.76	48.93	75.40	76.87	69.21	67.31	46.77	32.82	38.72	604.33
	S	787	1254	837	966	800	819	921	960	966	934	960	864	
BAHR HADOUS	Q	177.97	62.24	190.38	138.17	128.49	207.28	247.33	225.33	257.08	241.66	163.70	201.11	2240.73
	S	2112	3116	1561	1638	1593	1664	1555	1804	1606	1459	1734	1567	
TOTAL	Q	215.10	82.79	238.24	180.93	177.42	282.68	324.20	294.54	324.39	288.43	196.52	239.83	2845.06
1988														
EL SIRW	Q	36.32	17.16	44.55	35.48	48.54	65.58	0.00	0.00	0.00	0.00	0.00	0.00	247.63
	S	1107	2483	1215	1254	902	1113	0	0	0	0	0	0	
BAHR HADOUS	Q	212.18	69.11	168.86	116.50	111.08	113.47	0.00	0.00	0.00	0.00	0.00	0.00	791.20
	S	1644	2611	1587	2009	1798	2470	0	0	0	0	0	0	
TOTAL	Q	248.50	86.27	213.41	151.98	159.62	179.05	0.00	0.00	0.00	0.00	0.00	0.00	1038.83
		Q	DISCHARGE IN MCM											
		S	SALINITY IN PPM											

Table C-24 Required Amount of Water from Nile River, Hadous Drain and El Sirw Drain
(Nile Water; 250ppm, Upper Limit of Salinity; 800ppm)

(SALINITY OF NILE WATER : 250 PPM)
(UPPER LIMIT OF SALINITY : 800 PPM)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1985													
EL SIRW Q	34.15	24.36	0.00	35.98	42.08	58.44	68.39	69.32	63.85	44.08	42.26	39.87	522.79
BAHR HADOUS Q	38.75	70.74	0.00	109.53	79.21	123.13	164.23	158.57	99.83	38.35	56.70	58.90	997.94
NILE RIVER Q	139.81	160.09	0.00	97.08	95.71	203.33	260.68	207.11	117.92	48.37	69.43	77.93	1477.47
TOTAL Q	212.70	255.20	0.00	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	2998.20
SALINITY PPM	800	743	0	800	800	800	800	800	800	800	800	800	800
1986													
EL SIRW Q	33.41	23.32	36.30	39.29	44.58	50.59	63.61	60.60	65.70	49.26	41.01	37.45	545.11
BAHR HADOUS Q	57.70	36.00	109.04	92.08	70.79	104.65	144.62	126.54	81.81	38.63	58.79	16.49	939.15
NILE RIVER Q	121.60	193.88	171.27	111.22	101.63	229.66	285.07	247.86	134.09	42.92	68.60	122.76	1830.54
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	3314.80
SALINITY PPM	800	800	800	800	800	800	800	800	800	800	800	800	800
1987													
EL SIRW Q	33.42	18.49	43.07	38.48	44.04	67.86	69.18	62.29	60.58	42.09	29.54	34.85	543.90
BAHR HADOUS Q	53.19	42.48	112.81	76.25	70.80	122.40	172.27	125.43	82.19	35.67	48.27	57.50	999.25
NILE RIVER Q	128.10	194.22	160.72	127.87	102.16	194.64	251.84	247.28	138.83	53.04	90.59	84.35	1771.65
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	3314.80
SALINITY PPM	800	800	800	800	800	800	800	800	800	800	800	800	800
1988													
EL SIRW Q	32.69	15.44	40.10	31.93	43.69	59.02	0.00	0.00	0.00	0.00	0.00	0.00	222.87
BAHR HADOUS Q	63.78	44.84	101.26	57.60	58.67	72.38	0.00	0.00	0.00	0.00	0.00	0.00	398.54
NILE RIVER Q	116.23	194.92	175.25	153.07	114.64	253.49	0.00	0.00	0.00	0.00	0.00	0.00	1007.60
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	0.00	0.00	0.00	0.00	0.00	0.00	1629.00
SALINITY PPM	800	800	800	800	800	800	0	0	0	0	0	0	0

Table C-25 Required Amount of Water from Nile River, Hadous Drain and El Sirw Drain
(Nile Water; 370ppm, Upper Limit of Salinity; 800ppm)

(SALINITY OF NILE WATER : 370 PPM)
(UPPER LIMIT OF SALINITY : 800 PPM)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL	
1985														
EL SIRW	Q	34.15	24.36	0.00	35.98	42.08	58.44	68.39	69.32	65.85	44.08	42.26	39.87	522.79
BAHR HADOUS	Q	26.09	67.36	0.00	95.76	68.34	103.89	138.93	135.35	85.76	32.58	49.05	49.61	852.73
NILE RIVER	Q	152.46	163.47	0.00	110.85	106.57	222.57	285.98	230.33	131.99	54.14	77.08	87.22	1622.68
TOTAL	Q	212.70	255.20	0.00	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	2998.20
SALINITY	PPM	800	800	0	800	800	800	800	800	800	800	800	800	
1986														
EL SIRW	Q	33.41	23.32	36.30	39.29	44.58	50.59	63.61	60.60	65.70	49.26	41.01	37.43	545.09
BAHR HADOUS	Q	46.08	28.42	92.15	78.90	59.85	85.86	119.19	105.44	68.66	33.31	50.81	0.00	768.66
NILE RIVER	Q	133.22	203.46	188.15	124.41	112.57	248.45	310.49	268.96	147.24	48.24	76.58	139.27	2001.04
TOTAL	Q	212.70	255.20	316.60	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	3314.80
SALINITY	PPM	800	800	800	800	800	800	800	800	800	800	800	800	
1987														
EL SIRW	Q	33.42	18.49	43.07	38.48	44.04	67.86	69.18	62.29	60.58	42.09	29.54	34.85	543.90
BAHR HADOUS	Q	44.50	34.00	96.62	64.15	60.78	104.55	146.77	104.75	68.71	29.83	40.30	49.05	843.82
NILE RIVER	Q	134.78	202.71	176.90	139.97	112.18	212.69	277.34	267.96	152.31	58.88	98.56	92.80	1927.08
TOTAL	Q	212.70	255.20	316.60	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	3314.80
SALINITY	PPM	800	800	800	800	800	800	800	800	800	800	800	800	
1988														
EL SIRW	Q	32.69	15.44	40.10	31.93	43.69	59.02	0.00	0.00	0.00	0.00	0.00	0.00	222.87
BAHR HADOUS	Q	52.84	34.40	83.98	46.40	49.04	57.90	0.00	0.00	0.00	0.00	0.00	0.00	324.57
NILE RIVER	Q	127.17	205.35	192.53	164.27	124.27	267.98	0.00	0.00	0.00	0.00	0.00	0.00	1081.57
TOTAL	Q	212.70	255.20	316.60	242.60	217.00	384.90	0.00	0.00	0.00	0.00	0.00	0.00	1629.00
SALINITY	PPM	800	800	800	800	800	800	0	0	0	0	0	0	

Table C-26 Required Amount of Water from Nile River, Hadous Drain and El Sirw Drain
(Nile Water; 250ppm, Upper Limit of Salinity; 1,000ppm)

(SALINITY OF NILE WATER : 250 PPM)
(UPPER LIMIT OF SALINITY : 1000 PPM)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1985													
EL SIRW Q	34.15	24.36	0.00	35.98	42.08	58.44	68.39	69.32	63.85	44.08	42.26	39.87	522.79
BAHR HADOUS Q	68.17	70.74	0.00	124.70	116.07	138.66	199.93	217.06	149.84	61.58	84.55	90.29	1321.59
NILE RIVER Q	110.39	160.09	0.00	81.92	58.84	187.81	224.98	148.63	67.90	25.14	41.58	46.54	1153.82
TOTAL Q	212.70	255.20	0.00	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	2998.20
SALINITY PPM	1000	743	0	860	1000	856	898	959	1000	1000	1000	1000	
1986													
EL SIRW Q	33.41	23.32	36.30	39.29	44.58	50.59	63.61	60.60	65.70	49.26	41.01	37.45	545.11
BAHR HADOUS Q	88.62	58.05	136.59	134.93	105.94	130.10	196.70	183.44	123.72	62.68	88.03	51.45	1360.26
NILE RIVER Q	90.67	173.84	143.71	68.38	66.48	204.21	232.98	190.97	92.18	18.86	39.35	87.80	1409.42
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	3314.80
SALINITY PPM	1000	1000	916	1000	1000	904	954	1000	1000	1000	1000	1000	
1987													
EL SIRW Q	33.42	18.49	43.07	38.48	44.04	67.86	69.18	62.29	60.58	42.09	29.54	34.85	543.90
BAHR HADOUS Q	76.03	49.79	152.30	110.54	102.79	165.82	197.86	180.26	123.71	57.30	70.96	84.52	1371.69
NILE RIVER Q	103.25	186.91	121.22	93.58	70.17	151.22	226.25	192.45	97.31	31.40	67.91	57.54	1399.21
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	493.30	435.00	281.60	130.80	168.40	176.70	3314.80
SALINITY PPM	1000	882	943	996	998	959	867	995	1000	1000	1000	1000	
1988													
EL SIRW Q	32.69	15.44	40.10	31.93	43.69	59.02	0.00	0.00	0.00	0.00	0.00	0.00	222.87
BAHR HADOUS Q	94.28	55.29	135.09	85.18	86.70	90.78	0.00	0.00	0.00	0.00	0.00	0.00	547.31
NILE RIVER Q	85.73	184.47	141.42	125.49	86.61	235.10	0.00	0.00	0.00	0.00	0.00	0.00	858.82
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	0.00	0.00	0.00	0.00	0.00	0.00	1629.00
SALINITY PPM	1000	896	942	1000	1000	906	0	0	0	0	0	0	

Table C-27 Required Amount of Water from Nile River, Hadous Drain and El Sirw Drain
(Nile Water; 370ppm, Upper Limit of Salinity; 1,000ppm)

(SALINITY OF NILE WATER : 370 PPM)
(UPPER LIMIT OF SALINITY : 1000 PPM)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL
1985													
EL SIRW Q	34.15	24.36	0.00	35.98	42.08	58.44	68.39	69.32	63.85	44.08	42.26	39.87	522.79
BAHR HADOUS Q	58.18	70.74	0.00	124.70	109.59	138.66	199.93	216.66	141.74	58.58	79.97	84.74	1283.29
NILE RIVER Q	120.38	160.09	0.00	81.92	65.52	187.81	224.98	149.03	76.00	28.13	46.16	52.09	1192.12
TOTAL Q	212.70	255.20	0.00	242.60	217.00	384.90	493.30	435.00	281.60	150.80	168.40	176.70	2998.20
SALINITY PPM	1000	818	0	900	1000	914	952	1000	1000	1000	1000	1000	1000
1986													
EL SIRW Q	33.41	23.32	36.30	39.29	44.38	50.59	63.61	60.60	65.70	49.26	41.01	37.45	545.11
BAHR HADOUS Q	79.96	49.45	136.59	126.82	98.78	150.10	192.54	167.18	114.68	60.34	83.46	39.63	1279.53
NILE RIVER Q	99.34	182.43	143.71	76.48	73.64	204.21	237.15	207.23	101.22	21.20	43.93	99.62	1490.16
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	493.30	435.00	281.60	150.80	168.40	176.70	3314.80
SALINITY PPM	1000	1000	970	1000	1000	968	1000	1000	1000	1000	1000	1000	1000
1987													
EL SIRW Q	33.42	18.49	43.07	38.48	44.04	67.86	69.18	62.29	60.58	42.09	29.54	34.85	543.90
BAHR HADOUS Q	88.92	49.79	149.76	102.40	96.25	163.84	197.86	165.39	114.27	53.84	64.98	78.55	1305.86
NILE RIVER Q	110.36	186.91	123.76	101.71	76.71	153.20	226.25	207.32	106.75	34.86	73.88	63.30	1465.04
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	493.30	435.00	281.60	150.80	168.40	176.70	3314.80
SALINITY PPM	1000	970	1000	1000	1000	1000	922	1000	1000	1000	1000	1000	1000
1988													
EL SIRW Q	32.69	15.44	40.10	31.93	43.69	59.02	0.00	0.00	0.00	0.00	0.00	0.00	222.87
BAHR HADOUS Q	86.21	55.29	135.09	75.99	79.43	90.78	0.00	0.00	0.00	0.00	0.00	0.00	522.78
NILE RIVER Q	93.80	184.47	141.42	134.68	93.89	235.10	0.00	0.00	0.00	0.00	0.00	0.00	883.35
TOTAL Q	212.70	255.20	316.60	242.60	217.00	384.90	0.00	0.00	0.00	0.00	0.00	0.00	1629.00
SALINITY PPM	1000	983	996	1000	1000	979	0	0	0	0	0	0	0

APPENDIX D. Crop and Livestock Production

D.1. Crop Production D-1

D.2. Livestock D-4

D.1. Crop Production

Table D-1. Breakdown of the Total Net Area

(unit : 1000 / feddan, net)

Cropping Pattern	C. P-1	C. P-2	C. P-3	C. P-4	C. P-5	C. P-6	Total
North Tina Plain	-	16.7	-	-	-	-	16.7
South Tina Plain	7.0	12.8	16.1	14.7	-	-	50.6
South Qantara East	3.1	-	15.2	-	-	-	18.3
Kathib El Agramia	-	-	-	20.2	-	-	20.2
Rabaa / Qatia	23.5	1.8	4.6	6.0	5.7	-	41.6
Hod Abu Santara	-	-	-	11.2	-	-	11.2
Bir El Abd	-	-	-	8.0	-	-	8.0
Tofaha	3.3	-	-	-	-	-	3.3
North Salmana	9.6	-	-	-	-	-	9.6
South Salmana	7.3	-	-	-	-	-	7.3
Misfaq	-	-	4.0	-	-	-	4.0
El Mazar	2.8	-	-	2.2	-	-	5.0
El Midan	4.4	-	-	3.6	-	-	8.0
Sub-total (canal irrigated)	61.0	31.3	39.9	65.9	5.7	0	203.8
Wadi El Arish	-	-	-	-	-	5.1	5.1
Sheikh Zuwayed / Rafah	-	-	-	-	-	54.4	54.4
Sub-total (ground water irrigated)	-	-	-	-	-	59.5	59.5
Total	61.0	31.3	39.9	65.9	5.7	59.5	263.3

Table D-2. Estimated Agricultural Production by Cropping Patterns

(unit: 1000 feddan, 1000 ton)

stabilized stage

Cropping Pattern	C. P-1		C. P-2		C. P-3		C. P-4		C. P-5		C. P-6		Total	
	A	P	A	P	A	P	A	P	A	P	A	P	A	P
Area under pattern (net)	61.0		31.3		39.9		65.9		5.7		51.0		262.9	
rice	-	-	11	21	-	-	-	-	-	-	-	-	11	21
wheat	-	-	8	11	-	-	-	-	-	-	-	-	8	11
miaze	-	-	-	-	2	3	-	-	-	-	-	-	2	3
groundnut	-	-	-	-	2	2	-	-	-	-	-	-	2	2
sunflower	6	5	-	-	6	6	13	12	-	-	-	-	25	23
safflower	6	5	-	-	2	1	-	-	-	-	-	-	8	4
flax (grain)	6	3	-	-	2	1	-	-	-	-	-	-	8	4
flax (stalk)	-	14	-	-	-	4	-	-	-	-	-	-	-	18
tomato	6	42	5	40	2	14	-	-	-	-	3	24	16	120
cucumber	2	8	-	-	-	-	-	-	-	-	-	-	2	8
cantaloup	3	18	-	-	-	-	-	-	-	-	-	-	3	18
squash	-	-	5	40	2	14	-	-	-	-	3	24	10	78
potato	2	10	-	-	-	-	-	-	-	-	-	-	2	10
green pepper	-	-	-	-	2	10	-	-	-	-	-	-	2	10
green pea	-	-	-	-	2	8	-	-	-	-	-	-	2	8
french bean	-	-	5	25	-	-	-	-	-	-	-	-	5	25
okra	-	-	-	-	-	-	-	-	-	-	3	24	3	24
eggplant	-	-	-	-	-	-	-	-	-	-	3	27	3	27
berseem	-	-	8	224	-	-	-	-	-	-	-	-	8	224
alfalfa	24	728	-	-	6	178	40	1201	-	-	-	-	70	2107
fodder beet	18	583	8	286	8	253	13	427	-	-	-	-	37	1549
sordan	6	194	5	174	4	127	13	427	-	-	-	-	28	922
napierglass	6	164	3	75	2	53	-	-	-	-	-	-	11	292
fodder maize	-	-	-	-	-	-	13	334	-	-	-	-	13	334
feed barley	-	-	-	-	-	-	13	13	-	-	-	-	13	13
apple	-	-	-	-	4	8	-	-	2	5	-	-	6	13
orange	-	-	-	-	4	32	-	-	1	5	-	-	5	37
grape	-	-	-	-	4	24	-	-	1	7	-	-	5	31
fig	-	-	-	-	4	20	-	-	1	6	2	12	-	-
guava	-	-	-	-	-	-	-	-	1	4	-	-	1	4
peach	-	-	-	-	-	-	-	-	-	-	10	30	10	30
almond	-	-	-	-	-	-	-	-	-	-	29	23	29	23
oil olive	12	36	-	-	-	-	-	-	-	-	7	28	19	64

Note : A ; area, P; production

Table D-3. Proposed List of Agricultural Machinery with Working Hours

Cropping Pattern	C.P.2	C.P.3	C.P.4	C.P.5	Proposed Attachment etc.
	hrs.	hrs.	hrs.	hrs.	
(1) fodder crops					
plowing	-	-	58.8	-	rotabator, tooth harrow
sowing	-	-	66.7	-	hand seeder, lime sower
manure spreader	-	(16.6)	27.8	-	manure loader, culti packer
hay tedding	-	-	17.7	-	gyro tedder
cutting/hay collecting	-	(16.7)	56.0	-	reciprocal mower, hay bailer
carrying	-	(105.1)	353.1	-	load wagon
(2) orchard					
plowing	-	-	-	3.6	bottom plow
manure spreading	-	-	-	4.1	manure spreader
spraying	-	-	-	1.9	self-propelled speed sprayer
dusting	-	-	-	2.0	duster
harvest carrying	-	(20.7)	-	6.0	load wagon
(3) paddy field					
puddling	8.3	-	-	-	puddling roter
transplanting	24.0	-	-	-	manure spreader, 6 row walking
reap harvesting	13.1	-	-	-	paddy reaper planter
carrying	26.0	-	-	-	load wagon
required sets of tractor	295		500	18	
annual hours/tractor	240	(540)	1,200	1,000	

note : parenthesis indicating possibility of utilizing tractors for paddy during off-season of rice cultivation (October - March)

D.4. Livestock

Table D-4. Projected Livestock Herds and Estimated Products
unit : 1000 heads, tons

Cropping Pattern	C.P.1	C.P.2	C.P.3	C.P.4	Total
Beef Cattle					
calf	0	12.4	15.8	70.9	99.1
yearling	0	12.4	7.7	60.0	80.1
stock cow	18.7	15.8	83.4	0	117.9
Goats					
kid	291	0	0	0	291
she-goats	146	0	0	0	146
Sheep					
lamb	49	0	0	0	49
ewe	24	0	0	0	24
<hr/>					
Beef (carcass basis)	0	2,737	2,732	13,398	18,867
Goat-meat (")	7,679	0	0	0	7,679
Mutton (")	1,348	0	0	0	1,348
Cattle hide (1000sheet)	0	12	12	64	88
Goat/sheep hide (")	753	0	0	0	753

Table D-5. Nutritional Gradient Content of Livestock Feedstuff

unit : w/w %									
crop/ feed	moisture	D.M.	D.C.P.	T.D.N.	applicable livestock	D.E.	M. E.	S. E.	
berseem/fresh	79.0	21	2.1	12.1			7.9		
Berseem/hay	30.8	70	9.0	51.9					
alfalfa/fresh	78.0	22	2.6	11.6		0.54	9.4		
alfalfa/meal	9.4	91	11.6	50.3	finishing	2.21			
bermuda grass	74.7	25	2.6	15.6		0.69			
napier grass	84.7	15	1.1	8.0		0.35			
sordan	74.8	15	1.1	12.1		0.46		12.0	
fodder beet	89.8	11	0.9	8.6		0.38	12.5		
amshoot	85.0	15	2.6	10.0	beef cattle				
barley straw	14.7	85	0.8	39.6		1.75			
dry ricestraw	12.2	88	1.2	15.5		1.58			
freshrice "	67.4	33	0.9	14.3		0.63			
maize stover	60.8	39	1.2	15.5		1.58			
wheat straw	14.2	86	1.0	38.0		1.68			
broadbean "	84.9	15	4.5	45.8		2.02			
frenchbean "	80.7	19	5.6	48.6		1.98			
groundnut "	79.5	21	1.6	11.8		0.52			
fodder maize	72.9	27	1.2	19.1		0.84			
sunflowercake	10.2	90	24.6	42.0	dairy, beef	1.94			
sesame cake	8.5	92	37.5	62.2	"	2.74			
flax cake	11.3	89	29.3	66.2	"	3.14			
safflowercake	8.5	91	15.9	31.6	"	1.80			
olive cake	17.0	83	35.0	75.0	sheep & goats				
feed maize	12.0	88	12.7	62.9	dairy, beef	3.52	10.8	82.0	
concentrate (for beef c.)	12.0	88	17.0	65.0				55.0	

Table D-6. Nutrition Availability and Carrying Capacity

Cropping pattern	C.P.1	C.P.2	C.P.3	C.P.4
Nutritional output at the stabilized stage				
D.C.P. basis (1000ton)	12.2	0.5	1.0	3.5
T.D.N. basis (")	61.1	4.0	6.6	23.8
Carrying capacity (adult heads per feddan)				
beef cattle(DCP basis)	2.2	1.2	0.9	2.5
" (TDN basis)	0.9	0.8	0.5	1.4
goats/sheep (DCP basis)	23.6	12.7	9.5	26.8
" (TDN basis)	19.0	16.2	10.5	28.9
dairy cow (DCP basis)	0.9	0.5	0.4	1.1
" (TDN basis)	0.4	0.3	0.2	0.5

APPENDIX E. Fisheries

E.1. Improvement Plan of Bardawil Lake Openings E-1

E.2. Marine Fisheries E-7

E.1. Improvement Plan of Bardawil Lake Opening

E.1.1. Introduction

The Bardawil Lake is only the clean hypersaline lake in Egypt which has not polluted by either domestic or agriculture effluents. The artificially dug openings which connected the lake with the Mediterranean Sea has enabled the people dwelling around the lake live on fishery. The fishery in the lake has contributed for the people's welfare and development of the area through creating a new employment opportunity and supplying additional food (animal protein) for the people.

General Authority for Fishery Resources Development (GAFRD) has placed a high priority on the preservation of the fishing ground in the Bardawil Lake through the improvement of the openings to sustain the fisheries production in the lake.

The fishery in the lake is under control of GAFRD and its field office, Bardawil Lake Management Office established at Tulul has carried out various management work for the lake and fishery activities. The maintenance of the two openings is one of the important jobs of the office. It has conducted the dredging work in the openings with its own dredger (15 ton boat with 480 HP engine, dredging capacity of approx. $100 \text{ m}^3/\text{hour}$ and up to 6 m depth) in every summer. In addition to the continuous dredge conducted by the office, a large scale dredge is necessary in several years, spending a large amount of the budget. The latest large scale dredging work was conducted in 1986.

E.1.2. Necessity of Fishery Plan

The Bardawil Lake exists in the natural and physical conditions, that is, no inflow of rivers/drains, little rain fall and much evaporation. Therefore, for production of fish in the lake, they have to keep salinity of the water low by exchange of water between the lake and the sea through the openings and also maintain fish migration into the lake through the same openings. Sands and particles are deposited in the openings by the tidal current and wave. The openings will be silted if they are left without any cares. This will cause a rapid increase of the salinity and deterioration of the ecosystem in the lake. Fish migration to the lake will be disturbed and fish in the lake will leave for the sea. Consequently, the catch will be drastically decreased. The salinity increased to 70 ppt (more than 120 ppt^{1/} in some places) and caused the decrease in the fish production in the lake when the opening was closed in 1970 and 1979. The continuous maintenance of the openings is, therefore, necessary to preserve the environment of the lake and keep the fishery production level.

GAFRD is spending large amount of budget and manpower for maintaining this openings, which burdens them. The construction of brake water and embankment before the openings will decrease the chance of sand deposit at the openings which in turn reduces the expense and manpower of GAFRD, preserves the fishery environment of the lake, helps to keep the fishery production level and to promote further development in the fishery.

^{1/} ... 1 ppt = 1,000 ppm

Coastal Research Institute of Water Research Center conducted the following survey and research on the fisheries resources in the Bardawil Lake from 1985 to 1987:

1. General reconnaissance of whole coastal area to get acquainted with its geomorphological features and to get information of the existing constructions.
2. Survey of the hydrographic profiles at 65 stations conducted for 2 days.
3. Measurements of surface sediments with 830 samples
4. current measurements
5. Wave measurements
6. Meteorological data (Wind direction and velocity)
7. Water level observation in the lake
8. Salinity and temperature measurements at 26 coastal stations
9. Analyses of the collected data
10. Construction of mathematical model and application of it to the actually measured values

E.1.3. Objectives of the Project

The final objective of the project is to maintain of the fishery production and to support further fishery development in the Bardawil Lake, by the improvement of the openings which makes the water exchange between the sea and the lake more efficient and stable.

For the improvement of the openings of the lake, that is the direct objective, it is projected to implement measures with civil engineering such as embankments and breakwaters to protect the openings from silting and erosion.

E.1.4. Scope of Work

As the first step for the project, a study shall be made to establish a master plan for improvement of the openings with basic designs of effective protection works. The study shall consist of two phases.

In the first phase, the circumstances and natural conditions of the openings and coast of the lake are to be elucidated by analyses of existing data and field surveys to obtain elements necessary for designing the protections. Based on the data obtained, a master plan is to be made with basic design of the structures for improvement of the openings.

Economic and financial feasibility analyses are to be made in the second phase.

1) First Phase

The study area is the Bardawil Lake mainly its existing openings Bugaz No.1 and Bugaz No.2 including the coastal area from Rumana to El Zaranig.

Analysis of existing data and field survey of the study area shall be made to obtain elements necessary for establishment of the plan and design of protection works. The survey and analysis shall include (but not be limited) the following items.

Analysis of Existing Survey/Study Reports

Existing study reports and data shall be analyzed. There are some study reports and data on this project as mentioned before. Especially, the report and data made by the Water Research Center, Coastal Research Institute in 1985 to 1987 are useful for this study and must be carefully analyzed.

Those reports and data are to be provided by GAFRD.

Collection of Existing Data and Analysis

Existing data shall be collected and analyzed to seize the natural conditions in the study area such as tide, ocean current, wind velocity and direction.

Field Survey and Data Analysis

The following surveys and data analyses shall be conducted. The survey points shall be determined, referring ones of the study made by the Coastal Research Institute in 1985/87.

- ° Depth survey:

Depth of water shall be sounded in the lake and the sea shore area to analyze the hydrographic profiles. The survey shall be carried out two times with an interval of one year. With the data obtained and existing data, variation of the shoreline shall be analyzed.

- ° Survey of waves:

The survey shall be carried out periodically for one year to obtain data of factors of waves such as height, length, period and direction. Based on the data obtained, characteristics of waves shall be analyzed for each month. Characteristics of wave necessary for designing the protection works shall be determined by the analysis data together with those collected by the Coastal Research Institute in 1985/87.

- ° Survey of littoral current:

Currents shall be observed in the coastal area beyond breaker zone to determine current velocities and directions. The observation shall be carried out continuously for more than 15 days a time and two times at each point.

- ° Water level observation:

Water level shall be observed at the observation points in the sea side and lake side of the openings and in the lake. Variation of the water levels and time lags shall be observed.

° Survey of water quality:

Following data shall be collected periodically at the observation points in the lake and the sea side.

Water temperature

Dissolved oxygen (DO)

pH

Water current velocity and direction

Wind velocity and direction

Temperature

° Measurement and sounding of the openings

Measurement and depth sounding shall be carried out in the openings No.1, No.2 and their adjacent areas. And detailed drawings of contour lines and cross sections of the openings shall be prepared.

The survey shall be performed two times with a interval of one year.

Based on the data obtained, variation of the openings shall be observed and siltation and erosion shall be analyzed.

° Survey of water movement in the openings

Current velocities shall be measured in the openings. The measuring points shall be in the surface, medium and bottom layer in the center line of the smallest cross-section of the openings and the edges of the same section.

Volume of inflows and outflows shall be analyzed.

E.2. Marine Fisheries

The marine fishery in the region is conducted in the coastal areas of the Mediterranean Sea by fishermen living in El Arish.

About 490 fishermen are engaged in this fishery with about 81 fishing boats (statistics in 1987). 49 fishing boats are provided with inboard diesel engines and 32 boats are driven by outboard engines. The annual production is approximately 550 - 1,300 tons, most of which are sardines. In 1987, the quantity of sardines was 927 tons holding about 90 percent of the total catch; 1,036 tons. Besides sardines the following species are caught, but they are little in quantity.

Species		
LOUT	AGRYROSOMUS REGIUM	Croaker
WAGHAR	EPINEPHELUS AENEUS	White grouper
GHAROUS	DICENTRARCHUS LABRAX	Seabass
DENIS	SPARUS AURATUS	Gilthead seabream
GANBARI	PENAEUS KERATHURUS	Shrimp

(1) Fishing Activities

The following fishing methods are practiced.

- 1) Purse seine fishing (CIONCHOLLA): 32 fishing boats are engaged in this fishing. The boats are wooden with a length of 10 - 13 m and equipped with inboard diesel engines of 100 - 200 HP.

The boats are provided with purse line winches driven by the propelling engines and block davits for purse line.

They are engaged in the purse seine fishing in the coastal areas of North Sinai from December to March, then, they move into the Bardawil Lake when the fishing season is started on early April and work in the lake till November or December.

The purse seine nets used in the coastal areas have smaller meshes than ones in the lake. Most of the catches are sardines.

GAFRD is instructing the fishermen to stop the fishing operation in the lake and work in the coastal area all the year.

- 2) Bottom long line (SINAR): 19 boats with inboard engines are operated for this fishing. The boats are about 6 - 8 m long, smaller than the boats for purse seine fishing. Three or four fishermen per boat work for 2 - 4 day per voyage.

Their fishing gears are bottom long lines made of nylon monofilament. The length and number of hooks are different by the boats. They are about 200 m - 1,000 m in length with 200 - 500 pieces of fishing hooks.

As Line haulers are not equipped on the boat, the lines are hauled by the fishermen's hands. Therefore, it is difficult for them to conduct the fishing in deep waters and eventually. Their fishing grounds are limited to the area with a depth less than 50 m.

Some boats with outboard engines also are working with this method.

- 3) Gill net fishing (DABBA): Number of the boats operated for this fishing is about 32 boats. They are approximately 6 - 7 m long and driven by outboard engines. Gill nets, trammel nets with various mesh sizes, depth and length are used. The length of about 200 m are prevailed. As the nets are hauled by fishermen's hands, it is difficult for the fishermen to perform the fishing in deep water.

Some gill nets for shark fishing are also used.

Their fishing boats and gears are generally very old and timeworn. The fishery have remained in very low level though there are potentials of the development. It is necessary to lead the promotion of the fishery by improving their fishing gears/boats and introducing new and effective techniques.

(II) Infrastructure and Facilities Supporting the Fishery

There is no place suitable for ports because almost all the coast line in the North Sinai is very monotonous. The port constructed in El Arish in 1986 is the only port on the coast of the North Sinai.

Two wooden piers are constructed in the port. They are utilized for fish landing and mooring the fishing boats. But the port are not fully utilized yet, because other necessary facilities have prepared for the port. The land facilities supporting the fishing activities and marketing fish such as fish handling hall and ice storages are required to the arranged in order to encourage fisherman and promote the marine fishery.

Table E.2-1. : Numbers of fishermen and Fishing boats, working for marine fishery.

Year	Number of Fishermen	Number of Fishing boats		
		with inboard engine	with outboard engine	
1983	375 Persons	46 Boats	(43)	(3)
1984	350 Persons	43 Boats	(43)	(0)
1985	422 Persons	64 Boats	(42)	(22)
1986	460 Persons	70 Boats	(46)	(24)
1987	488 Persons	81 Boats	(49)	(32)

Source: El Arish Office of GAFRD

(III) Marine Fishery Development Plan

Marine fishery is practiced on small scale by fishermen of El Arish in the coastal area of the Mediterranean Sea. Their fishing grounds are limited only in-shore due to their old and primitive fishing gears and boats. Few infrastructure and facilities are prepared for supporting the marine fisheries. This causes the fishery in the Mediterranean difficult.

Therefore, the following measures should be taken in order to encourage the fishermen and promote the marine fishery.

- i) Research of new fishing grounds and resources.
- ii) Improvement of fishing gears/boats and introduction of new fishing equipment and technology.
- iii) Extension service for fishermen.
- iv) Construction of facilities in fishing port.

A fishery development center should be established in El Arish to conduct all the activities for the aforementioned items i), ii) and iii) and necessary facilities for supporting the fishery and marketing should be constructed and arranged in the port of El Arish.

(1) Marine Fishery Development Center

The center should be established in the El Arish port in order to perform the following functions, acting as a leader for encouraging the local fishermen and development of the fishery.

° Research:

To conduct research work for new fishing grounds and resources through various experimental fishing operations.

° Development of fishing techniques:

To renovate and improve the existing fishing gears/boats and introduce new fishing techniques and equipment suitable for new fishing ground/resources.

° Instructions and extension services for fishermen:

To conduct various extension service work for fishermen including lectures/practices in the center and instructions in the fields. The instruction items includes the following: improvement of fishing gears/boats, new fishing techniques, fishing and navigational equipment, repair and maintenance of engines, fish handling cooperatives.

To perform those function, the Center should have the following facilities.

- 1) Administration building: To be provided with a staff room, Researchers/instructors rooms, research rooms, data room and stores.
- 2) Training building: To be provided with lecture rooms, practice rooms and store room of equipment. Each room is to be prepared for a trainee group consisting of about 20 fishermen.
- 3) Workshop: To be prepared with equipment and tools necessary for the training of repairing and maintenance for engines boats and other equipment.

- 4) Fishing boats: To be provided with fishing equipment for trawl and long lines for experimental fishing and research.

(2) Arrangement of Fishing Port Facilities

The port in El Arish does not have facilities necessary for a base of the marine fishery though it is the only port in the north Sinai. For promoting the marine fishery in the region, it is essential to arrange the following facilities for supporting fishing activities and marketing. And they should be properly managed in collaboration with the North Sinai Governorate, fishery cooperatives and fish marketing cooperatives.

- 1) Fish handling and auction hall: To carry out fish handling such as washing, assorting, weighing and auction in high hygienic condition, the hall should be installed in the port. The hall should be provided with a roof, concrete floor, water supply system, drainage system and necessary equipment such as working tables of stainless steel, scales and plastic fish containers. The hall should be arranged with fish loading areas parking area and roads.
- 2) Cold storage: Ice is indispensable to keep high quality of the catch. It should be stocked in the port so that it can be supplied for fishing boats and fish distribution whenever necessary.

For this purpose, small cold storages should be installed in the port. They are also utilized to keep fish temporarily till their transportation.

- 3) Water supply and drainage systems: Water supply systems should be arranged as follow;

Well water (saline water) and its tank: For general use including washing equipment. The water is to be pumped up to a overhead tank from a well and supplied by the gravity.

Fresh water: For drinking water. It is to be supplied from a overhead tank.

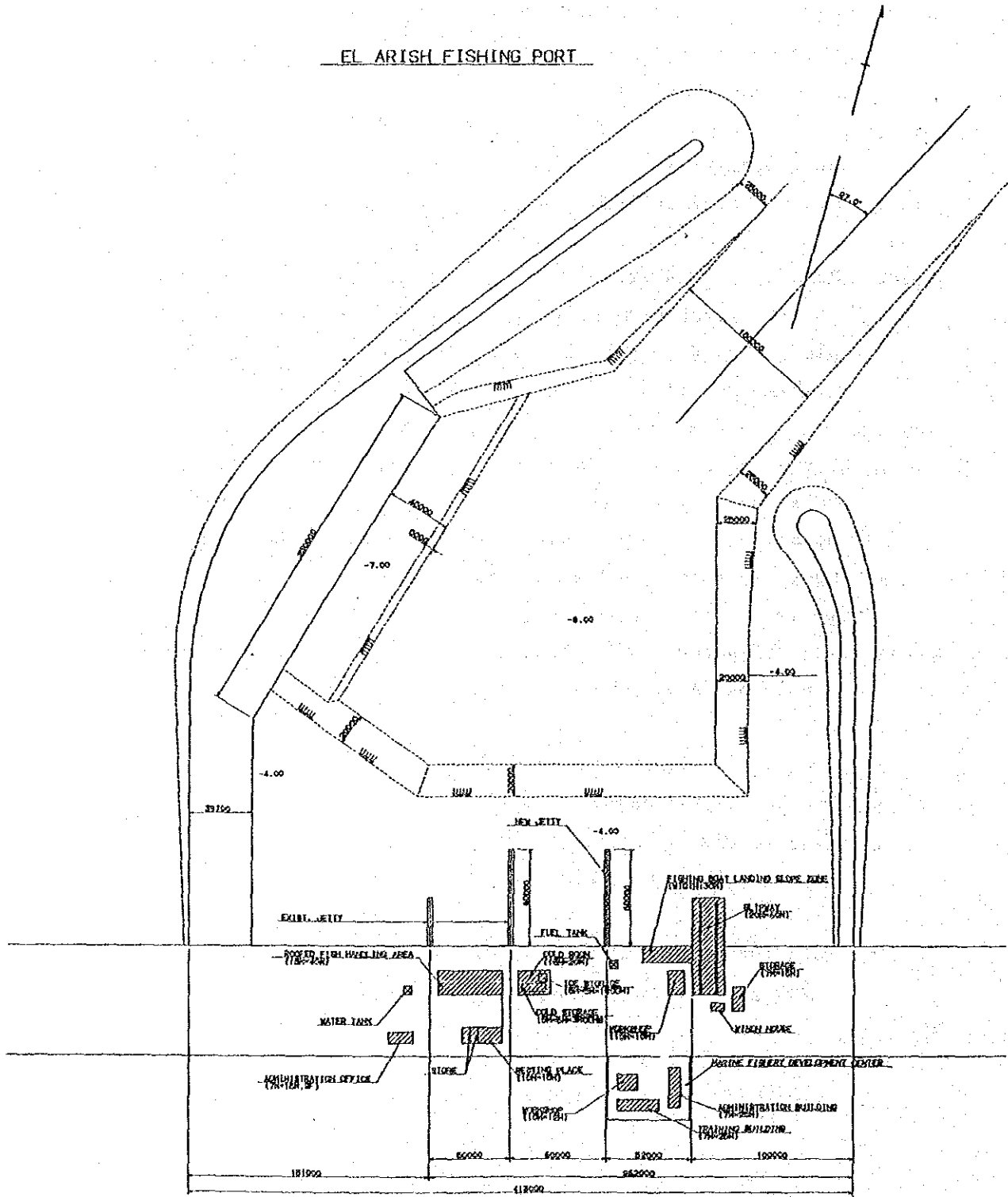
Drainage should be arranged for each building. All the drain should be led to a drain disposal tank.

- 4) Rest place and Stores: A rest place should be prepared for the fishermen and people working in the port. The place should be provided with a canteen and stores selling fishing materials etc.
- 5) Bunkering and water supply facility for fishing boats: To make supply for fishing boats easier, Fuel tanks with bunkering equipment and water pipeline for the fresh water tank aforementioned should be arranged.
- 6) Repairing facility: Capacity for repairing fishing boats should be improved by arranging the following facility.

Two sets of slip ways with a winch room
Machinery workshop
Wood working plant
Storages for materials

- 7) Administration building: For administration office of the fishing port and fishery cooperatives.

Figure E.2-1. Mrine Fishery Development Center
Arrangement of Fishing Port Facilities



APPENDIX F. New-Community Development

F.1.	Infrastructure	F-1
F.2.	Social Services	F-6

F.1. Infrastructure

Table F-1. Existing and Planned Water Lines and Networks

Description	Target (km)	Executed (km)	Capacity (m ³ /day)
From Beginning of Reconstruction and During First Five-Year Plan Period			
<u>Water Lines</u>			
Qantara E./Bir El Abd/El Tulul ϕ 300 mm	102	102	4,000
Qantara West/El Arish ϕ 700 mm	165	165	20,000
Lehfen/El Quseima ϕ 150 mm	36	13	600
Operating Line of Rafah/El Arish ϕ 250 mm	40	40	2,000
Operating Line of Rafah/El Goarh ϕ 250 mm	16	16	2,000
Operating Line of El Arish/Lehfen ϕ 250 mm	17	17	2,000
<u>Networks</u>			
New Qantara East New Community/Bir El Abd	12	12	
El Masaid Quarter	28	28	
Villages (Balouza, Rumana, Qatia, Rabaa) Nigila, El Khirba, Salmana, El Tulul)	20	20	
<u>Total</u>	<u>436</u>	<u>413</u>	
Second Five - Year Plan Period			
<u>Water Lines</u>			
Qantara E./El Arish	23		
<u>Networks</u>			
El Arish	63		
Qantara E.	32		
<u>Total</u>	<u>118</u>		

Source: SDA

Table F-2. Existing and Planned Wells and Desalination Stations

Description	Target (No.)	Executed (No.)	Capacity (m ³ /day)
<u>From Beginning of Reconstruction and During First Five-Year Plan Period</u>			
<u>Wells</u>			
Wadi El Arish	50	50	15,000
El Masaid	8	8	1,750
El Arish East (Rafah/El Sheikh Zuwayid)	43	43	4,600
Lehfen Airport South	12	12	2,500
El Thamada	4	4	40
Northern Coast (Gilbana/Bir El Abd)	150	150	1,500
Total	267	267	25,390
<u>Desalination Stations</u>			
El Masaid New Community	3	3	
El Salam New Community/El Arish	4	4	
Total	7	7	
<u>Second Five-Year Plan Period</u>			
<u>Wells</u>			
Wells and Stations	20		
<u>Desalination Stations</u>			
Lehfen/Qantara E./El Thamada	3		

Source: SDA

Table F-3. Existing and Planned Sewerage Networks

Description	Stage
First Five-Year Plan Period	
El Masaid	Finished
Bir El Abd	"
Rabaa	"
Nigila	"
Balouza	"
El Tulul	"
Rumana	"
Qantara E.	Under Construction
Total	8
Second Five-Year Plan Period	
El Arish	Under Construction
Qantara E.	Finished
Rafah	Under Construction
Total	3

Source: SDA

Table F-4. Existing and Planned Diesel or Gas Power Station

Description	Generator (No.)	Capacity (MW)
From Beginning of Reconstruction and During First Five-Year Plan Period		
Rumana	3	1.2
Bir El Abd	3	1.9
El Arish	2	12.0
El Masaid	3	20.0
Rafah	6	3.9
Low Voltage Stations at Other Places		2.0
Total	17	41.0
Second Five-Year Plan Period		
- Construction of Stations and Transformers		
- Nakhl/El Arish to be connected to the Main Network of North Sinai		

Source: SDA

Table F-5. Existing and Planned Roads

Section	Length (km)
First Five-Year Plan Period	
Qantara E./Bir El Abd	83
Qantara E./El Shatt	125
El Hasana/Naknl	63
El Hasana/El Quseima	68
El Arish/El Masaid	18
El Arish/Lehfen Intersection	19
Branches from El Qantara East/Bir El Abd	16
Ismailia/El Tasa	32
Lehfen Intersection	39
El Masaid Internal Roads	40
Bir El Abd New Community Internal Roads	25
Old El Qantara East Internal Roads	9
Qantara E. New Community Internal Roads	26
Rumana/Rabaa/Nigila/El Tulul/Internal Roads	9
Ferdan Internal Roads	3.5
Total	575.5
Second Five-Year Plan Period	
Port Fuad/Sahl El Tina	50
Port Said Ring Road	20
El Sad Air Port Track/Wadi El Maghara	50
El Hasana/El Qusaima Extension to Taba	153
Qantara E. Internal Roads	26
Total	299

Source: SDA

Table F-6. Number of Aircraft and Passenger Arrivals on El Arish Airport

Item	1981	1982	1983	1984	1985	85/86 ^{1/}
Aircraft Arrivals	-	169	254	314	175	101
Passenger Arrivals	-	1,000	5,000	8,000	6,000	5,000

Note : ^{1/} Estimation

Source: 1987 Statistical Year Book, 1987, CAPMAS

Table F-7. Existing Telephone Lines

Settlement	Line Number
Qantara East	N/A
Gilbana	-
Balouza	U.C.
Rumana	200
6 October	(private)
Rabaa	U.C.
Qatia	U.C.
Nigila	U.C.
El Khirba	U.C.
Bir El Abd	400
Salmana	U.C.
El Tulul	-
El Rouda	U.C.
El Masaido	300
El Arish	8,000
El Salam	300
Sheikh Zuwayid	400
Rafah	240

Note : U.C. is Under Construction
 Source: NSG and Field Study

F.2. Social Services

Table F-8. Existing Educational Facilities

<u>Settlement</u>	<u>Primary School</u>	<u>Preparatry School</u>	<u>Secondary School</u>
Gilbana	1		
Balouza	1	2	
Rumana	1	1	
6 October	1	1	
Rabaa	3	1	1
Qatia	3	1	
Nigila	1	1	
El Khirba	4	2	
Bir El Abd	2	1	4
Salmana	2	1	
El Tulul	1		
El Rouda	2	1	

Source: NSG and Field Study

Table F-9. Existing Health Care Facilities

<u>Settlement</u>	<u>Health Unit</u>	<u>Hospital</u>	<u>Bed</u>
Qantara E.	-	1	16
Gilbana	-		
Balouza	1		
Rumana	1		
6 October	1		
Rabaa	1		
Qatia	1		
Nigila	1		
El Khirba	1		
Bir El Abd	2 (clinic)	1	50
Salmana	1		
El Tulul	1		
El Rouda	1		
El Arish	4	2	64
Shelkh Zuwayid	6	1	40
Rafah	3	2	50

Source: NSG and Field Study