

THE ARAB REPUBLIC OF EGYPT
NORTH SINAI INTEGRATED RURAL DEVELOPMENT

THE FEASIBILITY STUDY
ON
PRIORITY SUB-PROJECTS

(APPENDICES)

AUGUST 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

THE ARAB REPUBLIC OF EGYPT
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(APPENDICES)

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APPENDICES

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

DRAWINGS

APPENDIX-A. Population and Economic Indices

Table A-1. Planted Area (1988)

(Unit: feddan)

Village Name	Olive	Fig	Citrus	Peach	Guava	Cantaloupe	Tomato	Cucumber	Water Melon	Dates	Grape
Balouza	33.5	4.0	1.0	-	5.0	60.5	48.0	14.0	400.0	75.0	2.0
Rumana	4.5	7.0	6.0	0.5	-	81.0	1.5	1.5	1.5	35.0	1.5
El Moraiah Village	7.0	1.0	-	-	2.0	20.0	15.0	5.0	45.0	50.0	0.5
6 October Village	13.0	17.0	30.0	3.3	23.0	71.0	8.0	7.0	3.5	86.0	0.5
Rabaa	14.5	16.0	14.0	1.0	32.0	105.0	58.0	24.0	15.0	98.0	3.5
Qatia Village	50.0	7.0	5.0	1.0	15.0	121.0	116.0	14.0	300.0	184.0	2.0
Nigila	9.0	9.0	12.0	1.0	8.0	46.0	19.0	-	-	174.0	3.5
El Nasr Village							1/				
Total	131.5	61.0	68.0	6.8	85.0	504.5	265.5	65.5	765.0	702.0	13.5

Source: Agricultural Office, MOA, El Arish

Table A-2. Number of Cooperatives (1988)

(Unit: places)

Village Name	Number of Village Bank	Credit Cooperative	Land Reform Cooperative	Reclamation Cooperative	Desert Cooperative
Balouza	-	1	-	-	-
Rumana	-	-	-	-	-
El Moraiah Village	-	1	-	-	-
6 October Village	-	-	-	-	-
Rabaa	1 ^{1/}	1	-	-	-
Qatia Village	-	1	-	-	-
Nigila	-	-	-	1	1
El Nasr Village	-	-	-	-	-
Total	1	4	-	1	1

Note: 1/ ... Warehouse is only located. Village bank office is in El Arish.

Source: Agricultural Office, MOA, El Arish

Table A-3. Number of Rural Facilities (1988)

	Number of School	Number of Hospital	Number of Telephone
Balouza	2	1	1
Rumana	2	1	1
El Moraiah Village	1	-	-
6 October Village	1	-	-
Rabaa	4	1	1
Qatia Village	4	2	1
Nigila	4	1	1
El Nasr Village	1	-	-
Total	19	6	5

Source: Agricultural Office, MOA, El Arish

APPENDIX-B. Meteorology and Hydrology

B.1. Mean Monthly Meteorological Features, Ismailia

B.2. Mean Monthly Meteorological Features, Port Said

B.3. Mean Monthly Meteorological Features, El Arish

Table B-1. Mean Monthly Meteorological Feature (1) Ismailia

Items	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Max. Temperature (°C)	20.1	21.6	23.6	28.0	32.0	34.5	36.1	36.1	33.5	30.5	26.4	21.6	28.7
Mean Min. Temperature (°C)	7.8	8.8	10.1	12.5	15.9	18.7	21.8	22.0	20.2	17.4	13.5	9.7	14.9
Mean Temperature (°C)	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
Mean Relative Humidity (%)	59	62	46	38	38	42	50	53	51	56	59	60	51
Mean Wind Speed (Knots)	5.7	5.1	7.2	6.9	6.5	6.5	6.8	5.5	5.5	4.4	4.2	5.1	5.8
Mean Cloudiness (oktas)	2.8	2.3	2.3	2.3	1.8	0.6	0.7	0.8	1.1	1.5	2.1	2.5	1.7
Piche Evaporation (mm/day)	4.3	5.2	7.2	10.2	10.1	11.8	10.5	9.4	7.7	6.0	4.6	4.5	7.6
Rainfall (mm)	6.6	1.6	7.4	1.3	3.5	0.0	0.0	0.0	0.0	2.3	7.7	2.9	33.3

Table B-2. Mean Monthly Meteorological Feature (2) Port Said

Items	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Max. Temperature (°C)	18.1	18.8	20.4	22.6	25.7	28.6	30.4	30.9	29.5	27.4	23.9	19.9	25.4
Mean Min. Temperature (°C)	11.2	11.8	13.3	15.6	19.1	22.2	23.8	24.4	23.5	21.4	18.0	13.1	17.8
Mean Temperature (°C)	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
Mean Relative Humidity (%)	71	68	66	69	69	70	71	71	68	68	70	71	69
Mean Wind Speed (Knots)	9.3	10.0	11.5	10.7	9.6	9.0	8.6	7.6	7.5	8.0	8.5	8.5	9.1
Actual Sunshine Time (%)	67.0	71.0	67.9	70.0	78.0	83.2	84.2	86.0	91.6	81.3	72.0	66.8	75.2
Piche Evaporation (mm/day)	4.5	5.5	6.2	6.2	6.5	7.1	7.1	7.0	7.2	7.0	6.0	4.6	6.0
Rainfall (mm)	13.5	11.7	8.8	3.7	2.2	0.0	0.0	0.0	0.2	6.3	8.9	18.0	73.3

Table B-3. Mean Monthly Meteorological Feature (3) El Arish

Items	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Max. Temperature (°C)	19.2	19.9	21.3	23.7	26.9	28.9	30.6	31.1	29.9	28.5	25.3	21.4	25.6
Mean Min. Temperature (°C)	8.5	9.1	10.8	13.3	16.1	18.9	21.3	21.9	20.4	18.0	14.4	10.2	15.2
Mean Temperature (°C)	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
Mean Relative Humidity (%)	70	69	67	67	68	72	74	75	71	73	71	66	70
Mean Wind Speed (Knots)	4.8	5.7	5.8	4.9	4.7	4.6	4.4	4.1	4.2	3.9	4.0	4.7	4.6
Mean Cloudiness (oktas)	3.1	3.6	3.2	3.1	2.2	1.2	1.4	1.6	2.2	2.5	2.7	2.9	2.5
Piche Evaporation (mm/day)	3.6	4.0	4.5	4.7	4.9	4.9	4.8	4.9	5.2	4.8	4.0	3.6	4.5
Rainfall (mm)	20.3	17.1	12.8	6.1	3.2	0.0	0.0	0.2	0.6	6.0	16.2	22.2	104.7

APPENDIX-C. Soil Survey

C.1. Previous Studies	C-1
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C.1. Previous Studies

The previous soil studies for the Study Area are listed as below:

<u>Year</u>	<u>Institute</u>	<u>Title</u>
1956	Desert Institute	Soil Survey of the Northwest Sinai Project
1963	GEOFIZIKA	Report on Investigation of Water and Soil Resources in the North and Central Part of Sinai Peninsula
1981	GARPAD/REGWA	Reconnaissance Soil Survey of North Sinai
1984	GARPAD/REGWA	Semi-Detailed Soil Survey of North Sinai
1985	Dames & Moore	Sinai Development Study (Phase I)
1985	GARPAD/CICCAS	The Overall Plan for Development of the Coastal Strip (El Arish - El Sheikh Zuwayid - Rafah)
1986	GARPAD Euroconsult-Pacer	Land Master Plan
1987	GARPAD/PPU	Tina Plain Development Project, Feasibility Study

Table C-2. Classification of Soils of North Sinai Region According to Soil Taxonomy (1975)

Order	Sub-order	Great Group	Subgroup	Family	Mapping Units
Entisols	Psammaquents	Torripsammaquents	Typic Torripsammaquents	1- Siliceous, thermic, < 2% slope	- Coarse textured soils having deep water table > 100 cm.
				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.
		Psammaquents	Typic Psammaquents	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).
Aquents	Hydraquents	Typic Hydraquents	1- Fine loamy, mixed, thermic, < 2% slope	- Loamy soils having moderately shallow water table (50-75 cm).	
			2- Fine loamy, mixed, thermic, 2-6% slope	- Fine textured soils having	
			3- Coarse loamy, mixed, thermic, < 2% slope	- Shallow water table (< 50 cm).	
			4- Coarse loamy, mixed, thermic, 2-6% slope	- Fine textured soils having	
			5- Clayey, mixed, 2% slope.	- Fine textured soils having	
			6- Clayey, montmorillonitic, < 2% slope	- Moderately shallow water table (50-75 cm).	
Aridisols	Orthids	Salorthids	Typic Salorthids	1- Siliceous, thermic, < 2% slope	- Loamy soils having deep water table (> 100 cm)
			2- Fine loamy, mixed, thermic, < 2% slope	- Loamy soils having moderately deep water table (75-100 cm).	
			3- Fine loamy, mixed, thermic, 2-6% slope	- Fine textured soils having deep water table (> 100 cm).	
			4- Coarse loamy, mixed, thermic, > 2% slope	- Fine textured soils having deep water table (> 100 cm).	
			5- Clay, montmorillonitic, thermic, 2-6% slope	- Fine textured soils having deep water table (> 100 cm), with sand substratum.	
					- Fine textured soils having moderately deep water table (75-100 cm).

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

C.3 Soil Survey Method

Soil survey for the F/S Area was made by the Study Team obtaining the cooperation from GARPAD during the period from November 6, 1988 to December 20, 1988. Topographical maps of 1:25,000 scale were used as the base map. The soil profiles were investigated by digging test pit of 3 m deep or by auger boring of 2 m deep, at the grid of one kilometer intervals, i.e., one per 100 ha.

Total number of test pits : 27
Total number of auger boring : 269

The soil profiles were described according to the FAO guidelines. A total of 100 soil samples were collected from every horizon of the representative test pits and sent to the laboratory for soil analysis. The analytical items were as follows;

- Mechanical analysis
- Saturation percent
- pH and ECe
- Soluble salts (HCO_3 , Cl, SO_4 , Ca, Mg, Na, K)
- Cation exchange capacity
- Gypsum and CaCO_3
- Gypsum requirement*
- Boron*
- Organic matter
- Total nitrogen
- Available phosphate

(* not all samples)

In addition, 24 soil cores (undisturbed samples) were collected from the representative sites for determining the physical properties as below;

- Bulk density
- Porosity
- Moisture content at field capacity and wilting point

About 600 soil samples from auger boring were checked their EC and pH values at the field office in Ismailia.

After compiling the results of soil survey and analysis, the soil classification were made in accordance with the USDA Soil Taxonomy and the USBR land classification system, respectively. Finally, the following maps scaled 1: 50,000 were prepared;

- Landform Classification Map
- Soil Map
- Land Classification Map

Soil Survey Data Sheet (Test Pit)

J I C A

Feasibility Study on North Sinai Integrated Rural Development Project
November 1988

Profile No. _____ Date: _____
 Surveyor: _____
 Survey Area: _____
 Physiographic Unit: _____
 Landform: * flat-very gently undulating Slope: _____
 * gently undulating
 * undulating
 Microrelief: density _____ height _____
 Parent material: _____
 Surface feature (stoniness, salt crusts etc.): _____
 Vegetation & land use: _____
 Type of profile: (sandy, gravelly, loamy, clayey)
 Disturbing layer: absent or starts at _____ cm
 (rock, gravel, gypsum, texture, others _____)
 Drainage: _____ water table: _____ cm
 Water-holding capacity: (good, moderate, poor, very poor)

(Disturbed Sample)		(Core Sample)	
Depth No.	EC	pH	CaCO ₃
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

PROFILE DESCRIPTION

Test Pit No. _____

Depth (cm)	Colour	Mottling	Texture	Structure	Moisture & Consistence			Stoniness Cracks	Concretions	Pores Roots	Gypsum CaCO ₃	Org. Matter	Boundary
					Dry	Moist	Wet						

J I C A

Soil Survey Data Sheet (Auger Boring)

PROFILE DESCRIPTION

Auger Hole No. _____

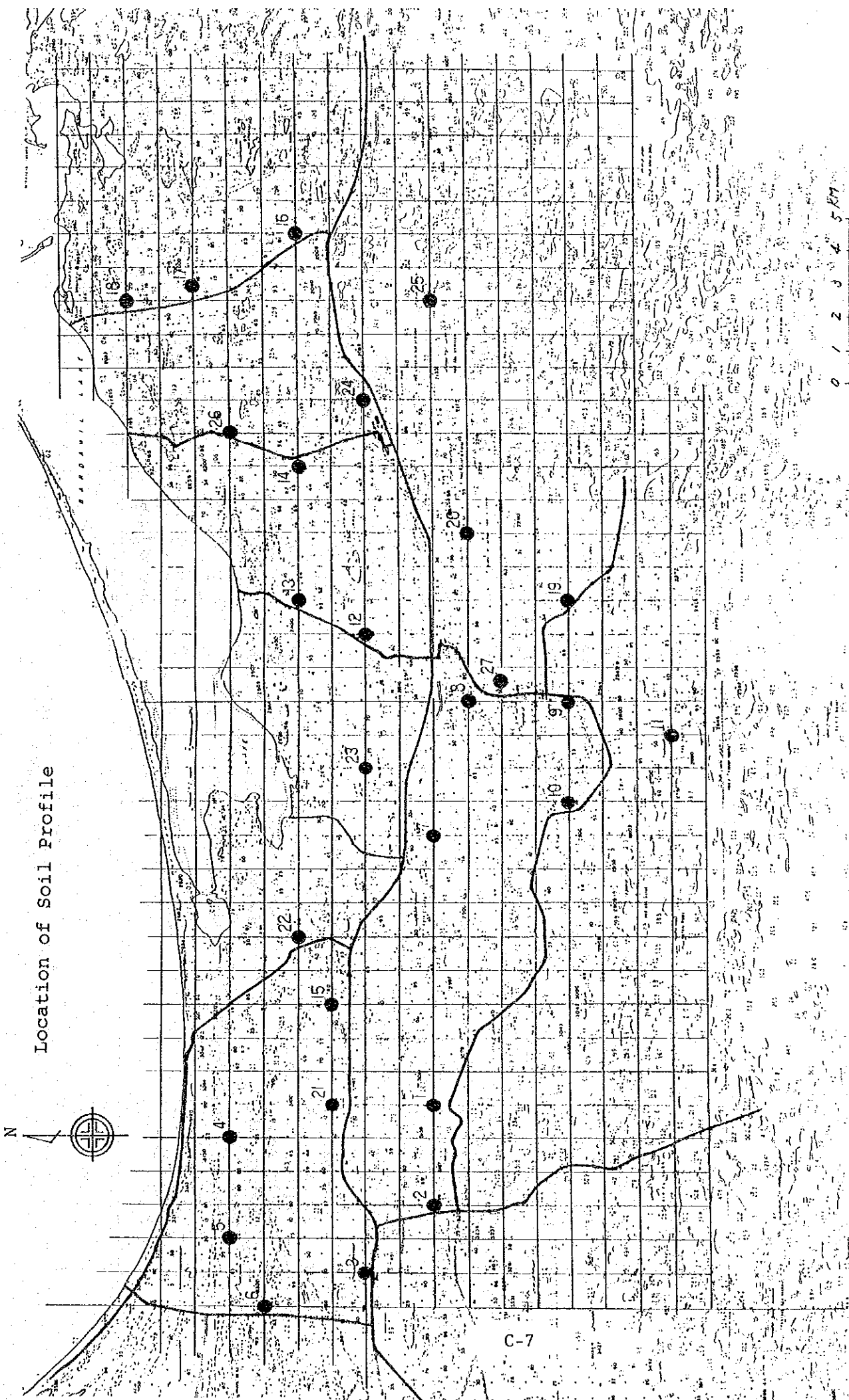
Depth (cm)	Colour	Mottling O.M.	Texture	Structure	Moisture & Consistence			Gypsum CaCO ₃
					Dry	Moist	Wet	

Remarks: _____

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C.4. Test Pit

Location of Soil Profile



GENERAL INFORMATION OF TEST PITS

Pit No.	Location	Landform	Slope (%)	Vegetation & Land Use	Texture	Water Table (cm)	Remarks
1	3km east of El Shohat vill.	gently undulating sand dune	3-5	dens "Aader"	sandy	7300	
2	El Shohait vill.	"	5	Scattered camel thorn	"	"	
3	Balouza	undulating sand dune	5	dense Sakornia, camelthorn	"	"	
4	East fringe of Tina Plain	flat	0-1	none	"	85	many gypsum needle
5	Tell El Farma, Tina Plain	"	"	"	clayey	130	salt crust
6	"	"	"	"	sand/clay	60	
7	6 October vill.	very gently undulating	2	dense "Golam", dates palm	sandy	7300	dry Sabkha
8	Rabaa	"	depression 0-1	Salicornia in patch	"	70	
9	Qatia	"	2	dates palm	"	225	
10	El Moraiiah	gently undulating	2-3	dates palm, "Aader"	"	350	
11	Hod Hamisa	"	3	Dates palm	"	215	
12	2.5 km north of Rabaa	undulating	5	dense "Aader", "Golam" etc	"	7300	
13	South of Sabkhet El Haswa	gently undulating	1-2	dense	"	230	
14	Hagf Elsouf (2km north of Nigila)	undulating	2-3	dense	"	7300	
15	Rumana	flat	0-1	none	"	50	dry Sabkha
16	Hod Saadia	undulating	2-3	dense "Aader"	"	7300	
17	El Wasiya	gently undulating	"	"	"	"	
18	2km south of Zanqur Abu Sabah	"	"	"	"	"	
19	Kotiya	flat	0-1	olive trees	"	"	
20	Hod Abu Rada	gently undulating	2-3	dense "Aader", dates palm	"	210	
21	El Ahrar vill.	undulating	3	"Aader"	"	7300	
22	Rumana	very gently undulating, depression	0-1	dense "Golam"	"	130	dry sabkha
23	6 October	undulating	2-3	dense "el Hodda"	"	100	
24	Nigila	"	"	"Aader"	"	"	
25	Hod Um Gamous	undulating	"	dense "Aader", dates palm	"	220	
26	North Nigila	gently undulating	1-2	dense "el Hadda"	"	7300	
27	Qatia	"	"	tomatoes farm	"	"	

Profile Description of Test Pits

No. 1

Location : 3 km east of El Shohat
 Physiography : Sand dune
 Slope : gently undulating, 3-5 %
 Microrelief : common (1~2m high)
 Parent Material : aeolian deposit
 Vegetation : "Aader"
 Drainage : excessive
 Water Table : deep, more than 300 cm
 Water holding Capacity : poor
 Classification : Typic Torripsamments

Depth (cm)

0 - 50

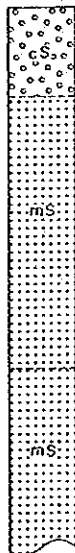
Light yellowish brown (10YR 6/4), coarse sand, single grain, dry, loose, common roots, diffuse boundary to;

50 - 200

Light yellowish brown (10YR 6/4), medium sand, single grain slightly moist, friable very few roots, diffuse boundary

200 - 300

Same as above but more moist

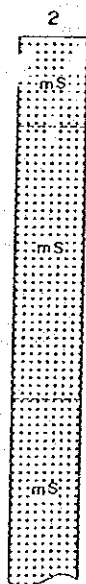


No. 2

Location : El Shohat village
Physiography : Sand dune
Slope : undulating, 6 %
Microrelief : common
Parent Material : aeolian deposit
Vegetation : few camel thorn
Drainage : excessive
Water Table : deep, more than 300 cm
Water holding Capacity : very poor
Classification : Typic Torripsamments

Depth (cm)

0 - 50



Very pale brown (10YR 8/3), median sand, single grain, dry, loose, diffuse boundary to;

50 - 200

Very pale brown (10YR 8/3), medium sand, single grain, slightly moist, friable, diffuse boundary ;

200 - 300

Same as above but more moist

No. 3

Location : Balouza
Physiography : Sand dune
Slope : undulating, 6 %
Microrelief : common, 1~2m high
Parent material : aeolian deposit
Vegetation : dense Salicornia, Agram, small camel thorn
Drainage : excessive
Water Table : deep, more than 300 cm
Water holding Capacity : very poor
Classification : Typic Torripsamments

Depth (cm)

0 - 40



Very pale brown (10YR 8/3), stratified coarse sand and medium sand layers, single grain, dry, loose, very few roots, clear smooth boundary to;

40 - 200



Very pale brown (10YR 7/4), fine sand, single grain, slightly moist, friable, very few roots, gradual smooth boundary to;

200 - 300



Same as above but more moist.

No. 4

Location : Eastend of Tina Plain
 Physiography : Sand dune
 Slope : flat, less than 1 %
 Microrelief : none
 Parent Material : aeolian deposit
 Vegetation : none
 Drainage : moderate
 Water Table : moderately shallow, 85 cm (110 ms/cm)
 Water holding Capacity : poor
 Classification : Typic Psammaquents

Depth (cm)

0 - 5		Light yellowish brown (10YA 6/4), dry loose sand
5 - 15		Light yellowish brown (10YA 6/4) coarse sand and stratified dark brown (10YA 3/3) sandy clay, platy structure, moist, friable, slightly sticky, slightly plastic, cleat smooth boundary to;
15 - 30		Light yellowish brown (10YA 6/4), medium sand, singly grain, moist, cleat smooth boundary to,
30 - 85		Dark grayish brown (2.5Y 4/2) with few black mottling, medium sand, single grain, wet
85 -		white (10YR 8/2), coarse sand

No. 7

Location : Six October village
 Physiography : Sand plain
 Slope : very gently undulating, 2-3%
 Microrelief : none
 Parent Material : aeolian deposit
 Vegetation : dense Goolam, scattered palm trees
 Drainage : excessive
 Water Table : deep, 220cm
 Water holding Capacity : poor
 Classification : Typic Torripsamments

Depth (cm)

0 - 5



Yellow (10YR 7/6), medium sand, single grain, dry, loose, slightly compact, very few roots, diffuse boundary to;

30 - 70

Yellow (10YR 7/6), medium sand, single grain, dry, loose, slightly compact, few roots, few snail, diffuse boundary to;

70 - 170

Yellow (10YR 7/6), medium sand, very weak blocky, moist, friable, few roots, gradual smooth boundary to;

170 - 220

Yellow (10YR 7/6) with some black spots, coarse sand, wet

No. 9

Location : Qatia village
 Physiography : Sand flat near Sabkha
 Slope : gently undulating, 2-3%
 Microrelief : none
 Parent Material : aeolian deposit
 Vegetation : dates palm plantation
 Drainage : moderate
 Water Table : deep, 225cm
 Water holding Capacity : poor
 Classification : Typic Torripsamments

Depth (cm)

0 - 15



Light yellowish brown (10YR 6/4), medium sand, very weak blocky structure, dry, slightly compact, gradual smooth boundary to;

15 - 120



Brownish yellow (10YR 6/6), medium sand, single grain, moist, friable, may roots, diffuse boundary to;

120 - 185



same as above but more moist, less roots

185 - 250



Brownish yellow (10YR 6/6), coarse sand, singly grain, wet

No. 10

Location : El Moraiah village
Physiography : Sand lowland
Slope : gently undulating, 2-3%
Microrelief : many, about 3m high
Parent Material : aeolian deposit
Vegetation : many dates palm trees and el Adder
Drainage : excessive
Water Table : deep, 350cm
Water holding Capacity : poor
Classification : Typic Torripsamments

Depth (cm)

0 - 40



Yellow (10YR 7/6), medium sand, dry, loose, diffuse boundary to;

40 - 80

Brownish yellow (10YR 6/6), fine sand, moist, friable, diffuse boundary to;

80 - 350

same as above but more moist

350 -

Light yellowish brown (10YR 6/4), medium sand, wet

No. 11

Location : El Hamaissa (4 km south of Qatia)
 Physiography : inland depression
 Slope : gently undulating, 3%
 Microrelief : common, 1-2m high
 Parent Material : aeolian sand
 Vegetation : dates palm trees and few castor
 Drainage : excessive
 Water Table : moderately deep, 215cm
 Water holding Capacity : poor
 Classification : Typic Torripsamments

Depth (cm)		
0 - 30		Yellow (10YR 7/6), medium sand, dry, loose, few roots, diffuse boundary to;
30 - 150		Very brown (10YR 7/4), fine sand, dry, loose, diffuse boundary to;
150 - 215		Yellow (10YR 7/6), coarse sand, single grain, moist, friable, diffuse boundary to;
215 - 250		Brownish yellow (10YR 6/6), coarse sand, wet

No. 12

Location :	north Rabaa (2.5 km north of Rabaa)
Physiography :	low sand dune
Slope :	undulating, 5%
Microrelief :	many small hummocks
Parent Material :	aeolian deposit
Vegetation :	dense el Adder, Gallam, el Hadda, el Sobat
Drainage :	excess
Water Table :	deep, more than 325 cm
Water holding Capacity :	
Surface Feature :	many shells and snails
Classification :	Typic Torripsamments

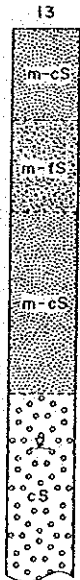
Depth (cm)

0 - 15		Yellow (10YR 7/6), medium sand, dry, loose, few fine / medium roots, diffuse boundary to;
15 - 150		Brownish yellow (10YR 6/6), coarse sand, single grain, moist, friable, few small shells, diffuse boundary to;
150 - 200		Brownish yellow (10YR 6/6), medium sand, moist, friable, diffuse boundary to;
200 - 325		Brownish yellow (10YR 6/6), coarse sand, moist, friable

No. 13

Location : south of Sabkha El Haswa, north Rabaa
Physiography : low sand dune
Slope : gently undulating, 1-2%
Microrelief : none
Parent Material : aeolian sand
Vegetation : dense cover
Drainage : excessive
Water Table : deep, 230 cm
Water holding Capacity : poor
Classification : Typic Torripsamments

Depth (cm)

0 - 50		Yellow (10YR 7/6), coarse sand, dry loose, few fine roots, clear smooth boundary to;
50 - 100		Brownish yellow (10YR 6/6), medium sand, single grain, slightly moist, very few roots, diffuse boundary to;
100 - 200		Same as above but more moist
200 - 300		Brownish yellow (10YR 6/6), coarse sand, wet

No. 15

Location : Rumana
 Physiography : dry Sabkha, depression
 Slope : flat, less than 1%
 Microrelief : none
 Parent Material : aeolian sand
 Vegetation : scarce halophites
 Drainage : slightly poor
 Water Table : shallow, 50 cm
 Water holding Capacity : poor
 Classification : Typic Psammaquents

Depth (cm)

0 - 50

50 -



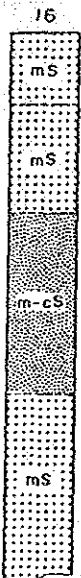
Very pale brown (10YR 7/4), medium sand, single grain, moist, friable, gradual smooth boundary to;

Gray (5Y 5/1), medium sand, wet

No. 16

Location : Hod Saadia, 1 km north of El Nasr
Physiography : low sand dune, deflated sand sheet
Slope : gently undulating, 2-3%
Microrelief : many, about 4m high
Parent Material : aeolian deposit
Vegetation : dense el Adder
Drainage : excessive
Water Table : more than 300cm
Water holding Capacity : poor
Surface Feature : many snails and shell fragments
Classification : Typic Psammaquents


Depth (cm)

0 - 40		Brownish yellow (10YR 6/6), medium sand, weak coarse blocky structure, dry slightly firm, very few roots on the top layer, diffuse boundary to;
40 - 100		Same as above but slightly moist
100 - 200		Brownish yellow (10YR 6/6), coarse sand, single grain, moist, friable, diffuse boundary to;
200 - 300		Very pale brown (10YR 7/4), medium sand, moist friable

No. 17

Location : El Wasiya, 4 km north of El Nasr
Physiography : low sand dune, deflated
Slope : gently undulating, 2-3%
Microrelief : common, about 5m high
Parent Material : aeolian deposit
Vegetation : dense el Adder, big shrub and bushes
Drainage : excessive
Water Table : deep, more than 300 cm
Water holding Capacity : poor
Classification : Typic Torripsamments





Depth (cm)

Depth (cm)		
0 - 20		Very pale brown (10YR 7/4), medium sand, dry, loose, few shell fragments, diffuse boundary to;
20 - 100		Brownish yellow (10YR 6/6), medium sand, single grain, slightly moist, friable, very few coarse roots, diffuse boundary to;
100 - 150		Same as above but more moist.
150 - 300		Yellow (10YR 7/6), medium / fine sand, single grain, moist, friable

No. 18

Location : El Wasiya village, 2 km south of Zanqur Abu Sabah
Physiography : low sand dune
Slope : gently undulating, 3-5%
Microrelief : many, about 2m high
Parent Material : aeolian sand
Vegetation : dense in depression
Drainage : excessive
Water Table : deep, more than 300 cm
Water holding Capacity : poor
Classification : Typic Torripsamments

Depth (cm)

Depth (cm)	Soil Profile	Description
0 - 20		Brownish yellow (10YR 6/6), medium sand, single grain, moist, friable, diffuse boundary to;
20 - 80		Brownish yellow (10YR 6/6), fine sand, moist, friable, diffuse boundary to;
80 - 150		Same as above but more moist.
150 - 300		Very pale brown (10YR 7/4), medium sand, moist, friable

No. 19

Location : Kotaia village
Physiography : sand plain
Slope : flat, less than 1%
Microrelief : none
Parent Material : aeolian deposit
Vegetation : olive trees
Drainage : excessive
Water Table : deep, more than 300 cm (9m 4.4 ms/cm)
Water holding Capacity : poor
Classification : Typic Torripsamments

Depth (cm)

0 - 20



Very pale brown (10YR 7/3), medium sand, weak blocky structure, dry, slightly firm, many fine roots, diffuse boundary to;

20 - 150

Brownish yellow (10YR 6/6), medium sand, weak blocky structure, moist, friable, diffuse boundary to;

150 - 200

Same as above but more moist.

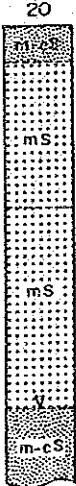
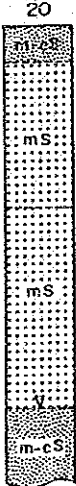
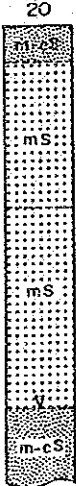
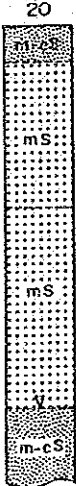
200 - 300

Light yellowish brown (10YR 6/4), medium sand, single grain, moist, friable

No. 20

Location : Abu Rouda
Physiography : inland Sabkha, depression
Slope : gently undulating, 2%
Microrelief : common, 2-3m high
Parent Material : aeolian deposit
Vegetation : dense el Adder, dates palm trees
Drainage : moderate
Water Table : moderately deep, 210 cm (more than 10 ms/cm)
Water holding Capacity : poor
Classification : Typic Torripsamments

Depth (cm)

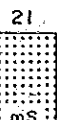
Depth (cm)	Soil Profile	Description
0 - 20		Very pale brown (10YR 7/4), medium sand, weak blocky structure, dry, slightly firm, common roots, diffuse boundary to;
20 - 100		Very pale brown (10YR 7/3), medium sand, dry, loose, diffuse boundary to;
100 - 210		Same as above but more moist.
210 - 300		Light yellowish brown (10YR 6/4), medium / coarse sand, wet

No. 21

Location : El Ahhrar village (between Balouza and Rumana)
Physiography : sand dune
Slope : undulating, 3-5%
Microrelief : many, 3-4m high
Parent Material : aeolian deposit
Vegetation : common
Drainage : excessive
Water Table : deep, more than 300cm
Water holding Capacity : poor
Surface Feature : many snails and shells
Classification : Typic Torripsamments

Depth (cm)

0 - 110



Very pale brown (10YR 7/3), medium sand, weak blocky structure, dry, slightly firm, diffuse boundary to;

20 - 100

Very pale brown (10YR 7/3), medium / coarse sand, single grain, moist, friable, diffuse boundary to;

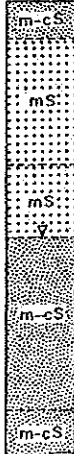
200 - 300

Yellow (10YR 7/6), coarse sand, moist, friable

No. 22

Location : north Rumana
 Physiography : dry Sabkha, depression
 Slope : very gently undulating, 2%
 Microrelief : none
 Parent Material : aeolian deposit
 Vegetation : dense Gallam
 Drainage : moderate
 Water Table : moderately shallow, 130 cm (44 ms/cm, pH 7.2)
 Water holding Capacity : poor
 Classification : Typic Psammaquents

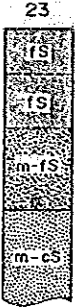
Depth (cm)

Depth (cm)	Soil Profile	Description
0 - 20	 <p>22 m-cS mS mS y</p>	Very pale brown (10YR 7/4), medium/coarse sand, stratified, dry, loose, very few fine roots, diffuse boundary to;
20 - 90		Yellow (10YR 7/6), medium sand, single grain, slightly moist, friable, diffuse boundary to;
90 - 130		Light yellowish brown (10YR 6/4), medium sand, single grain, moist, friable, clear smooth boundary to;
130 - 225		Light yellowish brown (10YR 6/4), coarse sand, wet

No. 23

Location : north Six October
Physiography : hollow between low sand dunes
Slope : undulating, 3%, concave
Microrelief : common
Parent Material : aeolian deposit
Vegetation : dense el Hodda
Drainage : moderate
Water Table : moderately shallow, 100 cm (12 ms/cm, pH 7.0)
Water holding Capacity : poor
Surface Feature : very fine gravels
Classification : Typic Psammaquents

Depth (cm)

0 - 25		Very pale brown (10YR 7/4), fine sand, dry, loose, few roots, diffuse boundary to;
25 - 55		Same as above but slightly moist
55 - 100		Yellow (10YR 7/6), medium sand, single grain, moist, friable, clear smooth boundary to;
100 -		Light yellowish brown (10YR 6/4), coarse sand, single grain, wet

No. 24

Location : north Nigila
Physiography : low sand dune
Slope : undulating, 2-3%
Microrelief : many, more than 5m high
Parent Material : aeolian deposit
Vegetation : common el Adder and el Sabbat
Drainage : excessive
Water Table : deep, more than 300cm
Water holding Capacity : poor
Surface Feature : many shells and snails
Classification : Typic Torripsamments

Depth (cm)

0 - 20



Very pale brown (10YR 8/4), medium sand, dry, loose, diffuse boundary to;

20 - 80

Yellow (10YR 7/6), medium sand, single grain, slightly moist, friable, diffuse boundary to;

80 - 170

Same as above but more moist

170 - 230

Light yellowish brown (10YR 6/4), medium sand, moist

No. 25

Location : Omm Gamous, south of El Nasr
 Physiography : hollow between sand dunes
 Slope : gently undulating, 3-5%
 Microrelief : common, more than 4m
 Parent Material : aeolian deposit
 Vegetation : dense el Adder and dates palm trees
 Drainage : excessive
 Water Table : deep, 220cm (4 ms/cm)
 Water holding Capacity : poor
 Classification : Typic Torripsamments

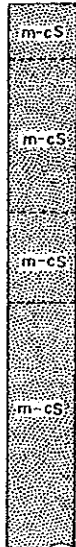
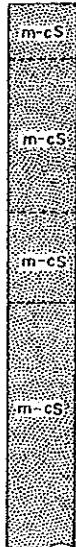
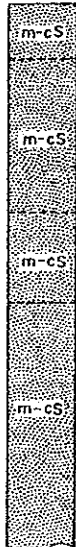
Depth (cm)

Depth (cm)	Soil Profile	Description
0 - 40	IS	Very pale brown (10YR 7/4), fine sand, dry, loose, diffuse boundary to;
40 - 120	m-IS	Yellow (10YR 7/6), medium sand, single grain, slightly moist, friable, diffuse boundary to;
120 - 220	m-IS	Same as above but more moist
220 - 300	m-cS	Light yellowish brown (10YR 6/4), coarse sand, wet

No. 26

Location : north Nigila
Physiography : sand plain
Slope : gently undulating, 1-2%
Microrelief : none
Parent Material : aeolian deposit
Vegetation : dense el Hadda, Metnan
Drainage : excessive
Water Table : deep, more than 300 cm
Water holding Capacity : poor
Surface Feature : common snails
Classification : Typic Torripsamments

Depth (cm)

Depth (cm)	Soil Profile	Description
0 - 30		Very pale brown (10YR 7/4), medium sand, moderate blocky structure, dry, slightly compact, very few roots, diffuse boundary to;
30 - 115		Very pale brown, (10YR 7/4), medium / coarse sand, single grain, moist, friable, some shell fragments, diffuse boundary to;
115 - 300		Same as above but more moist

No. 27

Location : Ganayien village, Qatia
Physiography : low sand dune, stable
Slope : gently undulating, 2-3%
Microrelief : none
Parent Material : aeolian deposit
Vegetation : tomato farm by drip irrigation, 4 years old
Drainage : excessive
Water Table : deep, more than 300 cm (5 m using by pump, 5.8 ms/cm)
Water holding Capacity : poor
Classification : Typic Torripsamments

Depth (cm)

0 - 30



Light yellowish brown (10YR 6/4), medium sand, dry, loose, many roots and organic matter, diffuse boundary to;

30 - 70

Same as above but more moist

70 - 160

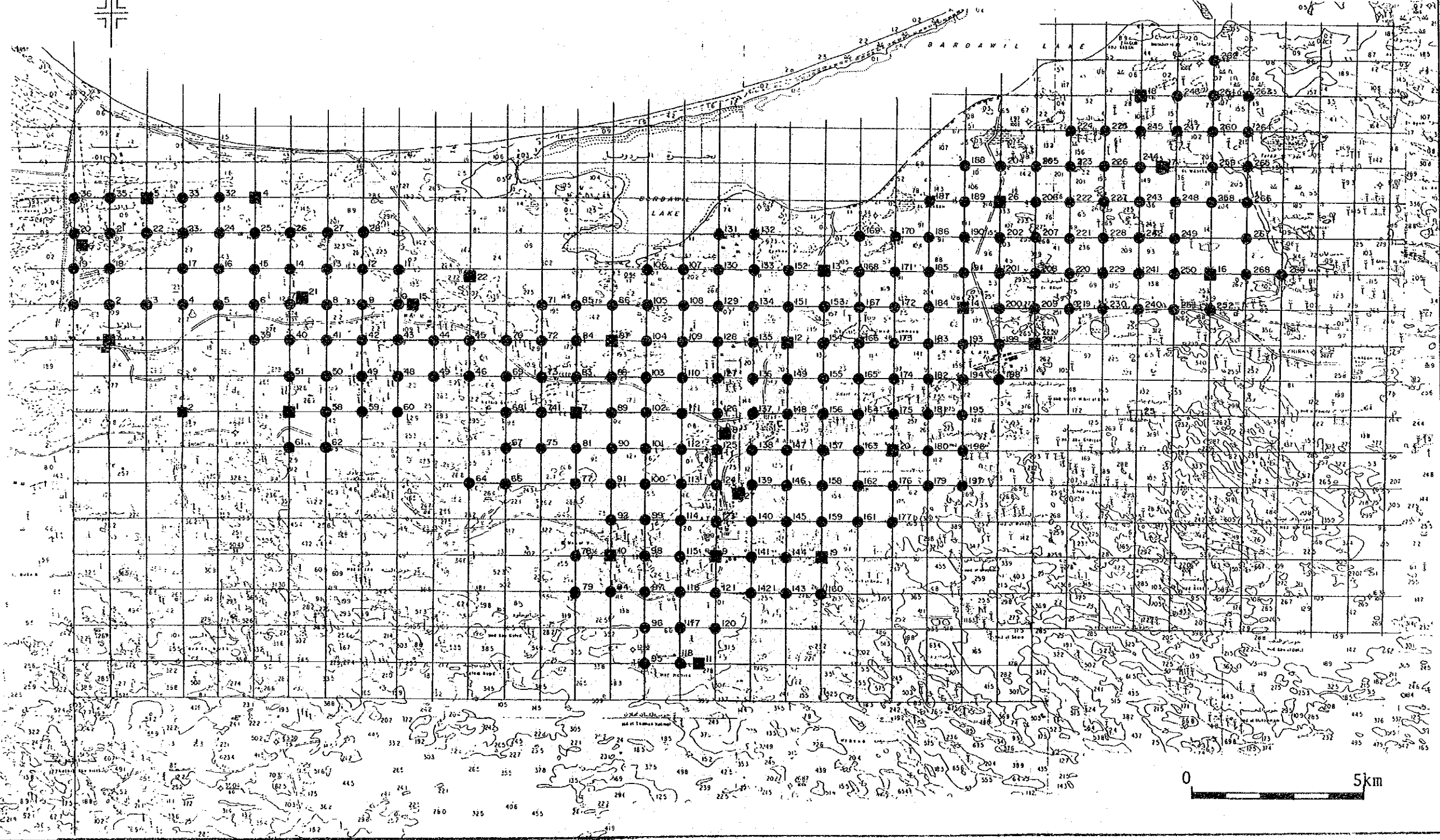
Very pale brown (10YR 7/4), medium sand, single grain, moist, friable, diffuse boundary to;

160 - 300

Very pale brown (10YR 7/4), medium / coarse sand, moist, friable

C.5. Auger Boring

LOCATION OF AUGER BORING



C.5. Auger Boring

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
1	Farma Tina Plain	Flat	Gallam	60	LS CS	46 56 63	7.6 7.6 7.5	slight none none	Salinity and water table	Limited
2	north Balouza	Undulating	Gallam	>150	CS MS CS	7.0 11.7 30	7.9 7.8 7.6	none	Salinity and topography	Moderate
3	north Balouza	Undulating	el Hadai	>150	CS	1.0	8	none	Topography	Moderate
4	north Balouza	Undulating	el Hadai	>150	MFS FS	1.0	8	none	Topography	Moderate
5	north Balouza	Undulating	el Hadai	>150	FS M CS	1.0	8	none	Topography	Moderate
6	Abu Galadia	Undulating	Gallam and el Hadai	>150	P CS	12 4.6 3.6	8	none	Salinity and topography	Moderate
7	Abu Galadia	Undulating	el Hadai few Gallam	>150	MCS MS	1.2 6.5 5	8 7.9 7.8	none	Topography	Moderate
8	el Shohada	Undulating	few Gallam and el Hadai	>150	FS CS VCS	0.5 0.7 3.6	8 8 7.9	none	Topography	Moderate
9	el Shohada	Undulating	Gallam	>150	FS MCS CS	6 6.5 11	8 8.1 7.9	none	Topography and Salinity	Moderate
10	north Rumana	Flat ~ depression	Gallam	60	MCS CS	63 110	7.5	none	Salinity and water table	Limited
11	north Rumana Tina Plain	Flat	Gallam	70	SCL CS	240 375 275 345	7.6 7.8 7.5 7.5	none slight none	Salinity and water table	Limited

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
12	north Rumana	V. gently undulating	Gallam	75	SL MCS CS	197 210 238	7.8 7.8 7.8	none slight none	Salinity and water table	Limited
13	Farma Tina Plain	Flat	Gallam	100	SCL MCS CS	120 132 174	7.7 7.8 7.8	none none none	Salinity and water table	Limited
14	Farma Tina Plain	V. gently undulating	Gallam	85	SCL MS MCS	45 57 165	7.6 7.8 7.8	none moderate none	Salinity and water table	Limited
15	Farma Tina Plain	Flat	Gallam	70	LS CS	60 213 225	6.9 7.0 6.9	slight none none	Salinity and water table	Limited
16	Farma Tina Plain	Flat	Gallam	70	LS MS	248 273 285	7.9 7.8 7.8	sligh none none	Salinity and water table	Limited
17	Farma Tina Plain	Flat	Gallam	50	LS MS CS	100 150 166	7.9 7.8 7.8	slight none none	Salinity and water table	Limited
18	Farma Tina Plain	Intermediate	Gallam	50	MS C MS	980 159 160	7.8 7.6 8	none	Salinity and water table	Limited
19	Farma	Intermediate	Gallam	60	SCL CS	240 275	7.8 7.9	none	Salinity and water table	Limited
20	Sand intermediate	Intermediate	Gallam	60	SCL MCS SIL	228 270 288	7.6 7.6 7.7	none	Salinity and water table	Limited
21	Sand intermediate	Intermediate	Gallam	100		163 240 363	7.9 7.8 7.6	none	Salinity and water table	Limited

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
22	Farma Tina Plain	Flat	Gallam	85	C MCS CS	140 245 325	7.8 7.7 7.7	none	Salinity and water table	Limited
23	Farma Tina Plain	Flat	Gallam	90	MFS MCS CS	210 365 380	7.8 7.6 7.7	none	Salinity and water table	Limited
24	Farma Tina Plain	Flat	Gallam	80	CS MS CS	50 113 120	7.8 7.6 7.5	none	Salinity and water table	Limited
25	Clay over sand Tina Plain	Flat	Gallam	85	C CS CS	260 308 364	7.6 7.8 7.8	none moderate slight	Salinity and water table	Limited
26	Clay over sand Tina Plain	Flat	Gallam	90	C CS	180 280 325	6.6 7.8 7.0	none none slight	Salinity and water table	Limited
27	north Rumana	Undulating	Gallam	65	MS MS	35 40 44	7.8 7.8 7.8	none	Salinity and water table	Limited
28	north Rumana	between sand dunes	Gallam	75	MS MCS CS	25 45 60	7.6 7.8 7.8	none	Salinity, water table and topography	Limited
32	Clay over sand Tina Plain	Flat	Gallam	70	SCL C CS	258 277 380	7.7 7.8 7.6	none slight slight	Salinity and water table	Limited
33	Clay over sand Tina Plain	Flat	Gallam	100	SCL SCL CS	150 180 220	7.6	none	Salinity and water table	Limited
35	Clay over sand Tina Plain	Flat	Gallam	120	Clay	195 330 360	7.8 7.8 7.8	none none slight	Salinity and water table	Limited

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
36	Tina Plain	Flat	Gallam	100	Clay	220 280 335	7.6 7.8 7.8	slight none none	Salinity and water table	Limited
39	el Shtta	Gently undulating	el Adder	> 150	FS FS MCS	1.5 0.7 1.2	8 8.1 8.1	none none none	Topography	Moderate
40	el Shtta	Gently undulating	el Adder	> 150	FS MFS MCS	1.0 1.5 1.0	8 8 8	none slight none	Topography	Moderate
41	south el Sholdiadi	Gently undulating	el Adder	120	CS CS	3.0 2.6	7.9 8	none none	Water table and topography	Limited
42	south el Sholdiadi	Gently undulating	el Adder		FS FS CS	1.3 1.3 2.2	7.9 8 8	none	Topography	Moderate
43	south Rumana	Gently undulating	el Adder Sobbat		FS MFS MCS	2.0 1.5 2.8	8 8 8.2	none none none	Topography	Moderate
44	south Rumana	Gently undulating	el Adder	> 150	MS MCS CS	1.0 2.0 3.6	8.1 8 7.9	none none none	Topography	Moderate
45	south Rumana	Gently undulating	el Adder	> 150	MCS MCS CS	1.5 2.0 2.5	8 8 8	none none none	Topography	Moderate
46	south Rumana	Gently undulating	el Adder/ palm trees	> 150	FS MCS CS	2.0 1.5 2.2	8 8 7.9	none none none	Topography	Moderate
47	south Rumana	Gently undulating	el Adder Sobbat	> 150	MCS CS CS	1.0 2.0 4.4	8.1 7.9 8	none none none	Topography	Moderate
48	south Rumana	Gently undulating	el Adder	> 150	MFS CS CS	2 2 2	8 8 8	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
49	south el Shohadai	Gently undulating	el Adder	> 150	MFS CS CS	1.5 2.2 2.0	8 8 8	none none none	Topography	Moderate
50	south Rumana	Undulating	el Adder / palm trees	> 150	FS MFS S	1.0 1.0 1.5	8.1 8.1 8	none none none	Topography	Limited
51	el Shohalte	Undulating	el Adder Sobbat		FS MCS CS	0.7 2.0 3.3	8 8 8	none none none	Topography	Limited
58	el Shohalte	Undulating	el Adder / palm trees	> 150	MFS CS CS	2.5 3.7 7.3	8 8 7.9	none none none	Topography and Salinity	Limited/ moderate
59	south Rumana	Undulating	el Adder Sobbat	> 150	FS FS MCS	2 2.5 2.5	8 8 8	none none none	Topography	Limited/ moderate
60	Shohadai	Undulating	el Adder Sobbat	> 150	FS FS CS	2.5 0.7 3.6	7.9 8 8	none none none	Topography	Limited/ moderate
61	el Shohadai	Gently undulating	el Adder	> 150	MCS MS CS	0.7 1.5 1.5	8.2 8 8	none none none	Topography	Moderate
62	south el Shohalta	Undulating	el Adder	> 150	MFS CS CS	0.5 0.7 0.7	8 8 8	none none none	Topography	Limited
64	south 6. October (west el Hemesa.)	Gently undulating	Gatlam / Sobbat	> 150	MFS MCS CS	1.2 2.2 1.7	8.1 8 8	none none none	Topography	Moderate
66	south 6. October	Gently undulating	Gatlam / Sobbat	> 150	MFS MCS CS	1.2 2.0 1.7	8 7.9 8.2	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
67	south 6. October elHamarai	Gently undulating	Gallam	>150	MFS MFS CS	1.0 2.0 1.7	7.9 7.8 8.1	none none slight	Topography	Moderate
68	south Rumana (Kateep Gaafer)	Undulating	el Adder		FS FS CS	0.7 2.0 2.0	8.1 8.0 8	none none none	Topography	Limited
69	south Rumana	Gently undulating	el Adder Sabbat el Hadai	>150	FS MCS CS	2 1.5 2.2	8 8 8	none none none	Topography	Moderate.
70	north Rumana	Depression	none	60	MCS CS	25 75	7.8 7.8	none none	Water table and salinity	Limited
71	6. October	Gently undulating	Gallam and el Hadai	>150	MFS MS MCS	2 1.7 2	8 8.2 8.2	none none none	Topography	Moderate
72	6. October	Depression	none	60	MCS CS	29.5 45	7.8 7.8	none none	Water table and salinity	Limited.
73	6. October	Gently undulating	el Adder	>150	MS MCS	1.0 1.5	8.1 7.9	none none	Topography	Moderate
74	south 6. October	Gently undulating	Gallam / el Hadai	>150	MFS MCS MCS	4.5 7.8 10.5	7.9 7.8 7.8	none none none	Salinity and topography	Limited.
75	south 6. October	Gently undulating	Gallam	>150	MS MCS CS	9.0 12 16.2	7.9 7.7 7.8	none none slight	Salinity Topography	Limited.
77	south 6. October	Gently undulating	Gallam / el Hadai	>150	MS MCS CS	1.7 1.0 2.2	8 8 8	none none none	Topography	Moderate
78	south Kottia (el Hemassai)	Undulating	el Adder / palm trees	>150	MFS MFS CS	1.5 1.5 2.0	8 8 8	none none none	Topography	Limited.

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	E _{Ce} (mS/cm)	pH	CaCO ₃	Limitation	Suitability
79	south 6. October	Undulating	el Adder	> 150	MS MS MCS	1.0 0.7 1.5	8.1 8 8	none slight none	Topography	Limited
81	south 6. October	Gently undulating	Gallam	> 150	MFS MS CS	6.0 6.5 8.7	7.8 7.7 7.8	none none none	Salinity and Topography	Limited
83	6. October	Gently undulating	el Hadai Gallam	> 150	MCS MFS MFS	0.7 1.0 5	7.8 7.9 8	none moderate none	Topography	Moderate
84	6. October	V. gently undulating	el Hadai Gallam	125	MFS MFS MCS	3.5 6.0 20	8.1 8.2 7.9	none none none	Water table and salinity	Limited
85	north. 6. October	Undulating	el Adder	> 150	CS CS CS	1.2 0.75 0.75	8 8.3 8.2	none none none	Topography	Limited
86	north. 6. October	Gently undulating	Gallam	120	MCS MCS CS	14.4 22.5 30.5	7.8 7.6 7.6	none none none	Salinity and water table	Limited
88	north 6. October	V. gently undulating	Gallam	> 150	MFS MFS MS	2.5 2.5 4.3	8 8.1 8	none slight moderate	none	Suitable
89	south 6. October	V. gently undulating	Gallam el Hadai	> 150	MFS MFS FS	1.0 0.5 5.5	8.1 8 7.8	none moderate slight	none	Suitable
90	south 6. October	Undulating	Gallam Sobbat	> 150	MFS MFS CS	0.5 0.5 0.5	8 8.1 8	none slight slight	Topography	Limited
91	south 6. October	V. gently undulating	Gallam	> 150	MCS MCS CS	1.0 1.0 1.0	7.9 7.9 8	none none none	none	Suitable

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
92	south 6. October	V. gently undulating	Gallam	> 150	MFS MCS	1.5 1.5	8 8	none none	none	Suitable
94	south Kattia	Undulating	el Adder	> 150	MS MS MCS	1.0 0.7 1.5	7.8 7.8 8.2	none slight none	Topography	Limited
95	basin of Hamaisia	Gently undulating	el Adder / palm trees	150	MFS MS MS	1.5☆ 4.5 6.8	8.2 8.2 8	none slight slight	Salinity and topography	Limited
96	el Hamaisia	Undulating	el Adder	> 150	MS MFS MCS	0.5 1.0 1.0	8.2 7.8 8	none none none	Topography	Limited
97	south el Moraiah	Gently undulating	el Adder	> 150	MFS MCS CS	1.5 1.0 1.5	7.8 7.8 8.0	none none none	Topography	Moderate
98	east el Moraiah	Gently undulating	el Adder	> 150	MS MS MCS	1.5 1.5 2.2	8 8 8.1	slight none none	Topography	Moderate
99	Kothia	Gently undulating	el Adder / el Hadai	> 150	FS MCS CS	1.0 1.2 1.0	7.9 8 8	none none none	Topography	Moderate
100	Rabas	Gently undulating	Gallam	150	MCS MCS MCS	1.5 2.2 7.0	8 9 7.8	none none moderate	Water table, salinity subsoil, and topography	Limited
101	south 6. October	Gently undulating	el Hadai Gallam	> 150	FS FS MCS	0.5 0.5 0.75	8 8 8.1	slight moderate slight	Topography	Moderate
102	south 6. October	Gently undulating	Gallam	> 150	MFS MS MS	6.5 7.5 8	7.8 7.8 7.8	slight none none	Salinity and topography	Moderate
103	north 6. October	Gently undulating	Gallam	150	CS MS MCS	14.5 17.5 26.3	7.7 7.8 7.8	none none none	Salinity, water table and topography	Limited

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
104	north. 6. October	Undulating	el Hadai	> 150	MFS MS MCS	1.5 1.0 2.2	8 8 8	none none none	Topography	Limited
105	north. 6. October	Undulating	el Hadai Callam	> 150	MS MCS CS	3.5 4.5 7.0	7.9 7.9 7.8	none none none	Topography and salinity	Limited
106	north 6. October	Flat depression	Callam	60	MCS CS	112 182	7.6 7.6	none none	Water table and salinity	Limited
107	north 6. October (Hagf el Tena)	Flat depression	none	60	MCS MS	80 83	7.6 7.5	slight none	Water table and salinity	Limited
108	6. October Hagf el tena	Undulating	el Hadai Callam	> 150	MS MS CS	1.5 1.0 1.5	8 7.9 8	none none none	Topography	Limited
109	6. Oct. Hagf el tena	Undulating	el Hadai Callam	> 150	MFS MS MCS	1.0 1.5 2.0	7.8 8 8	none none none	Topography	Limited
110	6. October	Gently undulating	el Hadai Callam	> 150	FS MFS	5 1.5	8 8.2	none none	Topography	Limited
111	6. October	Undulating	Callam el Hadai	> 150	MFS FS CS	1.0 1.5 0.7	8.2 8 8	none none slight	Topography	Limited
111	South 6. October	Gently undulating	Callam el Hadai	100	MFS MCS CS	1.8 2 8	7.8 8 7.9	none none	Water table, salinity and topography	Limited
112	South 6. October	Gently undulating	Callam el Hadai	> 150	MFS MFS MFS	1.0 0.5 2.2	8 8.2 2.2	none none none	Topography	Moderate
113	Rabaa	Flat, depression	Callam	70	MS CS CS	25.3 86 130	7.8 7.8 7.6	moderate none none	Water table and salinity	Limited

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm.)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
114	Kottia	Gently undulating	el Adder el Hadai	> 150	FS MCS CS	1.0 1.0 1.2	8 8 8.1	slight none slight	Topography	Limited
115	Kottia	Gently undulating	el Adder el Hadai	> 150	MFS MCS MCS	1.0 0.7 1.2	8.1 8 8	none none none	Topography	Moderate
116	el Hemasai	Gently undulating	el Adder	> 150	MFS MCS CS	1.5 1.0 1.5	8.1 8 8	slight slight none	Topography	Moderate
117	el Hemasia basin	Gently undulating	el Adder palm trees		MFS MCS MCS	1.5 1.0 1.5	7.8 7.3 8	slight slight none	Topography	Moderate
118	el Hemasia basin	Gently undulating	Gallam/el Hadai palm trees	90	MS MS MS	32.5 41.5 45	7.3 7.9 7.7	none moderate moderate	Water table and salinity	Limited
120	el Hemasia basin	Gently undulating	el Hadai Gallam/palm trees	> 150	MFS MCS MCS	0.5 1.0 0.7	8.1 8.2 8.1	none none none	Topography	Moderate
121	Kottia	Gently undulating	Gaava Farm	> 150	MS MS MS	1.0 0.5 1.5	7.8 7.8 8.2	none none none	Topography	Moderate
123	Kottia	Gently undulating	el Adder/el Hodai	> 150	FS MCS CS	1.0 1.0 1.2	8 8 8.1	slight none none	Topography	Moderate
125	Kottia	Flat sand plain	Gallam	> 150	MS MS MC	1.5 1.7 4.5	8 8 8	none none none	none	Suitable
126	el Karama	Gently undulating	Gallam	> 150	MS CS	1.2 1.0	7.8 8	none none	Topography	Moderate
127	north Rabaa el Gobara	Gently undulating	Gallam/el Hadai	80	MFS CS	4.5 7.5	8 8.2	none none	Water table, salinity, and topography	Limited

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
128	north Rabaa	Undulating	Gallam palm-trees	>150	MFS MCS CS	1.5 1.0 1.3	8.2 8.2 8	none none none	Topography	Limited
129	north Rabaa	Undulating	Gallam/el Hadai	>150	MFS MCS CS	0.5 1.4 1.35	7.9 8.2 8.2	slight none none	Topography	Limited
130	north Rabaa	Undulating	el Hadai/ Gallam	>150	MFS MCS MCS	1.5 2.0 2.5	8.2 8.1 8.2	none none none	Topography	Limited
131	north Rabaa	Flat, depression	Gallam	60	MCS CS	290 360	6.7 6.7	none none	Water table and salinity	Limited
132	north Rabaa	Flat, depression	Gallam	20	CS CS	278 312	6.7 6.6	none none	Water table and salinity	Limited
133	north Rabaa	Gently undulating	el Hadai and Gallam	>150	CS MS CS	0.5 1.2 2.5	8 7.8 7.9	none none none	Topography	Moderate
134	north Rabaa	Undulating	el Adder	>150	MCS MCS CS	1.0 0.75 1.3	7.8 7.9 8.2	none none none	Topography	Limited
135	north Rabaa	Gently undulating	el Adder el Hadai	150	MFS MCS CS	0.5 0.5 8.0	7.8 8 7.8	none none none	Topography	Moderate
136	north Rabaa	Gently undulating	el Adder	>150	MFS MCS CS	2.6 0.5 0.5	8 8.1 8.1	none none none	Topography	Moderate
137	north Rabaa	Gently undulating	el Adder	>150	MFS MFS MCS	4.4 1.0 1.2	7.9 8 7.8	none none none	Topography	Moderate
138	south of Rabaa	Gently undulating	el Adder	>150	CS CS CS	1.5 1.2 1.2	8 8 8	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
139	Kottia	Undulating	el/Adder	>150	FS CS CS	1.0 1.2 1.0	7.9 8 8	none none none	Topography	Limited
140	Kottia	Undulating	el/Adder	>150	FS CS CS	1.0 1.0 1.2	7.9 8 8	slight none slight	Topography	Limited
141	Kottia	Gently undulating	el/Adder	>150	MCS MS CS	1.2 2.0 2.0	8.1 8.2 8.2	none none none	Topography	Limited
142	Kottia	Gently undulating	el/Adder	>150	FS MCS CS	1.0 0.7 1.5	8.3 8 8	none none none	Topography	Limited
143	South Road of Kottia	Gently undulating	el/Adder	>150	FS MFS MCS	1.0 0.7 1.5	8.2 8.2 8.2	none none none	Topography	Moderate
144	Kottia	Gently undulating	el/Adder	>150	MCS MS CS	1.0 2 2.2	8.1 8.2 8.2	none none none	Topography	Moderate
145	Kottia	Undulating	el/Adder	>150	FS MCS CS	1.0 1.0 1.5	8 8 7.9	none none none	Topography	Limited
146	Kottia	Undulating	el/Adder	>150	FS CS CS	1.0 1.2 1.0	8 8 8	none none none	Topography	Limited
147	South of Rabaa	Gently undulating	el/Adder	>150	CS MS CS	1.0 0.7 1.5	8 8 8	none none none	Topography	Limited
148	North Rabaa	Gently undulating	el/Adal, Gallam	>150	MCS CS CS	2.3 3.6 5.8	8 7.9 7.9	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
149	north Rabaa	Undulating	Gallam Sobbat	>150	FS MFS MCS	1.3 3.3 3.0	8.2 8.2 8.1	none none none	Topography	Limited
151	north Rabaa	Gently undulating	el Hadai	>150	MCS MS MCS	1.0 1.5 2.0	8 8 8	none none none	Topography	Moderate
152	north Rabaa	Gently undulating	el Hadai Sobbat	>150	MFS MCS CS	1.5 1.2 2.5	8 7.8 7.9	none none none		
153	north Neglia	V. gently undulating	el Hadai Metnan	>150	FS FS CS	1.7 1.0 1.0	8.0 8.0 8.0	none moderate slight	none	Suitable
154	north Rabaa	Undulating	Gallam, el Hadai Sobbat	>150	MFS MS MCS	1.7 2 2.5	8 7.9 7.8	none slight none	Topography	Limited
155	north Neglia	Gently undulating	Gallam, Sobbat	>150	FS CS CS	1.0 1.5 2.2	8.1 8.1 8.1	none none none	Topography	Moderate
156	north Om Ocba	Gently undulating	Gallam	>150	MCS CS	1.0 1.0	8 8	none none	Topography	Moderate
157	el Fath south Neglia	Gently undulating	el Adder Sobbat	>150	MCS MCS CS	1.0 0.7 1.2	8 8.1 8	none none none	Topography	Moderate
158	south Neglia	Gently undulating	el Adder Sobbat	>150	MS MCS CS	1.0 1.2 1.0	8.1 8 8	none none none	Topography	Moderate
159	Abu roda	Gently undulating	el Adder Sobbat	>150	MFS VCS VCS	0.7 1.0 1.2	8.2 8.1 8.1	none none none	Topography	Moderate
160	south Road Kottai	Gently undulating	el Adder	>150	FS MFS MCS	1.0 0.7 1.5	8 8 8	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
161	Abu Roda south of el Fatih north Kottia	Gently undulating	el Adder Sobbat	>150	MFS VCS VCS	2 2.6 2	8 8 8	none none none	Topography	Moderate
162	Abu Roda south el Fatih	Gently undulating	el Adder Sobbat, Akrush	>150	FS CS CS	0.5 0.7 0.7	8.1 8.2 8.1	none none none	Topography	Moderate
163	el Fatih	Gently undulating	el Adder Sobbat	>150	MCS MCS MCS	0.5 0.7 0.5	8.2 8.0 8.1	none none none	Topography	Moderate
164	el Fatih	V. gently undulating	Gallam, few palm trees	120	MFS FS CS	1.0 3 6.5	8.1 8.0 8.0	none none	Water table	Moderate
165	north Om Ocba, north Rabaa	Gently undulating	el Hadai Sobbat, Akrush Metnan	>150	MFS VCS VCS	1.5 2 2.2	8.2 8.1 8.2	none none none	Topography	Moderate
166	north Rabaa	Undulating	Gallam, el Hadai, Sobbat	>150	FS MCS CS	2.5 3.1 4.5	8 7.9 7.9	none none none	Topography	Limited
167	el Haswa north Negila	V. gently undulating	el Hadai, Metnan	>150	MCS MFS MCS	0.5 0.7 3.6	8.1 8 8	none slight moderate	none	Suitable.
168	el Haswa north Negila	V. gently undulating	Gallam	80	MCS MCS CS	23 30.7 44.0	7.8 7.6 7.6	none none none	Water table and salinity	Limited
169	north Negila and Rabaa	V. gently undulating	Gallam	80	FS MFS CS	13.6 16.0 38.0	7.8 7.8 7.8	none slight none	Water table and salinity	Limited
170	north Negila	Gently undulating	el Hadai, Sobbat	>150	MCS CS CS	13.5 6.8 2.5	7.8 7.8 7.9	slight none none	Topography and salinity	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	E _{Ce} (mS/cm)	pH	CaCO ₃	Limitation	Suitability
171	north Negila	Gently undulating	Gallam	> 150	FS MS CS	4.6 5.3 8.9	7.9 8 7.8	none none none	Topography and salinity	Moderate
172	north Negila el Fath	Gently undulating	Gallam, Sobbat few el Hadai	> 150	FS FS CS	0.5 0.7 0.7	8 8 8	none none none	Topography	Moderate
173	north Om Ocoba	Gently undulating	Gallam, Sobbat few el Hadai	> 150	MS MCS CS	2 3.3 4.5	8 7.8 7.9	none none none	Topography	Moderate
174	north Om Ocoba	Undulating	el Hadai, Sobbat, Akraakt, Metnan	> 150	CS VCS	2.0 1.7	8.1 8	none none	Topography	Limited
175	south Om Ocoba	V. gently undulating	el Adder, palm trees	> 150	MCS MCS CS	1.7 2.0 3.0	8.2 8.2 8.1	none none none	none	Moderate
176	south Negila east north Kottia	Gently undulating	el Adder, Sobbat, Akrush	> 150	FS MCS CS	0.5 0.7 0.7	8.1 8.1 8.1	none none none	Topography	Moderate
177	south Negila east north Kottia	Gently undulating	el Adder	> 150	MFS VCS VCS	2 2.5 2	8 8 8	none none none	Topography	Moderate
179	Abu GHouRab south Negila	Gently undulating	el Adder	> 150	CS CS CS	0.5 0.7 0.7	8.1 8.1 8.1	none none none	Topography	Moderate
180	Abar el Nar	Undulating	el Adder, Sobbat	> 150	FS MFS CS	0.5 0.5 0.5	8 8 8	none none none	Topography	Limited
181	south Negila	Gently undulating	el Hadai, Sobbat	> 150	FS MFS MFS	1.7 4.4 2.0	8 8 8	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	EC _e (mS/cm)	pH	CaCO ₃	Limitation	Suitability
182	north Abu Rodai	Gently undulating	el Adder, el Hadai, Metnan	> 150	FS CS VCS	0.5 0.5 2.0	8.2 8.2 8.1	none none none	Topography	Moderate
183	north Negila	Gently undulating	el adder, Sobbat	> 150	MFS MCS CS	3.5 4.0 6.5	7.9 7.8 7.8	none none none	Topography and salinity	Moderate
184	north Negila	Gently undulating	el Adder, Hadai, Sobbat	> 150	FS MFS CS	0.5 0.7 0.7	8.1 8 8	none none none	Topography	Moderate
185	north Negila	Gently undulating	el Adder, Hadai, Gallam	> 150	FS MFS CS	6.5 8.5 11.3	7.8 7.8 7.6	none none none	Topography and salinity	Moderate
186	north Negila	Gently undulating	el Adder, el Hadai, Metnan	> 150	FS MS MCS	0.5 0.5 1.5	8.2 8 8	none slight none	Topography and salinity	Moderate
187	north Negila	V. gently undulating	Gallam	100	MCS CS CS	13.5 26.5 30.5	7.8 7.6 7.6	none none none	Water table and salinity	Limited
188	north Negila	Flat	Gallam	60	MCS CS	47.0 56.5	7.6 7.6	none none	Water table and salinity	Limited
189	north Negila	Flat	Gallam, el Hadai	100	MCS CS CS	19.4 28.3 44.5	7.8 7.6 7.5	none none none	Water table and salinity	Limited
190	north Negila	Undulating	el Hadai, Metnan, Sobbat	> 150	MFS VFS FS	1.0 0.5 0.7	8 8 8	none none none	Topography	Limited
191	north Negila	Gently undulating	el Hadai, Gallam	> 150	FS MFS MCS	5.9 7.0 10.3	7.9 7.8 7.8	none none none	Topography and salinity	Moderate
193	north Negila	Gently undulating	el Hadai, Sobbat	> 150	FS MCS CS	1.5 0.5 0.7	8 8.1 8	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECa (mS/cm)	pH	CaCO ₃	Limitation	Suitability
194	south Negila	Gently undulating	el Adder, Metnan	> 150	MS MCS CS	0.5 0.5 0.5	8.1 8.1 8.1	none none slight	Topography	Moderate
195	south Negila	Gently undulating	el Adder, Metnan	> 150	FS FS MCS	0.5 0.5 1.0	8.1 8.2 8.2	none none none	Topography	Moderate
196	south Negila	Undulating	el Adder	> 150	FS MCS CS	0.5 0.5 0.5	8.1 8 8	none none none	Topography	Limited
197	south Negila Abu GHourab	Gently undulating	el Adder		FS CS CS	0.5 0.5 0.5	8.1 8.1 8.1	none none slight	Topography	Moderate
198	south Negila	Gently undulating	el Adder, Sobbat		FS MFS MCS	1.3 2.6 2.5	8 8 8.1			
199	north Negila	Gently undulating	el Adder, el Hadai	> 150	FS MCS CS	1.5 0.5 0.7	8 8.1 8	none none none	Topography	Moderate
200	north Negila	Gently undulating	el Adder	> 150	MFS MFS MCS	0.7 1.0 1.0	8.1 8 8.2	none none none	Topography	Moderate
201	north Negila	Undulating	el Hadai, Sobbat	> 150	MCS MCS CS	0.5 1.0 0.5	8 7.9 8	none none none	Topography	Limited
202	north Negila	Gently undulating	el Hadai, Metnan	> 150	MFS MFS MCS	0.5 0.7 0.5	8 8 8	none slight none	Topography	Moderate
204	north Negila	Gently undulating	el Adder, el Hadai, Sobbat	> 150	FS MCS CS	6.7 7.5 11.5*	7.8 7.8 7.8	none none none	Topography and salinity	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	E _{Ce} (mS/cm)	pH	CaCO ₃	Limitation	Suitability
205	north Negila (Hogph el deep)	Gently undulating	el Adder, el Hadai	> 150	FS MFS MS	4.6 5.3 8.9	7.9 8 7.8	none slight none	Topography and Salinity	Moderate
206	north Negila	Gently undulating	el Adder	> 150	FS MCS CS	1.5 0.7 1.5	8 8.1 8	none none none	Topography	Moderate
207	north Negila	Gently undulating	el Adder	> 150	FS MCS MCS	2.0 1.0 1.5	8 8 8	none none none	Topography	Moderate
208	north Negila	Gently undulating	el Adder, palm trees trees	> 150	FS MCS MCS	2.5 0.5 1.0	7.9 8 8	none none none	Topography	Moderate
209	north Negila	Gently undulating	el Adder el Hadai	> 150	FS MFS MCS	1.0 0.5 1.2	8 8.2 8	none none none	Topography	Moderate
219	north Negila	Gently undulating	el Adder	> 150	MFS MS MC	0.7 1.0 1.5	8.1 8 8	none none none	Topography	Moderate
220	north Negila	Gently undulating	el Adder	> 150	MS FS FS	0.5 0.5 0.5	8 8 8	none none none	Topography	Moderate
221	north Negila	Gently undulating	el Adder el Hadai	> 150	FS MFS MS	1.0 1.0 1.2	8 8.1 8.1	none none none	Topography	Moderate
222	north Negila	Gently undulating	el Adder	> 150	FS MCS CS	1.5 0.7 1.5	8 8.1 8	none none none	Topography	Moderate
223	north Negila	Gently undulating	el Adder, el Hadai	> 150	FS MFS MCS	4.0 6.5 8.4	7.9 7.8 7.8	none slight none	Topography and salinity	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (ms/cm)	pH	CaCO ₃	Limitation	Suitability
224	north Negila (Haseph ei deep)	Gently undulating	ei Adder, ei Hadai	120	FS MFS MCS	8.5 11.5 20.3	7.8 7.8 7.8	none none none	Water table and salinity	Limited
225	north Negila	Gently undulating	ei Adder, few Callam, ei Hadai	100	FS MFS MCS	6.5 12.5 16.7	7.8 7.8 7.7	none none none	Water table and salinity	Limited
226	north Negila	Gently undulating	ei Adder ei Hadai	> 150	FS MFS MCS	3.6 4.5 6.5	8 8 7.9	none slight none	Topography and salinity	Moderate
227	north Negila	Gently undulating	ei Adder	> 150	FS MFS MFS	0.5 1.0 1.0	8.1 8 8	none none none	Topography	Moderate
228	north Negila	Gently undulating	ei Adder	> 150	FS MFS MS	1.5 0.7 1.5	8.1 8 8	none none none	Topography	Moderate
229	north Negila	Gently undulating	ei Adder	> 150	FS FS FS	0.5 0.5 0.5	7.9 8 8	none none slight	Topography	Moderate
230	north Negila	Gently undulating	ei Adder	> 150	FS MFS CS	0.5 0.5 0.5	8.1 8.1 8.2	none none none	Topography	Moderate
240	north Negila	Gently undulating	ei Adder	> 150	FS MFS MCS	1.0 0.7 1.2	8 8 8	none none none	Topography	Moderate
241	north Negila	Gently undulating	ei Adder	> 150	FS MCS FS	0.7 0.5 0.7	8 8 8	none none none	Topography	Moderate
242	north Negila	Gently undulating	ei Adder and Castor	> 150	FS FS MCS	0.5 1.2 2.0	8 8 8.2	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
243	north Negila	Gently undulating	el Adder	> 150	FS FS MCS	0.7 1.0 1.2	8 8 8	none none none	Topography	Moderate
244	north Negila	Gently undulating	el Adder	> 150	MFS MS CS	2 2.5 3.6	8 8 8	none none none	Topography	Moderate
245	north Negila	Gently undulating	el Adder	> 150	FS MFS MCS	1.0 1.0 1.3	8 8 8	none none none	Topography	Moderate
246	el Wasiya north Nasr village.	Flat, depression	none	60	MC CS	144 258	7.8 7.7	slight slight	Water table and salinity	Limited
247	el Wasiya north Nasr village.	Gently undulating	el Adder and some Gallam	> 150	MFS MFS MCS	3.5 4.5 9.0	8 8 7.9	none none none	Topography and salinity	Moderate
248	el Wasiya north of Nasr village	Undulating	el Adder, few palm trees	> 150	MFS MFS MCS	1.0 2.0 2.5	8 8 8	none none none	Topography	Limited
249	el Wasiya north of Nasr village	Undulating	el Adder, Palm trees	> 150	MS FS FS	0.5 1.2 5.0	8 7.9 8	none moderate moderate	Topography	Moderate
250	north el Nasr	Gently undulating	el Adder	> 150	FS FS MCS	0.5 0.7 0.7	8.1 8.1 8.2	none none none	Topography	Moderate
251	north el Nasr	Gently undulating	el Adder	> 150	FS MFS MCS	0.5 0.5 0.7	8 8 8	none slight none	Topography	Moderate
252	north el Nasr	Gently undulating	el Adder, el Hadai	> 150	FS MFS MCS	2.0 2.7 3.5	8 8 8	none slight none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
258	el Wasiya	Gently undulating	Gallam, el Adder Palmtrees	120	FS MCS CS	11.00 30 39	8.1 7.8 8	none slight moderate	Water table and salinity	Limited
259	el Wasiyai	Undulating	el Adder	>150	FS MCS MCS	1.2 2.5 2.0	8 8 8	none none none	Topography	Limited
260	el Wasiyai	Undulating	Gallam	>150	MCS CS	4.5 9.5	8 8	none none	Topography and salinity	Limited
261	el Wasiya	Undulating	Gallam Sabbat	>150	MFS MCS MCS	1.5 1.5 6.0	8.1 8 7.8	none none none	Topography and Salinity	Limited
262	el Wasiya	Flat, depression	Gallam	60	MCS CS	144 258	7.6 7.8	none none	Water table and salinity	Limited
263	el Wasiya	Gently undulating	Gallam and Sabbat	>150	FS MFS MCS	4.5 6.3 8.9	8 7.9 7.8	none none none	Topography and Salinity	Moderate
264	el Wasiya	Flat, depression	Gallam, Sabbat	80	MCS MCS CS	18.2 26.4 32.5	7.8 7.6 7.6	none none none	Water table and salinity	Limited
265	el Wasiya	Undulating	el Adder	>150	FS MCS MCS	1.2 1.2 1.0	8 8 8	moderate none none	Topography	Limited
266	el Wasiya	Gently undulating	el Adder	>150	FS MCS MCS	0.7 1.2 2.0	8 8 7.9	none none none	Topography	Moderate
267	el Wasiya	Gently undulating	el Adder	>150	FS MS MS	0.7 1.5 2.0	8 7.9 8	none none none	Topography	Moderate

Soil Characteristics

Bore-hole No.	Survey Area	Landform	Vegetation	Water Table (cm)	Texture	ECe (mS/cm)	pH	CaCO ₃	Limitation	Suitability
268	ei Wasiya north of Nasr village	Gently undulating	el/Adder	> 150	FS MS MS	1.0 1.5 2.0	8 8 8	none none none	Topography	Moderate
269	ei Wasiya	Gently undulating	Callam, el Hadai	100	FS MCS CS	10 25 30.2	7.9 7.8 7.9	none slight none	Water table and salinity	Limited

C.6. Soil Analysis

Results of Physical Analysis

Pit No.	Core No.	Depth cm	Particle density	Bulk density	Porosity %	Water Capacity		AWC %
						0.3 atm	15 atm	
1	# 7	40	2.65	1.69	36	9.0	3.8	5.2
	#1	50	"	1.65	38	8.8	3.9	4.9
4	#17	top	"	1.52	43	20.0	9.7	10.3
	#14	40	"	1.51	43	11.0	5.6	5.4
6	#2	top	"	1.79	31	23.0	11.0	12.0
	#12	12	"	1.74	34	22.0	10.2	10.8
7	#6	85	"	1.63	38	7.0	2.7	4.3
	#23	100	"	1.65	38	6.8	3.6	3.2
9	#4	25	"	1.64	38	7.0	2.8	4.2
	#5	50	"	1.69	36	6.0	2.5	3.5
10	#10	25	"	1.57	41	8.0	3.6	4.4
	#24	60	"	1.68	37	9.4	3.6	5.8
12	#11	25	"	1.59	43	6.0	2.1	3.9
	#18	50	"	1.63	38	8.2	3.8	4.4
17	#20	25	"	1.56	41	8.9	3.9	5.0
	#16	70	"	1.64	38	8.0	4.2	3.8
19	#3	30	"	1.62	40	8.0	3.5	4.5
	#9	50	"	1.63	38	8.0	3.8	4.2
22	#19	40	"	1.60	40	9.3	3.5	5.8
	#8	70	"	1.61	40	7.0	2.6	4.4
24	#22	30	"	1.61	40	8.5	3.6	4.9
	#21	50	"	1.63	38	8.3	3.8	4.5
27	#15	top	"	1.70	36	7.0	2.9	4.1
	#13	top	"	1.68	37	6.0	2.7	3.3

Pit No.	Depth cm	Mechanical Analysis						CaCO ₃ %	S.P. %	pH	ECe mS/cm	Anions meq/L			Cations meq/L				CEC meq/100g soil	Exchangeable Cations meq/100g soil				ESP %	Total-N mg/100g soil	Org. M. %	Avail. P ppm	Gypsum Content tons/fed	Gypsum Requirement tons/fed	Boron	Remarks	
		Clay %	Silt %	F. Sand %	M. Sand %	C. Sand %	Total Sand %					Texture	HCO ₃	Cl	SO ₄	Ca	Mg	Na		K	Ca	Mg	Na									K
21	0 - 110	0.2	0.4	87.1	12.3	99.6	S	0.2	22	7.8	0.43	0.3	2.3	2.85	1.01	1.39	3.0	0.05	2.25	1.70	0.33	0.18	---	tr	0.003	tr	3.47					
	110 - 200	0.6	0.2	75.8	23.4	99.4	S	0.2	21	7.8	0.50	0.4	2.9	2.67	1.01	1.39	3.6	0.07	2.30	1.60	0.49	0.12	---	tr	0.001	tr	2.93					
	200 - 300	1.5	0.8	76.8	21.9	98.5	S	0.2	21	7.9	0.52	0.4	3.9	1.64	1.01	0.91	4.0	0.02	2.30	1.62	0.61	0.18	---	tr		tr	1.47					
22	0 - 20	0.4	12.7	70.4	16.5	99.6	S	0.2	21	7.3	3.9	0.32	31.36	18.12	6.56	18.68	23	1.0	2.1	1.61	0.17	0.28	---	tr	0.005	tr	8.64					
	20 - 90	0.3	11.8	74.8	13.1	99.7	S	0.2	22	7.4	3.1	0.32	13.72	25.96	16.65	6.45	15	1.9	2.1	0.43	1.20	0.38	---	tr	0.003	tr	10.24					
	90 - 130	0.3	11.7	71.6	16.2	99.7	S	0.4	22	7.3	11.5	0.36	117.60	30.74	30.30	27.30	90	1.1	1.9	0.23	1.33	0.38	---	tr		tr	13.92					
	130 - 180	0.8	11.5	76.2	11.5	99.2	S	0.4	23	7.6	15.1	0.36	181.30	19.44	28.28	40.42	130	2.4	2.5	1.21	1.03	0.25	---	tr		tr	5.41					
23	0 - 25	0.5	11.5	77.2	10.8	99.5	S	0.2	22	7.7	0.31	0.32	1.96	1.84	1.51	0.49	2.0	0.12	2.47	1.51	0.67	0.25	---	tr	0.005	tr	3.12					
	25 - 55	0.8	51.6	36.7	10.9	99.2	S	0.2	22	7.6	0.79	0.36	6.80	2.22	2.52	2.18	4.5	0.18	2.30	1.21	0.80	0.26	---	tr	0.003	tr	3.82					
	55 - 100	0.4	51.7	37.3	10.6	99.6	S	0.2	21	7.5	16.70	0.32	176.00	30.58	32.32	36.88	135.0	2.70	2.10	0.68	1.10	0.27	---	tr		tr	16.90					
	100 - 125	0.2	53.6	35.0	11.2	99.8	S	0.2	22	7.6	15.00	0.32	177.40	10.28	30.30	35.50	120.0	2.20	2.00	0.62	1.18	0.23	---	tr		tr	8.02					
24	0 - 20	0.6	49.6	38.3	11.5	99.4	S	0.2	20	7.8	0.46	0.81	3.90	0.85	1.51	0.39	3.5	0.16	2.05	0.46	1.37	0.12	---	tr	0.005	tr	3.12					
	20 - 80	0.8	50.8	37.6	10.8	99.2	S	0.4	20	7.8	0.45	0.36	1.96	2.64	1.61	1.29	2.0	0.16	2.30	0.76	1.32	0.16	---	tr	0.003	tr	4.69					
	80 - 170	0.4	51.7	37.3	10.6	99.6	S	0.2	20	7.8	0.52	0.32	2.94	3.36	1.01	0.69	4.6	0.12	2.10	0.52	1.49	0.11	---	tr		tr	6.30					
	170 - 300	0.2	56.3	31.8	11.7	99.8	S	0.2	22	7.5	0.71	0.32	4.90	2.54	0.51	1.89	5.2	0.16	2.24	0.23	1.89	0.18	---	tr		tr	4.70					
25	0 - 40	0.3	56.0	23.0	20.7	99.7	S	0.2	21	7.7	0.33	0.32	1.96	1.62	0.51	0.89	2.2	0.2	2.50	0.23	2.10	0.15	---	tr	0.020	tr	1.54					
	40 - 120	0.6	63.1	25.3	11.0	99.4	S	0.2	22	7.8	0.47	0.18	3.92	1.60	0.51	1.39	3.6	0.1	2.15	0.78	1.18	0.17	---	tr	0.010	tr	3.12					
	120 - 220	0.3	64.3	24.8	10.6	99.7	S	0.2	20	7.7	0.63	0.32	3.92	2.96	1.01	1.39	4.7	0.1	2.11	0.72	1.18	0.13	---	tr		tr	3.36					
	220 - 310	0.8	72.0	25.3	1.9	99.2	S	0.2	17	7.6	1.55	0.32	11.76	5.04	2.52	2.78	11.7	0.12	2.00	0.68	0.84	0.42	---	tr		tr	4.66					
26	0 - 30	0.6	6.0	42.1	51.3	99.4	S	0.2	20	7.95	0.26	0.36	0.98	2.16	1.51	0.89	1.0	0.10	1.81	0.67	0.87	0.13	---	0.65	0.580	tr	3.10					
	30 - 115	0.3	1.5	48.0	50.2	99.7	S	1.8	15	7.8	0.37	0.32	1.96	2.66	1.51	1.29	2.0	0.14	1.99	0.22	1.60	0.14	---	0.50	0.460	tr	4.70					
	115 - 165	0.4	2.3	47.3	50.0	99.6	S	3.0	20	7.8	0.52	0.32	2.94	3.24	2.02	1.78	2.6	0.10	2.35	0.90	1.30	0.13	---			tr	4.02					
	165 - 300	0.5	63.3	22.7	13.5	99.5	S	2.0	20	7.7	0.34	0.36	1.96	1.40	0.51	0.89	2.2	0.12	2.35	0.31	1.87	0.13	---			tr	3.14					
27	0 - 30	0.5	13.3	36.0	50.2	99.5	S	0.6	20	7.7	1.70	0.54	8.82	9.16	5.55	4.95	8.7	0.72	2.95	0.45	1.39	0.18	---	0.70	0.600	tr	3.86					
	30 - 70	0.8	11.0	37.5	50.7	99.2	S	0.2	18	7.6	0.87	0.32	4.90	4.20	1.51	3.29	4.0	0.62	1.75	0.21	1.34	0.18	---	0.62	0.520	tr	3.04					
	165 - 300	0.9	3.1	75.0	21.0	99.1	S	0.2	21	7.7	0.92	0.36	6.86	3.88	2.02	2.78	5.0	1.30	2.25	1.86	0.36	0.10	---			tr	3.02					

APPENDIX-D. Irrigation and Drainage

D.1. Irrigation and Drainage Plan	D-1
D.2. Infiltration Test, Hydraulic Conductivity Measurement and Leaching Test	D-35
D.3. Available Water from River Nile, Bahr Hadous Drain and El Sirw Drain	D-57

D.1. Irrigation and Drainage Plan

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

Item	Location	Weighting Factor	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total (Mean)
			14.2	14.7	16.4	18.7	21.8	25.0	26.6	27.3	26.1	24.3	20.6	16.0	
Mean daily temperature (°C)	Port Said	0.5	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)
	Ismailia	0.3	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)
	El Arish	0.2	14.0	14.7	16.4	19.2	22.4	25.4	27.2	27.8	26.2	24.0	20.2	15.8	
	Project Area														
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	38	42	50	53	51	56	59	60	(51)
	El Arish	0.2	70	69	67	67	68	72	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	2.6	(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 D-1 Estimation of Weighing Factor for Calculation of Mean Climatic Characteristics by Thiessen Method

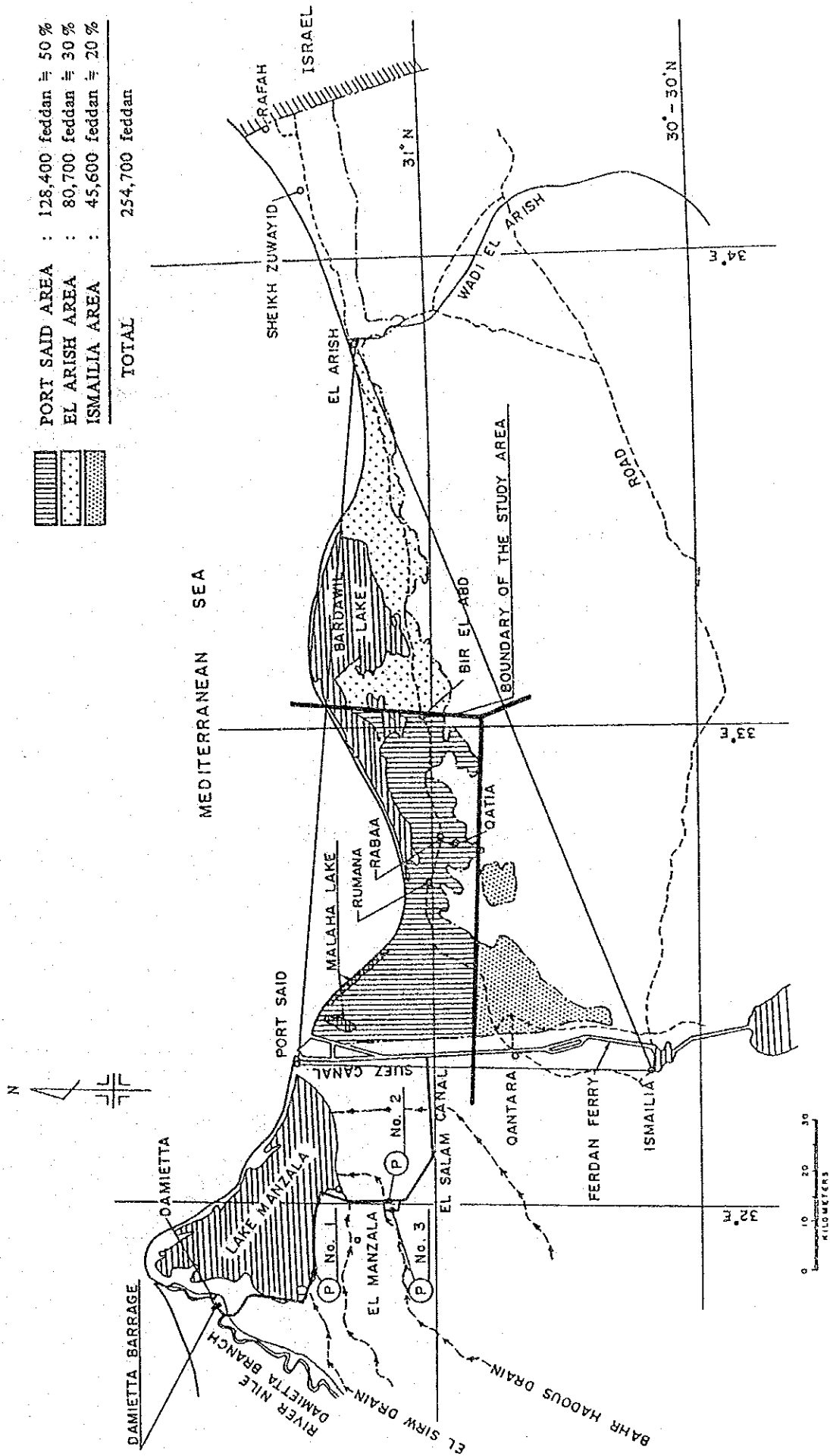


Table D.1-2 Calculation Method of Reference Crop Evapotranspiration (ET_o)

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,

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

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 D.1-3 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	22.8
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	65.7
Mean wind speed : km/day	326	338	403	372	339	326	321	277	279	271	283	299	329
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	77.6
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	27.0
Actual water vapour pressure : 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	18.0
ea - ed	5.3	5.6	7.4	9.1	11.0	12.3	12.5	12.6	12.4	10.4	7.8	6.0	9.0
Wind function : f(u)	1.15	1.18	1.36	1.27	1.19	1.15	1.14	1.02	1.02	1.00	1.03	1.08	1.12
Weighting factor : (1-N)	0.39	0.38	0.36	0.33	0.29	0.26	0.24	0.23	0.25	0.27	0.32	0.36	0.30
Weighting factor : (W)	0.61	0.62	0.64	0.67	0.71	0.74	0.76	0.77	0.75	0.73	0.68	0.64	0.70
Extra-terrestrial radiation : Ra 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	12.8
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	9.0
Net shortwave radiation : Rns	3.76	4.68	5.76	6.76	7.84	8.60	8.48	7.94	7.02	5.50	4.25	3.57	6.5
Effect of temperature on Rnl : f(t)	13.5	13.6	13.9	14.4	15.1	15.8	16.1	16.3	15.9	15.4	14.6	13.8	15.0
Effect of vapour pressure on Rnl: f(ed)	0.195	0.193	0.192	0.180	0.163	0.142	0.126	0.121	0.136	0.146	0.163	0.188	0.16
Effect of ratio n/N on Rnl : f(n/N)	0.898	0.720	0.714	0.725	0.790	0.864	0.862	0.864	0.873	0.808	0.746	0.708	0.80
Net longwave radiation : Rnl	1.84	1.89	1.91	1.88	1.94	1.94	1.75	1.70	1.89	1.82	1.80	1.84	1.84
Net radiation : Rn	1.92	2.79	3.85	4.88	5.90	6.66	6.73	6.24	5.13	3.68	2.45	1.73	4.5
Adjustment factor : c	0.833	0.866	0.905	0.940	0.964	0.981	0.978	0.966	0.946	0.895	0.851	0.826	0.90
(RHmax ≈ 60%, Uday ≈ 3 m/s, Uday/Night ≈ 1)													
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 D.1-4 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	≈70
Reference crop evap. (RHmin = 20-50%, U 3.5 m/s)	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)
	92	92	123	148	187	227	248	242	204	156	117	93	1,929

Table D.1-5 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 D.1-6 Reference Crop Evapotranspiration

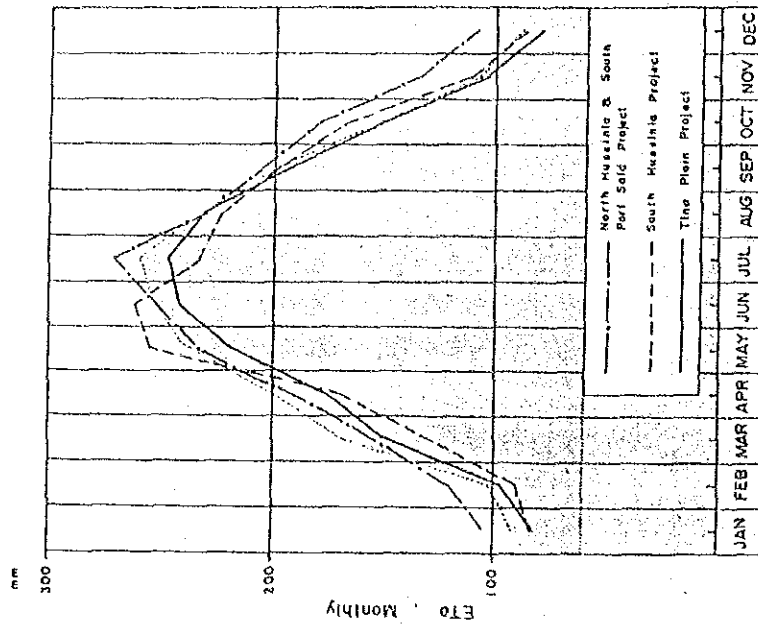
METHOD	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	REMARKS
(1) M/P Land Reclamation Area (Climatic data : Port Said, Ismailia & El Arish)														
Blaney Criddle	92	92	123	148	187	227	248	242	204	156	117	93	1,929	
Penman	92	103	171	200	239	259	233	199	153	108	88	88	2,092	adopted
Radiation	90	104	148	178	228	254	266	251	209	162	111	89	2,090	
(2) North Hussinia & South Port Said Project (Climatic data : Port Said) 1/														
Blaney Criddle	105	120	155	192	233	252	270	229	204	180	135	109	2,184	
Penman	105	123	198	228	273	285	282	257	219	186	126	93	2,375	
Radiation	90	106	149	180	223	246	264	223	186	152	106	87	2,014	
(3) South Hussinia (Climatic data : Mansura) 2/														
Blaney Criddle	84	90	130	171	254	261	233	223	198	167	111	87	2,009	
Penman	87	106	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	
(4) Tina Plain Development Project (Climatic data : Port Said & Ismailia) 3/														
Blaney Criddle	81	95	127	153	195	213	223	233	210	152	105	84	1,871	
Penman	83	97	150	177	219	241	236	231	193	150	104	80	1,971	
Radiation	78	98	142	172	222	248	260	243	205	154	101	78	2,001	
(5) North Sinai Project (Climate data : Port Said, Ismailia, El Arish, Rafah, El Maghara and El Ausajima) 4/														
Penman	92	105	163	196	236	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 - GARPAD, June 1987

4/ Source : PPU (GARPAD)



ETo for M/P Land Reclamation Area

Table D.1-7 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	0.60	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	0.85	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

(Unit: mm)

Table D.1-8 Daily Crp Water Requirement

CROPS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MAX.
1. BARLEY	2.67	4.05	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	1.42	4.05
2. BERSEEM	2.23	2.76	4.14	5.00	5.78	0.00	0.00	0.00	0.00	0.00	1.80	2.13	5.78
3. FLAX	2.82	3.68	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	1.99	3.68
4. PEAS - GREEN	3.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.97	2.16	2.55	3.12
5. POTATO	2.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.48	2.88	2.98	2.98
6. FODDER BEET	2.67	3.86	5.79	6.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44	1.70	6.00
7. WHEAT	2.08	3.31	5.79	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	5.79
8. SQUASH	2.57	1.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	2.13	2.67
9. SQUASH	1.48	2.76	4.96	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.96
10. CUCUMBER	2.67	2.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	2.13	2.67
11. SAFFLOWER	2.82	3.86	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44	1.99	3.86
12. TOMATO	2.82	3.68	4.41	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	1.99	4.41
13. TOMATO	0.00	0.00	0.00	0.00	0.00	4.22	5.85	7.14	6.63	3.95	1.08	0.00	7.14
14. TOMATO	0.00	0.00	0.00	0.00	3.85	5.90	7.94	7.52	5.31	1.48	0.00	0.00	7.94
15. FRENCH BEAN	0.00	0.00	0.00	0.00	3.85	6.75	7.94	7.52	0.66	0.00	0.00	0.00	7.94
16. GROUNDNUT	0.00	0.00	0.00	0.00	2.31	5.06	6.68	7.14	5.31	0.99	0.00	0.00	7.14
17. MAIZE - FODDER	0.00	0.00	0.00	0.00	2.31	6.75	6.27	5.26	5.31	0.00	0.00	0.00	6.75
18. PEPPER	2.67	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.47	2.88	2.70	3.31
19. RICE	0.00	0.00	0.00	0.00	6.94	9.28	9.19	8.64	7.63	0.49	0.00	0.00	9.28
20. SUNFLOWER	0.00	0.00	0.00	0.00	0.00	3.37	5.85	7.89	1.33	0.00	0.00	0.00	7.89
21. SUNFLOWER	0.00	1.47	3.86	7.00	1.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00
22. CANTALOUPE	0.00	0.00	0.00	0.00	3.08	6.32	7.94	4.89	0.00	0.00	0.00	0.00	7.94
23. NAPIER GRASS	0.00	0.00	0.00	0.00	3.08	6.75	8.35	4.51	5.31	0.00	0.00	0.00	8.35
24. SORDAN	0.00	0.00	0.00	0.00	2.31	6.75	8.35	4.51	5.31	0.00	0.00	0.00	8.35
25. ALFALFA	2.52	3.49	5.52	6.67	7.32	8.01	4.93	4.43	3.91	2.91	3.42	2.70	8.01
26. ALFALFA	2.52	3.49	5.52	6.67	0.00	0.00	0.00	0.00	0.00	2.91	3.42	2.70	6.67
27. APPLE	0.00	0.00	3.09	4.00	4.93	5.73	5.68	4.81	4.25	2.96	1.87	0.00	5.73
28. FIG	0.00	0.00	2.21	3.73	4.93	6.07	5.68	5.11	3.98	2.76	1.44	0.00	6.07
29. GRAPE	0.00	0.00	1.77	3.20	4.01	4.72	4.68	3.91	2.92	1.78	1.01	0.00	4.72
30. GUAVA	1.78	2.21	3.09	3.73	4.01	4.39	4.34	3.91	3.45	2.76	2.02	1.59	4.39
31. OLIVE	1.42	1.77	3.65	3.20	3.70	4.05	4.01	3.61	3.18	2.37	1.73	1.36	4.05
32. ORANGE	1.78	2.21	3.53	4.27	4.32	4.39	4.34	3.91	3.45	2.76	2.02	1.59	4.39

Table D.1-9 Monthly Crop Water Requirement

(Unit: mm)

CROPS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1. BARLEY	82.8	113.3	34.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.6	44.0	295.9
2. BERSEEM	69.0	77.3	128.2	150.0	179.2	0.0	0.0	0.0	0.0	0.0	54.0	66.0	723.7
3. FLAX	87.4	103.0	34.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	61.6	340.2
4. PEAS - GREEN	96.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.2	64.8	79.2	301.8
5. POTATO	73.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.9	86.4	92.4	298.3
6. FODDER BEET	82.8	108.2	179.6	180.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	52.8	646.5
7. WHEAT	64.4	92.7	179.6	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.2	411.8
8. SQUASH	82.8	51.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	66.0	254.3
9. SQUASH	46.0	77.3	153.9	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	377.1
10. CUCUMBER	82.8	72.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	66.0	274.9
11. SAFFLOWER	87.4	108.2	34.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	61.6	334.5
12. TOMATO	87.4	103.0	136.8	60.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	61.6	502.8
13. TOMATO	0.0	0.0	0.0	0.0	0.0	126.5	181.3	221.3	199.0	122.4	32.4	0.0	882.9
14. TOMATO	0.0	0.0	0.0	0.0	119.5	177.1	246.0	233.0	159.2	45.9	0.0	0.0	980.7
15. FRENCH BEAN	0.0	0.0	0.0	0.0	119.5	202.4	246.0	233.0	19.9	0.0	0.0	0.0	820.8
16. GROUNDNUT	0.0	0.0	0.0	0.0	71.7	151.8	207.2	221.3	159.2	30.6	0.0	0.0	841.8
17. MAIZE - FODDER	0.0	0.0	0.0	0.0	71.7	202.4	194.2	163.1	159.2	0.0	0.0	0.0	790.6
18. PEPPER	82.8	92.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.5	86.4	83.6	422.0
19. RICE	0.0	0.0	0.0	0.0	215.1	278.3	286.9	267.9	238.8	15.3	0.0	0.0	1290.4
20. SUNFLOWER	0.0	0.0	0.0	0.0	0.0	101.2	181.3	244.7	39.8	0.0	0.0	0.0	566.9
21. SUNFLOWER	0.0	41.2	119.7	210.0	47.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	418.7
22. CANTALOUPE	0.0	0.0	0.0	0.0	95.6	189.7	246.0	151.4	0.0	0.0	0.0	0.0	682.8
23. NAJIER GRASS	0.0	0.0	0.0	0.0	95.6	202.4	259.0	139.8	159.2	0.0	0.0	0.0	856.0
24. SORDAN	0.0	0.0	0.0	0.0	71.7	202.4	259.0	139.8	159.2	0.0	0.0	0.0	832.1
25. ALFALFA	78.2	97.8	171.0	200.0	227.0	240.3	152.8	137.5	117.4	90.3	102.6	83.6	1698.6
26. ALFALFA	78.2	97.8	171.0	200.0	0.0	0.0	0.0	0.0	0.0	90.3	102.6	83.6	823.5
27. APPLE	0.0	0.0	95.8	120.0	153.0	172.0	176.1	149.1	127.4	91.8	56.2	0.0	1141.3
28. FIG	0.0	0.0	68.4	112.0	153.0	182.2	176.1	158.4	119.4	85.7	43.2	0.0	1098.4
29. GRAPE	0.0	0.0	54.7	96.0	124.3	141.7	145.0	121.2	87.6	55.1	30.2	0.0	855.8
30. GUAVA	55.2	61.8	95.8	112.0	124.3	131.6	134.7	121.2	103.5	85.7	60.5	49.3	1135.4
31. OLIVE	44.2	49.4	82.1	96.0	114.7	121.4	124.3	111.8	95.5	73.4	51.8	42.2	1007.0
32. ORANGE	55.2	61.8	109.4	128.0	133.8	131.6	134.7	121.2	103.5	85.7	60.5	49.3	1174.6

Table D.1-10 Field Irrigation Requirement (CP-1)

(FARM AREA = 40.0 ha)

CROPS	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
		(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
FLAX	4.0	3496.0	4120.0	1365.0	0.0	0.0	0.0
POTATO	1.0	736.0	0.0	0.0	0.0	0.0	0.0
FODDER 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
NAPIER GRASS	4.0	0.0	0.0	0.0	0.0	3624.0	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 ³ /month/beddar		313.4	376.8	503.5	517.4	405.0	622.7
m ³ /day/beddar		10.1	13.5	16.2	17.2	13.1	20.8
l/sec/beddar		0.137	0.156	0.188	0.200	0.151	0.240
m ³ /month/ha		748.1	897.1	1198.7	1232.0	964.4	1482.6
m ³ /day/ha		24.1	32.0	38.7	41.1	31.1	49.4
l/sec/ha		0.279	0.371	0.448	0.479	0.360	0.572

(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	2160.0	2464.0	13608.0
POTATO	1.0	0.0	0.0	0.0	459.0	864.0	924.0	2983.0
FODDER 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	22676.0
CANTALOUPE	2.0	4921.0	3029.0	0.0	0.0	0.0	0.0	13657.0
NAPIER 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	7041.6	5436.2	6156.0	5036.0	101916.4
ALFALFA	4.0	0.0	0.0	0.0	3630.0	4104.0	3364.0	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	24567.2	485227.5
m ³ /month/beddar		701.1	579.3	375.7	180.6	261.3	258.2	5094.9
m ³ /day/beddar		22.6	18.7	12.5	5.8	8.7	8.3	
l/sec/beddar		0.262	0.216	0.145	0.067	0.101	0.096	
m ³ /month/ha		1669.3	1379.4	894.5	429.9	622.1	614.7	12130.7
m ³ /day/ha		53.8	44.5	29.8	13.5	20.7	19.8	
l/sec/ha		0.623	0.515	0.345	0.161	0.240	0.229	

Table D.1-11 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
m/month/feddan		278.9	367.7	664.3	462.0	719.4	832.4
m/day/feddan		8.9	13.1	21.4	15.4	23.2	27.7
l/sec/feddan		0.103	0.152	0.248	0.178	0.269	0.321
m/month/ha		659.3	875.5	1581.7	1100.0	1712.3	1981.8
m/day/ha		21.3	31.5	51.0	36.7	55.3	66.1
l/sec/ha		0.246	0.362	0.591	0.424	0.539	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	41195.0
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	129039.3
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
m/month/feddan		970.0	840.0	640.8	107.1	126.5	178.6	6187.7
m/day/feddan		31.3	27.1	21.4	3.5	4.3	5.8	
l/sec/feddan		0.362	0.314	0.247	0.040	0.050	0.067	
m/month/ha		2309.4	1999.9	1525.7	255.0	306.0	425.3	14732.6
m/day/ha		74.5	64.5	50.9	8.2	10.2	13.7	
l/sec/ha		0.862	0.747	0.589	0.095	0.118	0.159	

Table D.1-12 Field Irrigation Requirement (CP-3)

(FARM AREA = 30.0 ha)

CROPS	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
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	4965.0	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	41403.6
m/month/feddan		235.7	254.2	403.6	439.3	364.9	579.6
m/day/feddan		7.6	9.1	13.0	14.6	11.8	19.3
l/sec/feddan		0.088	0.105	0.151	0.169	0.136	0.224
m/month/ha		561.2	605.1	961.0	1046.0	888.8	1380.1
m/day/ha		18.1	21.6	31.0	34.9	28.0	48.0
l/sec/ha		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
		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
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	5018.2
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	6130.0
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	12860.0
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	47084.2	41625.4	28626.1	14779.8	16718.4	13358.4	324860.4
m/month/feddan		659.2	582.8	400.8	206.9	234.1	187.0	4348.0
m/day/feddan		21.3	18.8	13.4	6.7	7.2	6.0	
l/sec/feddan		0.246	0.218	0.155	0.077	0.090	0.070	
m/month/ha		1569.5	1387.5	954.2	492.7	557.3	445.3	10828.7
m/day/ha		50.6	44.8	31.8	15.9	18.6	14.6	
l/sec/ha		0.586	0.518	0.368	0.154	0.215	0.166	

Table D.1-13 Field Irrigation Requirement (CP-4)

(FARM AREA = 25.0 ha)

CROPS	AREA PLANTED	JAN	FEB	MAR	APR	MAY	JUN
	(ha)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
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
	m/month/feddan	336.2	467.2	711.0	831.6	542.1	743.5
	m/day/feddan	10.8	16.7	22.9	27.7	17.5	24.8
	l/sec/feddan	0.126	0.193	0.265	0.321	0.202	0.267
	m/month/ha	800.4	1112.4	1692.9	1980.0	1290.6	1771.0
	m/day/ha	25.8	39.7	54.6	68.0	41.5	59.0
	l/sec/ha	0.299	0.460	0.632	0.764	0.482	0.683

(FARM AREA = 25.0 ha)

CROPS	AREA PLANTED	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	(ha)	(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	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
	m/month/feddan	637.5	485.4	464.7	227.5	313.0	292.0	6051.8
	m/day/feddan	20.6	15.7	15.5	7.3	10.4	9.4	
	l/sec/feddan	0.238	0.181	0.179	0.085	0.121	0.109	
	m/month/ha	1517.7	1155.7	1106.4	541.6	745.2	695.2	14409.2
	m/day/ha	49.0	37.3	36.9	17.5	24.8	22.6	
	l/sec/ha	0.567	0.431	0.427	0.202	0.267	0.260	

Table D.1-14 Field Irrigation Requirement (CP-5)

(FARM AREA = 10.0 ha)

CROPS	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
		(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
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	0.436	0.532	0.617

(FARM AREA = 10.0 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)
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	864.0	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	0.229	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	

Table D.1-15 Field Irrigation Requirement

CP - 1 (smallholders, sand flat)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
m/month/beddan	333.4	376.8	503.5	517.4	405.0	622.7	701.1	579.3	375.7	180.6	261.3	258.2	5092.9
m/day/beddan	10.1	13.5	16.2	17.2	13.1	20.8	22.6	18.7	12.5	5.8	8.7	8.3	
l/sec/beddan	0.117	0.156	0.188	0.200	0.151	0.240	0.262	0.216	0.145	0.067	0.101	0.096	

CP - 2 (smallholders, clay flat)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
m/month/beddan	274.9	367.7	464.3	462.0	719.4	832.4	970.0	840.0	640.0	107.1	128.5	178.4	5187.7
m/day/beddan	8.9	13.1	15.4	15.4	23.2	27.7	31.3	27.1	21.2	3.5	4.2	5.8	
l/sec/beddan	0.103	0.152	0.248	0.178	0.269	0.321	0.362	0.316	0.247	0.040	0.090	0.087	

CP - 3 (graduates)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
m/month/beddan	255.7	254.2	403.6	439.3	364.9	579.4	659.2	582.8	400.8	204.9	234.1	187.0	4548.0
m/day/beddan	7.6	9.1	13.0	14.6	11.8	19.3	21.3	18.8	13.2	6.7	7.5	5.7	
l/sec/beddan	0.088	0.105	0.151	0.169	0.156	0.226	0.246	0.218	0.155	0.077	0.090	0.070	

CP - 4 (investors, livestock)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
m/month/beddan	336.2	467.2	711.0	831.6	542.1	743.8	837.5	485.4	444.7	237.5	313.0	292.0	2051.8
m/day/beddan	10.2	16.2	23.5	27.7	17.5	24.3	28.0	15.7	15.5	7.5	10.4	9.2	
l/sec/beddan	0.125	0.173	0.255	0.321	0.202	0.287	0.238	0.151	0.179	0.083	0.121	0.109	

CP - 5 (investors, fruit)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
m/month/beddan	46.4	51.9	350.5	477.1	598.3	671.6	678.3	587.2	474.7	364.4	206.9	111.2	5229.1
m/day/beddan	1.5	1.9	11.3	15.9	19.3	22.4	21.9	18.9	15.3	11.1	6.9	3.3	
l/sec/beddan	0.017	0.021	0.131	0.194	0.223	0.259	0.253	0.219	0.233	0.129	0.260	0.055	

Table D.1-16 Project Irrigation Supply for Each Cropping Pattern
(not including irrigation water for windbreak)

CP - 1 (smallholders, sand flat)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
m/month/beddan	482.5	580.7	775.4	793.0	614.3	933.3	1075.3	887.1	571.6	270.3	396.9	396.5	7797.2
m/day/beddan	15.6	20.7	24.9	26.4	19.8	31.8	34.7	28.5	19.1	8.7	13.3	12.8	
l/sec/beddan	0.180	0.240	0.289	0.306	0.229	0.368	0.401	0.331	0.221	0.101	0.154	0.148	

CP - 2 (smallholders, clay flat)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
m/month/beddan	461.5	612.8	1107.2	770.0	1199.0	1387.3	1616.6	1399.9	1068.0	178.5	214.2	297.7	50312.3
m/day/beddan	14.9	21.9	35.7	25.7	38.7	46.2	52.1	45.2	35.6	5.8	7.1	9.6	
l/sec/beddan	0.172	0.252	0.443	0.297	0.448	0.533	0.604	0.523	0.412	0.067	0.083	0.111	

CP - 3 (graduates)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
m/month/beddan	363.8	392.1	604.1	649.5	524.5	954.9	978.9	866.1	590.8	297.6	359.3	288.2	5760.2
m/day/beddan	11.7	12.0	19.5	21.7	16.9	28.5	31.6	27.9	18.5	9.6	11.7	9.3	
l/sec/beddan	0.136	0.162	0.226	0.251	0.196	0.330	0.365	0.323	0.228	0.111	0.135	0.108	

CP - 4 (investors, livestock)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
m/month/beddan	528.5	750.0	1111.0	1299.4	947.0	1182.2	998.0	750.4	726.1	355.4	489.0	456.2	9456.0
m/day/beddan	16.9	28.1	35.3	43.3	27.3	38.7	32.1	24.5	24.2	11.5	16.3	14.7	
l/sec/beddan	0.196	0.302	0.415	0.501	0.316	0.448	0.372	0.283	0.280	0.133	0.189	0.170	

CP - 5 (investors, fruit)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
m/month/beddan	63.5	71.1	480.1	633.4	219.5	919.9	929.8	504.3	650.3	471.8	283.3	56.7	4206.2
m/day/beddan	2.0	2.3	15.3	21.8	20.1	30.7	30.0	15.9	21.7	15.2	9.4	1.8	
l/sec/beddan	0.026	0.029	0.179	0.252	0.306	0.353	0.347	0.300	0.225	0.176	0.109	0.021	

Table D.1-17 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	7466.7	11066.7	
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	
NAPIER 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	4835.4	5418.1	8995.1	10520.5	12572.1	13308.5	
TOTAL		60.0	45951.9	55308.7	73654.4	75520.5	58504.8	90789.6	
			m/month/feddar	462.5	580.7	773.4	793.0	614.3	953.3
			m/day/feddar	15.6	20.7	24.9	26.4	19.8	31.8
			l/sec/feddar	0.180	0.240	0.289	0.306	0.229	0.365
			m/month/ha	1148.8	1382.7	1841.4	1888.0	1462.6	2269.7
			m/day/ha	37.1	49.4	59.1	62.9	47.2	75.7
			l/sec/ha	0.429	0.572	0.657	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	121218.5
CUCUMBER	1.0	0.0	0.0	0.0	0.0	843.7	1021.2	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	2886.7	0.0	0.0	61296.8
FRENCH BEAN	2.0	7689.1	7281.2	621.9	0.0	0.0	0.0	25691.5
SUNFLOWER	4.0	11331.2	15290.6	2487.5	0.0	0.0	0.0	35431.4
CANTALOUPE	2.0	7689.1	4732.8	0.0	0.0	0.0	0.0	21339.0
NAPIER GRASS	4.0	16187.5	8737.5	9950.0	0.0	0.0	0.0	52900.0
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	13621.1	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/ha	1075.3	867.1	571.6	270.3	399.9	7797.8
		m/day/ha	34.7	28.6	19.1	8.7	13.3	12.8
		l/sec/ha	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	18566.2
		m/day/ha	82.6	68.1	45.4	20.8	31.7	30.5
		l/sec/ha	0.956	0.789	0.525	0.240	0.367	0.353

Table D.1-18 Project Irrigation Supply (CP-2)

(FARM AREA = 30.0 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)
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	35250.0	46325.3
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	79087.4	55000.0	85641.6	99091.6
			461.5	612.8	1107.2	770.0	1199.0	1387.3
			14.9	21.9	35.7	25.7	38.7	46.2
			0.172	0.253	0.413	0.297	0.448	0.535
			1098.9	1459.2	2636.2	1832.3	2854.7	3303.1
			35.4	52.1	85.0	61.1	92.1	110.1
			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 ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
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	44656.3	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	21523.3	11650.0	13266.7	0.0	0.0	0.0	69141.6
TOTAL	57.5	115470.7	99995.6	76283.2	12750.0	15300.0	21266.6	736628.2
		1616.6	1399.9	1068.0	178.5	214.2	297.7	20312.8
		52.1	45.2	35.6	5.8	7.1	9.6	
		0.604	0.523	0.412	0.067	0.083	0.111	
		3849.0	3333.2	2542.8	425.0	510.0	708.9	24554.3
		124.2	107.5	84.8	13.7	17.0	22.9	
		1.437	1.244	0.981	0.159	0.197	0.265	

Table D.1-19 Project Irrigation Supply (CP-3)

(FARM AREA = 30.0 ha)

CROPS	PROJECT EFFICIENCY	AREA PLANTED (ha)	JAN	FEB	MAR	APR	MAY	JUN
			(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
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	1.5	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	5633.2
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	3933.3	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
m/month/feecan			363.8	392.1	604.1	649.5	524.5	854.9
m/day/feecan			11.7	14.0	19.5	21.7	16.9	28.5
l/sec/feecan			0.136	0.162	0.226	0.251	0.196	0.330
m/month/ha			866.2	933.6	1438.3	1546.5	1248.8	2035.6
m/day/ha			27.9	31.3	46.4	51.6	40.3	67.9
l/sec/ha			0.323	0.386	0.537	0.597	0.468	0.795

(FARM AREA = 30.0 ha)

CROPS	AREA PLANTED (ha)	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
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	682917.6
m/month/feecan		978.9	866.1	590.8	297.6	350.3	288.2	6760.8
m/day/feecan		31.6	27.9	19.7	9.6	11.7	9.3	
l/sec/feecan		0.365	0.323	0.228	0.111	0.135	0.108	
m/month/ha		2330.7	2062.1	1406.6	708.5	934.1	686.3	16097.3
m/day/ha		75.2	66.5	46.9	22.9	27.8	22.1	
l/sec/ha		0.870	0.770	0.543	0.265	0.322	0.256	

Table D.1-20 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	6468.7	8851.6	2671.9	0.0	0.0	0.0
FODDER BEET	0.64	5.0	6468.7	8449.2	14027.3	14062.5	0.0	0.0
MAIZE - FODDER	0.64	5.0	0.0	0.0	0.0	0.0	3601.6	15812.5
SUNFLOWER	0.64	5.0	0.0	3218.7	9551.6	16406.2	3734.4	0.0
SORDAN	0.64	5.0	0.0	0.0	0.0	0.0	3601.6	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/month/feddan			525.3	730.0	1111.0	1299.4	847.0	1162.2
m/day/feddan			14.9	26.1	35.8	43.3	27.3	38.7
l/sec/feddan			0.196	0.302	0.415	0.501	0.316	0.448
m/month/ha			1250.6	1738.1	2645.2	3093.7	2016.6	2767.2
m/day/ha			40.3	62.1	85.3	103.1	65.1	92.2
l/sec/ha			0.447	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	3325.0	6125.0	50507.8
MAIZE - FODDER	5.0	15175.8	12742.2	12437.5	0.0	0.0	0.0	41769.5
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	44337.5
TOTAL	40.0	59286.7	45143.7	43220.3	21157.0	29109.4	27156.2	562857.7
m/month/ha		996.0	758.4	726.1	355.4	489.0	456.2	9456.0
m/day/ha		32.1	24.5	24.2	11.5	16.3	14.7	
l/sec/ha		0.372	0.283	0.280	0.133	0.189	0.170	
m/month/ha		2371.5	1805.7	1728.8	848.3	1164.4	1086.2	22514.3
m/day/ha		76.5	58.2	57.6	27.5	38.8	35.0	
l/sec/ha		0.885	0.674	0.667	0.316	0.449	0.406	

Table D.1-21 Project Irrigation Supply (CP-5)

(FARM AREA = 10.0 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)
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	1933.4	1802.2
TOTAL		10.0	1512.2	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	0.500	0.729	0.845

(FARM AREA = 10.0 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)
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	6746.3	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	4.1	
l/sec/ha		0.627	0.715	0.597	0.419	0.260	0.050	

Table D.1-22 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	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	
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	JAN	FEB	MAR	APR	MAY	JUN	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	33836.3	31566.7	654307.5						
CP - 5	5700.0	5564.9	4813.7	3892.0	2823.7	1695.5	359.3	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 D.1-23 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 Mazar	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 D.I-24 Project Irrigation Supply for Western Area of F/S Area

CROPPING PATTERN	NET CULTIVABLE AREA (FEDDAN)	PROJECT IRRIGATION SUPPLY (1000 CU.M)					
		JAN	FEB	MAR	APR	MAY	JUN
CP - 1	10100.0	5116.9	6158.3	8201.9	8409.8	6514.6	10109.7
CP - 2	29500.0	14295.0	18981.5	34295.5	23850.7	37139.0	42971.6
CP - 3	31300.0	11956.3	12886.4	19853.7	21345.8	17237.7	28096.3
CP - 4	34900.0	19249.6	26750.8	40712.6	47616.5	31038.3	42588.8
CP - 5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	105800.0	50617.8	64777.0	103063.7	101222.8	91929.6	123766.4
	(CU.M/SEC)	18.9	26.8	38.5	39.1	34.3	47.7

CROPPING PATTERN	NET CULTIVABLE AREA (FEDDAN)	PROJECT IRRIGATION SUPPLY (1000 CU.M)						TOTAL
		JUL	AUG	SEP	OCT	NOV	DEC	
CP - 1	10100.0	11403.6	9407.7	6061.8	2866.5	4240.9	4204.9	82696.6
CP - 2	29500.0	50074.2	43361.9	33081.3	5529.0	6634.8	9221.3	319435.5
CP - 3	31300.0	32171.5	28464.4	19416.6	9780.6	11512.6	9471.7	222193.3
CP - 4	34900.0	36498.4	27791.6	26607.9	13023.6	17919.4	16717.4	346514.7
CP - 5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	105800.0	130147.6	109025.4	85167.6	31199.8	40307.8	39615.3	970840.7
	(CU.M/SEC)	48.6	40.7	32.9	11.6	15.6	14.8	

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 D.1-25 Project Irrigation Supply for F/S Area

CROPPING PATTERN	NET CULTIVABLE AREA (FEDDAN)	PROJECT IRRIGATION SUPPLY (1000 CU.M)					
		JAN	FEB	MAR	APR	MAY	JUN
CP - 1	23500.0	11905.7	14328.8	19083.6	19567.3	15157.9	23522.7
CP - 2	1800.0	872.2	1158.2	2092.6	1455.3	2266.1	2622.0
CP - 3	4600.0	1757.2	1893.8	2917.8	3137.1	2533.3	4129.2
CP - 4	6000.0	3309.4	4599.0	6999.3	8186.2	5336.1	7321.9
CP - 5	5700.0	380.0	425.5	2873.4	3911.8	4904.7	5505.6
TOTAL	41600.0	18224.5	22405.3	33966.7	36257.7	30198.1	43101.3
	(CU.M/SEC)	6.8	9.3	12.7	14.0	11.3	16.6

CROPPING PATTERN	NET CULTIVABLE AREA (FEDDAN)	PROJECT IRRIGATION SUPPLY (1000 CU.M)						TOTAL
		JUL	AUG	SEP	OCT	NOV	DEC	
CP - 1	23500.0	26533.0	21889.2	14104.2	6669.7	9867.5	9783.6	192412.9
CP - 2	1800.0	3055.4	2645.8	2018.5	337.4	404.8	562.7	19491.0
CP - 3	4600.0	4728.1	4183.3	2853.6	1437.4	1691.9	1392.0	32654.6
CP - 4	6000.0	6274.8	4777.9	4574.4	2239.0	3080.7	2874.1	59572.8
CP - 5	5700.0	5564.9	4813.7	3892.0	2823.7	1695.5	339.3	37130.3
TOTAL	41600.0	46156.1	38309.9	27442.8	13507.2	16740.6	14951.7	341261.5
	(CU.M/SEC)	17.2	14.3	10.6	5.0	6.5	5.6	

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 D.1-26 Project Irrigation Supply for Hod Abu Samara

CROPPING PATTERN	NET CULTIVABLE AREA (FEDDAN)	PROJECT IRRIGATION SUPPLY (1000 CU.M)					
		JAN	FEB	MAR	APR	MAY	JUN
CP - 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CP - 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CP - 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CP - 4	11200.0	6177.5	8584.8	13065.4	15280.9	9960.7	13667.5
CP - 5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	11200.0	6177.5	8584.8	13065.4	15280.9	9960.7	13667.5
	(CU.M/SEC)	2.3	3.5	4.9	5.9	3.7	5.3

CROPPING PATTERN	NET CULTIVABLE AREA (FEDDAN)	PROJECT IRRIGATION SUPPLY (1000 CU.M)											
		JUL	AUG	SEP	OCT	NOV	DEC	TOTAL					
CP - 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CP - 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CP - 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CP - 4	11200.0	11713.0	8918.8	8538.9	4179.5	5750.6	5364.9	111202.4	5364.9	111202.4	5364.9	111202.4	0.0
CP - 5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	11200.0	11713.0	8918.8	8538.9	4179.5	5750.6	5364.9	111202.4	5364.9	111202.4	5364.9	111202.4	0.0
	(CU.M/SEC)	4.4	3.3	3.3	1.6	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0

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 D.1-27 Project Irrigation Supply for Eastern Area of F/S Area

CROPPING PATTERN	NET CULTIVABLE AREA	PROJECT IRRIGATION SUPPLY (1000 CU.M)					
		JAN	FEB	MAR	APR	MAY	JUN
	(FEDDAN)						
CP - 1	27400.0	13881.5	16706.7	22250.7	22814.6	17673.4	27426.4
CP - 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CP - 3	4000.0	1528.0	1646.8	2537.2	2727.9	2202.9	3590.6
CP - 4	13800.0	7611.6	10577.7	16098.4	18828.3	12273.0	16840.3
CP - 5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	45200.0	23021.1	28931.3	40886.3	44370.8	32149.3	47857.3
	(CU.M/SEC)	8.6	12.0	15.3	17.1	12.0	18.5

CROPPING PATTERN	NET CULTIVABLE AREA	PROJECT IRRIGATION SUPPLY (1000 CU.M)					
		JUL	AUG	SEP	OCT	NOV	DEC
	(FEDDAN)						
CP - 1	27400.0	30936.4	25521.9	16444.9	7776.5	11505.1	11407.3
CP - 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CP - 3	4000.0	4111.4	3637.6	2481.4	1249.9	1471.3	1210.4
CP - 4	13800.0	14432.0	10989.2	10521.2	5149.7	7085.6	6610.3
CP - 5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	45200.0	49479.8	40148.7	29447.5	14176.2	20062.0	19228.1
	(CU.M/SEC)	18.5	15.0	11.4	5.3	7.7	7.2

NOTE :

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

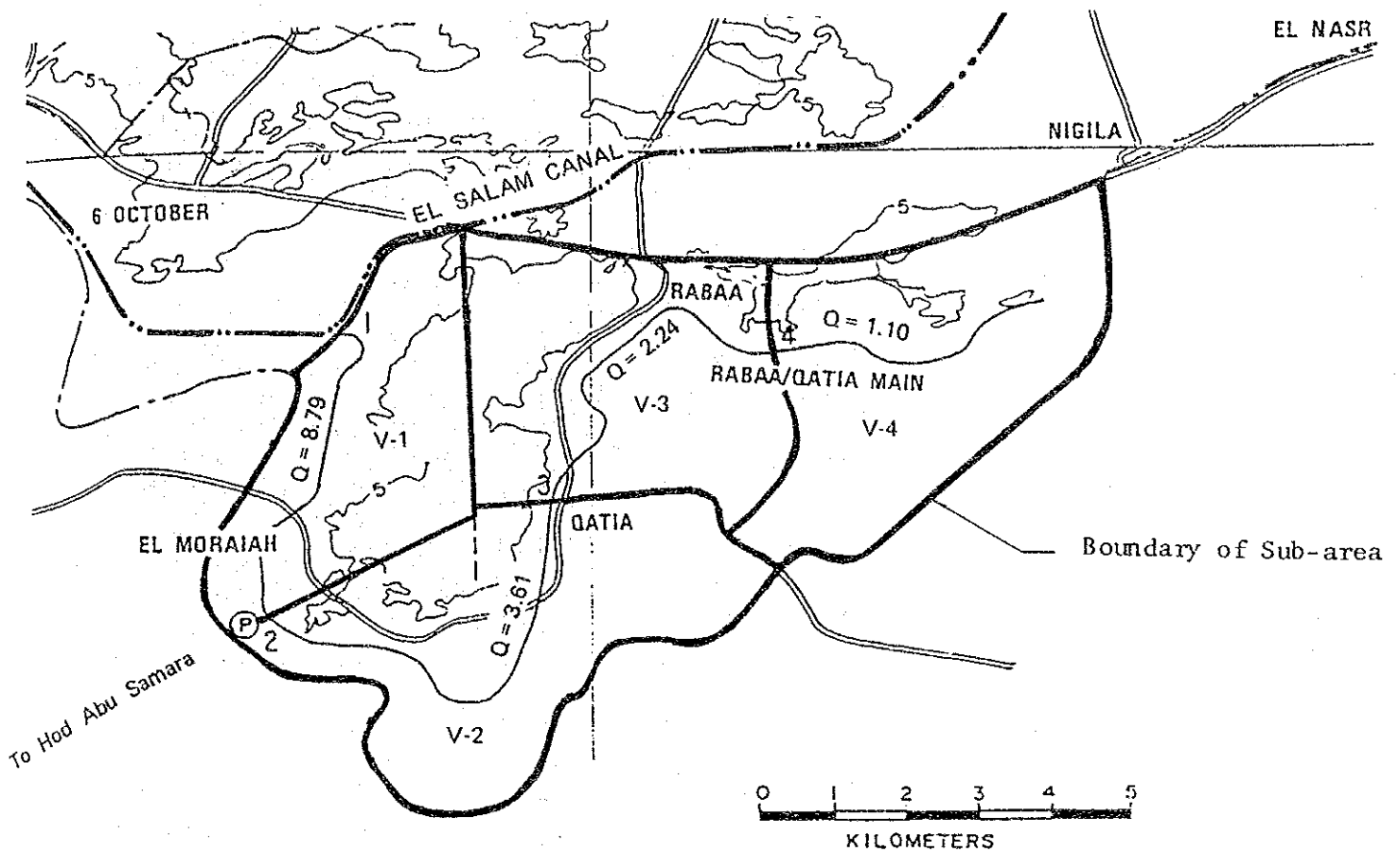
PROJECT IRRIGATION SUPPLY = ET(CROP) / EP X 1.05
 ET(CROP) : REFERENCE CROP EVAPOTRANSPIRATION
 EP : PROJECT EFFICIENCY

Table D.1-28 Peak Project Irrigation Supply

Subarea	CP-1	CP-2	CP-3	CP-4	CP-5	Total	Accumulated	
Peak project irrigation supply in ℓ /sec/feddan :								
	0.421	0.634	0.383	0.391	0.364			
<u>Western Area of F/S Area</u>								
A	10,100	29,500	31,300	34,900	-	105,800	203,800	
Q	4.26	18.71	11.99	13.65		48.61	88.66	
+++		++		++		++	+++	
<u>F/S Area</u>								
I	A	-	1,800	-	760	-	2,560	98,000
	Q	-	1.14	-	0.30	-	1.44	40.05
II	A	-	-	1,660	-	2,940	4,600	95,440
	Q	-	-	0.64	-	1.07	1.71	38.61
III	A	-	-	2,700	-	-	2,700	90,840
	Q	-	-	1.03	-	-	1.03	36.90
IV	A	1,780	-	240	670	80	2,770	88,140
	Q	0.75	-	0.09	0.27	0.03	1.14	35.87
V	A	10,480	-	-	-	-	10,480	85,370
	Q	4.41	-	-	-	-	4.41	34.73
<u>Had Abu Samara</u>								
A	-	-	-	11,200	-	-	11,200	74,890
Q	-	-	-	4.38	-	-	4.38	30.32
<u>F/S Area</u>								
VI	A	2,770	-	-	-	-	2,770	63,690
	Q	1.17	-	-	-	-	1.17	25.94
VII	A	-	-	-	1,780	2,680	4,460	60,920
	Q	-	-	-	0.70	0.97	1.67	24.77
VIII	A	-	-	-	1,130	-	1,130	56,460
	Q	-	-	-	0.44	-	0.44	23.10
IX	A	2,520	-	-	-	-	2,520	55,330
	Q	1.06	-	-	-	-	1.06	22.66
X	A	5,950	-	-	1,660	-	7,610	52,810
	Q	2.50	-	-	0.64	-	3.14	21.60
<u>Total (F/S Area)</u>								
A	23,500	1,800	4,600	6,000	5,700	-	41,600	
Q	9.89	1.14	1.76	2.35	2.07	-	17.21	
+++		++		++		++	+++	
<u>Eastern Area of F/S Area</u>								
A	27,400	-	4,000	13,800	-	-	45,200	
Q	11.53	-	1.53	5.40	-	-	18.46	

Note : A Net cultivable area in feddan
 Q Peak project irrigation supply in cu.m/sec

Table D.1-29 Required Canal Capacity of Rabaa/Qatia Main Canal



REQUIRED CANAL CAPACITIES OF RABAA/QATIA MAIN CANAL
(Peak Project Irrigation Supply : 0.421 lit/sec/feddan)

Location	Subarea	Net Cultivable Area (feddan)	Peak Project Irrigation Supply (cu.m/sec)	Required Canal Capacity (cu.m/sec)
1 - 2	V-1	1,890	0.80	8.79
Hod Abu Samara		(11,200)	4.38	--
2 - 3	V-2	3,260	1.37	3.61
3 - 4	V-3	2,710	1.14	2.24
4 -	V-4	2,620	1.10	1.10
Total		10,480 (21,680)	8.79	

Table D.1-30 Estimation of Irrigation Interval

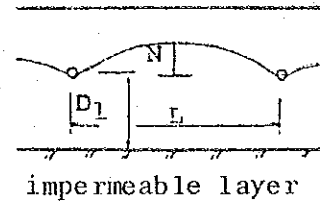
Crops	Rooting Depth		ET(crop) (mm)	Irrigation Interval (days)
	(m)	Ave.		
* Alfalfa	1.0 ~ 2.0	= 1.5	8.01	6
Fodderbeat	0.7 ~ 1.2	= 0.9	6.00	4
* Sordan	1.0 ~ 2.0	= 1.5	8.35	5
* Maize	1.0 ~ 1.7	= 1.3	6.75	6
* Groundnut	0.5 ~ 1.0	= 0.7	7.14	3
Peas	0.6 ~ 1.0	= 0.8	3.12	8
Pepper	0.5 ~ 1.0	= 0.7	3.31	6
* Tomato	0.7 ~ 1.5	= 1.1	7.94	4
Cucumber	0.7 ~ 1.2	= 0.9	2.67	11
Potato	0.4 ~ 0.6	= 0.5	2.98	5
* Sunflower	0.8 ~ 1.5	= 1.1	7.89	4
Safflower	1.0 ~ 2.0	= 1.5	3.86	12
Flax	1.0 ~ 1.5	= 1.2	3.68	10
Grape	1.0 ~ 2.0	= 1.5	4.72	10
Olive	1.2 ~ 1.7	= 1.4	4.05	11

Note : Readily Available Moisture : 33 mm/m
 * summer crop

Table D.1-31 Spacing of Field Drain

Hooghoudt Equation

$$N = \frac{qL^2}{8KD_1} + \frac{qL}{\pi k} \ln \left(\frac{D_0}{u} \right)$$



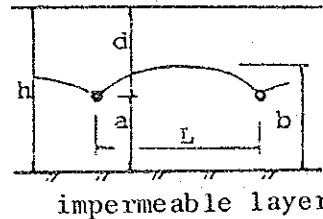
where,

- N : distance between the water level and drains, meter
- q : drain discharge, meter per day
- L : drain spacing, meter
- K : hydraulic conductivity, meter per day
- D₀ : distance between drain depth and barrier, meter
- D₁ : D₀ + 0.5^N, meter
- u : method perimeter

	<u>Tina Plain</u>	<u>Sandy Terrain</u>
N :	0.5 m	0.3
q :	0.0023	0.0008
K :	0.7	3.0
D ₀ :	2.0	2.0
D ₁ :	2.25	2.15
u :	0.5	0.5
L :	51 m	138 m

Donnan Equation

$$L^2 = \frac{4K(b^2 - a^2)}{q}$$

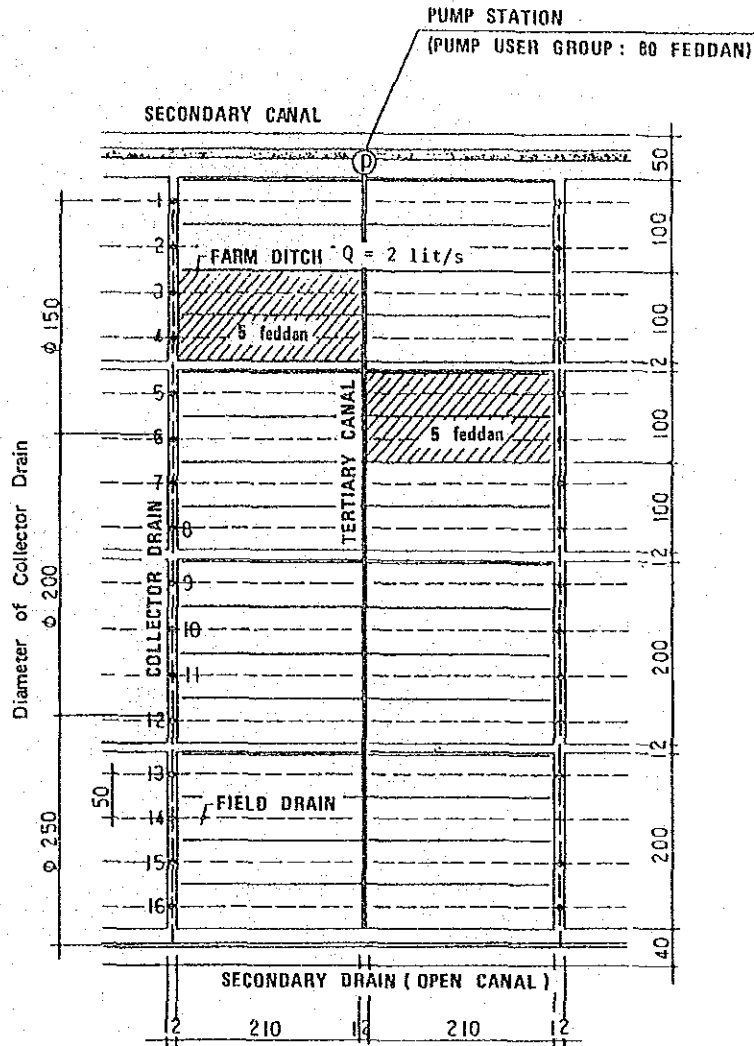


where,

- L : drain spacing, meter
- K : hydraulic conductivity, meter per day
- a : distance between drain depth and barrier, meter
- b : distance between maximum allowable water table height and the barrier, meter
- q : drain discharge, meter per day

	<u>Tina Plain</u>	<u>Sandy Terrain</u>
q :	0.0023	0.0008
K :	0.7	3.0
a :	2.0	2.0
b :	2.5	2.3
L :	52 m	139 m

Table D.1-32 Pipe Diameter of Collector Drain



NOTE :
 - COLLECTOR DRAIN : NON - REINFORCED CONCRETE PIPE
 - FIELD DRAIN : PVC CORRUGATED PERFORATE PIPE 80 mm dia.
 SPACING : 50 m

Location	Drainage Area (net feddan)	Drainage Surplus (lit/sec)	Dia. of Pipe (mm)	Capacity of Pipe Drain at Water Depth of 0.7·Dia.											
				1/2	8/3										
1	5.0	0.55	150 mm	$Q = \frac{1}{n} \cdot l \cdot \left(\frac{0.7}{2} \right)^{8/3} \cdot 1.65695$											
2	10.0	1.10													
3	15.0	1.65													
4	20.0	2.20													
5	25.0	2.75													
6	30.0	3.30	200 mm	where, Q : discharge, cu. m/sec n : roughness coefficient, (0.013) l : slope, 1/2,000 D : diameter of pipe, meter											
7	35.0	3.85													
8	40.0	4.40													
9	45.0	4.95													
10	50.0	5.50													
11	55.0	6.05													
12	60.0	6.60	250 mm	<table border="1"> <thead> <tr> <th>Dia. of Pipe (mm)</th> <th>Discharge (lit/sec)</th> </tr> </thead> <tbody> <tr> <td>150</td> <td>2.8</td> </tr> <tr> <td>200</td> <td>6.1</td> </tr> <tr> <td>250</td> <td>11.1</td> </tr> <tr> <td>300</td> <td>18.1</td> </tr> </tbody> </table>	Dia. of Pipe (mm)	Discharge (lit/sec)	150	2.8	200	6.1	250	11.1	300	18.1	
Dia. of Pipe (mm)	Discharge (lit/sec)														
150	2.8														
200	6.1														
250	11.1														
300	18.1														
13	65.0	7.15													
14	70.0	7.70													
15	75.0	8.25													
16	80.0	8.80													

