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ENVIRONMENT

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Table K.1.2.1 Water Quality of Abbasee Principal Irrigation Canal in the Study Area

Location	Midstream					
Date, Month	5, April	2, May	11, May	13, May	23, May	24, Oct.
measurement time	11:30	10:50	11:30	10:25	9:45	9:10
Water flow	Medium	Fast	N.D.	Fast	N.D.	Medium
Water quantity	Much	Much	N.D.	Much	N.D.	Much
Water Temperature (°C)	19.9	23.3	22.6	24.3	23.1	23.1
pH	8.03	7.93	7.28	7.31	7.97	7.60
Turbidity (NTU)	5	25	4	22	13	18
Electric Conductivity (dS/m)	0.368	0.378	0.379	0.376	0.367	0.354
Diasolved Oxygen (mg/l)	8.16	7.08	2.76	5.73	4.25	6.34
Total Diasolved Solids (mg/l)	240	240	240	240	240	230
Sodium (meq/l)	-	-	-	-	-	1.2
Calcium (meq/l)	-	-	-	-	-	2.6
Magnesium (meq/l)	-	-	-	-	-	1.0
Sodium Adsorption Ratio	-	-	-	-	-	0.9

Note 1. The measurement was done by JICA Study Team in 1998.

2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other date were determined on the field.
3. 9th, May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
   - pH: Normal range 6.5-8.4
   - Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
   - Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
   - Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

   - Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.2 Water Quality of Bahr Shebin Principal Irrigation Canal in the Study Area

Location	Midstream				
Date, Month	10, April	11, May	16, May	23, May	26, Oct.
Measurement time	12:30	10:30	10:30	10:00	8:45
Water flow	N.D.	N.D.	Slow	N.D.	Medium
Water quantity	N.D.	N.D.	Much	N.D.	Much
Water Temperature (°C)	21.8	24.3	24.0	23.9	22.8
pH	8.29	7.81	7.52	7.81	7.74
Turbidity (NTU)	30	14	11	14	19
Electric Conductivity (dS/m)	0.397	0.379	0.369	0.372	0.353
Dissolved Oxygen (mg/l)	8.05	3.91	6.03	4.60	5.59
Total Dissolved Solids (mg/l)	260	240	240	240	230
Sodium (meq/l)	-	-	-	-	1.5
Calcium (meq/l)	-	-	-	-	3.2
Magnesium (meq/l)	-	-	-	-	1.2
Sodium Adsorption Ratio	-	-	-	-	1.0

Location	End of downstream				
Date, Month	8, April	11, May	16, May	23, May	26, Oct.
Measurement time	10:45	11:55	11:00	11:55	9:45
Water flow	N.D.	N.D.	Medium	N.D.	Fast
Water quantity	N.D.	N.D.	Medium	N.D.	Much
Water Temperature (°C)	20.0	24.2	24.3	22.9	22.9
pH	7.95	7.59	7.72	7.94	7.97
Turbidity (NTU)	15	16	20	24	22
Electric Conductivity (dS/m)	0.384	0.382	0.386	0.368	0.391
Dissolved Oxygen (mg/l)	7.70	4.26	6.38	4.24	4.79
Total Dissolved Solids (mg/l)	250	250	250	240	250
Sodium (meq/l)	-	-	-	-	1.5
Calcium (meq/l)	-	-	-	-	3.4
Magnesium (meq/l)	-	-	-	-	1.3
Sodium Adsorption Ratio	-	-	-	-	1.0

Table K.1.2.3 Water Quality of Bahr Mallah Main Irrigation Canal in the Study Area

Location	Midstream				
Date, Month	2, May	11, May	13, May	23, May	24, Oct.
Measurement time	13:30	10:35	12:00	10:03	12:15
Water flow	Slow	N.D.	Fast	N.D.	Medium
Water quantity	Little	N.D.	Much	N.D.	Medium
Water Temperature (℃)	24.4	24.4	24.0	22.8	23.7
pH	7.93	7.77	7.62	7.51	7.86
Turbidity (NTU)	101	22	35	37	27
Electric Conductivity (dS/m)	0.405	0.379	0.367	0.416	0.384
Dissolved Oxygen (mg/l)	6.74	4.13	5.94	1.71	5.54
Total Dissolved Solids (mg/l)	260	240	240	270	250
Sodium (meq/l)	-	-	-	-	1.4
Calcium (meq/l)	-	-	-	-	3.3
Magnesium (meq/l)	-	-	-	-	1.1
Sodium Adsorption Ratio	-	-	-	-	0.9

Location	End of downstream			
Date, Month	11, May	13, May	23, May	24, Oct.
Measurement time	10:40	13:00	10:06	11:55
Water flow	N.D.	Slow	N.D.	Medium
Water quantity	ND.	Medium	N.D.	Much
Water Temperature (℃)	23.1	23.9	23.0	24.0
pH	7.67	7.56	7.91	7.67
Turbidity (NTU)	22	53	21	30
Electric Conductivity (dS/m)	0.473	0.393	0.374	0.367
Dissolved Oxygen (mg/l)	3.61	4.63	3.77	5.76
Total Dissolved Solids (mg/l)	300	250	240	240
Sodium (meq/l)	-	-	-	1.3
Calcium (meq/l)	-	-	-	3.4
Magnesium (meq/l)	-	-	-	1.1
Sodium Adsorption Ratio	-	-	-	0.9

Table K.1.2.4 Water Quality of Bahr Tera Main Irrigation Canal in the Study Area

Location	Midstream					
Date, Month	10, April	4, May	11, May	13, May	23, May	24, Oct.
Measurement time	14:15	16:20	12:20	13:40	12:49	13:20
Water flow	N.D.	Medium	N.D.	Medium	N.D.	Slow
Water quantity	N.D.	Medium	N.D.	Medium	N.D.	Little
Water Temperature (℃)	22.8	24.7	24.4	23.7	23.6	24.1
pH	8.32	7.95	7.77	7.59	7.78	7.77
Turbidity (NTU)	8	40	38	64	40	31
Electric Conductivity (dS/m)	0.402	0.388	0.380	0.376	0.390	0.388
Dissolved Oxygen (mg/l)	8.90	6.73	3.52	5.62	3.67	4.35
Total Dissolved Solids (mg/l)	260	250	240	240	250	250
Sodium (meq/l)	-	-	-	-	-	1.3
Calcium (meq/l)	-	-	-	-	-	3.0
Magnesium (meq/l)	-	-	-	-	-	1.1
Sodium Adsorption Ratio	-	-	-	-	-	0.9

Location	End of downstream				
Date, Month	3, May	11, May	13, May	23, May	24, Oct.
Measurement time	14:10	12:25	15:35	12:40	14:35
Water flow	Slow	N.D.	Slow	N.D.	Medium
Water quantity	Medium	N.D.	Little	N.D.	Medium
Water Temperature (℃)	25.3	24.3	24.4	24.1	24.6
pH	8.18	7.43	7.90	7.52	8.39
Turbidity (NTU)	41	11	40	44	150
Electric Conductivity (dS/m)	1.17	3.77	1.50	1.34	1.16
Dissolved Oxygen (mg/l)	5.25	0.68	2.62	0.47	4.73
Total Dissolved Solids (mg/l)	750	2,400	960	860	740
Sodium (meq/l)	-	-	-	-	5.1
Calcium (meq/l)	-	-	-	-	3.9
Magnesium (meq/l)	-	-	-	-	1.4
Sodium Adsorption Ratio	-	-	-	-	3.1

Note 1. The measurement was done by JICA Study Team in 1998.
2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th, May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.5 Water Quality of Bahr El Sahel Main Irrigation Canal in the Study Area

Location	Midstream					
Date, Month	5, April	6, May	11, May	17, May	23, May	20, Oct.
Measurement time	15:00	9:40	10:15	9:20	10:58	9:20
Water flow	Medium	Medium	N.D.	Stop	N.D.	Stop
Water quantity	Much	Medium	N.D.	Medium	N.D.	Much
Water Temperature (°C)	20.3	24.4	24.6	24.1	24.1	23.1
pH	8.32	7.02	7.16	7.70	7.70	7.08
Turbidity (NTU)	10	10	20	38	16	20
Electric Conductivity (dS/m)	0.432	0.460	0.429	0.418	0.424	0.426
Dissolved Oxygen (mg/l)	8.50	6.30	3.26	4.15	5.85	3.65
Total Dissolved Solids (mg/l)	280	290	280	270	270	270
Sodium (meq/l)	-	-	-	-	-	1.3
Calcium (meq/l)	-	-	-	-	-	3.0
Magnesium (meq/l)	-	-	-	-	-	1.2
Sodium Adsorption Ratio	-	-	-	-	-	0.9

Location	End of downstream				
Date, Month	6, May	11, May	17, May	23, May	20, Oct.
Measurement time	12:00	10:20	10:05	11:01	10:25
Water flow	Fast	N.D.	Fast	N.D.	Fast
Water quantity	Much	N.D.	Much	N.D.	Much
Water Temperature (°C)	26.7	25.5	26.6	24.0	25.3
pH	7.47	7.45	7.57	7.66	7.72
Turbidity (NTU)	5	4	8	7	13
Electric Conductivity (dS/m)	0.572	0.571	0.566	0.512	0.423
Dissolved Oxygen (mg/l)	7.40	2.74	2.60	3.74	3.65
Total Dissolved Solids (mg/l)	370	370	360	330	270
Sodium (meq/l)	-	-	-	-	1.3
Calcium (meq/l)	-	-	-	-	3.0
Magnesium (meq/l)	-	-	-	-	1.2
Sodium Adsorption Ratio	-	-	-	-	0.9

Table K.12.6 Water Quality of Bahr Basandila Main Irrigation Canal in the Study Area

Location	Midstream				
Date, Month	28, April	11, May	16, May	23, May	26, Oct.
Measurement time	9:50	12:00	11:30	11:58	11:00
Water flow	Medium	N.D.	Medium	N.D.	Medium
Water quantity	Medium	N.D.	Much	N.D.	Medium
Water Temperature (°C)	21.3	23.8	24.2	23.5	23.3
pH	7.91	7.68	7.76	7.94	7.89
Turbidity (NTU)	30	25	72	40	29
Electric Conductivity (dS/m)	0.391	0.384	0.391	0.384	0.404
Dissolved Oxygen (mg/l)	5.73	3.40	6.06	3.60	4.47
Total Dissolved Solids (mg/l)	250	250	250	250	260
Sodium (meq/l)	-	-	-	-	1.7
Calcium (meq/l)	-	-	-	-	3.6
Magnesium (meq/l)	-	-	-	-	1.3
Sodium Adsorption Ratio	-	-	-	-	1.1

Location	End of downstream				
Date, Month	28, April	11, May	16, May	23, May	26, Oct.
Measurement time	11:00	12:05	12:00	12:00	11:35
Water flow	Medium	N.D.	Medium	N.D.	Medium
Water quantity	Medium	N.D.	Much	N.D.	Much
Water Temperature (°C)	20.0	24.3	22.4	23.0	22.3
pH	7.88	7.36	7.84	7.87	8.09
Turbidity (NTU)	121	23	247	75	195
Electric Conductivity (dS/m)	3.330	0.691	2.27	2.30	3.00
Dissolved Oxygen (mg/l)	2.24	0.71	1.97	2.08	2.31
Total Dissolved Solids (mg/l)	2,300	440	1,500	1,800	1,900
Sodium (meq/l)	-	-	-	-	17.7
Calcium (meq/l)	-	-	-	-	5.4
Magnesium (meq/l)	-	-	-	-	5.8
Sodium Adsorption Ratio	-	-	-	-	7.5

Note 1. The measurement was done by JICA Study Team in 1998.
2. The data on 11th. and 23rd. May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th. May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECws	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.7 Water Quality of El Balamoun Branch Irrigation Canal in the Study Area

Location	Midstream				
Date, Month	6, May	11, May	17, May	23, May	20, Oct.
Measurement time	10:10	10:20	9:45	11:04	10:05
Water flow	Fast	N.D.	Slow	N.D.	Medium
Water quantity	Much	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	23.6	24.7	23.3	24.7	24.2
pH	7.59	7.64	7.67	7.63	7.58
Turbidity (NTU)	22	6	38	4	15
Electric Conductivity (dS/m)	0.563	0.556	0.550	0.555	0.426
Dissolved Oxygen (mg/l)	4.31	3.22	4.47	3.93	3.82
Total Dissolved Solids (mg/l)	360	360	350	360	270
Sodium (meq/l)	-	-	-	-	1.3
Calcium (meq/l)	-	-	-	-	3.0
Magnesium (meq/l)	-	-	-	-	1.3
Sodium Adsorption Ratio	-	-	-	-	0.9

Location	End of downstream					
Date, Month	5, April	6, May	11, May	17, May	23, May	20, Oct.
Measurement time	16:15	10:50	10:25	10:20	11:07	10:45
Water flow	Medium	Medium	N.D.	Medium	N.D.	Medium
Water quantity	Little	Medium	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	20.4	24.9	25.2	24.2	24.1	22.3
pH	7.11	7.15	7.58	7.13	7.23	7.57
Turbidity (NTU)	120	16	21	30	19	63
Electric Conductivity (dS/m)	1.36	0.733	0.797	0.834	0.694	1.63
Dissolved Oxygen (mg/l)	0.15	0.63	0.40	0.03	3.98	0.04
Total Dissolved Solids (mg/l)	870	470	510	530	440	1,000
Sodium (meq/l)	-	-	-	-	-	6.6
Calcium (meq/l)	-	-	-	-	-	2.6
Magnesium (meq/l)	-	-	-	-	-	1.7
Sodium Adsorption Ratio	-	-	-	-	-	4.5

Table K.1.2.8 Water Quality of Bahr Hafir Shehab El Deen Branch Irrigation Canal in the Study Area

Location	Midstream				
Date, Month	13, April	11, May	15, May	23, May	28, Oct.
Measurement time	11:00	12:10	9:50	12:12	10:00
Water flow	N.D.	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	N.D.	Much	N.D.	Much
Water Temperature (°C)	24.3	24.2	23.0	23.0	22.9
pH	8.48	7.75	7.82	7.90	7.89
Turbidity (NTU)	20	30	42	40	27
Electric Conductivity (dS/m)	0.389	0.383	0.375	0.389	0.378
Dissolved Oxygen (mg/l)	9.36	3.63	5.74	4.06	5.38
Total Dissolved Solids (mg/l)	250	250	240	250	240
Sodium (meq/l)	-	-	-	-	4.4
Calcium (meq/l)	-	-	-	-	3.1
Magnesium (meq/l)	-	-	-	-	1.3
Sodium Adsorption Ratio	-	-	-	-	3.0

Location	End of downstream				
Date, Month	13, April	11, May	15, May	23, May	28, Oct.
Measurement time	11:30	12:15	10:10	12:15	10:25
Water flow	Stop	N.D.	Stop	N.D.	Stop
Water quantity	Little	N.D.	Little	N.D.	Medium
Water Temperature (°C)	22.2	24.5	23.4	22.9	22.9
pH	7.43	7.63	7.83	7.65	7.85
Turbidity (NTU)	23	59	116	55	55
Electric Conductivity (dS/m)	5.42	0.437	0.407	0.460	0.430
Dissolved Oxygen (mg/l)	0.92	1.74	5.21	2.55	4.45
Total Dissolved Solids (mg/l)	3,500	280	260	290	280
Sodium (meq/l)	-	-	-	-	5.3
Calcium (meq/l)	-	-	-	-	3.1
Magnesium (meq/l)	-	-	-	-	1.4
Sodium Adsorption Ratio	-	-	-	-	3.5

Note 1. The measurement was done by JICA Study Team in 1998.
2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th, May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw;

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.9 Water Quality of Bahr El Maasam Branch Irrigation Canal in the Study Area

Location	Midstream				
Date, Month	12, April	11, May	15, May	23, May	28, Oct.
Measurement time	11:30	12:00	9:30	12:03	9:30
Water flow	N.D.	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	23.5	24.0	23.2	23.0	22.8
pH	8.18	7.89	7.46	7.93	7.76
Turbidity (NTU)	30	23	45	25	38
Electric Conductivity (dS/m)	0.404	0.378	0.392	0.384	0.366
Dissolved Oxygen (mg/l)	8.80	3.76	5.85	3.81	6.16
Total Dissolved Solids (mg/l)	260	240	250	250	230
Sodium (meq/l)	-	-	-	-	2.9
Calcium (meq/l)	-	-	-	-	3.1
Magnesium (meq/l)	-	-	-	-	1.0
Sodium Adsorption Ratio	-	-	-	-	2.0

Location	End of downstream			
Date, Month	11, May	15, May	23, May	28, Oct.
Measurement time	12:05	11:15	12:06	11:30
Water flow	N.D.	Medium	N.D.	Fast
Water quantity	N.D.	Much	N.D.	Much
Water Temperature (°C)	24.1	23.4	22.9	23.3
pH	7.85	7.83	7.86	7.98
Turbidity (NTU)	30	116	16	49
Electric Conductivity (dS/m)	0.386	0.407	0.383	0.387
Dissolved Oxygen (mg/l)	3.72	5.21	3.70	5.45
Total Dissolved Solids (mg/l)	250	260	250	250
Sodium (meq/l)	-	-	-	3.2
Calcium (meq/l)	-	-	-	3.2
Magnesium (meq/l)	-	-	-	1.2
Sodium Adsorption Ratio	-	-	-	2.2

Table K.1.2.10 Water Quality of Bahr El Banawan Branch Irrigation Canal in the Study Area

Location	Midstream				
Date, Month	12, April	11, May	15, May	23, May	28, Oct.
Measurement time	12:45	12:10	12:00	12:09	12:00
Water flow	N.D.	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	N.D.	Much	N.D.	Little
Water Temperature (°C)	30.2	24.4	23.1	23.2	24.0
pH	7.96	7.57	7.83	7.85	8.17
Turbidity (NTU)	574	45	85	35	148
Electric Conductivity (dS/m)	0.749	0.465	0.389	0.450	0.940
Dissolved Oxygen (mg/l)	4.04	2.35	6.15	3.13	5.59
Total Dissolved Solids (mg/l)	480	300	250	290	600
Sodium (meq/l)	-	-	-	-	10.7
Calcium (meq/l)	-	-	-	-	3.9
Magnesium (meq/l)	-	-	-	-	1.7
Sodium Adsorption Ratio	-	-	-	-	6.4

Location	End of downstream			
Date, Month	11, May	15, May	23, May	28, Oct.
Measurement time	12:30	12:10	12:52	12:35
Water flow	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	Much	N.D.	Medium
Water Temperature (°C)	23.9	23.0	23.3	23.8
pH	7.68	7.67	8.05	8.32
Turbidity (NTU)	53	171	58	296
Electric Conductivity (dS/m)	1.96	1.23	1.41	2.10
Dissolved Oxygen (mg/l)	1.07	1.82	2.91	9.29
Total Dissolved Solids (mg/l)	1,300	790	900	1,300
Sodium (meq/l)	-	-	-	27.6
Calcium (meq/l)	-	-	-	5.4
Magnesium (meq/l)	-	-	-	4.2
Sodium Adsorption Ratio	-	-	-	12.6

Note 1. The measurement was done by JICA Study Team in 1993.
2. The data on 11th. and 23rd. May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th. May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.11 Water Quality of Mansour Derivery Irrigation Canal in the Study Area

Location	Midstream			
Date, Month	11, May	13, May	23, May	22, Oct.
Measurement time	12:30	14:40	12:55	13:55
Water flow	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	Medium	N.D.	Little
Water Temperature (°C)	24.0	25.3	24.6	25.7
pH	7.63	7.82	7.48	8.43
Turbidity (NTU)	25	203	32	122
Electric Conductivity (dS/m)	1.12	2.19	1.18	3.94
Dissolved Oxygen (mg/l)	0.68	0.83	0.59	9.61
Total Dissolved Solids (mg/l)	720	1,400	760	2,500
Sodium (meq/l)	-	-	-	18.1
Calcium (meq/l)	-	-	-	6.1
Magnesium (meq/l)	-	-	-	2.5
Sodium Adsorption Ratio	-	-	-	8.7

Location	End of downstream			
Date, Month	11, May	13, May	23, May	22, Oct.
Measurement time	12:35	15:20	12:58	14:20
Water flow	N.D.	Stop	N.D.	Stop
Water quantity	N.D.	Little	N.D.	Little
Water Temperature (°C)	24.3	24.0	24.4	25.2
pH	7.91	8.70	7.58	8.47
Turbidity (NTU)	20	236	27	169
Electric Conductivity (dS/m)	1.51	2.51	1.46	9.70
Diasolved Oxygen (mg/l)	2.94	7.83	0.45	12.00
Total Dissolved Solids (mg/l)	970	1,600	930	6,200
Sodium (meq/l)	-	-	-	46.3
Calcium (meq/l)	-	-	-	6.3
Magnesium (meq/l)	-	-	-	2.8
Sodium Adsorption Ratio	-	-	-	21.7

Table K.1.2.12 Water Quality of Bahr Biyala Delivery Irrigation Canal in the Study Area

Location	Midstream			
Date, Month	11, May	21, May	23, May	15, Nov.
Measurement time	11:15	13:45	11:47	15:45
Water flow	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	24.7	26.4	23.6	20.7
pH	6.90	7.80	7.68	8.07
Turbidity (NTU)	65	35	16	33
Electric Conductivity (dS/m)	0.517	0.395	0.399	0.491
Dissolved Oxygen (mg/l)	1.82	6.64	2.96	5.71
Total Dissolved Solids (mg/l)	330	250	260	310
Sodium (meq/l)	-	-	-	2.2
Calcium (meq/l)	-	-	-	3.2
Magnesium (meq/l)	-	-	-	5.0
Sodium Adsorption Ratio	-	-	-	2.2

Location	End of downstream			
Date, Month	11, May	21, May	23, May	15, Nov.
Measurement time	11:18	14:40	11:50	14:55
Water flow	N.D.	Stop	N.D.	Stop
Water quantity	N.D.	Much	N.D.	Medium
Water Temperature (°C)	24.5	28.5	24.0	21.3
pH	7.32	8.78	7.64	8.46
Turbidity (NTU)	98	499	27	100
Electric Conductivity (dS/m)	0.783	1.34	0.444	1.29
Dissolved Oxygen (mg/l)	2.27	13.45	2.06	11.04
Total Dissolved Solids (mg/l)	500	860	280	830
Sodium (meq/l)	-	-	-	6.7
Calcium (meq/l)	-	-	-	4.6
Magnesium (meq/l)	-	-	-	5.0
Sodium Adsorption Ratio	-	-	-	3.1

Note 1. The measurement was done by JICA Study Team in 1998,
2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th, May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.13 Water Quality of Hamoul Pumping Station for Reuse in the Study Area

Location	Before mixed					
Month, Date	10, Apr.	3, May	11, May	13, May	23, May	7, Nov.
Measurement time	14:45	12:20	12:35	13:45	13:00	12:05
Water flow	N.D	Slow	N.D.	Fast	N.D.	Medium
Water quantity	N.D	Much	N.D.	Much	N.D.	Medium
Water Temperature (°C)	21.9	22.7	24.1	22.7	23.5	21.8
pH	7.12	7.86	7.64	7.53	7.32	8.26
Turbidity (NTU)	55	169	45	56	38	48
Electric Conductivity (dS/m)	1.78	2.48	2.22	1.92	1.66	1.58
Dissolved Oxygen (mg/l)	0.07	0.68	0.40	0.12	0.36	0.46
Total Dissolved Solids (mg/l)	1,200	1,700	1,600	1,300	1,200	1,000
Sodium (meq/l)	-	-	-	-	-	13.7
Calcium (meq/l)	-	-	-	-	-	5.0
Magnesium (meq/l)	-	-	-	-	-	5.8
Sodium Adsorption Ratio	-	-	-	-	-	5.9

Location	After mixed with Behr Tera irrigation canal					
Month, Date	15, Apr.	3, May	11, May	13, May	23, May	7, Nov.
Measurement time	11:45	12:40	12:40	13:55	13:03	12:20
Water flow	N.D	Fast	N.D.	Medium	N.D.	Medium
Water quantity	N.D	Much	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	25.1	24.2	23.9	23.4	23.3	21.9
pH	7.63	8.04	7.72	7.85	7.51	8.24
Turbidity (NTU)	115	84	49	105	53	50
Electric Conductivity (dS/m)	1.41	0.636	2.17	1.13	1.62	0.97
Dissolved Oxygen (mg/l)	0.12	5.62	0.72	0.55	0.17	3.68
Total Dissolved Solids (mg/l)	990	450	1,500	790	1,100	620
Sodium (meq/l)	-	-	-	-	-	7.9
Calcium (meq/l)	-	-	-	-	-	4.2
Magnesium (meq/l)	-	-	-	-	-	2.7
Sodium Adsorption Ratio	-	-	-	-	-	4.3

Table K.1.2.14 Water Quality of No.3 Pumping Station for Reuse in the Study Area

Location	Before mixed				
Date, Month	12, April	11, May	15, May	23, May	22, Oct.
Measurement time	14:45	12:40	12:25	13:06	12:40
Water flow	N.D.	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	N.D.	Medium	N.D.	Much
Water Temperature (°C)	27.0	23.5	20.8	23.1	22.9
pH	7.72	7.79	7.26	7.68	8.26
Turbidity (NTU)	108	364	223	98	282
Electric Conductivity (dS/m)	3.36	2.50	2.21	2.30	2.29
Dissolved Oxygen (mg/l)	3.15	1.63	2.06	0.51	3.40
Total Dissolved Solids (mg/l)	2,200	1,600	1,400	1,500	1,500
Sodium (meq/l)	-	-	-	-	12.3
Calcium (meq/l)	-	-	-	-	4.2
Magnesium (meq/l)	-	-	-	-	6.3
Sodium Adsorption Ratio	-	-	-	-	5.4

Location	After mixed				
Date, Month	12, April	11, May	15, May	23, May	22, Oct.
Measurement time	14:40	12:45	12:30	13:09	12:45
Water flow	N.D.	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	N.D.	Much	N.D.	Much
Water Temperature (°C)	25.4	23.7	20.8	23.1	22.9
pH	7.81	7.75	7.94	7.60	8.22
Turbidity (NTU)	360	319	253	139	346
Electric Conductivity (dS/m)	3.09	2.51	2.22	2.40	2.30
Dissolved Oxygen (mg/l)	2.36	2.51	5.41	0.87	4.34
Total Dissolved Solids (mg/l)	2,000	1,600	1,400	1,500	1,500
Sodium (meq/l)	-	-	-	-	11.8
Calcium (meq/l)	-	-	-	-	4.1
Magnesium (meq/l)	-	-	-	-	7.1
Sodium Adsorption Ratio	-	-	-	-	5.0

Note 1. The measurement was done by JICA Study Team in 1998.
2. The data on 11th. and 23rd. May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th. May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw;

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(N_a): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.15 Water Quality of Near Hafir Pumping Station for Reuse in the Study Area

Location	El Gharbia drain				
Date, Month	4, May	11, May	14, May	23, May	24, Oct.
Measurement time	15:45	12:45	13:45	12:43	15:20
Water flow	Medium	N.D.	Medium	N.D.	Medium
Water quantity	Medium	N.D.	Much	N.D.	Much
Water Temperature (℃)	25.2	24.1	23.0	24.3	23.5
pH	7.93	7.74	7.78	7.09	7.98
Turbidity (NTU)	156	31	70	42	64
Electric Conductivity (dS/m)	1.62	1.40	2.34	1.73	1.99
Dissolved Oxygen (mg/l)	2.34	1.21	0.29	0.63	2.92
Total Dissolved Solids (mg/l)	1,000	900	1,500	1,100	1,300
Sodium (meq/l)	-	-	-	-	9.3
Calcium (meq/l)	-	-	-	-	5.3
Magnesium (meq/l)	-	-	-	-	2.5
Sodium Adsorption Ratio	-	-	-	-	4.7

Location	After mixed with Bahr Tera irrigation canal				
Date, Month	4, May	11, May	14, May	23, May	24, Oct.
Measurement time	15:50	12:50	13:35	12:46	15:30
Water flow	medium	N.D.	Medium	N.D.	Medium
Water quantity	Medium	N.D.	Much	N.D.	medium
Water Temperature (℃)	25.1	23.9	22.9	24.0	24.7
pH	7.87	7.69	7.58	7.03	8.04
Turbidity (NTU)	41	34	56	40	142
Electric Conductivity (dS/m)	1.18	1.13	2.09	1.74	0.97
Dissolved Oxygen (mg/l)	2.27	1.04	0.18	0.31	4.16
Total Dissolved Solids (mg/l)	760	720	1,300	1,100	620
Sodium (meq/l)	-	-	-	-	4.0
Calcium (meq/l)	-	-	-	-	4.1
Magnesium (meq/l)	-	-	-	-	1.3
Sodium Adsorption Ratio	-	-	-	-	2.4

Table K.1.2.16 Water Quality of Lower No.1 Drainage Canal in the Study Area

Location	Upstream end			
Date, Month	11, May	16, May	23, May	26, Oct.
Measurement time	9:40	13:50	10:30	9:20
Water flow	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	Little	N.D.	Little
Water Temperature (℃)	22.2	22.6	23.4	21.3
pH	7.17	7.61	7.77	8.23
Turbidity (NTU)	34	120	21	38
Electric Conductivity (dS/m)	1.19	1.68	1.31	1.66
Dissolved Oxygen (mg/l)	1.58	0.64	1.49	2.22
Total Dissolved Solids (mg/l)	760	1,100	840	1,100
Sodium (meq/l)	-	-	-	10.2
Calcium (meq/l)	-	-	-	5.5
Magnesium (meq/l)	-	-	-	4.2
Sodium Adsorption Ratio	-	-	-	4.6

Location	Midstream			
Date, Month	11, May	16, May	23, May	26, Oct.
Measurement time	9:45	12:50	10:35	10:25
Water flow	N.D.	Fast	N.D.	Fast
Water quantity	N.D.	Medium	N.D.	Medium
Water Temperature (℃)	22.5	23.5	23.7	22.4
pH	8.93	9.00	8.75	9.03
Turbidity (NTU)	45	93	72	42
Electric Conductivity (dS/m)	1.40	1.37	1.33	1.48
Dissolved Oxygen (mg/l)	1.02	1.29	1.16	0.91
Total Dissolved Solids (mg/l)	900	880	850	950
Sodium (meq/l)	-	-	-	6.7
Calcium (meq/l)	-	-	-	4.2
Magnesium (meq/l)	-	-	-	4.6
Sodium Adsorption Ratio	-	-	-	3.2

Note 1. The measurement was done by JICA Study Team in 1998.
2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th, May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.17 Water Quality of No.4 Drainage Canal in the Study Area

Location	Upstream end			
Date, Month	11, May	14, May	23, May	22, Oct.
Measurement time	12:50	11:10	11:39	9:00
Water flow	N.D.	Slow	N.D.	Stop
Water quantity	N.D.	Little	N.D.	Little
Water Temperature (°C)	24.7	21.1	23.4	21.9
pH	7.51	7.28	7.54	7.63
Turbidity (NTU)	42	76	43	103
Electric Conductivity (dS/m)	1.30	1.28	1.34	1.80
Dissolved Oxygen (mg/l)	0.87	1.80	0.96	0.82
Total Dissolved Solids (mg/l)	830	820	860	1,200
Sodium (meq/l)	-	-	-	7.4
Calcium (meq/l)	-	-	-	4.4
Magnesium (meq/l)	-	-	-	5.0
Sodium Adsorption Ratio	-	-	-	3.4

Location	Midstream			
Date, Month	11, May	21, May	23, May	22, Oct.
Measurement time	12:55	14:45	11:42	11:00
Water flow	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	24.5	25.3	24.0	22.6
pH	7.48	7.78	7.62	8.03
Turbidity (NTU)	75	145	86	86
Electric Conductivity (dS/m)	2.32	1.80	1.80	2.21
Dissolved Oxygen (mg/l)	0.83	2.84	1.22	1.58
Total Dissolved Solids (mg/l)	1,500	1,200	1,200	1,400
Sodium (meq/l)	-	-	-	11.3
Calcium (meq/l)	-	-	-	4.8
Magnesium (meq/l)	-	-	-	5.4
Sodium Adsorption Ratio	-	-	-	5.2

Table K.1.2.18 Water Quality of Zifta Drainage Canal in the Study Area

Location	Upstream end					
Date, Month	14, April	2, May	11, May	13, May	23, May	24, Oct.
Measurement time	11:00	11:10	11:35	10:40	9:50	9:25
Water flow	Fast	Fast	N.D.	Fast	N.D.	Medium
Water quantity	Mediun	M / much	N.D.	Much	N.D.	Medium
Water Temperature (°C)	25.3	22.6	22.6	22.1	23.2	21.9
pH	7.65	7.93	7.63	7.80	7.91	8.12
Turbidity (NTU)	35	82	27	51	26	74
Electric Conductivity (dS/m)	2.05	1.51	1.47	1.20	1.65	1.93
Dissolved Oxygen (mg/l)	1.28	0.07	0.44	3.73	0.86	3.50
Total Dissolved Solids (mg/l)	1,300	970	940	770	1,100	1,200
Sodium (meq/l)	-	-	-	-	-	8.6
Calcium (meq/l)	-	-	-	-	-	6.5
Magnesium (meq/l)	-	-	-	-	-	6.3
Sodium Adsorption Ratio	-	-	-	-	-	3.4

Location	Midstream					
Date, Month	14, April	2, May	11, May	13, May	23, May	24, Oct.
Measurement time	13:15	14:00	13:00	13:20	11:45	12:50
Water flow	Medium	Medium	N.D.	Medium	N.D.	Medium
Water quantity	Medium	Medium	N.D.	Much	N.D.	Much
Water Temperature (°C)	26.2	23.7	24.6	22.5	24.0	23.3
pH	7.27	7.46	7.60	7.62	7.54	7.76
Turbidity (NTU)	92	120	49	52	48	50
Electric Conductivity (dS/m)	1.71	1.66	1.69	1.36	1.25	1.45
Dissolved Oxygen (mg/l)	0.57	0.39	0.47	0.11	0.82	0.27
Total Dissolved Solids (mg/l)	1,100	1,100	1,100	870	800	930
Sodium (meq/l)	-	-	-	-	-	6.8
Calcium (meq/l)	-	-	-	-	-	4.7
Magnesium (meq/l)	-	-	-	-	-	4.2
Sodium Adsorption Ratio	-	-	-	-	-	3.2

Note 1. The measurement was done by JICA Study Team in 1998.
2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th, May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.19 Water Quality of Kahwagy Main Canal in the Kahwagy Area

Location	Intake from Mit Yazeed Canal					
Date, Month	9, April	7, May	11, May	18, May	23, May	31, Oct.
Measurement time	10:00	9:00	10:40	8:50	10:10	8:40
Water flow	N.D	Fast	N.D.	Fast	N.D.	Fast
Water quantity	N.D	Much	N.D.	Much	N.D.	Medium
Water Temperature (℃)	20.3	23.7	25.1	24.0	23.6	22.1
pH	7.77	7.04	7.73	7.59	7.82	7.76
Turbidity (NTU)	12	28	25	35	20	25
Electric Conductivity (dS/m)	0.438	0.375	0.420	0.403	0.391	0.403
Dissolved Oxygen (mg/l)	6.48	4.85	3.83	5.01	3.70	5.65
Total Dissolved Solids (mg/l)	280	240	270	260	250	260
Sodium (meq/l)	-	-	-	-	-	5.5
Calcium (meq/l)	-	-	-	-	-	2.5
Magnesium (meq/l)	-	-	-	-	-	1.0
Sodium Adsorption Ratio	-	-	-	-	-	4.2

Location	Midstream					
Date, Month	9, April	7, May	11, May	18, May	23, May	31, Oct.
Measurement time	12:00	9:15	10:45	9:05	10:15	9:10
Water flow	N.D	Fast	N.D.	Medium	N.D.	Medium
Water quantity	N.D	M/Much	N.D.	Much	N.D.	Medium
Water Temperature (℃)	21.2	23.4	26.4	23.6	23.5	22.2
pH	8.13	7.60	7.68	7.62	7.85	7.93
Turbidity (NTU)	65	37	33	28	24	34
Electric Conductivity (dS/m)	0.391	0.413	0.436	0.412	0.413	0.378
Dissolved Oxygen (mg/l)	7.26	5.14	3.57	5.71	3.84	5.37
Total Dissolved Solids (mg/l)	250	260	280	260	260	240
Sodium (meq/l)	-	-	-	-	-	5.1
Calcium (meq/l)	-	-	-	-	-	3.0
Magnesium (meq/l)	-	-	-	-	-	1.0
Sodium Adsorption Ratio	-	-	-	-	-	3.6

Location	End of downstream				
Date, Month	7, May	11, May	18, May	23, May	31, Oct.
Measurement time	9:50	10:50	9:30	10:26	9:45
Water flow	Slow	N.D.	Stop	N.D.	Stop
Water quantity	Medium	N.D.	Much	N.D.	Medium
Water Temperature (℃)	21.9	25.7	23.1	24.1	21.6
pH	7.97	7.67	7.71	7.80	7.74
Turbidity (NTU)	67	48	61	43	60
Electric Conductivity (dS/m)	0.420	0.423	0.420	0.416	0.412
Dissolved Oxygen (mg/l)	4.81	3.73	4.99	3.64	5.12
Total Dissolved Solids (mg/l)	270	270	270	270	260
Sodium (meq/l)	-	-	-	-	6.1
Calcium (meq/l)	-	-	-	-	3.1
Magnesium (meq/l)	-	-	-	-	1.8
Sodium Adsorption Ratio	-	-	-	-	3.9

Table K.1.2.20 Water Quality of Atwa Drainage Canal in the Kawhagy Area

Location	Before mixed at pumping station for reuse				
Date, Month	7, May	11, May	18, May	23, May	31, Oct.
Measurement time	9:20	10:45	9:10	10:18	9:20
Water flow	Stop	N.D.	Medium	N.D.	Fast
Water quantity	Medium	N.D.	Much	N.D.	Medium
Water Temperature (℃)	20.5	25.3	21.8	23.0	21.1
pH	6.67	7.79	7.35	7.67	7.74
Turbidity (NTU)	68	52	132	23	33
Electric Conductivity (dS/m)	2.82	2.10	0.786	1.49	1.18
Dissolved Oxygen (mg/l)	4.03	4.55	1.15	1.31	3.36
Total Dissolved Solids (mg/l)	1,800	1,300	500	950	760
Sodium (meq/l)	-	-	-	-	13.9
Calcium (meq/l)	-	-	-	-	5.3
Magnesium (meq/l)	-	-	-	-	4.6
Sodium Adsorption Ratio	-	-	-	-	6.2

Location	After mixed to Kahwagy Canal				
Date, Month	9, April	7, May	11, May	18, May	23, May
Measurement time	10:45	9:20	10:50	9:05	10:23
Water flow	N.D	Fast	N.D.	Medium	N.D.
Water quantity	N.D	M/Much	N.D.	Much	N.D.
Water Temperature (℃)	19.4	23.4	26.1	23.6	23.4
pH	7.77	7.73	7.66	7.62	7.74
Turbidity (NTU)	23	39	34	28	30
Electric Conductivity (dS/m)	0.384	0.414	0.441	0.412	0.410
Dissolved Oxygen (mg/l)	8.10	5.09	3.79	5.71	3.47
Total Dissolved Solids (mg/l)	250	270	280	260	260
Sodium (meq/l)	-	-	-	-	-
Calcium (meq/l)	-	-	-	-	-
Magnesium (meq/l)	-	-	-	-	-
Sodium Adsorption Ratio	-	-	-	-	-

Note 1. The measurement was done by JICA Study Team in 1998.
2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th, May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.21 Water Quality of El-Bahr El-Saghir Main Canal in the El Nazl Area

Location	Start of Area				
Date, Month	29, April	11, May	18, May	23, May	2, Nov.
Measurement time	10:15	11:40	11:40	12:18	9:35
Water flow	Medium	N.D.	Fast	N.D.	Medium
Water quantity	Medium	N.D.	Much	N.D.	Much
Water Temperature (°C)	22.2	27.3	24.9	23.8	22.8
pH	8.00	7.39	7.58	7.91	7.86
Turbidity (NTU)	7	20	26	14	26
Electric Conductivity (dS/m)	0.383	0.375	0.369	0.373	0.352
Dissolved Oxygen (mg/l)	5.82	4.34	5.92	4.55	6.05
Total Dissolved Solids (mg/l)	250	240	240	240	230
Sodium (meq/l)	-	-	-	-	2.4
Calcium (meq/l)	-	-	-	-	3.5
Magnesium (meq/l)	-	-	-	-	1.2
Sodium Adsorption Ratio	-	-	-	-	1.6

Location	Midstream				
Date, Month	29, April	11, May	18, May	23, May	2, Nov.
Measurement time	10:45	12:45	12:10	12:21	10:00
Water flow	Slow	N.D.	Medium	N.D.	Medium
Water quantity	Little	N.D.	Medium	N.D.	Much
Water Temperature (°C)	22.7	26.7	25.1	23.7	22.7
pH	8.00	7.70	7.74	7.92	8.03
Turbidity (NTU)	17	29	70	24	31
Electric Conductivity (dS/m)	0.384	0.378	0.370	0.371	0.352
Dissolved Oxygen (mg/l)	5.59	3.61	5.65	3.73	6.32
Total Dissolved Solids (mg/l)	250	240	240	240	230
Sodium (meq/l)	-	-	-	-	2.4
Calcium (meq/l)	-	-	-	-	3.6
Magnesium (meq/l)	-	-	-	-	1.3
Sodium Adsorption Ratio	-	-	-	-	1.5

Location	End of downstream				
Date, Month	29, April	11, May	18, May	23, May	2, Nov.
Measurement time	11:30	11:50	12:45	12:24	10:45
Water flow	Medium	N.D.	Medium	N.D.	Fast
Water quantity	Medium	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	22.8	26.3	25.2	23.7	22.8
pH	7.96	7.68	7.75	7.90	7.92
Turbidity (NTU)	24	18	35	13	28
Electric Conductivity (dS/m)	0.403	0.388	0.378	0.370	0.361
Dissolved Oxygen (mg/l)	5.23	3.69	6.26	3.97	5.58
Total Dissolved Solids (mg/l)	260	250	240	240	230
Sodium (meq/l)	-	-	-	-	2.5
Calcium (meq/l)	-	-	-	-	3.6
Magnesium (meq/l)	-	-	-	-	1.2
Sodium Adsorption Ratio	-	-	-	-	1.6

Table K.1.2.22 Water Quality of Upper Sirw Drainage Canal in the El Nazl Area

Location	Upper Sirw pumping station				
Date, Month	29, April	11, May	18, May	23, May	2, Nov.
Measurement time	13:15	11:50	14:25	12:27	11:25
Water flow	Medium	N.D.	Medium	N.D.	Fast
Water quantity	Medium	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	21.6	27.3	23.9	23.5	22.1
pH	7.80	7.53	7.80	7.77	8.09
Turbidity (NTU)	55	39	148	67	293
Electric Conductivity (dS/m)	1.63	1.27	0.93	1.76	1.64
Dissolved Oxygen (mg/l)	2.44	2.02	2.26	1.21	2.59
Total Dissolved Solids (mg/l)	1,000	810	600	1,100	1,100
Sodium (meq/l)	-	-	-	-	16.5
Calcium (meq/l)	-	-	-	-	4.7
Magnesium (meq/l)	-	-	-	-	4.2
Sodium Adsorption Ratio	-	-	-	-	7.8

Note 1. The measurement was done by JICA Study Team in 1998.
2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.
3. 9th, May was rainy during daytime.
4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.
5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.
6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.
- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.23 Water Quality of Lower Sirw Drainage Canal in the El Nazl Area

Location	Lower Sirw pumping station				
Date, Month	29, April	11, May	18, May	23, May	2, Nov.
Measurement time	12:30	11:55	13:15	12:30	12:00
Water flow	Medium	N.D.	Fast	N.D.	Medium
Water quantity	Medium	N.D.	Much	N.D.	Medium
Water Temperature (℃)	21.3	27.3	23.6	23.3	22.3
pH	7.76	7.64	7.87	7.29	8.20
Turbidity (NTU)	128	105	146	39	269
Electric Conductivity (dS/m)	1.84	1.74	1.83	0.757	1.05
Dissolved Oxygen (mg/l)	2.89	1.91	3.32	0.44	3.00
Total Dissolved Solids (mg/l)	1,200	1,100	1,200	480	670
Sodium (meq/l)	-	-	-	-	10.9
Calcium (meq/l)	-	-	-	-	4.8
Magnesium (meq/l)	-	-	-	-	3.8
Sodium Adsorption Ratio	-	-	-	-	5.3

Note 1. The measurement was done by JICA Study Team in 1998,

2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.

3. 9th, May was rainy during daytime.

4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.

5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.

6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.

- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.24 Water Quality of Bahr El Saidi Main Canal in the Bahr El- Saidi Area

Location	Start of Area					
Date, Month	30, April	9, May	11, May	20, May	23, May	4, Nov.
Measurement time	10:10	12:30	13:00	11:30	11:12	9:50
Water flow	Slow	Fast	N.D.	Medium	N.D.	Fast
Water quantity	M/Much	Little	N.D.	Medium	N.D.	Medium
Water Temperature (℃)	21.6	22.0	24.2	23.8	24.0	22.0
pH	7.88	7.29	7.46	7.15	7.75	7.76
Turbidity (NTU)	21	22	17	45	30	32
Electric Conductivity (dS/m)	0.554	0.513	0.494	0.487	0.484	0.387
Dissolved Oxygen (mg/l)	3.22	4.03	2.31	4.55	3.13	5.66
Total Dissolved Solids (mg/l)	360	330	320	310	310	250
Sodium (meq/l)	-	-	-	-	-	2.6
Calcium (meq/l)	-	-	-	-	-	3.7
Magnesium (meq/l)	-	-	-	-	-	1.4
Sodium Adsorption Ratio	-	-	-	-	-	1.6

Location	Midstream					
Date, Month	30, April	9, May	11, May	20, May	23, May	4, Nov.
Measurement time	13:25	11:50	13:05	14:10	11:20	12:35
Water flow	Medium	Medium	N.D.	Fast	N.D.	Medium
Water quantity	Medium	Medium	N.D.	Much	N.D.	Medium
Water Temperature (℃)	24.1	20.5	23.9	25.4	23.1	21.3
pH	7.76	6.91	7.81	7.76	7.78	8.12
Turbidity (NTU)	66	74	42	73	72	94
Electric Conductivity (dS/m)	0.617	1.77	0.990	1.85	1.45	2.47
Dissolved Oxygen (mg/l)	4.04	1.93	1.20	2.93	0.96	2.89
Total Dissolved Solids (mg/l)	400	1,100	630	1,200	930	1,600
Sodium (meq/l)	-	-	-	-	-	28.7
Calcium (meq/l)	-	-	-	-	-	6.7
Magnesium (meq/l)	-	-	-	-	-	5.8
Sodium Adsorption Ratio	-	-	-	-	-	11.4

Table K.1.2.25 Water Quality of Sakhawi Irrigation Canal in the Bahr El- Saidi Area

Location	Intake					
Date, Month	30, April		11, May	20, May	23, May	4, Nov.
Measurement time	12:50		13:00	13:55	11:16	11:50
Water flow	Medium		N.D.	Fast	N.D.	Medium
Water quantity	M/Much		N.D.	Medium	N.D.	Much
Water Temperature (°C)	22.8		23.9	24.8	23.7	22.4
pH	7.85		7.47	7.62	7.69	8.22
Turbidity (NTU)	47		19	32	24	34
Electric Conductivity (dS/m)	0.556		0.498	0.494	0.491	0.391
Dissolved Oxygen (mg/l)	3.63		2.13	4.70	3.13	5.63
Total Dissolved Solids (mg/l)	360		320	320	310	250
Sodium (meq/l)	-	-	-	-	-	2.7
Calcium (meq/l)	-	-	-	-	-	3.7
Magnesium (meq/l)	-	-	-	-	-	1.5
Sodium Adsorption Ratio	-	-	-	-	-	1.7

Location	Intake at East canal					
Date, Month	30, April	9, May	11, May	20, May	23, May	4, Nov.
Measurement time	12:30	12:50	13:10	13:40	11:24	11:50
Water flow	Medium	Fast	N.D.	Medium	N.D.	Medium
Water quantity	Medium	Medium	N.D.	Medium	N.D.	Much
Water Temperature (°C)	23.2	21.7	24.3	25.6	23.5	22.0
pH	7.74	7.54	7.41	7.67	7.62	8.08
Turbidity (NTU)	35	27	19	52	21	29
Electric Conductivity (dS/m)	0.565	0.530	0.521	0.503	0.502	0.400
Dissolved Oxygen (mg/l)	3.84	2.95	2.37	4.82	3.26	5.85
Total Dissolved Solids (mg/l)	360	340	330	320	320	260
Sodium (meq/l)	-	-	-	-	-	4.7
Calcium (meq/l)	-	-	-	-	-	3.7
Magnesium (meq/l)	-	-	-	-	-	1.7
Sodium Adsorption Ratio	-	-	-	-	-	2.9

Table K.1.2.26 Water Quality of Qassabi Irrigation Canal in the Bahr El Saidi Area

Location	Midstream					
Date, Month	30, April	9, May	11, May	20, May	23, May	4, Nov.
Measurement time	10:20	13:20	13:10	11:55	11:28	10:05
Water flow	Medium	Medium	N.D.	Medium	N.D.	Fast
Water quantity	Medium	Medium	N.D.	Medium	N.D.	Medium
Water Temperature (°C)	22.4	20.3	24.7	24.5	23.9	21.9
pH	7.87	7.09	7.54	7.59	7.69	7.87
Turbidity (NTU)	31	53	18	42	26	33
Electric Conductivity (dS/m)	0.558	0.811	0.504	0.497	0.493	0.393
Dissolved Oxygen (mg/l)	3.43	2.40	2.30	4.59	3.43	5.46
Total Dissolved Solids (mg/l)	360	520	320	320	320	250
Sodium (meq/l)	-	-	-	-	-	4.3
Calcium (meq/l)	-	-	-	-	-	3.6
Magnesium (meq/l)	-	-	-	-	-	1.5
Sodium Adsorption Ratio	-	-	-	-	-	2.7

Note 1. The measurement was done by JICA Study Team in 1998.

2. The data on 11th, and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.

3. 9th, May was rainy during daytime.

4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.

5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.

6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.

- pH: Normal range 6.5-8.4
- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.27 Water Quality of Abu Ismail Irrigation Canal in the Bahr El Saidi Area

Location	End of downstream			
Date, Month	11, May	20, May	23, May	4, Nov.
Measurement time	13:20	12:10	11:31	10:20
Water flow	N.D.	Fast	N.D.	Medium
Water quantity	N.D.	Medium	N.D.	Medium
Water Temperature (℃)	24.7	24.9	23.5	21.7
pH	7.39	7.56	7.44	7.33
Turbidity (NTU)	24	76	33	34
Electric Conductivity (dS/m)	0.527	0.508	0.516	0.403
Dissolved Oxygen (mg/l)	1.13	3.14	1.29	4.36
Total Dissolved Solids (mg/l)	340	330	330	260
Sodium (meq/l)	-	-	-	4.3
Calcium (meq/l)	-	-	-	3.6
Magnesium (meq/l)	-	-	-	1.5
Sodium Adsorption Ratio	-	-	-	2.7

Note 1. The measurement was done by JICA Study Team in 1998.

2. The data on 11th. and 23rd, May were measured in the IIP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.

3. 9th, May was rainy during daytime.

4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.

5. Total dissolved solids(TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.

6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.

- pH: Normal range 6.5-8.4
- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids(mg/l): None 450->, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.28 Water Quality of Zafrani Drainage Canal in the Bahr El Saidi Area

Location	End of downstream			
Date, Month	11, May	20, May	23, May	4, Nov.
Measurement time	13:20	12:30	11:34	10:45
Water flow	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	Little	N.D.	Medium
Water Temperature (℃)	24.2	25.0	23.7	20.1
pH	7.86	7.90	7.87	7.37
Turbidity (NTU)	156	476	163	180
Electric Conductivity (dS/m)	1.38	1.23	1.62	1.59
Dissolved Oxygen (mg/l)	1.72	4.29	2.05	5.08
Total Dissolved Solids (mg/l)	880	790	1,000	1,000
Sodium (meq/l)	-	-	-	13.9
Calcium (meq/l)	-	-	-	4.7
Magnesium (meq/l)	-	-	-	7.5
Sodium Adsorption Ratio	-	-	-	7.7

Table K.1.2.29 Water Quality of Kom El Arab Drainage Canal in Bahr El Saidi Area

Location	End of downstream			
Date, Month	11, May	20, May	23, May	4, Nov.
Measurement time	13.25	13.05	11:37	11:20
Water flow	N.D.	Medium	N.D.	Medium
Water quantity	N.D.	Little	N.D.	Medium
Water Temperature (℃)	24.5	25.0	22.9	20.7
pH	7.89	7.93	7.77	8.38
Turbidity (NTU)	135	305	452	185
Electric Conductivity (dS/m)	2.99	2.68	3.00	3.72
Dissolved Oxygen (mg/l)	2.21	4.86	2.35	5.34
Total Dissolved Solids (mg/l)	1,900	1,700	1,900	2,400
Sodium (meq/l)	-	-	-	27.9
Calcium (meq/l)	-	-	-	5.7
Magnesium (meq/l)	-	-	-	12.5
Sodium Adsorption Ratio	-	-	-	9.2

Note 1. The measurement was done by JICA Study Team in 1995.

2. The data on 11th, and 23rd, May were measured in the HP Tanta Office after collected samples at 8 o'clock in the morning. The other data were determined on the field.

3. 9th, May was rainy during daytime.

4. Water flow level was decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.

5. Total dissolved solids (TDS) is calculated from Electric Conductivity by doing 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.

6. Guideline of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.

- pH: Normal range 6.5-8.4
- Conductivity (dS/m) : None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <
- Total Dissolved Solids (mg/l) : None 450 >, Slight to Moderate 450-2000, Severe 2000 <
- Influence of irrigation was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0-3 and ECw=	0.7 <	0.7 - 0.2	0.2 >
3-6	1.2 <	1.2 - 0.3	0.3 >
6-12	1.9 <	1.9 - 0.5	0.5 >
12-20	2.9 <	2.9 - 1.3	1.3 >
20-40	5.0 <	5.0 - 2.9	2.9 >

- Specific Ion Toxicity (Na) : None 3 SAR >, Slight to Moderate 3-9 SAR, Severe 9 SAR <

Table K.1.2.30 Situation of process for water supply and disposal of life in village

Item	Used place	Disposal place	Note
1. Bathe of cattle	Irrigation canal	Inside of canal	
2. Washing	ditto	ditto	
3. Tabeware wash	ditto	ditto	
4. Cooking	Inside of house	Underground permeation	
5. Bathroom	ditto	ditto	
6. Lavatory	ditto	ditto	Mosque can discharge to drain

Note: Investigation place of hearing: Midstream of Bahr Bella branch canal, at Hazik village

Table K.1.2.31 Water Quality of Drinking Water

Place	1.	2.	3.	4.	5.
Measurement of Month, Date	17, May	17, May	28, April	21, May	17, May
Water Source	Clean W.	Ground W.	Clean W.	Clean W.	BARAKA
Water Temperature (°C)	23.5	21.7	22.1	23.8	24.9
pH	7.12	7.92	7.71	8.15	7.53
Turbidity (NTU)	1	3	2	3	1
Electric Conductivity (ds/m)	0.738	1.02	0.470	0.379	0.725
Dissolved Oxygen (mg/l)	3.59	1.94	6.47	6.95	6.17
Salinity (% indicated as Nacl)	0.03	0.04	0.01	0.01	0.03
Total Dissolved Solids (mg/l)	470	650	300	240	460

Note 1. The measurement was done by JICA Study Team in 1998.
2. Place no. are as follows.
1. Supplied water in Tanta city, near the Tanta Office of HP
2. Ground water in Tanta city, near the Tanta Office of HP
3. Supplied water in Balaweya village from Dakahlia Governorate
4. Supplied water in Hazik village from water station in Ebshan village intaked from Bahr Tera irrigation canal
5. Marketing water named "BARAKA"

Table K.1.2.32 Underdrainage Water Quality from Crop Field

Place	1.	2.
Measurement of Date, Nonth	21, May	21, May
Measurement Time	14:30	14:50
Main Crop	Cotton	Cotton
Water Flow	Medium	Medium
Water Quantity	Medium	Medium
Water Temperature (°C)	26.9	27.9
pH	7.53	8.11
Turbidity (NTU)	312	630
Electric Conductivity (ds/m)	0.531	0.980
Dissolved Oxygen (mg/l)	4.76	6.63
Salinity (% indicated as Nacl)	0.02	0.04
Total Dissolved Solids (mg/l)	340	630

Note: 1. The measurement was done by JICA Study Team in 1998.
2. Place no. are as follows.
1. Underdrainage water canal from crop field in Kom El Malaha village
2. Inflow water from underdrainage pipe to No.4 drainage canal

Table K.1.2.33 Change of Water Quality by the Time Passing through the Villages at the Bahr Basandila Canal

Midstream, 18 Km from start of the Bahr Basandila canal					
Water Flow:	Medium				Medium
Water Quantity:	Medium				Medium
Mesurement Time	9:55	11:50	13:30	14:50	11:00
Water Temperatere(℃)	21.3	22.3	23.1	23.4	23.3
pH	7.91	8.09	8.05	8.23	7.89
Turbidity(NTU)	30	33	54	39	29
Dissolved Oxygen(mg/l)	5.73	6.19	6.53	6.96	4.47
Electric Conductivity(dS/m)	0.391	0.400	0.408	0.406	0.404
Total Dissolved Solids(mg/l)	250	260	260	260	260
Sodium(meq/l)	-	-	-	-	1.7
Calcium(meq/l)	-	-	-	-	3.6
Magnesium(meq/l)	-	-	-	-	1.3
Sodium Adsorption Ratio	-	-	-	-	1.1

Downstream, 31 Km from start of the Bahr Basandila canal					
Water Flow:	Medium				Medium
Water Quantity:	Medium				Much
Mesurement Time	11:00	12:45	14:10	15:20	11:35
Water Temperatere(℃)	20.0	20.4	20.8	21.3	22.3
pH	7.88	7.87	7.72	7.79	8.09
Turbidity(NTU)	121	130	165	164	195
Dissolved Oxygen(mg/l)	2.24	2.21	2.39	2.61	2.31
Electric Conductivity(dS/m)	3.83	3.86	4.15	4.06	3.00
Total Dissolved Solids(mg/l)	2,500	2,500	2,700	2,600	1,900
Sodium(meq/l)	-	-	-	-	17.7
Calcium(meq/l)	-	-	-	-	5.4
Magnesium(meq/l)	-	-	-	-	5.8
Sodium Adsorption Ratio	-	-	-	-	7.5

Note 1. Start to 16.8Km of Bahr Basandila canal is continuous irrigation, and 16.8Km to end is intermittent irrigation, 1-6 date(off), 7-11 date (on), 12-21 date(off), 22-28(on), in April.

2. The measurement was done by JICA Study Team in 28th, April, 1998 and most right value is in 26th, October, 1998.

Table K.2.1 Location of Water Quality Survey in the Feasibility Study Area

I . Main canal

1. Bahr Tera canal, at upstream, midstream and downstream

II . Branch canal

1. Bahr El Banawan canal, at upstream, midstream and downstream

III. Delivery canal

1. Bahr Biyala canal, at upstream, midstream, downstream, and meska
2. Zobaa canal, at upstream, midstream, downstream, and meska
3. Ibshan canal, at upstream, midstream, downstream, and meska
4. El Nezam canal, at upstream, midstream, downstream, and meska
5. Bahr El Nour canal, at upstream, midstream, downstream, and meska
6. El Mahatta canal, at upstream, midstream, downstream, and meska
7. Ragheb Basha canal, at upstream, midstream, downstream, and meska
8. El Sharkaweiah canal, at upstream, midstream, and downstream
9. Foda canal, at upstream, midstream, and downstream
10. El Kafr El Sharkie canal, at upstream, midstream, downstream, and meska
11. Ganabia No.7 Left canal, at upstream, midstream, and downstream
12. Ganabia No.6 Right canal, at upstream, midstream, downstream, and meska
13. Marzouk canal, at upstream, midstream, and downstream
14. El Shorafa canal, at upstream, midstream, and downstream
15. Hazek canal, at upstream, midstream and, downstream
16. Abou Iweida canal, at upstream, midstream, and downstream

IV. Drainage canal

1. No.4 drainage canal, at upstream, midstream, and downstream
2. El Gharbia drainage canal, at upstream, midstream, and downstream
3. No.5 drainage canal, at upstream, midstream, and downstream
4. El Sharqawlya drainage canal, at midstream and downstream
5. Ibshan drainage canal, at upstream, midstream, and downstream
6. El Banawan drainage canal, at upstream, midstream, and downstream
7. El Hagg Yused drainage canal, at upstream and downstream
8. Biyala drainage canal, at upstream and downstream
9. No.3 drainage canal, at upstream and downstream
10. El Komsan drainage canal, at midstream
11. El Zoraba drainage canal, at downstream end

V . Subsurface drainage water from crop field

1. No.4 drainage canal, at midstream
2. El Komsan drainage canal, at midstream

Table K.2.2.1 Summary of Field Survey on Water Quality in the F/S Area

I . Irrigation Canal

Name of canal	Bahr Tera			
Measurement Point	Upstream, 1	Upstream, 2	Midstream, 1	Midstream, 2
Date, Month	15, Nov.	15, Nov.	18, Nov.	23, Nov.
Water Flow	Medium	Medium	Medium	Medium
Water Quantity	Much	Medium	Medium	Medium
Measurement Time	12:25	11:15	14:40	14:05
Water Temperature(℃)	23.1	20.2	20.7	21.6
pH	8.09	8.15	7.60	7.58
Dissolved Oxygen(mg/l)	6.20	6.64	7.69	5.08
Turbidity(NTU)	39	21	32	33
Conductivity(dS/m, 25 ℃)	0.386	0.382	0.365	0.393
Total Dissolved Solids(mg/l)	250	240	230	250
Sodium(meq/l)	1.9	1.9	1.7	1.5
Calcium(meq/l)	3.4	3.2	3.0	3.1
Magnesium(meq/l)	2.3	2.7	1.3	0.8
Sodium Adsorption Ratio	1.1	1.1	1.2	1.1

Name of canal	Bahr Tera	
Measurement Point	Downstream, 1	Downstream, 2
Date, Month	23, Nov.	22, Nov.
Water Flow	Medium	Medium
Water Quantity	Much	Medium
Measurement Time	13:20	9:00
Water Temperature(℃)	21.1	20.8
pH	8.12	6.73
Dissolved Oxygen(mg/l)	5.13	4.79
Turbidity(NTU)	28	29
Conductivity(dS/m, 25 ℃)	0.376	0.393
Total Dissolved Solids(mg/l)	240	250
Sodium(meq/l)	1.4	2.0
Calcium(meq/l)	3.0	3.1
Magnesium(meq/l)	0.8	0.9
Sodium Adsorption Ratio	1.0	1.4

Name of canal	Bahr Banawan			
Measurement Point	Upstream, 1	Upstream, 2	Midstream, 1	Midstream, 2
Date, Month	25, Nov.	25, Nov.	25, Nov.	25, Nov.
Water Flow	Medium	Medium	Medium	Medium
Water Quantity	Medium	Medium	Much	Much
Measurement Time	12:25	12:05	14:40	14:20
Water Temperature(℃)	20.5	20.3	20.5	20.6
pH	8.13	8.07	7.53	8.09
Dissolved Oxygen(mg/l)	4.27	5.37	3.99	4.21
Turbidity(NTU)	49	32	55	51
Conductivity(dS/m, 25 ℃)	0.491	0.428	0.990	0.823
Total Dissolved Solids(mg/l)	310	270	630	530
Sodium(meq/l)	2.6	2.0	4.5	4.2
Calcium(meq/l)	3.2	3.0	3.7	3.6
Magnesium(meq/l)	1.3	1.3	2.5	3.3
Sodium Adsorption Ratio	1.7	1.4	2.6	2.3

Name of canal	Bahr Banawan		
Measurement Point	Downstream, 1	Downstream, 2	End of Downstream
Date, Month	25, Nov.	25, Nov.	25, Nov.
Water Flow	Slow	Medium	Stop
Water Quantity	Much	Much	Much
Measurement Time	14:10	14:55	15:15
Water Temperature(℃)	20.5	20.6	20.3
pH	8.17	7.87	7.97
Dissolved Oxygen(mg/l)	4.71	2.90	2.47
Turbidity(NTU)	50	59	90
Conductivity(dS/m, 25℃)	0.766	1.74	1.94
Total Dissolved Solids(mg/l)	490	1,100	1,200
Sodium(meq/l)	3.8	8.0	9.3
Calcium(meq/l)	3.4	4.5	4.7
Magnesium(meq/l)	2.9	5.0	7.5
Sodium Adsorption Ratio	2.1	3.7	3.8

Name of canal	Bahr Biyala			
Measurement Point	Upstream	Midstream, 1	Midstream, 2	Downstream, 1
Date, Month	15, Nov.	15, Nov.	15, Nov.	15, Nov.
Water Flow	Medium	Medium	Medium	Medium
Water Quantity	Medium	Medium	Medium	Medium
Measurement Time	13:00	13:25	15:45	14:20
Water Temperature(℃)	21.2	20.5	20.7	20.0
pH	8.22	7.97	8.07	7.78
Dissolved Oxygen(mg/l)	6.14	4.26	5.71	4.78
Turbidity(NTU)	26	31	33	73
Conductivity(dS/m, 25℃)	0.372	0.739	0.491	1.92
Total Dissolved Solids(mg/l)	240	470	310	1,300
Sodium(meq/l)	2.5	4.2	2.2	13.0
Calcium(meq/l)	3.0	3.7	3.2	5.1
Magnesium(meq/l)	2.1	3.3	5.0	5.8
Sodium Adsorption Ratio	1.6	2.2	2.2	5.6

Name of canal	Bahr Biyala	
Measurement Point	Downstream, 2	Meska of downstream
Date, Month	15, Nov.	15, Nov.
Water Flow	Stop	Stop
Water Quantity	Medium	Medium
Measurement Time	14:55	14:30
Water Temperature(℃)	21.3	20.0
pH	8.46	7.83
Dissolved Oxygen(mg/l)	11.04	7.45
Turbidity(NTU)	100	84
Conductivity(dS/m, 25℃)	1.29	1.16
Total Dissolved Solids(mg/l)	830	740
Sodium(meq/l)	6.7	7.2
Calcium(meq/l)	4.6	5.0
Magnesium(meq/l)	5.0	5.4
Sodium Adsorption Ratio	3.1	3.2

Name of canal	Zobaa			
Measurement Point	Upstream	Midstream	Downstream, 1	Downstream, 2
Date, Month	22, Nov.	22, Nov.	22, Nov.	22, Nov.
Water Flow	Medium	Medium	Stop	Stop
Water Quantity	Medium	Medium	Medium	Medium
Measurement Time	9:10	9:20	9:55	10:05
Water Temperature(°C)	20.7	20.9	20.3	19.1
pH	7.39	7.43	7.46	7.17
Dissolved Oxygen(mg/l)	4.52	2.45	0.56	1.68
Turbidity(NTU)	39	46	42	17
Conductivity(dS/m, 25 °C)	0.386	0.405	0.502	0.608
Total Dissolved Solids(mg/l)	250	260	320	390
Sodium(meq/l)	2.0	2.6	3.7	4.4
Calcium(meq/l)	3.1	3.3	3.4	3.7
Magnesium(meq/l)	1.0	1.0	2.1	2.1
Sodium Adsorption Ratio	1.4	1.8	2.2	2.6

Name of canal	Zobaa	
Measurement Point	Meska of midstream	Meska of downstream
Date, Month	22, Nov.	22, Nov.
Water Flow	Slow	Stop
Water Quantity	Medium	Medium
Measurement Time	9:30	9:40
Water Temperature(°C)	20.0	20.9
pH	7.13	7.55
Dissolved Oxygen(mg/l)	0.43	0.43
Turbidity(NTU)	24	52
Conductivity(dS/m, 25 °C)	1.52	0.514
Total Dissolved Solids(mg/l)	970	330
Sodium(meq/l)	8.7	3.8
Calcium(meq/l)	4.9	3.5
Magnesium(meq/l)	4.2	2.5
Sodium Adsorption Ratio	4.1	2.2

Name of canal	Ibshan			
Measurement Point	Upstream	Midstream	Downstream	Meska of downstream
Date, Month	23, Nov.	23, Nov.	23, Nov.	23, Nov.
Water Flow	Medium	Medium	Stop	Medium
Water Quantity	Medium	Medium	Medium	Much
Measurement Time	11:30	11:50	12:25	12:05
Water Temperature(°C)	20.9	21.5	21.6	21.8
pH	6.64	7.38	7.23	7.87
Dissolved Oxygen(mg/l)	4.14	1.77	1.23	3.82
Turbidity(NTU)	37	52	28	61
Conductivity(dS/m, 25 °C)	0.412	0.419	0.456	0.425
Total Dissolved Solids(mg/l)	260	270	290	270
Sodium(meq/l)	2.0	2.1	2.3	2.0
Calcium(meq/l)	3.0	3.1	3.3	3.1
Magnesium(meq/l)	1.7	1.4	1.3	1.3
Sodium Adsorption Ratio	1.3	1.4	1.5	1.3

Name of canal	El Nezam		
Measurement Point	Upstream	Midstream	Downstream, 1
Date, Month	18, Nov.	18, Nov.	18, Nov.
Water Flow	Slow	Slow	Slow
Water Quantity	Medium	Medium	Medium
Measurement Time	14:10	13:55	13:40
Water Temperature(°C)	20.9	20.8	20.5
pH	7.84	7.62	7.52
Dissolved Oxygen(mg/l)	5.62	4.96	2.93
Turbidity(NTU)	20	33	35
Conductivity(dS/m, 25 °C)	0.365	0.380	0.453
Total Dissolved Solids(mg/l)	230	240	290
Sodium(meq/l)	1.5	1.7	2.2
Calcium(meq/l)	2.9	3.0	3.1
Magnesium(meq/l)	2.7	2.7	3.3
Sodium Adsorption Ratio	0.9	1.0	1.2

Name of canal	El Nezam	
Measurement Point	Downstream, 2	Meska of downstream
Date, Month	18, Nov.	18, Nov.
Water Flow	Stop	Stop
Water Quantity	Medium	Medium
Measurement Time	13:25	13:10
Water Temperature(°C)	21.4	19.8
pH	6.99	6.17
Dissolved Oxygen(mg/l)	1.50	0.87
Turbidity(NTU)	14	197
Conductivity(dS/m, 25 °C)	0.523	0.496
Total Dissolved Solids(mg/l)	330	320
Sodium(meq/l)	2.8	2.8
Calcium(meq/l)	3.3	3.3
Magnesium(meq/l)	4.2	4.2
Sodium Adsorption Ratio	1.4	1.4

Name of canal	Bahr El Nour		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	13, Nov.	13, Nov.	13, Nov.
Water Flow	Medium	Medium	Stop
Water Quantity	Medium	Medium	Medium
Measurement Time	9:30	10:05	12:20
Water Temperature(°C)	20.5	20.0	20.3
pH	7.88	7.85	7.87
Dissolved Oxygen(mg/l)	7.28	7.00	4.57
Turbidity(NTU)	22	28	36
Conductivity(dS/m, 25 °C)	0.385	0.398	0.466
Total Dissolved Solids(mg/l)	250	260	300
Sodium(meq/l)	2.5	2.4	2.8
Calcium(meq/l)	4.0	3.7	3.7
Magnesium(meq/l)	1.7	1.4	1.7
Sodium Adsorption Ratio	1.5	1.5	1.7

Name of canal	Bahr El Nour	
Measurement Point	Meska of midstream	Meska of downstream
Date, Month	13, Nov.	13, Nov.
Water Flow	Stop	Stop
Water Quantity	Medium	Little
Measurement Time	10:50	12:40
Water Temperature(°C)	19.7	19.0
pH	7.45	7.76
Dissolved Oxygen(mg/l)	4.70	3.04
Turbidity(NTU)	31	26
Conductivity(dS/m, 25 °C)	0.724	0.460
Total Dissolved Solids(mg/l)	460	290
Sodium(meq/l)	4.8	3.2
Calcium(meq/l)	4.5	4.0
Magnesium(meq/l)	3.3	3.2
Sodium Adsorption Ratio	2.4	1.7

Name of canal	El Mahatta			
Measurement Point	Upstream	Midstream	Downstream	Meska of downstream
Date, Month	23, Nov.	23, Nov.	23, Nov.	23, Nov.
Water Flow	Slow	Slow	Stop	Medium
Water Quantity	Medium	Much	Medium	Medium
Measurement Time	13:15	13:05	12:45	12:55
Water Temperature(°C)	21.3	22.3	21.5	21.0
pH	7.86	7.83	7.38	7.75
Dissolved Oxygen(mg/l)	5.29	4.43	3.47	3.08
Turbidity(NTU)	29	39	58	49
Conductivity(dS/m, 25 °C)	0.380	0.402	0.390	0.387
Total Dissolved Solids(mg/l)	240	260	250	250
Sodium(meq/l)	1.4	1.6	1.8	1.7
Calcium(meq/l)	3.0	3.1	3.1	3.1
Magnesium(meq/l)	1.1	1.3	1.0	1.5
Sodium Adsorption Ratio	1.0	1.1	1.3	1.1

Name of canal	Regheb Basha		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	22, Nov.	22, Nov.	22, Nov.
Water Flow	Medium	Medium	Stop
Water Quantity	Medium	Medium	Much
Measurement Time	11:40	11:05	10:50
Water Temperature(°C)	21.4	21.1	21.4
pH	7.74	7.65	7.64
Dissolved Oxygen(mg/l)	6.11	3.64	1.90
Turbidity(NTU)	30	36	42
Conductivity(dS/m, 25 °C)	0.395	0.391	0.438
Total Dissolved Solids(mg/l)	250	250	280
Sodium(meq/l)	2.1	2.3	2.5
Calcium(meq/l)	3.0	3.1	3.1
Magnesium(meq/l)	1.7	1.3	1.5
Sodium Adsorption Ratio	1.4	1.6	1.6

Name of canal	Regheb Basha	
Measurement Point	Meska of upstream	Meska of midstream
Date, Month	22, Nov.	22, Nov.
Water Flow	Stop	Slow
Water Quantity	Medium	Medium
Measurement Time	11:30	11:20
Water Temperature(°C)	22.4	21.9
pH	7.41	7.62
Dissolved Oxygen(mg/l)	4.35	3.63
Turbidity(NTU)	52	46
Conductivity(dS/m, 25 °C)	1.05	0.429
Total Dissolved Solids(mg/l)	670	270
Sodium(meq/l)	6.1	2.8
Calcium(meq/l)	3.7	3.0
Magnesium(meq/l)	3.3	1.5
Sodium Adsorption Ratio	3.3	1.9

Name of canal	El Sharkaweiah		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	15, Nov.	22, Nov.	22, Nov.
Water Flow	Fast	Medium	Stop
Water Quantity	Much	Medium	Medium
Measurement Time	11:20	13:30	13:55
Water Temperature(°C)	20.2	20.7	21.4
pH	6.93	7.58	6.95
Dissolved Oxygen(mg/l)	5.65	4.86	2.90
Turbidity(NTU)	40	52	18
Conductivity(dS/m, 25 °C)	0.383	0.398	0.524
Total Dissolved Solids(mg/l)	250	250	340
Sodium(meq/l)	1.9	2.2	2.8
Calcium(meq/l)	3.3	3.1	3.3
Magnesium(meq/l)	2.9	3.3	4.2
Sodium Adsorption Ratio	1.1	1.2	1.4

Name of canal	Foda		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	12, Nov.	12, Nov.	12, Nov.
Water Flow	Medium	Medium	Stop
Water Quantity	Medium	Medium	Medium
Measurement Time	12:10	12:00	11:40
Water Temperature(°C)	21.7	22.3	19.5
pH	7.93	7.95	8.33
Dissolved Oxygen(mg/l)	5.42	6.80	3.76
Turbidity(NTU)	33	83	48
Conductivity(dS/m, 25 °C)	0.387	0.396	0.426
Total Dissolved Solids(mg/l)	250	250	270
Sodium(meq/l)	1.4	1.5	2.0
Calcium(meq/l)	2.9	3.8	4.0
Magnesium(meq/l)	2.3	2.6	2.7
Sodium Adsorption Ratio	0.9	0.8	1.1

Name of canal	El Kaft El Sharkie			
Measurement Point	Upstream	Midstream	Downstream	Meska of midstream
Date, Month	23, Nov.	23, Nov.	23, Nov.	23, Nov.
Water Flow	Medium	Slow	Stop	Stop
Water Quantity	Medium	Medium	Medium	Medium
Measurement Time	14:25	14:45	15:00	14:35
Water Temperature(°C)	21.7	23.2	22.7	21.7
pH	7.26	8.14	7.83	7.52
Dissolved Oxygen(mg/l)	5.27	5.47	4.63	2.57
Turbidity(NTU)	45	43	85	56
Conductivity(dS/m, 25 °C)	0.394	0.384	0.381	0.454
Total Dissolved Solids(mg/l)	250	250	240	290
Sodium(meq/l)	1.5	1.4	1.5	2.2
Calcium(meq/l)	3.1	2.9	3.0	3.2
Magnesium(meq/l)	1.0	1.3	1.5	2.5
Sodium Adsorption Ratio	1.0	1.0	1.0	1.3

Name of canal	Ganabia No.7 Left		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	23, Nov.	23, Nov.	23, Nov.
Water Flow	Slow	Slow	Stop
Water Quantity	Medium	Medium	Medium
Measurement Time	13:30	13:45	13:55
Water Temperature(°C)	21.5	22.0	22.3
pH	8.40	8.29	7.60
Dissolved Oxygen(mg/l)	4.91	4.42	3.32
Turbidity(NTU)	28	28	52
Conductivity(dS/m, 25 °C)	0.380	0.397	0.520
Total Dissolved Solids(mg/l)	240	250	330
Sodium(meq/l)	1.4	1.6	3.1
Calcium(meq/l)	3.0	3.0	2.8
Magnesium(meq/l)	1.7	1.4	1.8
Sodium Adsorption Ratio	0.9	1.1	2.0

Name of canal	Ganabia No.6 Right			
Measurement Point	Upstream	Midstream	Downstream	Meska of midstream
Date, Month	15, Nov.	15, Nov.	15, Nov.	15, Nov.
Water Flow	Stop	Medium	Medium	Medium
Water Quantity	Little	Medium	Medium	Much
Measurement Time	12:20	12:35	11:30	11:50
Water Temperature(°C)	20.2	19.4	19.4	17.2
pH	8.15	8.03	7.91	7.87
Dissolved Oxygen(mg/l)	4.74	5.03	5.32	4.53
Turbidity(NTU)	44	82	96	120
Conductivity(dS/m, 25 °C)	0.411	0.462	0.419	0.537
Total Dissolved Solids(mg/l)	260	300	270	340
Sodium(meq/l)	2.2	2.5	2.2	2.8
Calcium(meq/l)	3.6	3.6	3.4	4.1
Magnesium(meq/l)	2.9	2.1	1.3	1.7
Sodium Adsorption Ratio	1.2	1.5	1.4	1.6

Name of canal	Marzouk		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	18, Nov.	18, Nov.	18, Nov.
Water Flow	Slow	Slow	Stop
Water Quantity	Medium	Medium	Little
Measurement Time	14:50	15:00	15:10
Water Temperature(°C)	20.7	21.2	20.6
pH	7.84	7.35	7.56
Dissolved Oxygen(mg/l)	5.48	2.42	3.48
Turbidity(NTU)	70	72	40
Conductivity(dS/m, 25 °C)	0.366	0.479	0.523
Total Dissolved Solids(mg/l)	230	310	330
Sodium(meq/l)	1.7	2.4	2.7
Calcium(meq/l)	2.9	3.4	3.5
Magnesium(meq/l)	1.3	1.8	2.5
Sodium Adsorption Ratio	1.2	1.5	1.6

Name of canal	El Shorafa		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	15, Nov.	15, Nov.	15, Nov.
Water Flow	Stop	Stop	Stop
Water Quantity	Little	Little	Medium
Measurement Time	13:35	13:45	14:00
Water Temperature(°C)	20.5	20.4	18.5
pH	8.27	7.93	7.90
Dissolved Oxygen(mg/l)	4.24	4.57	7.82
Turbidity(NTU)	39	34	57
Conductivity(dS/m, 25 °C)	0.749	1.09	2.62
Total Dissolved Solids(mg/l)	480	700	1,700
Sodium(meq/l)	4.2	5.7	16.5
Calcium(meq/l)	3.7	4.0	5.8
Magnesium(meq/l)	3.3	4.2	8.3
Sodium Adsorption Ratio	2.2	2.8	6.2

Name of canal	Hazek		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	18, Nov.	18, Nov.	18, Nov.
Water Flow	Stop	Stop	Medium
Water Quantity	Medium	Medium	Medium
Measurement Time	15:50	15:40	15:20
Water Temperature(°C)	20.7	20.4	20.8
pH	8.03	7.92	7.54
Dissolved Oxygen(mg/l)	4.87	4.03	1.21
Turbidity(NTU)	25	69	38
Conductivity(dS/m, 25 °C)	0.477	0.559	0.516
Total Dissolved Solids(mg/l)	310	360	330
Sodium(meq/l)	2.2	2.9	2.9
Calcium(meq/l)	3.2	3.4	3.8
Magnesium(meq/l)	5.0	3.3	4.2
Sodium Adsorption Ratio	1.1	1.6	1.5

Name of canal	Abou Iweida			
Measurement Point	Upstream	Midstream	Downstream, 1	Downstream, 2
Date, Month	22, Nov.	22, Nov.	22, Nov.	25, Nov.
Water Flow	Medium	Medium	Medium	Medium
Water Quantity	Medium	Medium	Medium	Medium
Measurement Time	11:55	12:10	12:25	11:50
Water Temperature(℃)	21.0	21.8	22.0	20.5
pH	7.92	7.78	7.95	8.19
Dissolved Oxygen(mg/l)	5.43	5.31	5.25	5.63
Turbidity(NTU)	61	57	44	33
Conductivity(dS/m, 25 ℃)	0.372	0.405	0.403	0.390
Total Dissolved Solids(mg/l)	240	260	260	250
Sodium(meq/l)	1.9	2.1	2.0	1.9
Calcium(meq/l)	3.0	3.0	3.2	3.3
Magnesium(meq/l)	1.0	1.0	1.0	1.7
Sodium Adsorption Ratio	1.3	1.5	1.4	1.2

II. Drainage Canal

Name of canal	No. 4			
Measurement Point	Upstream, 1	Upstream, 2	Midstream, 1	Midstream, 2
Date, Month	12, Nov.	13, Nov.	13, Nov.	22, Nov.
Water Flow	Medium	Medium	Medium	Medium
Water Quantity	Medium	Medium	Medium	Medium
Measurement Time	13:30	11:30	13:10	12:30
Water Temperature(℃)	20.6	19.6	19.6	21.4
pH	7.47	7.25	7.76	6.96
Dissolved Oxygen(mg/l)	0.20	3.27	2.87	2.61
Turbidity(NTU)	59	70	114	65
Conductivity(dS/m, 25 ℃)	1.41	2.11	2.24	2.37
Total Dissolved Solids(mg/l)	900	1,400	1,400	1,500
Sodium(meq/l)	11.2	13.4	14.7	15.2
Calcium(meq/l)	4.7	6.2	6.2	5.5
Magnesium(meq/l)	5.8	6.7	7.5	6.3
Sodium Adsorption Ratio	4.9	5.3	5.6	6.3

Name of canal	No. 4	
Measurement Point	Downstream, 1	Downstream, 2
Date, Month	22, Nov.	7, Nov.
Water Flow	Medium	Medium
Water Quantity	Medium	Much
Measurement Time	10:40	13:05
Water Temperature(℃)	20.7	22.3
pH	7.52	8.20
Dissolved Oxygen(mg/l)	2.40	4.25
Turbidity(NTU)	131	111
Conductivity(dS/m, 25 ℃)	1.93	2.12
Total Dissolved Solids(mg/l)	1,200	1,400
Sodium(meq/l)	12.9	18.0
Calcium(meq/l)	5.1	5.6
Magnesium(meq/l)	5.0	5.5
Sodium Adsorption Ratio	5.7	7.8

Name of canal	El Gharbia			
Measurement Point	Upstream, 1	Upstream, 2	Midstream, 1	Midstream, 2
Date, Month	7, Nov.	7, Nov.	7, Nov.	7, Nov.
Water Flow	Medium	Medium	Medium	Medium
Water Quantity	Medium	Medium	Medium	Much
Measurement Time	11:15	11:30	11:50	12:30
Water Temperature(°C)	21.8	21.9	21.7	22.1
pH	7.52	7.70	7.58	8.03
Dissolved Oxygen(mg/l)	0.13	0.02	1.01	0.46
Turbidity(NTU)	95	35	49	38
Conductivity(dS/m, 25 °C)	1.26	1.26	1.94	1.72
Total Dissolved Solids(mg/l)	810	810	1,200	1,100
Sodium(meq/l)	10.6	10.5	12.3	13.4
Calcium(meq/l)	4.5	4.6	4.9	5.0
Magnesium(meq/l)	5.5	4.2	4.2	5.8
Sodium Adsorption Ratio	4.7	5.0	5.8	5.8

Name of canal	El Gharbia	
Measurement Point	Downstream, 1	Downstream, 2
Date, Month	7, Nov.	7, Nov.
Water Flow	Medium	Medium
Water Quantity	Much	Much
Measurement Time	12:45	13:00
Water Temperature(°C)	22.4	22.4
pH	8.07	8.27
Dissolved Oxygen(mg/l)	0.84	1.28
Turbidity(NTU)	43	40
Conductivity(dS/m, 25 °C)	1.58	1.86
Total Dissolved Solids(mg/l)	1,000	1,200
Sodium(meq/l)	12.5	13.7
Calcium(meq/l)	4.9	5.2
Magnesium(meq/l)	5.8	7.5
Sodium Adsorption Ratio	5.4	5.4

Name of canal	No. 5			
Measurement Point	Upstream	Midstream	Downstream, 1	Downstream, 2
Date, Month	12, Nov.	12, Nov.	12, Nov.	12, Nov.
Water Flow	Medium	Medium	Medium	Medium
Water Quantity	Medium	Medium	Medium	Medium
Measurement Time	12:55	11:30	10:40	10:25
Water Temperature(°C)	23.1	19.9	19.3	19.3
pH	6.70	6.85	7.14	7.76
Dissolved Oxygen(mg/l)	0.05	0.71	0.18	1.31
Turbidity(NTU)	90	56	52	68
Conductivity(dS/m, 25 °C)	1.28	1.37	1.33	1.32
Total Dissolved Solids(mg/l)	820	880	850	840
Sodium(meq/l)	6.2	9.1	9.5	9.4
Calcium(meq/l)	4.0	4.1	5.4	4.7
Magnesium(meq/l)	5.4	5.8	5.8	5.4
Sodium Adsorption Ratio	2.9	4.1	4.0	4.2

Name of canal	El Sharqawlya	
Measurement Point	Midstream	Downstream
Date, Month	18, Nov.	22, Nov.
Water Flow	Medium	Medium
Water Quantity	Medium	Medium
Measurement Time	15:30	12:50
Water Temperature(°C)	19.2	23.4
pH	6.49	7.87
Dissolved Oxygen(mg/l)	3.46	5.56
Turbidity(NTU)	99	260
Conductivity(dS/m, 25 °C)	1.73	1.37
Total Dissolved Solids(mg/l)	1,100	880
Sodium(meq/l)	9.4	8.6
Calcium(meq/l)	5.2	4.1
Magnesium(meq/l)	8.3	3.8
Sodium Adsorption Ratio	3.6	4.3

Name of Canal	Ibshan		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	7, Nov.	7, Nov.	7, Nov.
Water Flow	Stop	Medium	Medium
Water Quantity	Medium	Little	Medium
Measurement Time	14:15	13:50	11:45
Water Temperature(°C)	28.3	25.5	21.0
pH	8.66	8.32	8.55
Dissolved Oxygen(mg/l)	13.13	7.39	3.92
Turbidity(NTU)	165	105	100
Conductivity(dS/m, 25 °C)	9.40	2.24	3.77
Total Dissolved Solids(mg/l)	6,000	1,400	2,400
Sodium(meq/l)	67.8	19.2	30.9
Calcium(meq/l)	10.4	5.6	7.5
Magnesium(meq/l)	35.0	5.0	6.5
Sodium Adsorption Ratio	14.4	5.8	11.7

Name of Canal	El Banawan		
Measurement Point	Upstream	Midstream	Downstream
Date, Month	25, Nov.	25, Nov.	25, Nov.
Water Flow	Medium	Medium	Medium
Water Quantity	Medium	Medium	Little
Measurement Time	12:45	13:15	13:50
Water Temperature(°C)	18.9	19.8	19.8
pH	7.54	7.86	7.77
Dissolved Oxygen(mg/l)	2.90	4.06	3.65
Turbidity(NTU)	230	155	308
Conductivity(dS/m, 25 °C)	1.80	1.48	1.54
Total Dissolved Solids(mg/l)	1,200	950	990
Sodium(meq/l)	9.0	7.3	7.7
Calcium(meq/l)	4.1	3.7	3.7
Magnesium(meq/l)	3.8	3.5	4.3
Sodium Adsorption Ratio	4.5	3.8	3.9

Name of Canal	El Hagg Yused	
Measurement Point	Upstream	Downstream
Date, Month	22, Nov.	22, Nov.
Water Flow	Medium	Medium
Water Quantity	Little	Medium
Measurement Time	11:45	10:45
Water Temperature(°C)	21.6	20.6
pH	7.94	7.10
Dissolved Oxygen(mg/l)	5.25	2.08
Turbidity(NTU)	50	204
Conductivity(dS/m, 25 °C)	0.412	1.98
Total Dissolved Solids(mg/l)	260	1,300
Sodium(meq/l)	2.9	12.3
Calcium(meq/l)	3.0	5.1
Magnesium(meq/l)	2.0	7.5
Sodium Adsorption Ratio	1.8	4.9

Name of Canal	Biyala	
Measurement Point	Upstream	Downstream
Date, Month	25, Nov.	25, Nov.
Water Flow	Medium	Medium
Water Quantity	Medium	Little
Measurement Time	13:40	13:20
Water Temperature(°C)	22.3	20.5
pH	6.88	7.41
Dissolved Oxygen(mg/l)	0.03	0.07
Turbidity(NTU)	318	121
Conductivity(dS/m, 25 °C)	2.86	3.02
Total Dissolved Solids(mg/l)	1,800	1,900
Sodium(meq/l)	27.4	21.5
Calcium(meq/l)	3.7	5.0
Magnesium(meq/l)	9.7	15.0
Sodium Adsorption Ratio	10.6	6.8

Name of Canal	No. 3	
Measurement Point	Upstream	Downstream
Date, Month	25, Nov.	25, Nov.
Water Flow	Medium	Medium
Water Quantity	Medium	Medium
Measurement Time	14:00	15:15
Water Temperature(°C)	19.5	20.2
pH	7.85	8.37
Dissolved Oxygen(mg/l)	3.66	5.05
Turbidity(NTU)	192	127
Conductivity(dS/m, 25 °C)	2.56	2.69
Total Dissolved Solids(mg/l)	1,600	1,700
Sodium(meq/l)	12.3	12.9
Calcium(meq/l)	4.3	5.0
Magnesium(meq/l)	7.5	10.0
Sodium Adsorption Ratio	5.1	4.7

Name of Canal	El Komsan	Zoraba
Measurement Point	Midstream	End of downstream
Date, Month	22, Nov.	15, Nov.
Water Flow	Medium	Medium
Water Quantity	Medium	Little
Measurement Time	10:20	14:10
Water Temperature(℃)	19.9	22.2
pH	6.96	8.06
Dissolved Oxygen(mg/l)	3.31	5.17
Turbidity(NTU)	70	82
Conductivity(dS/m, 25℃)	2.39	3.86
Total Dissolved Solids(mg/l)	1,500	2,500
Sodium(meq/l)	14.9	22.1
Calcium(meq/l)	4.7	7.4
Magnesium(meq/l)	8.8	14.2
Sodium Adsorption Ratio	5.7	5.2

III. Subsurface Drainage Water from Crop Field

Location	No. 4 Drain at Midstream, 1	No. 4 Drain at Midstream, 2
Date, Month	13, Nov.	22, Nov.
Water Flow	Medium	Medium
Water Quantity	Medium	Medium
Measurement Time	13:00	12:35
Water Temperature(℃)	20.6	22.9
pH	7.25	7.93
Dissolved Oxygen(mg/l)	3.35	3.14
Turbidity(NTU)	13	294
Conductivity(dS/m, 25℃)	4.99	0.626
Total Dissolved Solids(mg/l)	3,200	280
Sodium(meq/l)	39.3	5.2
Calcium(meq/l)	6.9	3.3
Magnesium(meq/l)	20.0	1.3
Sodium Adsorption Ratio	10.7	1.6

Location	El Komsan at Midstream
Date, Month	22, Nov.
Water Flow	Medium
Water Quantity	Little
Measurement Time	10:15
Water Temperature(℃)	21.4
pH	8.65
Dissolved Oxygen(mg/l)	7.22
Turbidity(NTU)	33
Conductivity(dS/m, 25℃)	0.439
Total Dissolved Solids(mg/l)	400
Sodium(meq/l)	2.4
Calcium(meq/l)	3.1
Magnesium(meq/l)	1.5
Sodium Adsorption Ratio	3.4

Note: 1. The measurement was done by JICA Study Team in 1998, and determined on the each point.

2. Water flow level decided by technical expert, stop, slow, medium, and fast, respectively. And also, water quantity were little, medium, and much.

3. Total dissolved solids(TDS)was calculated from conductivity by using 640 times, referred to Reuse Monitoring Programme Report 39 by Drainage Research Institute, 1995.

4. Guidelines of water quality for irrigation are shown as follows by FAO Irrigation and Drainage Paper 29, 1985.

- pH: Normal range 6.5-8.4

- Conductivity(dS/m): None 0.7 >, Slight to Moderate 0.7-3.0, Severe 3.0 <

- Total Dissolved Solids(mg/l): None 450 >, Slight to Moderate 450-2000, Severe 2000<

- Influence of infiltration was evaluated by SAR and ECw:

SAR	None	Slight to Moderate	Severe
0- 3 and ECw =	0.7 <	0.7-0.2	0.2 >
3- 6	1.2 <	1.2-0.3	0.3 >
6-12	1.9 <	1.9-0.5	0.5 >
12-20	2.9 <	2.9-1.3	1.3 >
20-40	5.0 <	5.0-2.9	2.9 >

- Specific Ion Toxicity(Na): None 3 SAR >, Slight to Moderate 3-9 SAR,
Severe 9 < SAR

Table K.2.3 Result of Farm Economy Survey(2) on Water Quality

<Question 1> (Unit: %)

Option	Foda	No.6 R	Nour	Shorafa	Hazek	Sharkawya	Sharkie	No.7 L	Zawbaa	Total
Drinking water	0	7	0	27	0	27	13	0	10	9
Domestic water	0	20	20	27	0	33	40	20	60	23
Livestock and poulry	100	100	93	100	100	80	100	100	100	97
Others	0	0	0	27	0	47	13	0	0	11

<Question 2> (Unit: %)

Option	Foda	No.6 R	Nour	Shorafa	Hazek	Sharkawya	Sharkie	No.7 L	Zawbaa	Total
No	27	0	0	0	0	0	0	13	0	5
Domestic waste water	0	53	60	73	87	33	53	47	90	54
Sewage water	0	40	93	100	100	67	80	73	80	70
Livestock and poulry	73	100	100	93	100	73	67	80	80	85
Others	0	0	13	0	0	13	0	0	0	3

<Question 3> (Unit: %)

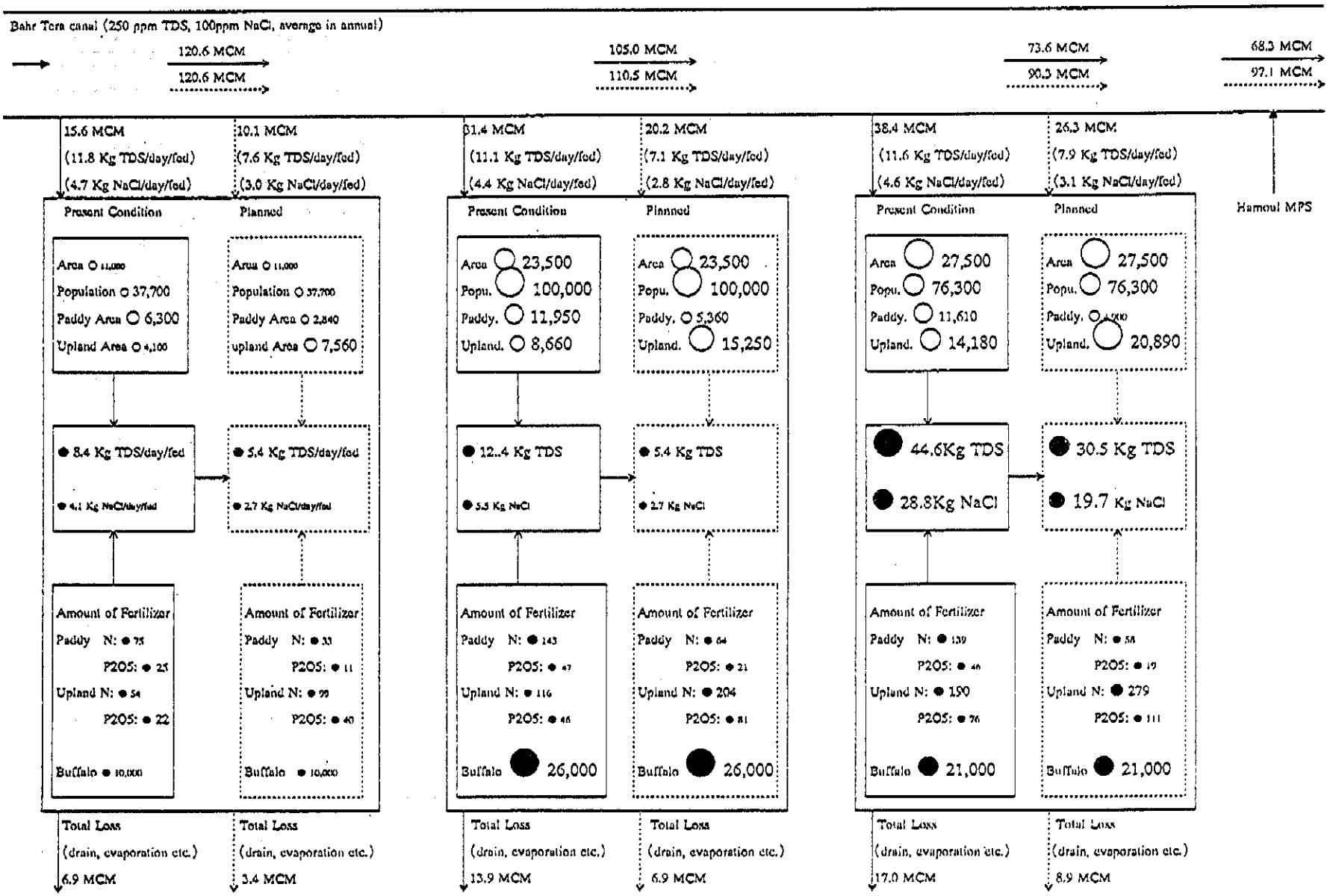
Option	Foda	No.6 R	Nour	Shorafa	Hazek	Sharkawya	Sharkie	No.7 L	Zawbaa	Total
No	27	7	0	0	0	7	7	7	0	6
Disease	73	93	100	100	100	87	93	80	100	92
Not suitable for domestic use	47	67	87	0	47	27	0	60	30	41
Others	0	0	0	0	0	13	0	0	0	2

<Question 4> (Unit: %)

Option	Foda	No.6 R	Nour	Shorafa	Hazek	Sharkawya	Sharkie	No.7 L	Zawbaa	Total
No	13	0	0	0	0	0	0	0	0	2
Drain development and treatment facilitites	27	80	87	100	100	80	93	93	100	84
Canal protection against livestock	73	93	100	100	87	93	80	93	100	91
Others	0	0	0	0	0	7	7	7	0	2

Note 1: Survey was done by JICA Study Team in 1998.
Note 2: Question is following;
Question 1: Do you use canal water apart from irrigation ?
Question 2: Do you notice any water pollution on canal water at present ?
Question 3: Do you have any problem caused by water pollution ?
Question 4: Do you need to improve water quality in canal ?

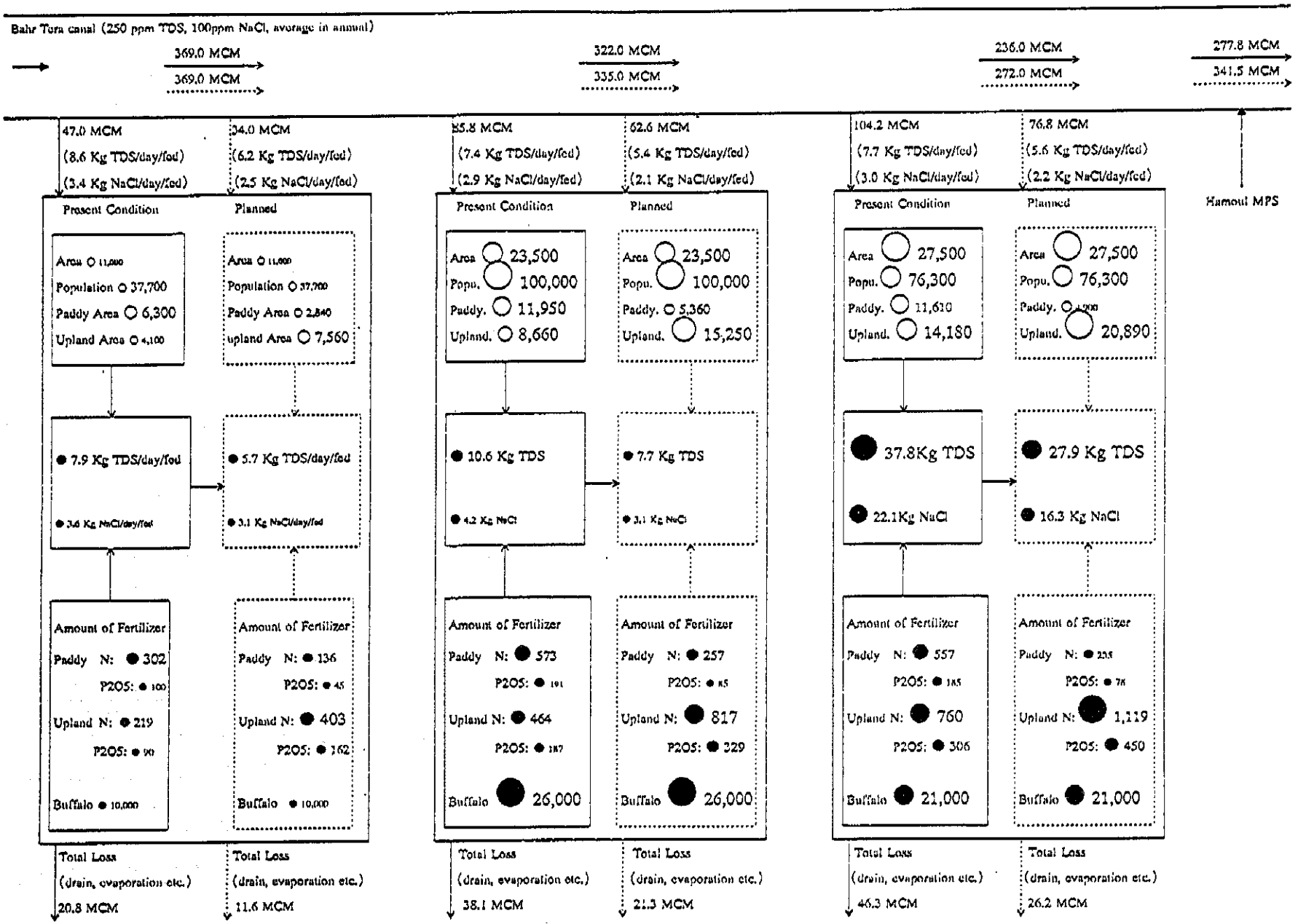
Figure K.3.1 Flow Diagram of Water Quality Environment on Puddling Period in Summer, June



Note 1: A size of circle shows strength of a load to water quality environment.

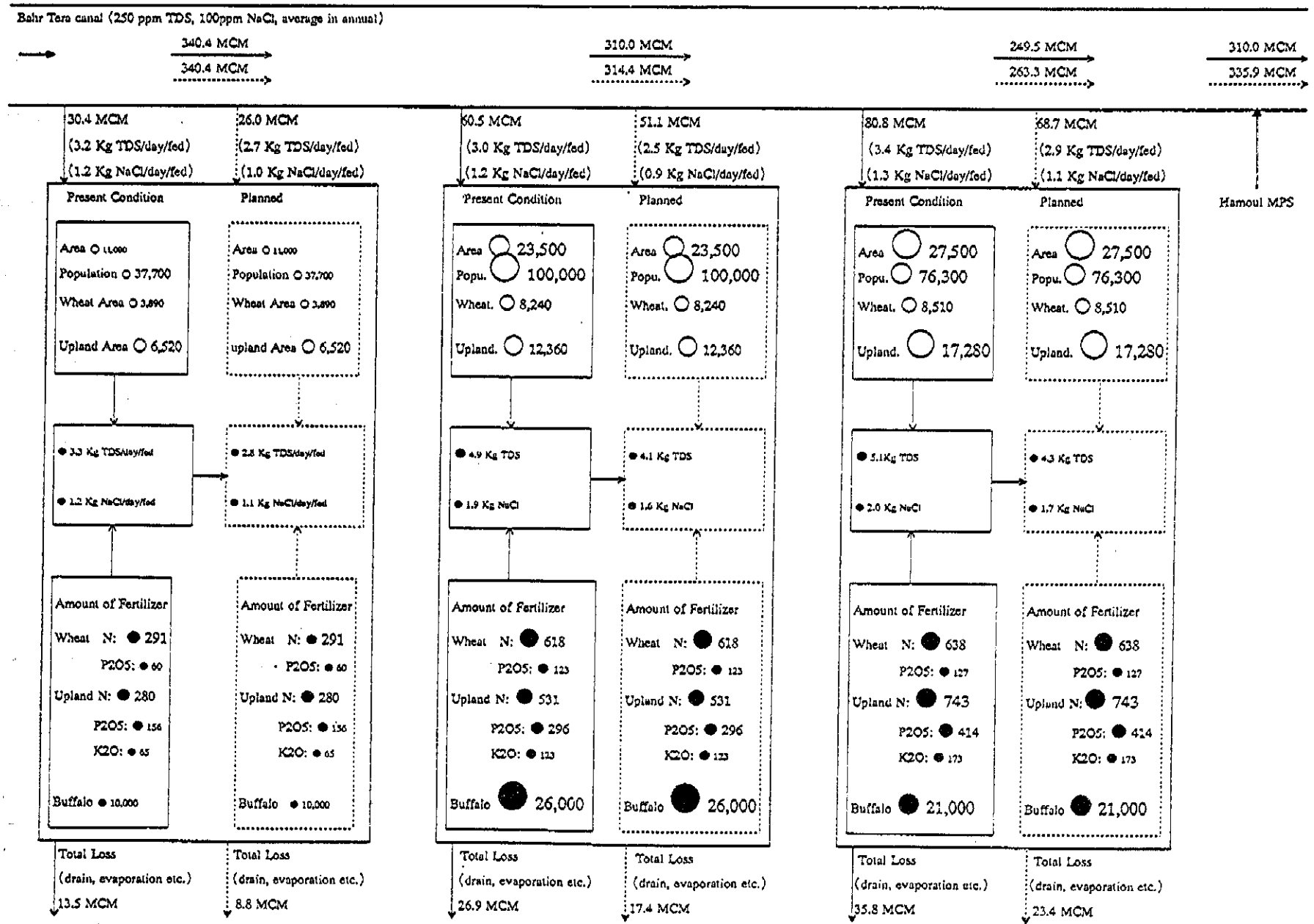
2: Unit of area and fertilizer are feddan, ton, respectively.

Figure K.3.2 Flow Diagram of Water Quality Environment on Summer Crop Period in Summer, July to October



Note 1: A size of circle shows strength of a load to water quality environment. 2: Unit of area and fertilizer are feddan, ton, respectively.

Figure K.3.3 Flow Diagram of Water Quality Environment on Winter Crop Period in Winter, November to May



Note 1: A size of circle shows strength of a load to water quality environment. 2: Unit of area and fertilizer are feddan, ton, respectively.

Table K.3.4 The Parameters for Analysis of Water Environment

Parameter		F/S Present			F/S Planned		
		Pudding Period June(30days)	Summer Crop Period July to October(123days)	Winter Crop Period November to May(212days)	Pudding Period June(30days)	Summer Crop Period July to October(123days)	Winter Crop Period November to May(212days)
1. Water Quality of Bahr Tera (mg / ℓ)	TDS	250	250	250			
	NaCl	100	100	100			
2. Water Quality of Irrigation Water (mg / ℓ)	Upstream(TDS)	180	230	260			
	(NaCl)	90	105	100			
	Midstream(TDS)	280	360	410			
	(NaCl)	125	145	140			
	Downstream(TDS)	960	1,230	370			
	(NaCl)	620	720	130			
3. Area(fed)	Upstream	11,000					
	Midstream	23,500					
	Downstream	27,500					
4. Population	Upstream	37,700					
	Midstream	100,000					
	Downstream	76,300					
5. Population Density(/fed)	Upstream	820					
	Midstream	1,010					
	Downstream	660					
6. Paddy Area(fed)	Upstream	6,300	6,300		2,840	2,840	
	Midstream	11,950	11,950		5,360	5,360	
	Downstream	11,610	11,610		4,900	4,900	
7. Wheat Crop Area(fed)	Upstream			3,890			3,890
	Midstream			8,240			8,240
	Downstream			8,510			8,510
8. General Upland Crop Area (fed)	Upstream	4,100	4,100	6,520	7,560	7,560	6,520
	Midstream	8,660	8,660	12,360	15,250	15,250	12,360
	Downstream	14,180	14,180	17,280	20,890	20,890	17,280

Parameter		F/S Present			F/S Planned		
		Pudding Period June(30days)	Summer Crop Period July to October(123days)	Winter Crop Period November to May(212days)	Pudding Period June(30days)	Summer Crop Period July to October(123days)	Winter Crop Period November to May(212days)
9. Amount of Fertilizer for Rice(N ton)	Upstream	75	302		33	136	
	Midstream	143	573		64	257	
	Downstream	139	557		58	235	
10. Amount of Fertilizer for Rice(P 2 O 5 ton)	Upstream	25	100		11	45	
	Midstream	47	191		21	85	
	Downstream	46	185		19	78	
11. Amount of Fertilizer for Wheat(N ton)	Upstream			291			291
	Midstream			618			618
	Downstream			638			638
12. Amount of Fertilizer for Wheat(P 2 O 5 ton)	Upstream			58			58
	Midstream			123			123
	Downstream			127			127
13. Amount of Fertilizer for General Upland Crop(N ton)	Upstream	54	219	280	99	403	280
	Midstream	116	464	531	204	817	531
	Downstream	190	760	743	279	1,119	743
14. Amount of Fertilizer for General Upland Crop (P 2 O 5 ton)	Upstream	22	88	156	40	162	156
	Midstream	46	187	296	81	329	296
	Downstream	76	306	414	111	450	414
15. Amount of Fertilizer for General Upland Crop (K 2 O ton)	Upstream			65			65
	Midstream			123			123
	Downstream			173			173
16. Number of Buffalo	Upstream	10,000	10,000	10,000	10,000	10,000	10,000
	Midstream	26,000	26,000	26,000	26,000	26,000	26,000
	Downstream	21,000	21,000	21,000	21,000	21,000	21,000
17. Water Requirement from Bahr Tera Canal (,000 m³)	Upstream	15,683	47,016	30,492	10,113	34,002	26,038
	Midstream	31,455	85,892	60,575	20,250	62,620	51,119
	Downstream	38,477	104,230	80,810	26,366	76,886	68,771
18. Total Loss from the Area (,000 m³)	Upstream	6,967	20,887	13,546	3,450	11,601	12,465
	Midstream	13,974	38,158	26,909	6,909	21,365	24,487
	Downstream	17,093	46,304	35,901	8,995	26,231	32,258

Note: Estimated by Study Team, based on the result of farm economic survey and modified Penman method, 1998

Table K.4.1 Definition of Environmental Impact Categories

Categories of Environmental Impact	Definition
Social Environment	
(1) Socio-economic issues	
(1)-1 Social Issues	
1. Planned residential settlement	New land settlement implemented in agriculture & rural development projects such as land clearing & leveling sea/swamp reclamation and irrigation development; settlement expected for nomad, landless farmers or shifting cultivators.
2. Involuntary resettlement	Forced resettlement of the inhabitants from their original dwelling places in the area that will be submerged with the development of the project.
3. Substantial changes in the way of life	Changes in the way of life of the people in particular in the role of women in family & society brought about by agricultural and rural development.
4. Conflict among communities and people	Friction due to conflicting interests between beneficiaries and non-beneficiaries, people in favor of and those against development, new settlers and host people, insiders and outsiders, people in a project area and those affected in the surrounding area.
5. Impact on native people	Adverse effects of development on local communities composed partly or entirely of indigenous people (including tribal groups), low-caste groups, ethnic minorities, or nomads.
(1)-2 Demographic issues	
6. Population increase	Significant population increase in a project or surrounding area due to development.
7. Drastic change in population composition	Drastic change in population composition in a project or surrounding area due to development.
(1)-3 Economic activities	
8. Changes in bases of economic activities	Forced or involuntary relocation of economic bases or means such as farmland, fishing grounds, etc., under a project due to land acquisition, changes in land use regulation, and deterioration or depletion of bases or means for economic activities.
9. Occupational change and loss of job opportunities	Forced or involuntary occupational change due to land acquisition and loss or deterioration of means or bases of economic activities; it includes loss of job opportunities due to farm mechanization.
10. Increase in income disparities	Increase in income disparities among groups brought about by the development; it implies relative impoverishment of the economically weak.
(1)-4 Institutional and custom related issues	
11. Adjustment & regulation of water or fishing (riparian) rights	Adverse development effects on water or fishing (ripajan) rights and necessary adjustments or regulations.
12. Changes in social and institutional structures	Changes in social and institutional structures as a result of establishment of new or modified rural organizations caused by development.
13. Changes in existing institutions and customs	Changes in existing institutions and customs involved in or induced by development activities.

Categories of Environmental Impact	Definition
(2) Health and sanitary issues	
14. Increased use of agrochemicals	Increased use of chemical pesticides due to intensification of agriculture; introduction of high-yielding species & new crops and irrigation.
15. Outbreak of endemic diseases	Spreading of endemic diseases as a result of the adverse effects of development.
16. Spreading of endemic diseases	Spreading of endemic diseases attributable to the adverse effects of development.
17. Residual toxicity of agrochemicals	Accumulation in the natural environment (soil, water, etc.) of agrochemicals or chemical substances with high residual toxicity such as organo-chloric insecticides, etc.
18. Increase in domestic and other human wastes	Increase in domestic and other human wastes due to the consequences of development such as population increase.
(3) Cultural asset issues	
19. Impairment of historic remains and cultural assets	Direct or indirect impairment or destruction of sites, structures, and remains of archaeological, historical, religious, cultural, or aesthetic value as result of development.
20. Damage to aesthetic sites	Direct or indirect negative effects on aesthetic features as a result of development.
21. Impairment of buried assets	Impairment or destruction of buried assets due to development activities.
Natural Environment	
(4) Biological and ecological issues	
22. Changes in vegetation	Direct or indirect deterioration or degradation of vegetation due to development activities including removal of vegetation cover, alternation of land use, encroachment into forest, alteration of environmental conditions, etc.
23. Negative impact on important or indigenous fauna and flora	Adverse effects on important or indigenous animal & plant species due to destruction of or changes in habitats.
24. Degradation of ecosystems with biological diversity	Degradation of ecosystems that allows the wild species of plants and animals to withstand external stress.
25. Proliferation of exotic and/or hazardous species	Introduction of pathogenic agents or spreading of hazardous species due to creation of environment conductive to their propagation.
26. Destruction of wetlands and peatlands	Extinction of wetlands or peatlands caused directly by development activities such as large-scale earth filling, or indirectly by changes of hydrological regime such as drying and decomposition.
27. Decrease of tropical rain forests and wildlands	Decrease or disappearance of tropical rain forests due to direct or indirect effects of development.
28. Destruction or degradation of mangrove forests	Disappearance of mangrove forests attributable to direct destruction or deterioration of supporting environmental conditions.
29. Degradation of coral reefs	Disappearance of coral reefs due to direct destruction, or damage to and deterioration of the supporting environment caused by sedimentation, etc.

Categories of Environmental Impact	Definition
(5) Soil and land resources	
(5)-1 Soil resources	
30 Soil erosion	Washing or blowing away of soil from the earth surface by the action of water or wind.
31. Soil salinization	Phenomena in which soluble salts accumulate in the surface layer of soil and crops growth is consequently affected.
32. Deterioration of soil fertility	Deterioration of soil productivity due to leaching and decomposition of nutrients, nutrient absorption by plants, surface soil erosion, salinization, failure in soil management, etc.
33. Soil contamination by agrochemicals and others	Accumulation of agrochemicals in soil with high residual toxicity.
(5)-2 Land resources	
34. Devastation or desertification of land	Deterioration of land productivity or desertification caused by artificial or natural impacts.
35. Devastation of hinterland	Devastation of area surrounding a project area as a result of secondary or indirect impacts of development.
36. Ground subsidence	Subsidence of ground caused by the dehydration or drying of wetlands, peat swamp, or reclaimed lands, or excessive exploitation of groundwater.
(6) Hydrology, water quality and air	
(6)-1 Hydrology	
37. Change in surface water hydrology	Alteration of river discharge or water level as the effects of reservoir construction, irrigation water intake, or drainage.
38. Change in ground water hydrology	Changes in the groundwater recharge mechanism or groundwater table caused by infiltration of irrigation water and exploitation of groundwater.
39. Inundation and flooding	Overflowing of a river onto the surrounding land or the surrounding of sea water onto the coastal land. Inundation or flooding are caused by increased river or run-off discharge or poor water management.
40. Sedimentation	Settlement of transported sediment in river, estuaries and reservoir.
41. Riverbed degradation	Degradation of riverbed in lower basin areas due to insufficient sediment load to maintain riverbed level.
42. Impediment of inland navigation	Adverse impacts on navigation due to development activities.
(6)-2 Water quality and temperature	
43. Water contamination and deterioration of water quality	Deterioration of water quality due to development activities.
44. Water eutrophication	Accumulation in water of nutritive soluble salts such as nitrate and phosphate.
45. Sea water intrusion	Intrusion of salt water wedge along the riverbed.
46. Change in temperature of water	Adverse impact of low temperate irrigation water on crops.
(6)-3 Atmosphere	
47. Air pollution	Diffusion of agrochemicals, sand dust, stench and exhaust gas from vehicles and machines.

Table K.4.2 Checklist for Proving Environmental Impact

Applicable columns with the following impact degree are marked with "X".

SEI: Significant Environmental Impact

A : The subject SEI is unquestionably induced by the Project.

B : The subject SEI is likely to be induced by the Project.

C : There is no possibility that the subject SEI is likely to be induced by the Project.

D : The SEI is not fully known.

Categories of Environmental Impact	Evaluation A	B	C	D	Evaluation Basis
Social Environment					
(1) Socio-economic issues					
(1)-1 Social issues					
1. Planned residential settlement			X		Nil
2. Involuntary resettlement			X		Nil
3. Substantial changes in the way of life				X	
4. Conflict among communities and people		X			Possibility of friction by repair
5. Impact on native people			X		Nil
(1)-2 Demographic issues					
6. Population increase			X		Nil
7. Drastic change in population composition			X		Nil
(1)-3 Economic activities					
8. Changes in bases of economic activities			X		Nil
9. Occupational change and loss of job opportunities			X		Nil
10. Increase in income disparities				X	
(1)-4 Institutional and custom related issues					
11. Adjustment & regulation of water or fishing (riparian) rights		X			There is possibility of coordination according to repair
12. Changes in social and institutional structures		X			Ditto
13. Changes in existing institutions and customs		X			Ditto
(2) Health and sanitary issues					
14. Increased use of agrochemicals				X	may increase by changing of cropping system
15. Outbreak of endemic diseases				X	
16. Spreading of endemic diseases				X	
17. Residual toxicity of agrochemicals				X	
18. Increase in domestic and other human wastes				X	

Categories of Environmental Impact	Evaluation A	B	C	D	Evaluation Basis
(3) Cultural asset issues					
19. Impairment of historic remains and cultural assets			X		Nil
20. Damage to aesthetic sites			X		Nil
21. Impairment of buried assets			X		Nil
Natural Environment					
(1) Biological and ecological issues					
22. Changes in vegetation			X		Nil
23. Negative impact on important or indigenous fauna and flora			X		Nil
24. Degradation of ecosystems with biological diversity			X		Nil
25. Proliferation of exotic and/or hazardous species			X		Nil
26. Destruction of wetlands and peat lands			X		Nil
27. Decrease of tropical rain forests and wild lands			X		Nil
28. Destruction or degradation of mangrove forests			X		Nil
29. Degradation of coral reefs			X		Nil
(5) Soil and land resources					
(5)-1 Soil resources					
30. Soil erosion				X	
31. Soil salinization		X			Dry climate and re-use of drainage water
32. Deterioration of soil fertility				X	
33. Soil contamination by agrochemicals and others		X			Pollution of irrigation water quality
(5)-2 Land resources					
34. Devastation or desertification of land			X		
35. Devastation of hinterland			X		
36. Ground subsidence				X	
(6) Hydrology, water quality and air					
(6)-1 Hydrology					
37. Change in surface water hydrology				X	
38. Change in ground water hydrology				X	
39. Inundation and flooding			X		Nil
40. Sedimentation			X		Nil
41. Riverbed degradation			X		Nil
42. Impediment of inland navigation			X		Nil

Categories of Environmental Impact	Evaluation A	B	C	D	Evaluation Basis
(6)-2 Water quality and temperature					
43. Water contamination and deterioration of water quality		X			Pollution of irrigation water during mixing with drainage water
44. Water eutrophication				X	
45. Sea water intrusion				X	
46.Change in temperature of water				X	
(6)-3 Atmosphere					
47. Air pollution			X		Nil

Table K.4.3 Soil, Groundwater Level, and Necessary Amount of Gypsum in the Feasibility Study Area

1. Biyala District

Credit Cooperative	Soil	Groundwater Level	Amount of Gypsum
Hudah	M 1-2 (M 1)	S 2	G 3
Biyala No. 1	M 1-2 (M 1)	S 1	G 0-3 (G 3)
Biyala No. 4	M 1-4 (M 1/2)	S 1-2 (S-1)	G 0-3 (G 3)
Abshan	M 1-2 (M 1)	S 2	G 2-3 (G 3)
Shorafa	M 1-2 (M 2)	S 1	G 0-4 (G 3)
Al Navy	M 1-2 (M 1)	S 1	G 0-3 (G 0)
Abu Badawi	M 1-2 (M 1)	S 2-3 (S-2)	G 2-3
Hazek	M 1-3 (M 2)	S 1-2 (S-1)	G 0-4 (G 3)
Al Himmah	M 1-2 (M 1)	S 2	G 2-4 (G 3)
El Saaee	M 1-2 (M 2)	S 2-3	G 2

2. Hamoul District

Credit Cooperative	Soil	Groundwater Level	Amount of Gypsum
East Banawan	M 2-3	S 2	G 3-4 (G 4)
West Banawan	M 1-2	S 2	G 2-4 (G 3/4)
Sanayit	M 1-3 (M 2)	S 2	G 2-4 (G 3)
Salahib	M 1-3 (M 2/3)	S 2	G 1-5 (G 4)
Zawba	M 1-2	S 2	G 2-4 (G 3/4)
Hamoul	M 1-3 (M 2)	S 2	G 2-5 (G 4)
Kafr Ash Sharikh	M 1-3 (M 1)	S 2	G 2-4 (G 2/3)

Note 1. ( )is occupied high percentage area.

2. Symbol is following.

Soil;

M1 Normal saline soil (TDS < 0.2 %)
M2 Medium saline soil (0.2 - 0.5 %)
M3 High saline soil (0.5 - 1.0 %)
M4 Extra high saline soil(> 1.0 %)

Groundwater Level;

S1 Low water table (> 120 cm)
S2 Medium water table (70 - 120 cm)
S3 High water table (< 70 cm)

Amount of Gypsum;

G0 -- G5 (ton / feddan)

Source: Executive Authority for Land Improvement Project(LELIP)

Table K.4.4 Soil Improvement Plan

Item	M/P Area				F/S Area			
	Upstream	Midstream	Downstream	Total	Upstream	Midstream	Downstream	Total
Cultivated Area(fed)	167,400	223,900	303,900	695,200	10,500	20,600	25,800	56,900
Land Class 2(ESP 12%)								
Improvement Area Ratio(%)	53	18	8		35		6	
Amount of Gypsum(ton)	301,000	137,000	83,000	521,000	37,00		6,000	43,000
Land Class 3, 4(ESP 15%)								
Improvement Area Ratio(%)	43	81	90		65		87	
Amount of Gypsum(ton)	367,000	93,000	1,395,000	1,855,000	103,000		115,000	218,000
Improvement Area of Subsoiling(%)	100	100	100		100		100	

Note 1. Exchangeable sodium percentage(ESP) makes 2 % decrease for Land Class 2, and 3 % decrease for Land Class 3, 4.
2. Improvement makes from soil surface about 30 cm.

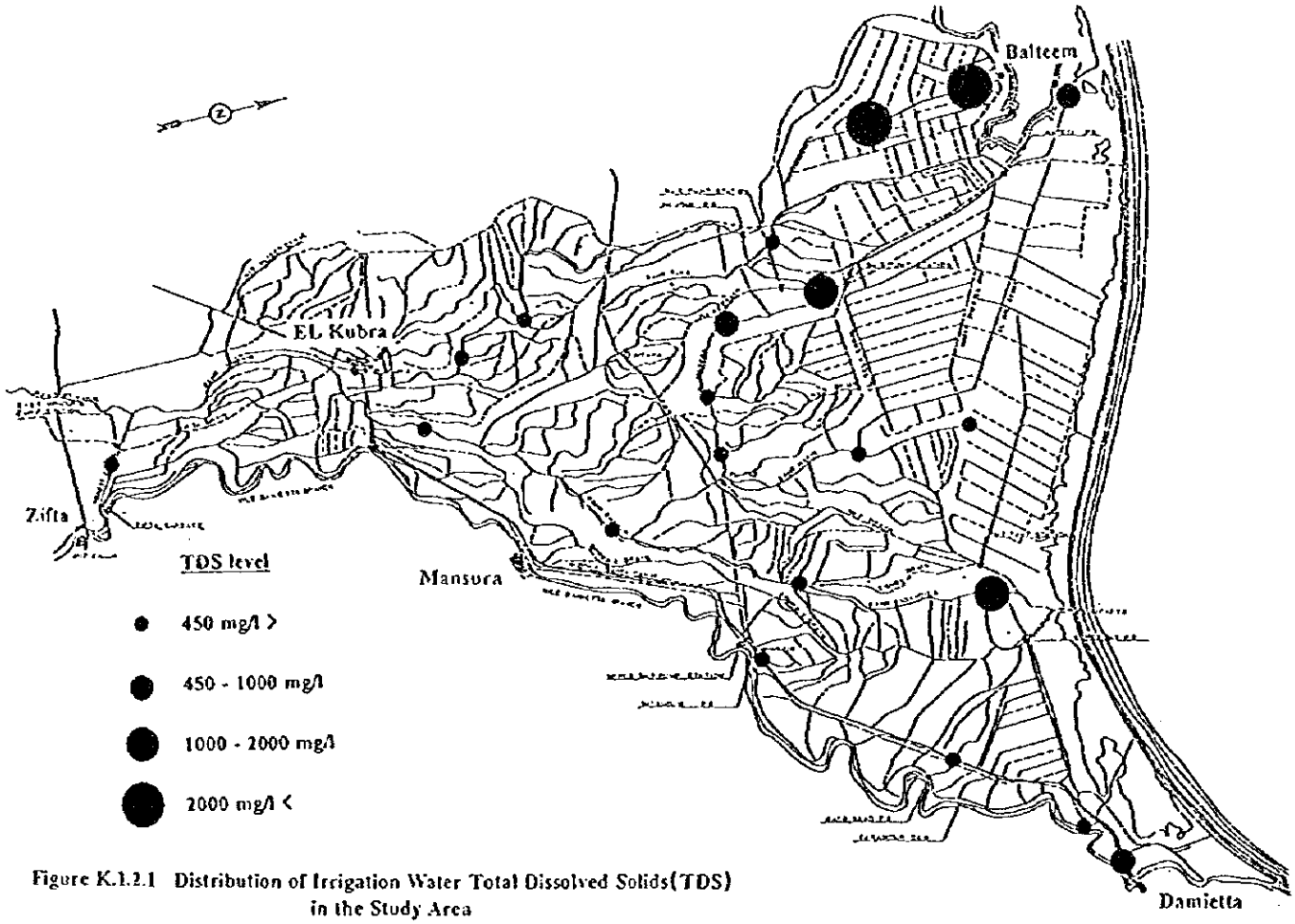


Figure K.1.2.1 Distribution of Irrigation Water Total Dissolved Solids(TDS) in the Study Area

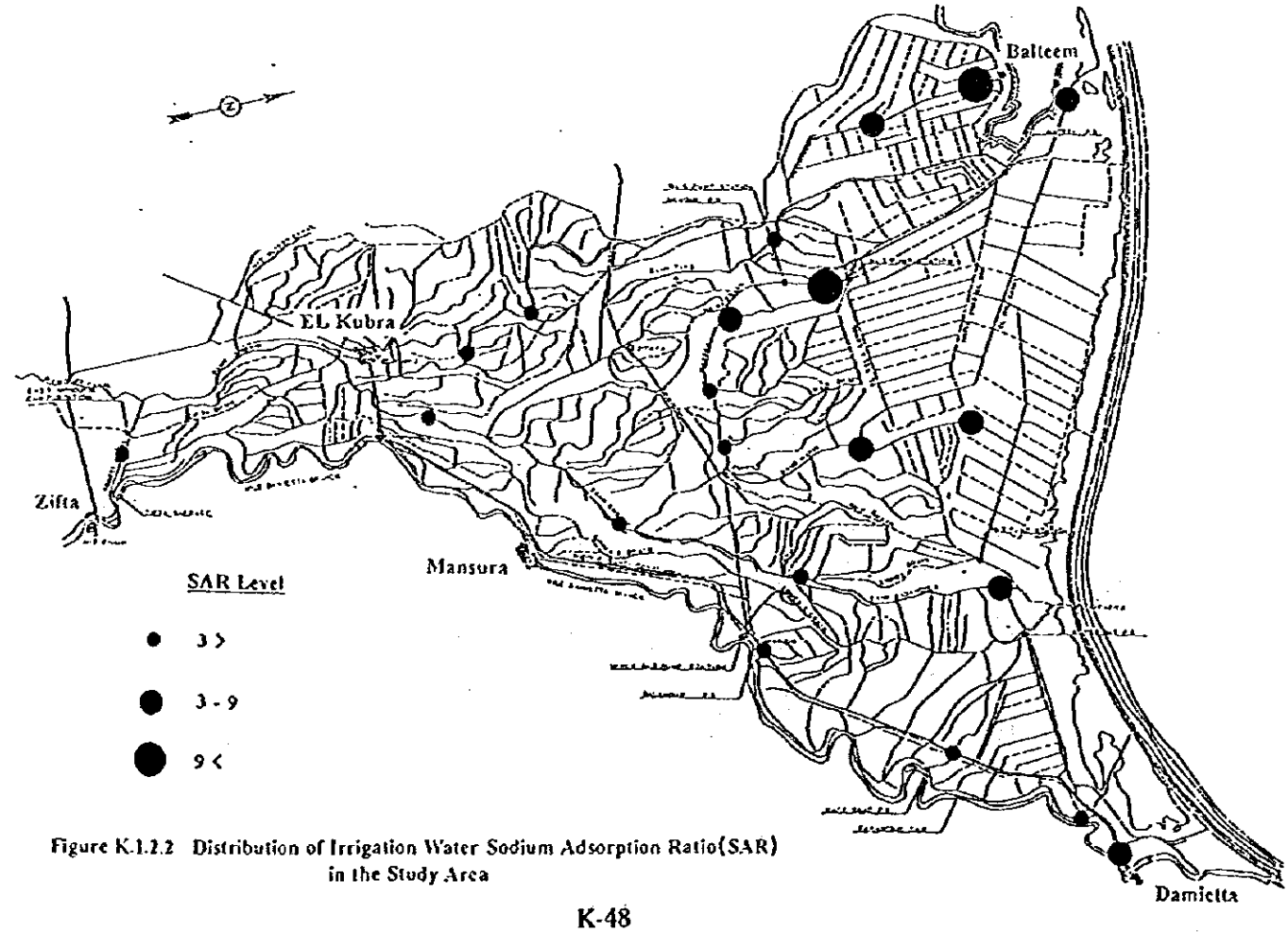


Figure K.1.2.2 Distribution of Irrigation Water Sodium Adsorption Ratio(SAR) in the Study Area

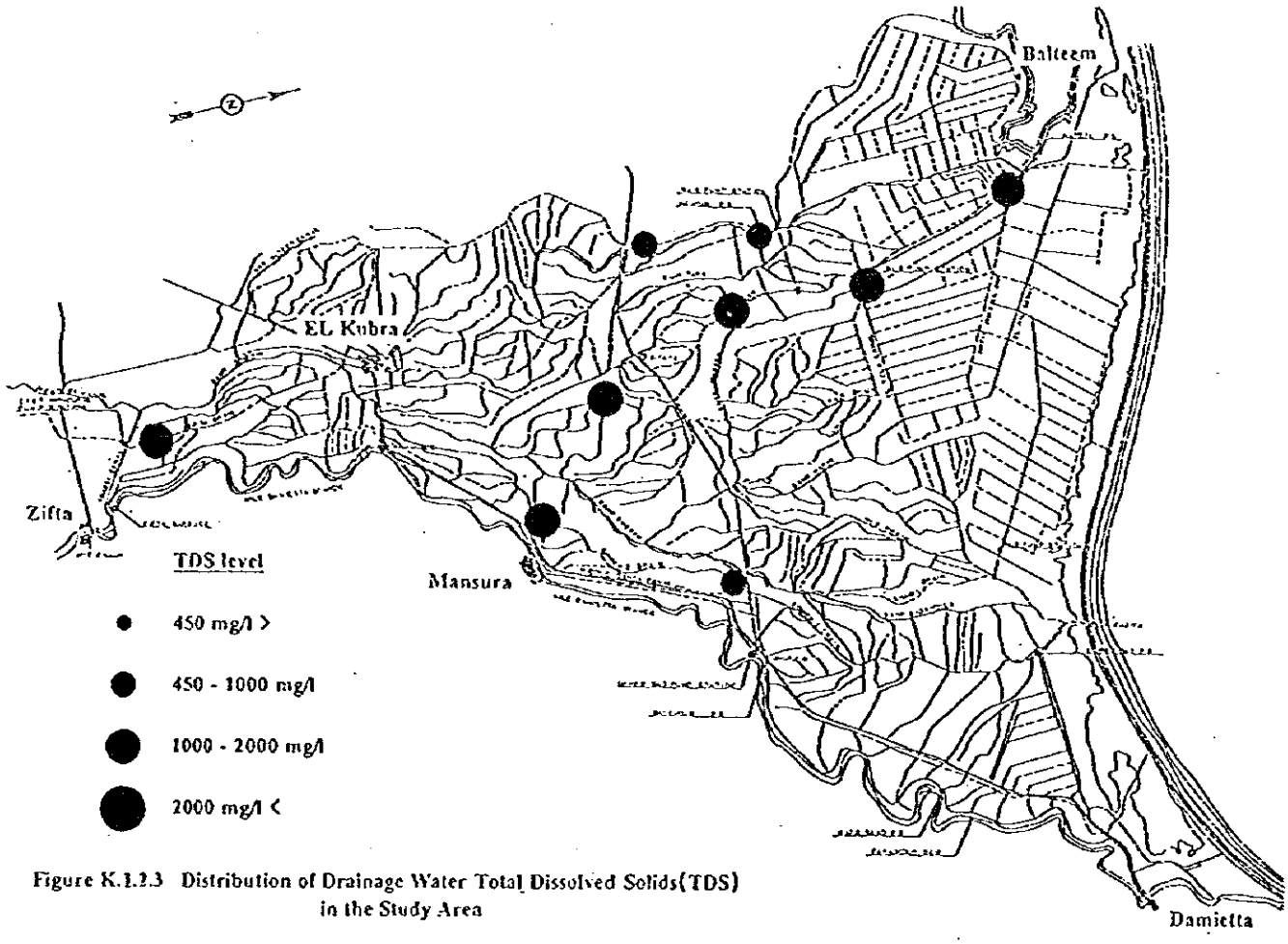


Figure K.1.2.3 Distribution of Drainage Water Total Dissolved Solids(TDS) in the Study Area

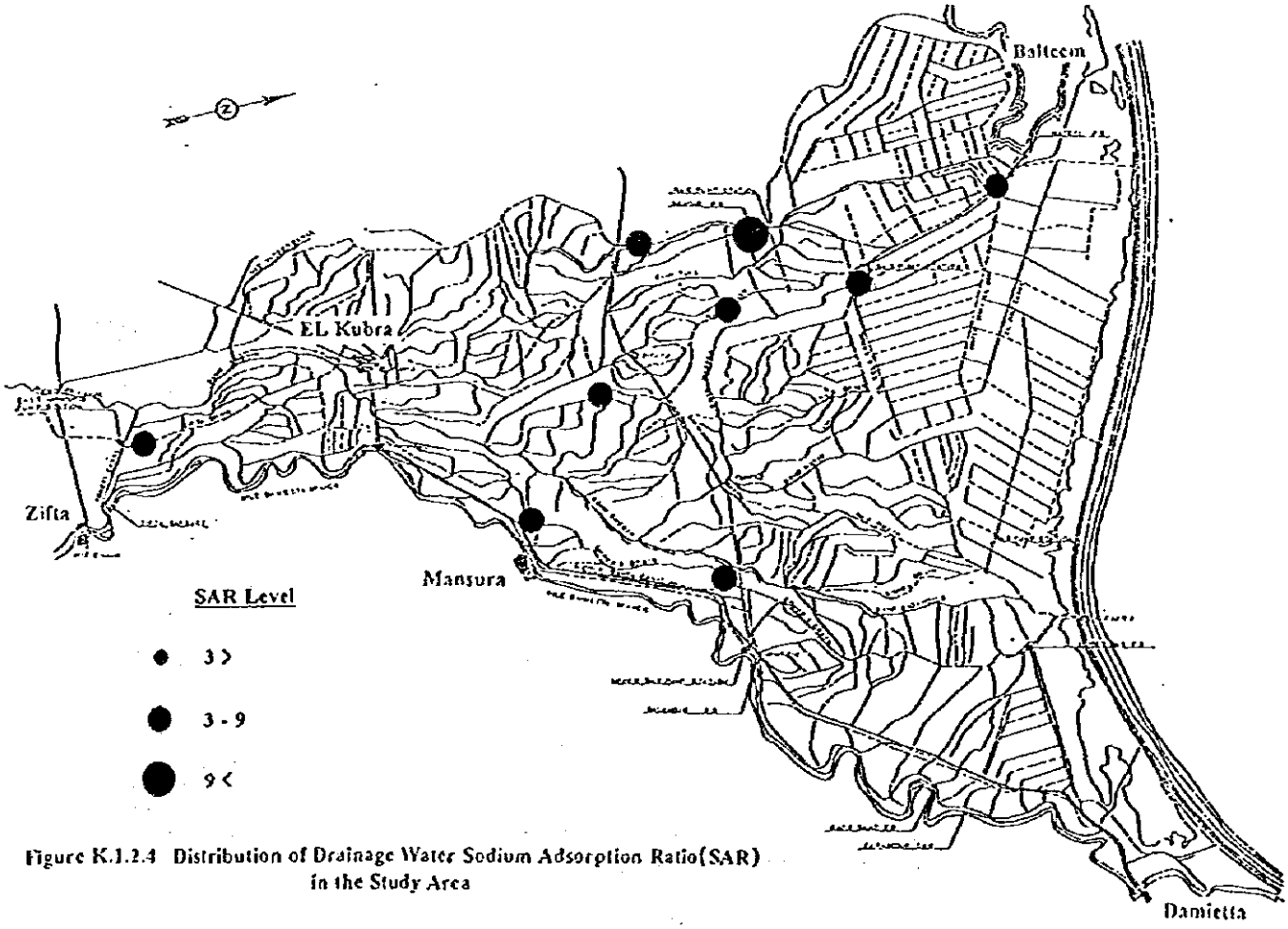


Figure K.1.2.4 Distribution of Drainage Water Sodium Adsorption Ratio(SAR) in the Study Area

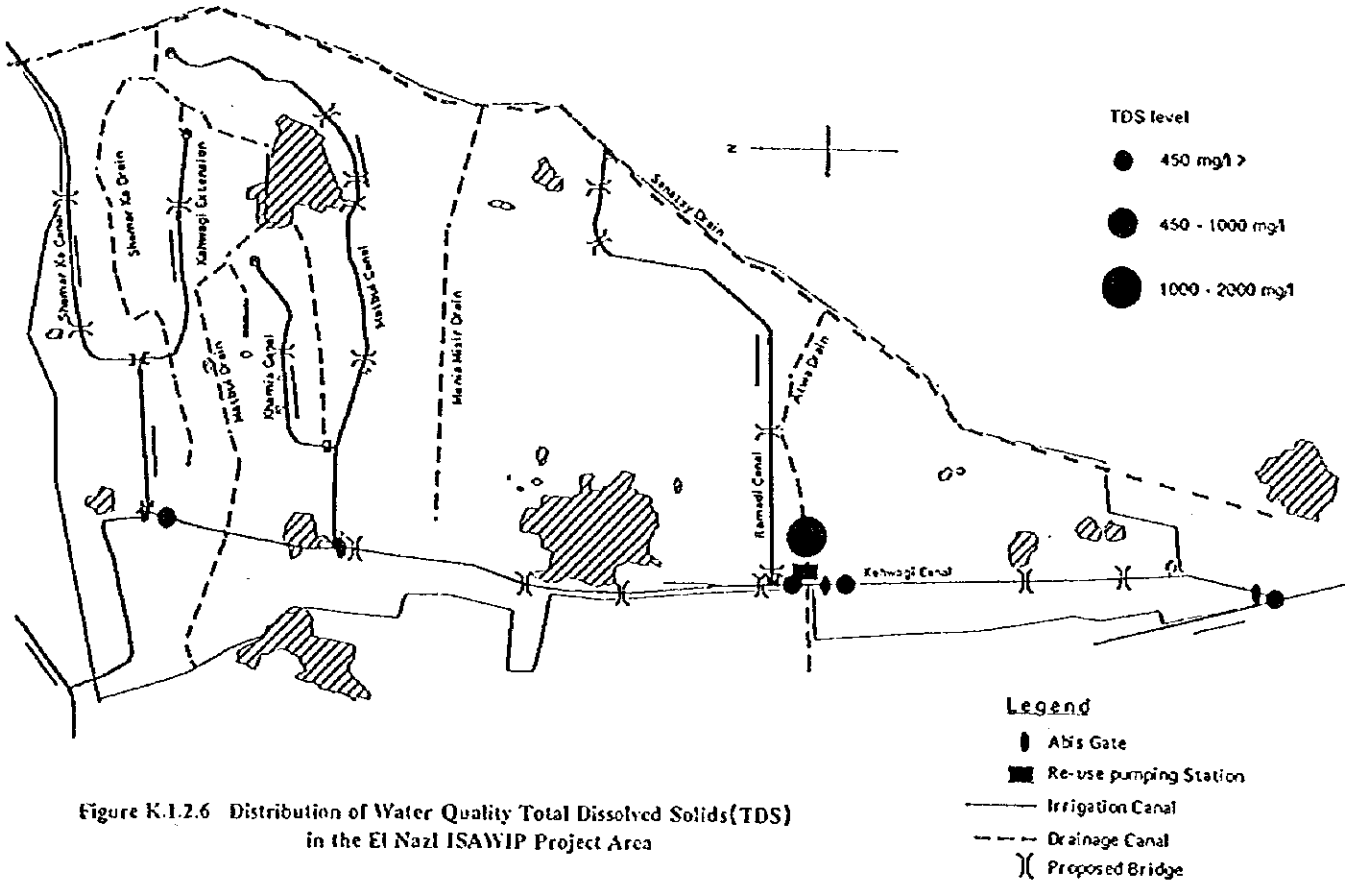


Figure K.1.2.6 Distribution of Water Quality Total Dissolved Solids(TDS) in the El Nazl ISAWIP Project Area

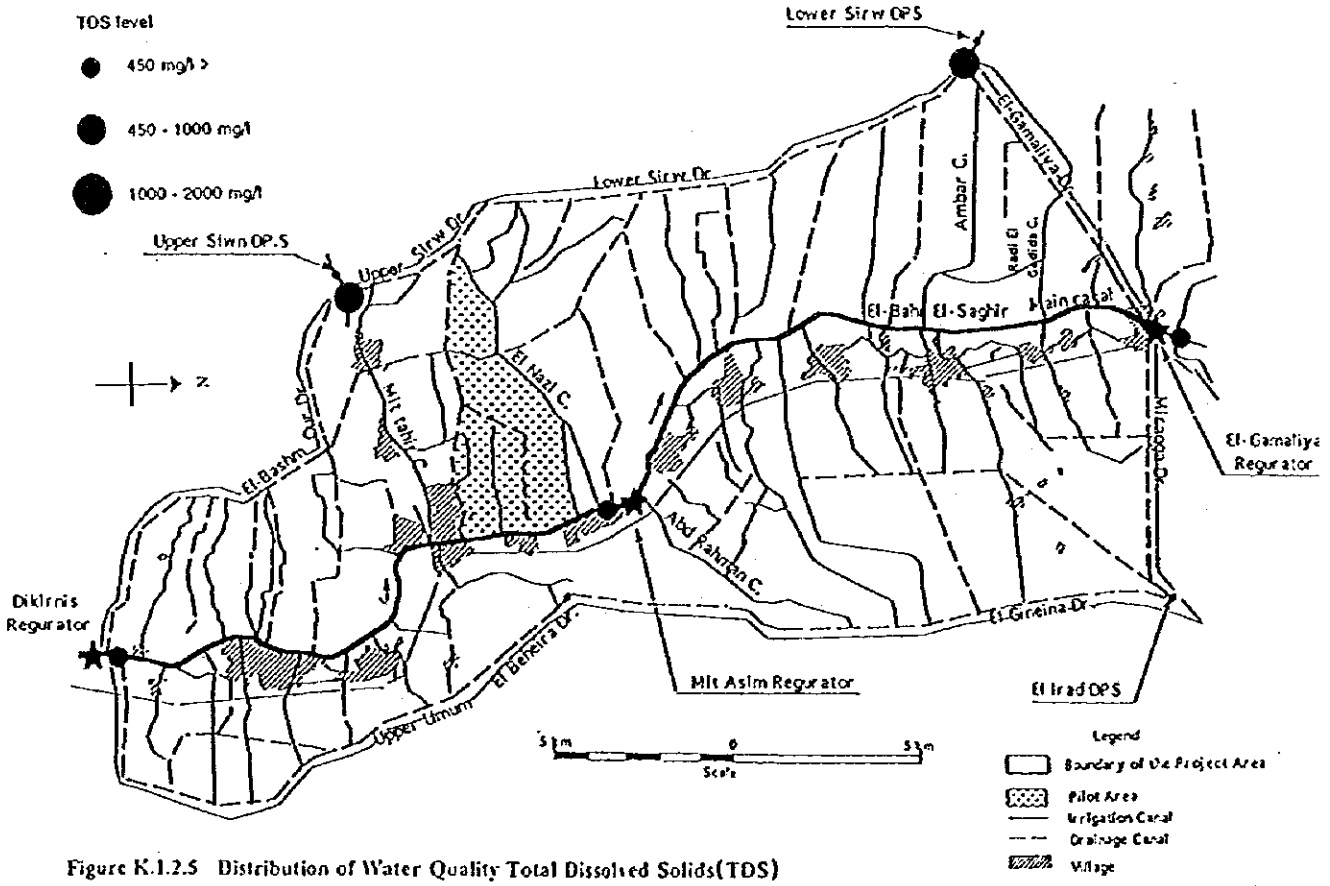


Figure K.1.2.5 Distribution of Water Quality Total Dissolved Solids(TDS) in the Kahwagy USAID Project Area

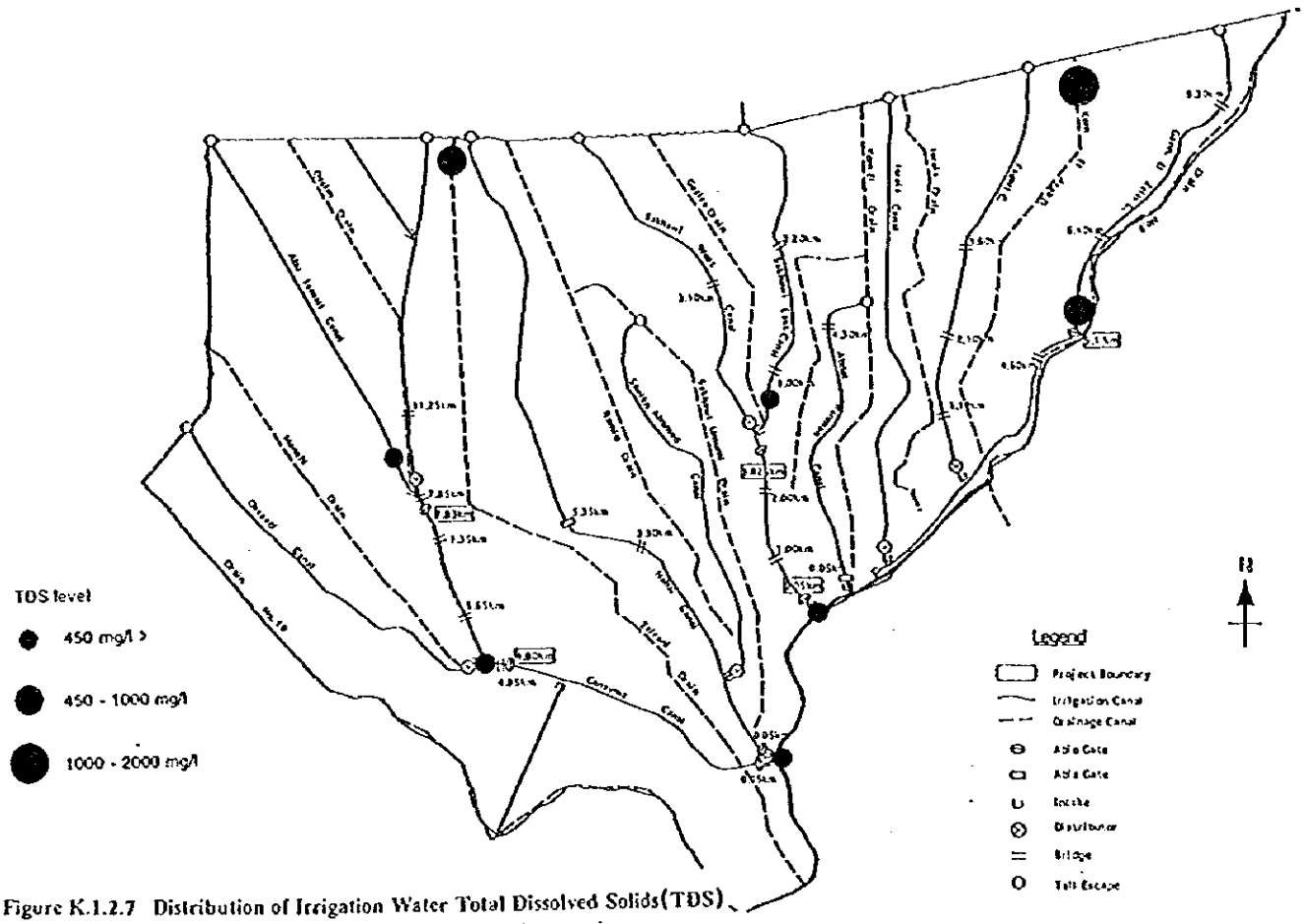
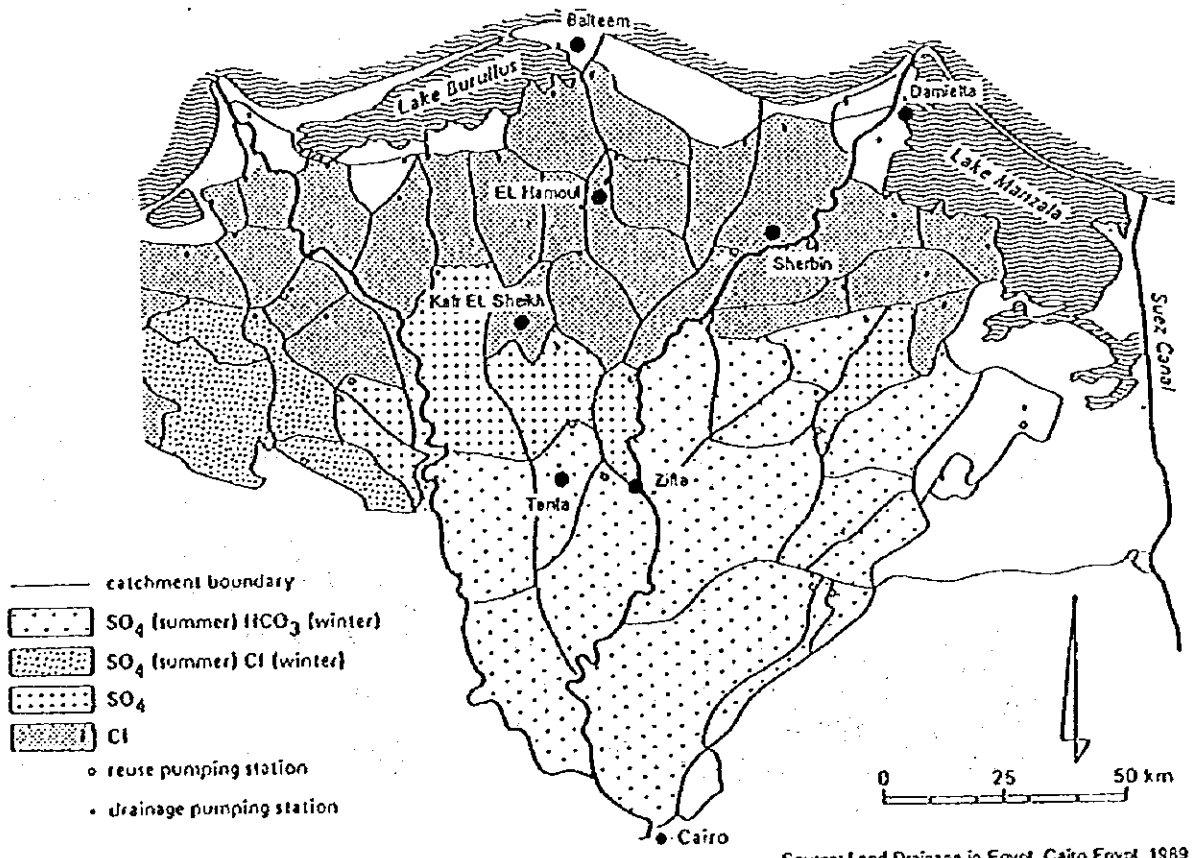


Figure K.1.2.7 Distribution of Irrigation Water Total Dissolved Solids(TDS) in the El Saidi USAID Project Area



Source: Land Drainage in Egypt, Cairo Egypt, 1989

Figure K.1.2.8 Dominant Salts in Drainage Water

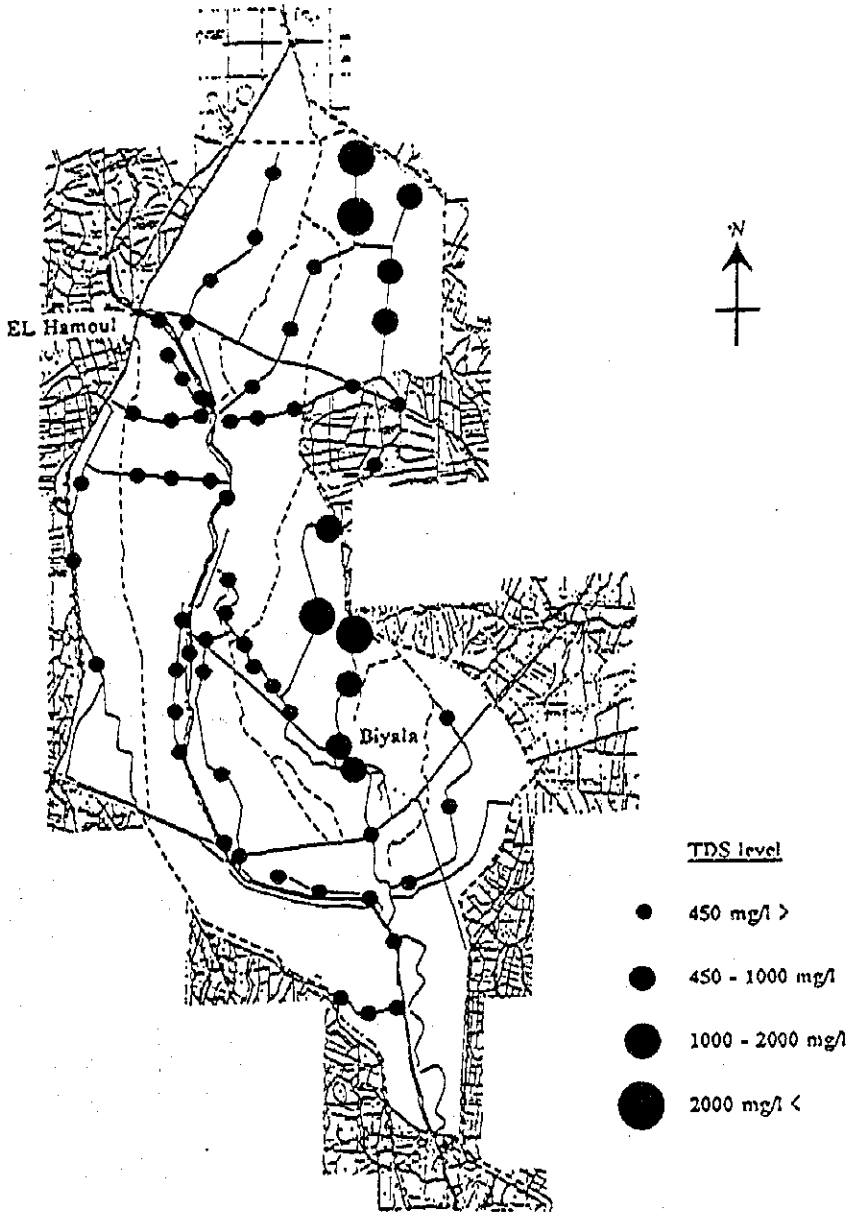


Figure K.2.2.1 Distribution of Irrigation Water Total Dissolved Solids(TDS) in the Feasibility Study Area

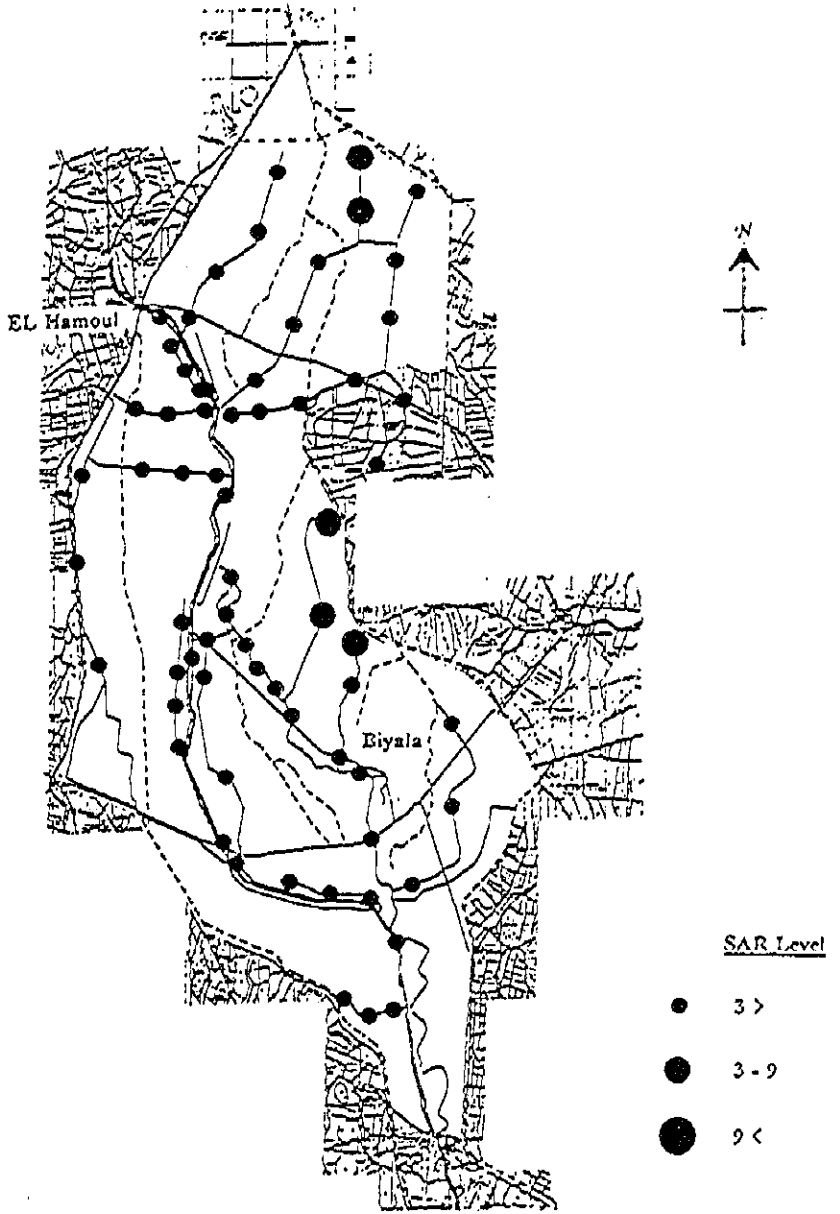


Figure K.2.2.2 Distribution of Irrigation Water Sodium Adsorption Ratio(SAR) in the Feasibility Study Area

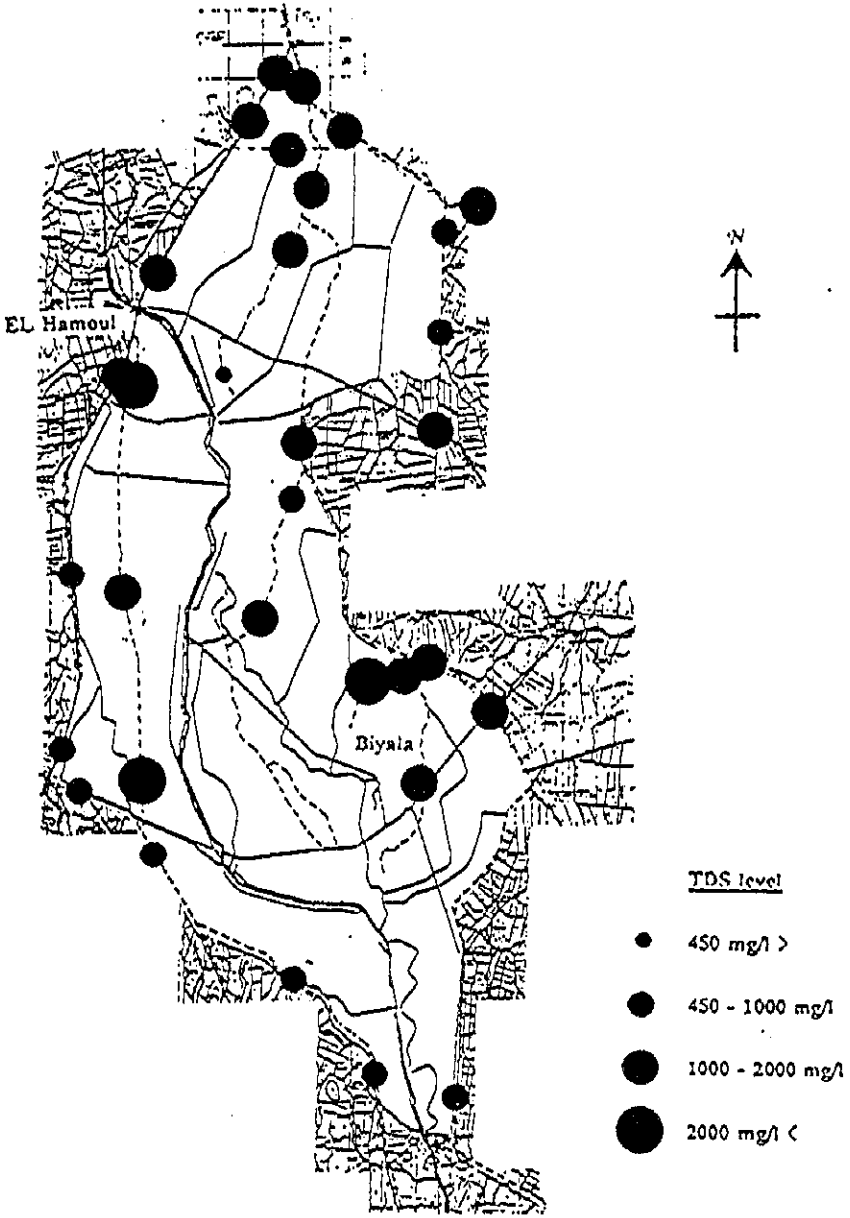


Figure K.2.2.3 Distribution of Drainage Water Total Dissolved Solids(TDS) in the Feasibility Study Area

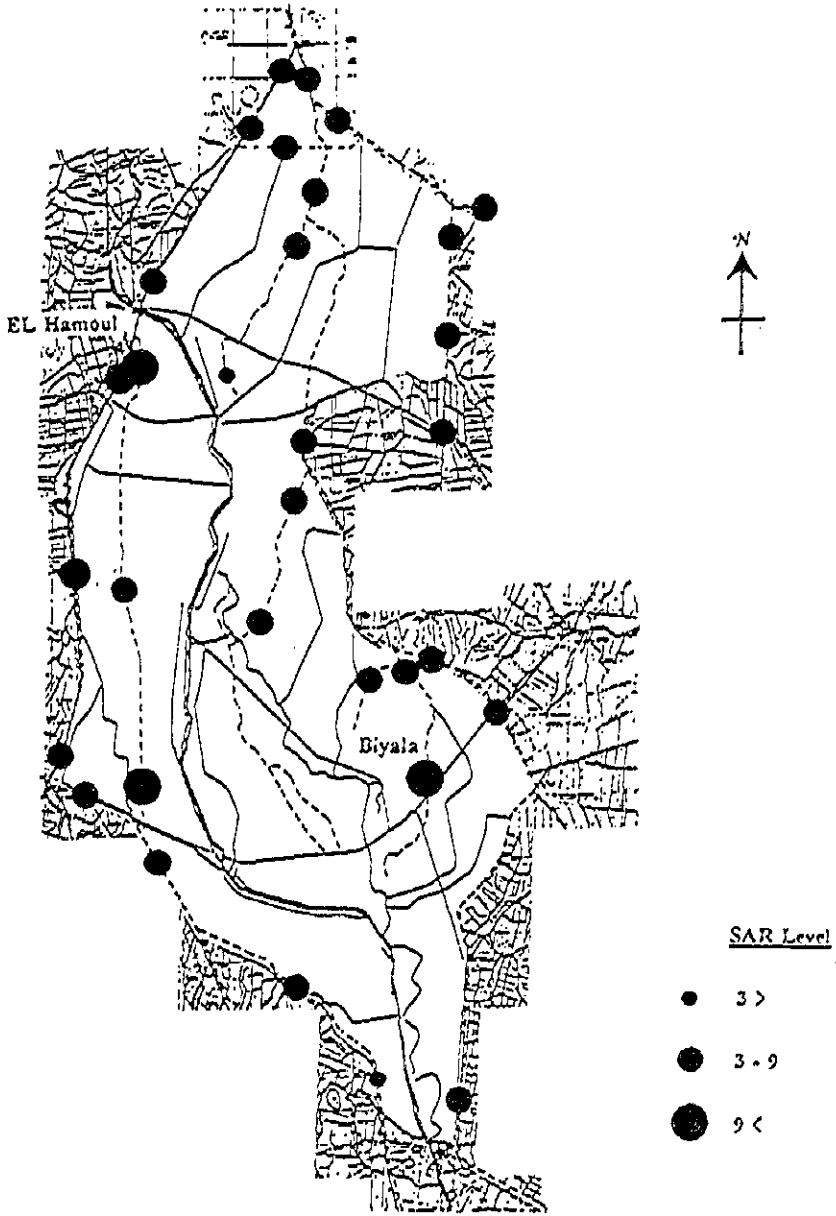


Figure K.2.2.4 Distribution of Drainage Water Sodium Adsorption Ratio(SAR) in the Feasibility Study Area

APPENDIX L.

FARM ECONOMY

Appendix L Farm Economy

Appendix L Farm Economy

L.1 Farm Economy Survey for the Master Plan

L.1.1 Sampling Method of the Survey

The sample farm household economy survey was conducted in the end of April 1998 to 240 sample farmers in the Study area and nearby tow on-going Irrigation Improvement Project (here in after referred to as IIP) areas, namely Kahwagi and Bahr El Saidi both of which are located west side of the Study Area. 18 delivery canals are selected from the Study Area and two (2) delivery canals from IIP areas. For each delivery canal, 12 farm households are selected along the location from upper part to lower part of a delivery canal so as to analyze the effect of farmers' location along the canal. The selection of delivery canals were carried out through a workshop with IAS staff and water district engineers whose jurisdiction include the Study Area, discussing present situation of agricultural and water supply conditions. (Refer to Figure L.1.1)

Considering the different water supply condition from upstream reaches to downstream reaches, the Study area is divided into three (3) regions which are defined as the upstream area (Gharbia governorate), the midstream area (Sherbin and Talkha district in Dakahlia governorate, and Biyala district in Kafr El Sheikh governorate), and the downstream area (Bilqas district in Dakahlia governorate, El Hamoul, and El Bullurus district in Kafr El Sheikh governorate, and Damietta govenorate). The downstream area could be separated distinguishably into two regions, as the west area which belongs to around El Hamoul district in kafr El Sheikh governorate and the east area around Damietta governorate. The separation of the downstream area is adopted for the sample farm household economy survey analysis. As for the east downstream area, the sample farmers selected were those who were in relatively better condition of productivity and non-farm job. Therefore the sample farmers in the west downstream area are taken as representative of downstream area for analyzing outline of general farm economy in the Study Area.

The number of the sample farm households are 48 in the upstream area, 72 in the midstream area, 48 in the west downstream area, 48 in the east downstream area and 24 in the on-going Irrigation Improvement Project areas. The characteristics of the sample farmers according to the areas above are described as follows. (Refer to Table L.1.1)

L.1.2 Outline of the Result

The family size of the sample farm households is distributed from four (4) to 17

persons. The average family size is 9.6 persons in the upstream area, 7.2 in the midstream area, 7.8 in the west downstream area., 7.3 in the east downstream area and 7.9 in the IIP areas. These contain about equal number of men and women and majority of the labor force in the families are working on their own farms.

Most of the sample farmers are cultivating their own lands and some farmers are renting lands additionally for their farming. Farmers who are leasing their lands are rare. The average farming lands are 2.8 feddan in the upstream area, 3.8 in the midstream area, 4.2 in the downstream area (5.4 in the west downstream area, 3.1 in the east downstream area) and 3.1 in IIP areas. The average farming size of the sample farmers is increasing from upstream to downstream reaches. This tendency is corresponding to the regional statistical data. The farming land per capita is 0.3 feddan in the upstream area as the smallest and 0.7 feddan in the west downstream as the biggest as it's calculated.

Cropping intensity for the sample farm households is almost 200%. However, the general tendency shown in the regional statistical data(referred to Chapter3.3 Agriculture) is higher in the upstream area and contrary lower in the downstream area because there are more fallow lands downstream due to stronger salinity problem. The grown crops are generally rice, cotton, maize, vegetables, wheat, broad bean, berseem, and few of the sample farmers are growing fruits. The cropping intensity of rice are about 40 to 50% in each areas except for IIP areas where rice is planted 66% of the land. The sample farm households are keeping one (1) or two (2) cattle and buffaloes and more than one dozen of poultry such as chicken.

The unit yields of the crops show the tendency of relatively higher rate in the upstream area and the midstream area and lower in the downstream area.(except for the east downstream area). Also it is observed that the unit yields on the fields positioned at the upper reaches of the delivery canals are higher than the unit yields on the land positioned at the lower part of the delivery canals. This tendency is common in each region from the upstream area to downstream area. For instance, on the delivery canals in the upstream area, the average unit yield of rice is 3,286kg per feddan at the upper-reaches- positioned field and 2,408kg per feddan at the lower-positioned field of the delivery canals. Likewise on the delivery canals in downstream area, the unit yields of rice is higher in the field positioned at the upper reaches of the delivery canals than the field positioned at the lower part of the delivery canals (2,472kg per feddan and 2,027kg per feddan respectively). This indicates that over the socio-economic conditions such as family size, land holdings and so on described above, the effect of conditions on water efficiency and soil condition is evidently related to the productivity. (Refer to Table L.1.2)

The farmers themselves consume some agricultural products, such that about 40% of rice are self-consumed on average. Likewise the percentage of self consumption of maize, wheat, bean and berseem are about 32%, 51%, 15% and 56% on average respectively. Especially grains are important for farmers not only for sale but also for their food security.

L.2 Farm Economy Survey for the Feasibility Study

L.2.1 Sampling Method of the Survey

In the Priority Area, The farm economy survey was conducted in the end of October 1998 to 130 farm households whose irrigation water was served by nine (9) delivery canals according to the location from upstream to downstream reaches of the Priority Area. For the selection of farm households, two (2) factors were considered to grasp the situation of farm households, namely location of the farming land along the canal (condition of water use) and farm size. The procedure of the selection is as follows;

a) dividing a delivery canal into three (3) areas (upstream, midstream, downstream) equitably according to the canal length.

b) Based on the three (3) areas, five (5) farm households in each area were picked up from a list of an agricultural cooperative related to the canal.

c) The five (5) farm households in each area of a delivery canal were selected by the farm size with large-scale farm (more than six (6) feddan, 1 household), middle-scale farm (three (3) to five (5) feddan, two (2) households), and small-scale farm (less than three (3) feddan, two (2) households). The criteria of the separation by scale is based on the result of the Master Plan Study which suggests that the farm size enough to earn a living is at least about three (3) feddan. Actually the selection of farmers were shifted to small-scale farm as a result.

d) In case there is Meska in each area of a delivery canal, two (2) farm were selected from head side of Meska and so were three (3) from tail of Meska. These farms were, however, satisfied with the condition of above 3). If there is no Meska, the farms directly irrigated were selected.

(Refer to Figure L.2.1)

L.2.2 Outline of the Result

Among the sample farm households the average number of family member is 8.3 and 7.5 for small-scale farm households, 10.0 for middle-scale farm households and 8.4 for large-scale farm households. The number of women is fewer than that of men in a family on average. About 60% of the family members are aged from 15 to 60 years old for each

category of farming size. The large-scale farmers are distributing their labor force to non-farm job more than the other scales. Women's working days are generally shorter than men. (Refer to Table L.2.1)

The average farming size is 3.2 feddan for 130 farm households and according to the category, the average farming size of small, middle and large-scale farm household is 1.8 feddan, 3.8 feddan and 7.2 feddan respectively and the farming land per capita is 0.2 feddan, 0.4 feddan and 0.9 feddan for small, middle and large-scale farm household respectively.

Cropping intensity is 200% and the larger the farming land is, the larger the planting area of most of crops increase except for maize which is considered as less profitable crop. Rice is planted in about 60% of land among sample farmers in summer season and about 20 to 30 % for cotton, three (3) to 10 % for maize and Six (6) to 11 % of the land is used for growing watermelon seeds. In winter season sugar beet is grown in 10% of the land.

On average one (1) or (2) cows, buffaloes and sheep or goats are kept by a farm household. As for poultry, about 14 chicken for egg and 16 chicken for meat are fed by a sample farme household. The large-scale farm households are raising bigger number of livestock and poultry than the middle and small-scale farm households.

Home consumption of rice and wheat is about 30% to 40%. Also about 50 % of maize, and about 20% of bean are self-consumed. The larger the farming size is, the less home consumption ratio is. Berseem is self-consumed with 80 to 90% of the product.

The difference of unit yield between upstream and downstream reaches of delivery canals was observed. Logically the unit yields of the crops would be lower in downstream reaches. The result of the farm economy survey relatively showed this tendency except some samples. (Refer to Table L.2.2)

According to farm income estimate for each category of farming size, the farm income per feddan is the highest in middle-scale farm household with 1,893 LE, followed by large-scale farm with 1,815 LE and small-scale farm with 1,733 LE. (Refer to Table L.2.3)

L.2.3 Detailed Farm Economy Survey (Production Cost Survey)

26 farm households out of the 130 samples were selected for the detailed farm economy survey (production cost survey) to estimate production cost by crop. The 26 sample farm households were selected with criteria of average farm size and three (3) samples from

each delivery canal (two (2) were selected from Zobaa canal). The data collected from the sample farm households were evaluated with other research from MALR, preceding IIP project reports, research at universities or institutes and utilized for average input and production cost estimate. (Refer to Appendix E Agriculture, and Appendix N Project Evaluation)

L.1 Farm Economy Survey for the Master Plan

Table L.1.1 Average Data of Family Status and Agriculture by Region as the Result of Farm Economy Survey (M/P)

Item	Upstream		Midstream		Downstream (West)		Downstream (East)		IIP Areas	
1) No. of Sample Farm Households	48		72		48		48		24	
2) Family Size (persons)										
Total	9.6		7.2		7.8		7.3		7.9	
Men	4.6		4.3		4.4		4.1		4.1	
Women	5.0		2.9		3.4		3.2		3.8	
3) Labor Force in a family										
Total	7.1		5.9		5.5		6.7		5.7	
Men	4.2		3.9		3.7		4.1		3.4	
Women	2.9		2.0		1.8		2.6		2.3	
4) Farming Land(fed.)	2.8		3.8		5.4		3.1		3.1	
5) Farming Land per capita(fed/capita)	0.3		0.5		0.7		0.4		0.4	
6) Cropping Area(fed) and Intensity(%)	Area	%	Area	%	Area	%	Area	%	Area	%
Total	5.52	197	7.47	197	10.75	200	6.15	200	6.15	200
Wheat	0.98	35	1.69	44	2.07	38	1.09	35	0.85	26
Broad bean	0.27	10	0.64	16	0.51	10	0.78	25	0.80	25
Long Barseem	0.95	34	0.63	16	1.20	22	1.03	34	1.13	36
Short Barseem	0.29	11	0.24	5	0.50	10	0.18	6	0.19	6
Sugar Beet	0.16	6	0.32	7	1.11	21	0.00	0	0.08	3
Onion	0.04	2	0.00	0	0.00	0	0.00	0	0.00	0
Winter vegetables	0.03	2	0.15	4	0.00	0	0.00	0	0.00	0
Rice	1.27	45	1.83	48	2.53	47	1.19	39	2.04	66
Cotton	0.85	30	0.97	25	2.28	42	0.99	32	0.63	20
Maize	0.47	16	0.41	10	0.39	7	0.82	26	0.15	4
Summer Vegetables	0.07	2	0.12	3	0.00	0	0.04	2	0.15	4
Water Mellon Seed	0.14	4	0.21	5	0.16	3	0.03	1	0.00	0
Fruits(Citrus)	0.00	0	0.26	7	0.00	0	0.00	0	0.13	5
7) Livestock(No. of Head)										
Cattle	0.9		0.9		1.6		1.7		0.9	
Buffalo	1.9		1.5		1.6		1.6		0.7	
Chicken(meat)	23.0		35.0		10.4		8.3		10.5	
Chicken(egg)	16.4		11.2		12.1		14.3		15.4	
8) % of Home Consumption										
Rice	45		33		34		47		35	
Maize	40		20		12		41		45	
Wheat	52		38		49		43		72	
Bean	20		18		6		17		16	
Berseem	72		31		44		58		74	
9) Worker and Working Days(day/year/capita)										
by Status	No.	days	No.	days	No.	days	No.	days	No.	days
Regular Work										
On Own Farm(male)	2.0	322	2.4	212	2.9	201	2.0	241	1.2	303
On Own Farm(female)	0.9	261	1.2	176	1.8	116	1.0	239	0.7	179
On Other Farm(male)	0.0	0	0.0	0	0.0	0	0.2	109	0.0	0
On Other Farm(female)	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Non Farm Occupation(male)	0.3	234	0.5	195	0.1	137	0.7	301	0.5	100
Non Farm Occupation(female)	0.1	90	0.1	108	0.0	0	0.1	61	0.1	50
Temporary Work										
On Own Farm(male)	1.4	159	0.8	108	0.4	43	0.7	72	1.5	105
On Own Farm(female)	1.8	134	0.7	81	0.0	0	1.4	94	1.3	97
On Other Farm(male)	0.2	33	0.1	21	0.1	9	1.3	155	0.2	67
On Other Farm(female)	0.1	33	0.0	0	0.0	0	0.1	43	0.2	58
Non Farm Occupation(male)	0.3	89	0.1	54	0.2	63	0.2	171	0.0	0
Non Farm Occupation(female)	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

Source: Result of Farm Economiy Survey in 1998 by the Study Team

Note: The downstream area is divided into two regions as downstream east and downstream west area. As for the downstream east area, the farmers who are in relatively better condition of productivity and non-farm job were chosen as samples. Therefore the sample farmers in the downstream west were taken as representative of downstream area for analysing outline of general farm economy in the Study Area

Table L.1.2 Unit Yields of Crops by Location–Regional Level and Field Position along the Delivry Canals

Location in the Study Area	Field Position along the Delivery Canal	Crop Production (Unit yield (kg/feddan))												
		Winter Crops							Summer Crops					
		Bean	Long Berseem	Short Berseem	Wheat	Sugar Beet	Onion	Vegetables	Rice	Cotton	Maize	Vegetables	Water Melon Seeds	Fruits
Upstream	upstream	2,169	24,958	15,243	2,616	-	14,000	9,000	3,286	967	1,831	-	700	-
	midstream	1,171	19,355	7,000	1,871	19,000	-	-	2,571	856	2,016	5,000	475	-
	downstrem	1,288	23,261	6,695	1,750	17,467	-	-	2,408	900	1,513	5,000	450	-
Average		1,543	22,525	10,596	2,079	18,233	14,000	9,000	2,755	902	1,759	5,000	510	-
Midstream	upstream	1,294	29,319	7,909	1,839	20,000	-	8,000	2,285	981	2,097	6,000	240	15,000
	midstream	1,336	26,906	6,000	1,793	14,206	-	6,362	2,202	944	1,633	6,667	250	-
	downstrem	1,188	18,867	24,000	1,786	19,333	-	5,287	2,254	1,013	1,583	6,667	300	8,000
Average		1,286	24,725	13,964	1,806	17,416	-	6,029	2,247	979	1,804	6,444	263	10,333
Downstream (West)	upstream	1,318	12,825	2,000	1,511	11,286	-	-	2,472	1,030	1,650	-	200	-
	midstream	978	10,443	2,400	1,519	12,448	-	-	2,023	790	1,937	-	150	-
	downstrem	620	18,383	5,486	1,189	13,375	-	-	2,027	798	1,660	-	301	-
Average		1,042	13,540	4,171	1,406	12,377	-	-	2,174	873	1,776	-	217	-
Downstream (East)	upstream	1,187	34,366	18,000	1,965	-	-	-	2,515	937	2,282	-	-	-
	midstream	1,180	28,574	20,600	1,873	-	-	-	3,168	850	2,167	8,000	-	-
	downstrem	1,093	22,607	14,000	1,830	-	-	-	2,452	862	1,991	4,000	500	-
Average		1,150	28,516	17,533	1,889	-	-	-	2,712	883	2,161	6,000	500	-
IIP Area	upstream	1,134	32,200	-	1,562	-	-	-	2,544	575	900	-	-	3,976
	midstream	1,523	29,291	-	2,151	-	-	-	2,359	851	2,800	-	-	-
	downstrem	1,200	16,790	4,941	1,942	22,000	-	-	2,381	1,009	1,260	4,167	-	-
Average		1,316	26,094	4,941	1,885	22,000	-	-	2,428	861	1,653	4,167	-	3,976

Source: The Result of the Farm Economy Survey in 1998 by the Study Team

Table L.1.3 Estimate of Farm Income by Region

Farm Area		Area (fed)	Beans (fed)	Long Berseem (fed)	Short Berseem (fed)	Wheat (fed)	Sugarbeet (fed)	Onion (fed)	Vegetables (fed)	Rice (fed)	Cotton (fed)	Maize (fed)	Vegetables (fed)	Water melon Seed (fed)	Fruits (fed)
Upstream		2.6	0.27	0.95	0.29	0.98	0.16	0.04	0.03	1.27	0.85	0.47	0.07	0.14	0.00
Midstream		3.8	0.64	0.53	0.24	1.69	0.32	0.00	0.15	1.83	0.97	0.41	0.12	0.21	0.25
Downstream West		5.4	0.51	1.20	0.50	2.07	1.11	0.00	0.00	2.53	2.28	0.39	0.00	0.15	0.00
Downstream East		3.1	0.78	1.03	0.18	1.09	0.00	0.00	0.00	1.19	0.99	0.82	0.04	0.03	0.00
IIP Areas		3.1	0.80	1.13	0.19	0.85	0.08	0.00	0.00	2.04	0.53	0.15	0.15	0.00	0.13

Farm Unit Gross Return			Beans (LE/fed)	Long Berseem (LE/fed)	Short Berseem (LE/fed)	Wheat (LE/fed)	Sugarbeet (LE/fed)	Onion (LE/fed)	Vegetables (LE/fed)	Rice (LE/fed)	Cotton (LE/fed)	Maize (LE/fed)	Vegetables (LE/fed)	Water melon Seed (LE/fed)	Fruits (LE/fed)
Upstream			2,003	1,397	657	1,663	1,855	3,640		1,691	3,044	994	1,500	3,825	0
Midstream			1,670	1,533	866	1,445	1,773	0	1,566	1,378	3,304	1,020	1,932	1,950	4,649
Downstream West			1,362	839	269	1,125	1,260	0	0	1,329	2,943	1,005	0	1,650	0
Downstream East			1,493	1,768	1,087	1,511	0	0	0	1,660	2,960	1,223	1,800	3,750	0
IIP Areas			1,709	1,618	306	1,508	2,239	0	0	1,458	2,905	1,488	1,251	0	0

Farm Unit Income			Beans (LE/fed)	Long Berseem (LE/fed)	Short Berseem (LE/fed)	Wheat (LE/fed)	Sugarbeet (LE/fed)	Onion (LE/fed)	Vegetables (LE/fed)	Rice (LE/fed)	Cotton (LE/fed)	Maize (LE/fed)	Vegetables (LE/fed)	Water melon Seed (LE/fed)	Fruits (LE/fed)
Upstream			1,237	880	388	1,039	1,105	2,632		809	1,566	314	656	3,182	0
Midstream			918	1,004	580	830	1,026	0	696	816	1,098	338	1,067	1,340	2,421
Downstream West			613	370	24	523	535	0	0	469	1,471	324	0	1,045	0
Downstream East			748	1,219	782	893	0	0	0	790	1,506	536	941	3,107	0
IIP Areas			956	1,062	68	890	1,470	0	0	619	1,435	257	419	0	0

Farm Total Gross Return		Total Income	Beans (LE)	Long Berseem (LE)	Short Berseem (LE)	Wheat (LE)	Sugarbeet (LE)	Lentil (LE)	Vegetables (LE)	Rice (LE)	Cotton (LE)	Maize (LE)	Vegetables (LE)	Water melon Seed (LE)	Fruits (LE)
Upstream	Total	9,439	541	1,327	191	1,630	297	146	0	2,148	2,587	467	105	536	0
	per fed	3,371													
Midstream	Total	11,864	1,069	966	208	2,442	567	0	235	2,822	3,205	418	232	410	1,209
	per fed	3,122													
Downstream West	Total	16,019	690	1,007	130	2,329	1,399	0	0	3,362	6,710	392	0	264	0
	per fed	2,966													
Downstream East	Total	10,829	1,165	1,821	196	1,647	0	0	0	1,975	2,950	1,003	72	113	0
	per fed	3,493													
IIP Areas	Total	9,992	1,367	1,828	58	1,282	179	0	0	3,036	1,831	223	188	0	0
	per fed	3,223													

Farm Total Income		Total Income	Beans (LE)	Long Berseem (LE)	Short Berseem (LE)	Wheat (LE)	Sugarbeet (LE)	Lentil (LE)	Vegetables (LE)	Rice (LE)	Cotton (LE)	Maize (LE)	Vegetables (LE)	Water melon Seed (LE)	Fruits (LE)
Upstream	Total	5,136	334	836	113	1,018	177	105	0	1,027	1,331	148	46	445	0
	per fed	1,834													
Midstream	Total	6,247	588	633	139	1,403	328	0	104	944	1,841	139	128	281	629
	per fed	1,644													
Downstream West	Total	7,113	313	444	12	1,083	694	0	0	1,187	3,354	126	0	167	0
	per fed	1,317													
Downstream East	Total	5,849	583	1,256	141	973	0	0	0	926	1,491	439	38	93	0
	per fed	1,887													
IIP Areas	Total	5,145	766	1,223	13	767	118	0	0	1,263	904	39	63	0	0
	per fed	1,660													

Source: Study Team

Note: Farmers' average area, cropping intensity, and unit yield are based on the result of the Farm Economy Survey. The gross and net income per feddan is based on the Study including the Feasibility Study in the Priority Area. (Refer to Appendix N)