1-3 Import and Export of Livestock and Livestock Products

The trade in livestock and its products has also been expanding rapidly in the recent years, and in five years from 1977 to 1981 the export value increased 2.8 - fold whereas the import value 7.6 - fold. In other word, the deficit ratio (import over export) of 10.7 in 1977 expanded to 29 in 1981. The major items of export are live sheep and goats while the import items are meat and dairy products. Growth in income and population would further increase the import demand in future (See Tables D-1-7 through D-1-10).

1-4 Consumption of Livestock Products

Per capita consumption of livestock products in 1978 is estimated at 12.0 kg of meat and 47.5 kg of dairy products (6.4 kg of cheese and 2.4 kg of butter) (See Table D-1-11). Meat consumption has been increasing whereas consumption of dairy products remains rather stable.

Consumption in 1986 is projected to be 15.1 kg of meat and 71.8 kg of dairy products in milk equivalent.

Recent retail price per kg in Egypt is 2.4 L E for meat and 2.3 L E for lamb (See Table D-1-12).

1-5 Livestock in the Project Area

The Project Area extends over three governorates of Dakahlia, Sharkia, and Port Said. These governorates raise about 0.92 million head of cattle and buffalos, accounting for a high rate of 18.4 percent of the total head in Egypt.

The cattle raised number 470,740 head, of which Baladi shares 416,597 head or 16 percent of its total head raised in Egypt, Friesian shares 1,100 head or 16 percent and Baladi crossbred with Friesian shares 53,043 head or 46 percent. The buffalos amount to 446,583 head or 20 percent of its total head in Egypt (See Table D-1-13).

Part of the cattle and buffalos are raised on dairy farm or fattening farm managed on the governorate or commercial basis, but the majority are raised by individual farm households who also engage in other farm production.

Table D-1-1 Number of Livestock

(Unit: '000 heads)

Variety	1974	1975	1976	1977	1978	1979	1980	1981*
Cows	2,119	2,102	2,079	2,048	2,587	1,954	1,912	1,852
Buffaloes	2,170	2,204	2,236	2,266	2,542	2,321	2,347	2,370
Sheep	1,965	1,926	1,878	1,821	2,554	1,679	1,593	1,498
Goarts	1,293	1,321	1,349	1,375	1,440	1,427	1,451	1,475
Camels	109	105	101	97	93	88	84	80
Pigs	15	15	15	15	15	15	15	15

Note: *: Tentative Figures

Source: Statistical Yearbook, Central Agency for Public Mobilization and Statistics, August 1982.

Table D-1-2 Number of Poultry

(Unit: '000)

Variety	1974	1975	1976	1977	1978	1979	1980	1981*
Local Chickens	25,764	26,069	26,375	26,680	26,786	27,292	27,697	27,903
Turkeys	687	696	705	715	724	733	742	751
Ducks	3,197	3,246	3,294	3,343	3,392	3,440	3,489	3,538
Geese	2,589	2,613	2,637	2,661	2,685	2,725	2,734	2,758
Pigeons (pairs)	1,569	1,551	1,440	1,325	1,207	1,084	1,107	1,126
Rabbits	2,063	2,053	2,054	2,032	2,020	2,012	1,994	1,983

Source: Statistical Yearbook, Central Agency for Public Mobilization and Statistics, August 1982.

Table D-1-3 Crop Area

(Unit: '000 feddans)

Year	Winter Crops	Summer Crops	Nile Crops	Orchard	Total
1952	4,364	3,026	1,824	94	9,308
1972	4,911	5,078	595	253	10,837
1973	4,943	5,075	648	258	10,924
1974	4,980	5,101	667	273	11,021
1975	5,069	5,083	723	285	11,160
1976	5,042	5,122	734	313	11,211
1977	4,958	5,082	750	321	11,111
1978	5,029	4,968	813	332	11,142
1979	5,063	5,051	781	342	11,237
1980	4,929	5,038	803	360	11,128
1981*	5,195				11,259

Table D-1-4 Cultivated Area for Clover (Berseem)

(Unit: '000 Feddans)

Year	Area
1952	2,202
1975	2,812
1976	2,757
1977	2,854
1978	2,782
1979	2,777
1980	2,711
1981*	2,778

Source: Statistical Yearbook 1982.

Table D-1-5 Animal Products

(Unit: '000 tons)

Commodities	1969-71	1979	1980	1981
Beef and Veal	119	122	*127	125F
Buffalow Meat	96	117	119F	121F
Mutton and Lamb	29	23	25F	25F
Gaot Meat	16	20	*20	21F
Pig Meat	1	2	3	3F
Poultry Meat	NA	139	NA	NA
Cow Milk	575	646	667F	688F
Buffalo Milk	1,011	1,227	1,265F	1,303F
Sheep Milk	15	21	22	23
Goat Milk	6	8	8F	9F
Cheese	204	238F	243F	247F
Butter	56	67F	68F	70F
Hen Eggs	55	89	*90	92F

Source: Production Yearbook, 1981 FAO.

Note: *; unofficial figure, F; FAO estimate.

Table D-1-6 Number of Slaughtered Livestock

(Unit: '000 head)

	1973	1974	1975	1976	1977	1978	1979	1980	1981*
Oxen	18	7	2	2	1	1	2	1	1
Cows	28	32	33	26	26	41	56	46	41
Buffaloes	75	89	83	72	74	98	111	98	82
Veals	306	329	295	259	285	347	340	282	269
Calves	323	365	352	327	355	384	472	443	474
Sheep	379	372	400	371	399	445	432	369	422
Goats	26	20	22	22	23	21	24	24	30
Pigs	40	42	45	49	46	45	56	58	59
Camels	53	64	50	51	57	52	45	32	46
Total	1,248	1,320	1,282	1,179	1,266	1,434	1,538	1,353	1,424

Source: Statistical Yearbook, Gentral Agency for Public Mobilization and Statistics, August 1982.

Table D-1-7 Foreign Trade by Tariff Nomenclature

(Unit: LE '000)

Item	Export		Import	
	1979	1980	1979	1980
Live animals	7,732	10,598	1,972	1,806
Meat & edible meat offals	198	168	50,782	120,287
Fish crustaceans & molluscs	525	385	7,687	9,778
Dairy products, birds' eggs and natural honey	96	147	49,172	78,106
Products of animal origin	842	602	108	217
Total	9,393	11,900	109,721	210,194

Source: Monthly Bulletin of Foreign Trade, August 1981
Central Agency for Public Mobilization and statistics

Table D-1-8 Foreign Trade of Living Animal and its Products

(Unit: LE '000)

	1976	1977	1978	1979	1980	1981*
Export	4,077	5,129	5,621	9,393	11,900	14,493
Import	39,249	54,911	95,175	109,721	201,194	417,530

Note : * Tentative figures
Source: Statistical Yearbook, Augugst 1982

Table D-1-9 Imports Quantity of Livestock Products

(Unit: tons)

Commodities	1979	1980	1981
Bovine Meat	34,277	65,152	120,509
Poultry Meat	27,453	54,354	83,962
Milk Dry	24,103	27,466	14,000
Cheese	15,067	14,416	*14,000
Butter	22,008	35,207	*30,000
Egg with Shell	1,092	2,252	*8,200
Total	124,880	198,577	302,907

Note : * Unofficial figure
Source: Trade Yearbook, 1981 FAO

Table D-1-10 Imports Value of Livestock Products

(Unit: '000 US$)

Commodities	1979	1980	1981
Bovine Meat	48,441	84,268	174,972
Poultry Meat	27,453	54,353	83,962
Milk Dry	25,872	28,555	73,531
Cheese	19,320	25,189	21,000F
Butter	31,226	60,018	*68,000
Egg with Shell	1,291	2,600	8,300F
Total	162,603	254,983	429,765

Note : *; unofficial figure
F; FAO estimate

Source: Trade Yearbook 1981, FAO.

Table D-1-11 Annual Share per Capita from Foodstuffs in ARE

(Unit: kg)

Food Stuffs	1972	1973	1974	1975	1976	1977	1978
Seeds	231.0	244.6	249.3	254.4	275.9	266.1	281.1
Starchy Products	9.5	16.8	16.1	13.1	16.8	20.4	19.0
Sugar and Sweets	21.9	22.3	23.4	27.4	28.8	28.8	26.3
Pulses, Nuts and Roots	10.2	13.1	12.0	11.7	12.8	9.1	10.2
Fresh Vegetables	92.3	85.4	92.7	96.0	99.3	107.3	90.2
Fruits	54.4	58.8	66.4	63.9	63.1	58.0	62.4
Meat and Poultry	10.9	10.9	10.9	10.6	10.2	10.6	12.0
Fish	2.2	2.2	2.6	2.9	3.7	3.3	4.7
Dairy Products	49.3	48.5	48.2	48.2	50.4	48.2	47.5
Eggs	1.5	1.5	1.5	1.8	1.5	1.8	3.3
Vegetable Oils	9.1	9-9	1.9	11.3	11.0	11.0	12.8

Source: Statistical Indicators, Central Agency fro Public Mobilization and Statistics.

Note : All of figures in this table was calculated based on the Statistical Indicators metioned above.

Table D-1-12 Mean Retail Prices of Animal Products in Cairo (1981)

Commodities	Unit	Prices (LE)
Local Meat		
Veal with bones	kg	2.25
Beef without bones	"	2.40
Lamb with bones	"	2.30
Poultry and Eggs		
Turkeys (live)	kg	2.42
Local chickens (live)	"	2.30
Ducks (live)	"	2.08
Rabbits (live)	"	2.00
Pigeons (live)	Pairs	2.29
Local chickens (killed)	kg	1.49
Imported chickens (killed)	"	1.20
Eggs	Unit	0.087

Source: Monthly Bulletin of Mean Prices of Food Commodities, Retail Prices, Central Agency for Public Mobilization and Statistics, 1981.

Table D-1-13 Number of Cattle in 3 Governorate and Egypt (1981)

Governorate	Cattle Breed	Less than 2 years	More than 2 years	Cattle Total
Dakahlia	Baladi	67,725	92,538	160,263
	Friesian	392	383	775
	Cross (BxF)	15,223	32,991	48,214
	Sub-total	83,340	125,912	209,252
	(Buffaloe)	(55,487)	(167,519)	(223,006)
Sharkia	Baladi	68,606	187,728	256,445
	Friesian	48	108	156
	Cross (BxF)	224	1,700	1,924
	Sub-total	68,878	189,536	258,414
	(Buffaloe)	(42,158)	(179,524)	(221,682)
Port Said	Baladi	-	-	-
	Friesian	-	169	169
	Cross (BxF)	1,201	1,704	2,905
	Sub-total	1,201	1,873	3,074
	(Buffaloe)	(318)	(1,577)	(1,895)
A.R.E.	Baladi	581,846	2,016,984	2,598,830
	Friesian	2,677	4,403	7,080
	Cross (BxF)	40,901	75,605	116,506
	Sub-total	625,424	2,096,992	2,722,416
	(Buffaloe)	(356,026)	(1,914,584)	(2,270,610)

Source: Statics of Ministry of Agriculture, 1981.

2. Animal Husbandry Plan

2-1 General

In the project planning, animal husbandry would play an important role with respect to the following points;

a) animal husbandry will consume a sizeable production of the fodder to be produced according to the proposed cropping patterns and convert it into various livestock products, which helps reduce the rapidly increasing imports of meat and dairy products, resulting in foreign exchange savings,

b) it will provide raw materials for agro-industrial development,

c) a considerable amount of animal manure will provide ample supply of organic matter which is indispensable for improving heavy clayey soils which are predominant in the Project area.

2-2 Breeding Plan

(1) Selection of Livestock

For the selection of livestock, the following criteria are taken into consideration:

a) to reduce the increasing demand for imported meat and dairy products,

b) to efficiently utilize a sizeable fodder production resulting from the proposed cropping patterns,

c) to improve soil characteristics by plowing back a considerable amount of animal manure which is produced by livestock.

On the basis of the above criteria, dairy cattle will form the mainstay of the livestock in the proposed animal husbandry. Beef cattle and water buffaloes will also be introduced in view of efficiently utilizing the fodder production based on the proposed cropping patterns.

From the same viewpoint, introduction of sheep and goat will also be considered, instead of poultry - mainly chicken (layer and broiler) - which totally depends on concentrated fodder as its feedstuff.

(2) Breed of Selected Livestock

1) Dairy Cattle

Friesians are recommendable for dairy cattle because of the large milk production and superior meat quality. It currently occupies a considerable portion of dairy cattle in Egypt and has been raised for over 50 years.

As of 1981, Friesians totalled 7,000 head and Friesian crossbred with Baladi over 110,000 head, indicative of its good performance. Moreover, this breed is also commonly raised all over the world.

Though the Brown Swiss breed has recently been introduced to certain Governorates and has a higher fat ratio, it has a slightly lower milk production capacity and more or less the similar meat productivity. It is not as commonly raised as Friesians are.

2) Buffalo

A buffalo has slower maturity than a cattle. The average age of the first calving is 38 months ranging from 22 months to 56 months. It easily happens to miss the proper time for mating because of its silent heat in addition to its dry period of 200 days and calving interval of 500 days. (See Table D-2-1).

While a buffalo milk contains 7 percent of fat on an average and is preferred by consumers, its milk yield is rather low showing annual yield of 1,320 kg to 1,760 kg or daily yeild of 5.7 kg to 6.9 kg at the experiment station, and 2.4 kg to 4.1 kg at village level (See Table D-2-1).

Although the meat of male calves for veal aged 3 to 4 weeks is tender and in good quality, that of adult buffalo is coarse and tough. Its daily gain is 0.6 kg on an average, and its dressing percentage is about 57 percent, but its hide is rather thick and proportion of bone, head and leg is high (See Table D-2-1).

While feeding buffalo is rather easy, has heat resistence, and requires watering and shelter. Mortality is about 35 percent from birth to 3 year age, ranging 44 percent at first month, 24 percent at second month and 9 percent at third month. A buffalo is easily affected by diseases of cattle.

Table D-2-1 Some Items of Buffalo in the A.R.E.

1. Breed & Types

2 types ° Beheri - delta
° Saidi - upper Egypt

2. Reproduction

(1) Age at first calving

38 months (22 ~ 56 m)

Ministry of Agricultural Experimental Farms:
25 ~ 35 months - 30%, 36 ~ 43 months - 50%.
44 ~ 56 months - 20%

(2) Gestation period

3, 6 + 8 days

(3) Oestrous cycle

21.14±0.72 days

Silent heat ... The finding of a mating chance is different

(4) Lactation, dry period & calving internal

Lactation period	325 days (186 ~ 363 days)
Dry period	200 dyas (101 ~ 296 days)
Calving internal	540 days (471 ~ 585 days)

3. Productivity

(1) Milk production

Experimental station's case 1,320 ~ 1,760 kg±220 ~ 440 kg
daily yield 5.7 ~ 6.9 kg

Village condition 680 kg daily yield
1 3.2 ~ 3.9 kg
2 2.4 ~ 4.1 kg

(2) Butter fat

Average 7% (1 4.1 ~ 12.0%, 2 6.0 ~ 7.3%)

(3) Meat

Male calf for veal (3 4 week age) - tender good quality
Adult male meat - coarse and tough, dark colour

(Cont'd)

Age	Live Weight (kg)	Daily Gain (kg)	Carcass (%)
50 days	74	0.67	59.9
6 months	157	0.64	57.2
12 "	230.3	0.40	57.7
18 "	359.3	0.72	57.6
24 "	449.0	0.50	52.7

4. Husbandry

(1) Nutrition

Winter months (Nov. - May): Berseem (clover)

Summer period: Concentrate cottonseed cake, wheat & rice, bran, clover hay, maizeforage, wheat & rice straw

(2) Mortality and longevity

° Mortality rate 0 - 3 years 35%, 1st Month 44%, 2nd Month 24%, 3rd Month 9%

Asber : 0 - 3 years 33%, 0 - 6 Month 81.8%, 6 - 12 Month 10.9%, 12 - 18 Month 2.4%. 18 - 24 Month 1.3%, 24 - 36 Monnth 3.6%

Shahin : 0 - 3 years 35.1%, 0 - 6 Month 70.5%

° Longevity

Female 6 - 8 lactation period (village condition) 3.45 lactation or 79.7 Months (Experimental Farms)

Male First use 3.7 years, disposal 7.7 years

Source: The Buffalo in the A.R.E. by A.A. EL-Itaiby
The husbandary and health of the domestic buffaloe 1974, FAO.

3) Beef Cattle

The beef cattle proposed is the Baladi of local variety which has a high quality meat and is most commonly raised in Egypt together with the buffalo.

4) Sheep and goats

Most Egyptians prefer beef to sheep and goat meat. Also the productivity of milk and meat as well as manure is less than these of cattle. They consume a large amount of fodder relative to their size and the dressing percent is lower (See Table D-2-2).

(3) Fundamental Items of Breeding Plan

Table D-2-3 compiles the collected data as well as the minutes of discussion with the staff concerned of GARPAD, Animal Production Research Institute, and of fattening farm and dairy farm. The breeding plan has been formulated based on these items.

(4) Feeding Unit and Nutrients Requirement

1) Feeding Unit of Cattle

Feeding unit for this Project is composed of an adult cow (delivered cow) and its fattening cows of both dairy and beef cattle. Details of the composition of feeding unit are presented in Table D-2-5.

2) Nutrients Requirement

Feeding standard for the Project employs SE(Starch Equivalent) and DCP (Digestible Crude Protein) which are adopted by Animal Production Research Institute, Ministry of Agriculture, Egypt.

Feeding standard required for adult cows, fattening cows, and raising cows are presented in Table D-2-6 and D-2-7, while the chemical constituent of various crops is shown in Table D-2-8. Based on these tables, nutrients requirement per feeding unit are estimated in Table D-2-9.

Table D-2-2 Some Items of Sheep

1. Total gain/head during the experimental period (8 weeks)

System of Feeding	Average (kg)	Daily Gain (g)	Remarks
I	2.17	27.5	the initial body weight of the lambs were around 25.0 kg
II	6.59	116	
III	11.29	200	
Average	6.59	116	

2. Feed consumption kg/head/day (as fed)

System of Feeding	Berseem (Clover)	Concentrates	Rice Straw
I	5.11	-	0.10
II	3.47	0.25	0.06
III	2.85	0.50	-

3. Carcass traits

Traits	System of Feeding I $\bar{X}$	I SE	II $\bar{X}$	II SE	III $\bar{X}$	III SE	Total Average $\bar{X}$	Total Average SE
Dressing	41.80	2.43	50.80	1.39	49.10	2.34	47.12	1.56
Carcass Score	2.33	0.33	2.67	0.20	3.58	0.15	2.86	0.19
Fat Thickness	0.55	0.24	0.90	0.20	1.20	0.10	0.88	0.11

Source: EARLY FATTENING OF LOCAL SHEEP ON DIFFERENT FEEDING SYSTEMS
by A.M. ABOUL-NAGA, B. MARKOTIC AND N. ABDEL-SALAM
Alex J. Agric. Res. 21 (2) 193-198 (1973)

Tabel D-2-3 Fundamental Items for Breeding Plan

1. Milk Cow (Friesian)

Body Weight	500 kg
Milk Yield	4,500 kg
Milk Fat	3.8% - 3.6%
First Calving	at 26 month after birth
Lactation Period	306 days
Delivery Rate	85%
Duration for Milk Production	5 - 7 yeads
Mortality for Rasing Cow	7%
Labor Requirement for Management	0.1 person/head (10 head/person)
Fodder Crop to be Offered	50 kg of fodder (berseem)/day
Concentrate to be Offered	3.5 kg - 5 kg/day
Straw to be Offered	2 kg/day
Unit Price of Fresh Milk	LE 0.3/kg - Farm gate price
Unit Price of Concentrate	LE 0.045/kg (LE 45/ton)
Unit Price of Berseem (Hay)	LE 0.08/kg (LE 80/ton)
Unit Price of Imported Heifer	LE 1,000/head
Unit Price of Imported Bull	LE 1,200/head] Brown Swiss
Unit Price of Rice Straw	LE 25/ton (LE 0.025/kg)
Production Cost of Fresh Milk	LE 0.24/kg
Unit Price of Fresh Berseem	LE 10 - 12/ton

2. Beef Cattle	Baladi	Friesian
Body Weight	350 kg	500 kg
Daily Gain	0.6 kg/day	0.9 kg/day
Duration for Fattening	6 months	6 months
Age to be Slaughtered	18 months	18 months
Mortality	2%	2%
Dressing Percentage	54%	52%

(Cont'd)

Labor Requirement	50 head/man	50 head /man
Straw to be Offered	2 - 3 kg	- do -
Berseem to be Offered	10 kg	- do -
Concentrate	Graduately increased from 2kg/day to 6 or 7 kg/day	
Unit Price of Meat	LE 2.5/kg	- do -
Selling Price of Fattened Cattle	LE 375/head	- do -
Production Cost for Fattening	LE 0.50/day	LE0.71/day

Table D-2-4 Some Items of Bovine Cattle

	Buffale	Brown Swiss	Friesian	Baladi
Weight (kg)	500 - 600	500 - 600	500 - 600	350 - 380
Milk Production (kg)	1,320-1,760±200-400 898 - 1,168	3,200 - 4,000	4,000 - 4,500	790 - 1,800
First (month)	38 (22 - 56)	30 - 33	26 - 29	32 - 35
Gestation Period (day)	316	290	285	290
Interval (month)	18	14	14	16
Mortality (%)	Birth- years 35		Birth-2 years 14.5	Birth-2 years 12.8

Table D-2-5 Feeding Unit

Type	Kind	No. of Head	Weight (kg)	Remarks
Dairy Cattle (Friesian)	Delivered Cow	1	500	
	Raising Heifer	0.31	270	Agerage
	Feeder Cattle	0.42	32.5 - 180	0-6 months
Beef Cattle	Delivered Cow	1	380	
	Raising Heifer	0.30	200	Average
	Feeder Cattle	0.37	27.5 - 115	0-6 months
Fattening Cattle	Friesian	0.42	500*	7-18 months
	Baladi	0.37	350*	7-18 months

Note: * Slaughtering weight at age of 18 months.

Table D-2-6 Nutrients Requirements of Cow

	SE (kg/day)	DCP (g/day)
1. Maintenance		
each 100 kg body wieght needs	0.58	50
2. Production		
each 1 kg of FCM (4% fat) needs	0.263	67.6
3. Growth calf from weaning till 2 years old		
body weight - 65 kg	1.05	200
160	1.64	290
175	2.33	370
250	3.04	440
300	3.16	480

Source: Animal Production Research Institute.

Table D-2-7 Nutrient Requirement for Fattening Cattle

Live Weight (kg)	Requirement (g/day) SE	DCP	Expected Daily Gain (kg/day)
1. Growth			
91 - 135	2,340	470	0.85
136 - 180	2,580	515	0.85
181 - 225	3,060	565	0.80
226 - 270	3,480	580	0.70
271 - 315	3,650	580	0.70
316 - 360	4,020	605	0.70
2. Finishing			
300 - 350	4,980	540 - 600	1.00
351 - 400	5,220	565 - 655	1.00
401 - 450	5,460	585 - 685	1.00
451 - 500	5,580	606 - 700	1.00
501 - 550	5,780	625 - 720	1.00
551 - 600	5,950	645 - 745	1.00

Source: Animal Production Research Institute.

Table D-2-8 Chemical Composition of Crops

(Unit: %)

Materials	Moisture	DCP	SE	Fibers
Berseem				
1st cutting	88.28	1.8	6.3	2.49
2nd cutting	85.15	2.6	7.8	3.88
3rd cutting	80.50	2.0	9.6	6.11
Sorghum	80.46	0.40	11.1	6.04
Hay of Berseem	8.82	7.5	35.2	34.9
Sudan Grass				
1st cutting	26.89	2.50	12.5	7.53
2nd cutting	80.73	2.00	9.9	6.21
3rd cutting	80.00	1.00	9.3	6.24
Maize	9.64	5.9	81.8	1.79
Beet Pulp	88.0	6.0	53.6	1.04
Rice Straw	9.0	-	21.7	30.41
Soybean Cake	11.0	38.4	71.7	-
Wheat Straw	6.88	-	23.0	36.98

Note: DCP: Digestible Crude Protein
SE: Starch Equipvalent

Source: Animal Production Research Institute.

Table D-2-9 Nutrients Requirement

(Unit: ton/feeding unit/year)

	Fodders		Concentrate		Total	
	SE	DCP	SE	DCP	SE	DCP
Dairy Cattle	2.17	0.33	0.32	0.08	2.49	0.41
Beef Cattle	1.44	0.20	-	-	1.44	0.20
Fattening Cattle						
Friesian	0.58	0.06	0.14	0.04	0.72	0.10
Baladi	0.34	0.06	0.03	0.00	0.37	0.06
Sub-total	0.92	0.12	0.17	0.04	1.09	0.16

(5) Forage Production and Availability of Nutrients

All roughage shall be self-supplied from the farmers' own field and the nutrients not supplied by the roughage will be supplemented by the concentrate (mixed feed).

Berseem (Egyptian Clover) cropped during the winter will be fed between the autumn and the spring while the sorghum, rice straw, and hay will be fed between the summer and the autumn. In the winter and the summer, mixed feed will be fed whenever necessary by making use of soybean cake and beat pulp produced as "by-product" at the plant in the Area.

Forage production in the Project Area at the full development stage and its nutrients production are estimated. Availability of nutrients per annum is estimated at SE of 140,556 ton. (See Table D-2-10)

As for the feeding method, the forage cut in the field will be fed to the livestock instead of leaving them grazing in the field. Surplus forage will be preserved for the off-crop season in the form of hay. Hay baler under the contract system will be necessary for this purpose.

(6) Livestock Introduction Plan and Annually Feedable Number of Livestock

The proposed livestock introduction plan will have to be co-ordinated with the annual plan of forage crop production in order to realize stable animal husbandry income at an earliest time.

Friesian breed which constitute the main livestock will need to be introduced since the initial stage of the Project development to attain high economic efficiency. Considering, however, the foreign exchange reserve situations as well as the readiness of supply on the part of the countries of origin, three alternative cases of animal introduction centering around Friesian have been studied as shown in Table D-2-11.

Table D-2 - 10 Production of Fodder and Total S.E.

(Unit: ton)

	Project year 8	9	10	11	12	13	14	15	16	17	18	19
North Hussinia												
Sorghum	-	-	-	-	38,360	87,262	148,750	218,625	253,162	278,686	293,282	298,764
Berseem	-	28,448	66,136	118,240	193,526	244,044	297,169	354,697	396,288	424,930	443,076	448,500
Rice straw	-	1,778	5,467	10,557	18,613	26,763	34,061	41,562	47,189	50,466	52,735	53,820
Beet Pulp	-	-	-	-	2,885	6,346	10,521	15,957	17,837	19,377	20,570	21,080
Soybeam C.	-	-	-	-	1,726	4,157	7,402	11,633	13,726	15,192	15,940	16,146
South Port Said												
Sorghum	-	-	-	42,732	51,672	109,100	123,412	140,650	147,752	154,854	→	
Berseem	36,792	45,990	102,043	134,180	164,912	199,485	229,497	245,855	260,802	266,500	→	
Rice straw	2,300	4,599	8,803	14,410	18,675	23,073	27,213	29,346	30,841	31,980	→	
Beet Pulp	-	-	-	3,732	4,198	8,949	10,148	11,187	11,990	12,525	→	
Soybeam C.	-	-	-	2,380	3,124	6,595	7,821	8,900	9,328	9,594	→	
Whole Project												
Sorghum	-	-	-	42,732	90,032	196,352	272,162	359,275	400,914	433,540	448,136	453,618
Berseem	36,792	74,438	168,179	252,420	358,438	443,529	526,666	600,552	657,090	691,430	709,576	715,000
Rice straw	2,300	6,377	14,270	24,967	37,288	49,836	61,274	70,908	78,030	82,446	84,715	85,800
Beet Pulp	-	-	-	3,732	7,053	15,295	20,705	27,144	29,827	31,902	33,095	33,605
Soybeam C	-	-	-	2,380	4,850	10,752	15,223	20,533	23,054	24,786	25,534	25,740
Total SE	2,824	6,088	13,725	28,871	45,996	72,189	92,761	114,517	126,578	134,957	139,069	140,556

Table D-2-11: Three Cases of Livestock Introduction Plan (Heads)

Case	Total	Friesian			Baladi			Buffalo		
		Year			Year			Year		
		1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
I	3,000	1,000	2,000	-	1,000	2,000	-	1,000	-	-
II	5,000	2,000	3,000	-	1,000	1,000	3,000	1,500	-	-
III	6,000	2,000	2,000	2,000	1,000	3,000	2,000	1,800	-	-

The quantam and timing of animal introduction in these 3 cases may by summarized as follows;

Case 1: 3,000 heads of Friesian and 3,000 heads of Baladi will be introduced in 2 years (1,000 each in Year 1 and 2,000 each in Year 2), with 1,000 heads of buffalo to be introduced once for all in Year 1.

Case 2: 5,000 heads of Friesian to be introduced in 2 years (2,000 in Year 1 and 3,000 in Year 2), together with 5,000 heads of Baladi in 3 years (1,000 each in Years 1 and 2, and 3,000 in Year 3); 1,500 heads of buffalo will be introduced once for all in Year 1.

Case 3: 6,000 heads of Friesian to be introduced in 3 years at equal instalment of 2,000 per year, side by side with 6,000 heads of Baladi (1,000 in Year 1, 3,000 in Year 2 and 2,000 in Year 3); 1,800 heads of buffalo will be introduced once for all in Year 1.

In Year 12 when forage production is expected to reach full development stage, the number of buffalo would represent 10 - 15% of the total number of cattle. Baladi, the local variety, would occupy about 30 percent of the total cattle population between Year 6 and Year 9, and since Friesian's lactescent period lasts for 7 years, Baladi would be largely replaced by Friesian in Year 13 with Case III, Year 14 with Case II, and Year 17 with Case I. The stage where Baladi would be largely replaced by Friesian corresponds to the full development stage from animal husbandry

point-of view. Animal husbandry products in Year 12 when forage production reaches its full development stage and those in different years of animal husbandry full development stage among Cases I, II and III are estimated as per Table D-2-12.

Table D-2-12: Animal Production at Different Stages (Tons)

Case	Year 12				Animal Husbandry Full Development				
	Friesian+Baladi		Buffalo		Year	Mostly Friesian		Buffalo	
	Meat	Milk	Meat	Milk		Meat	Milk	Meat	Milk
I	2,952	84,715	204	2,370	17	5,948	187,425	402	3,604
II	4,651	141,948	305	3,555	14	5,011	183,619	515	4,759
III	5,376	157,405	367	4,266	13	5,816	175,170	589	5,440

Consequently, Case II has been adopted as the most balanced animal husbandry development plan from both financial as well as economic efficiency viewpoints.

As regards sheep or goat, each houshold can keep 1.5 heads per year by the fodder left over after consumption by Friesian, Baladi and buffalos.

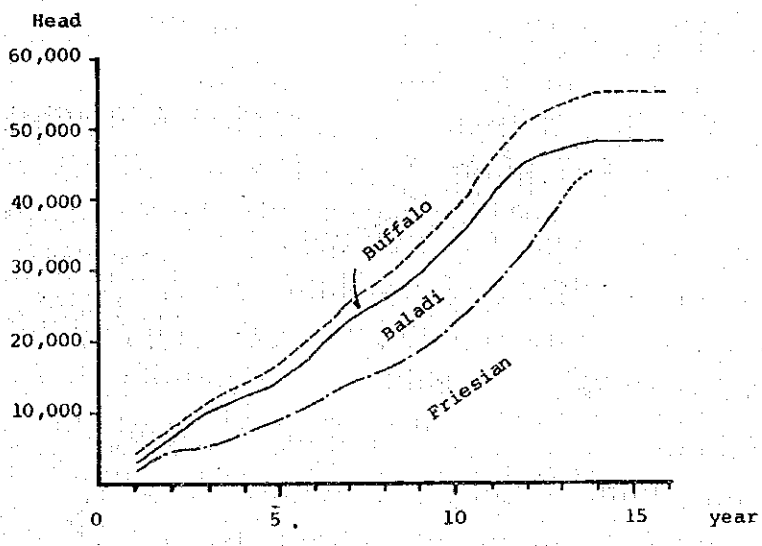

Fig. D-2-1 Number of Cow

2-3 Milk and Meat Production Plan

The annual production of fresh milk and meat based on the above feedable number of livestock is estimated at as below;

	Dairy Cow	Buffalo	Lamb
Fresh Milk	183,620 ton	4,760 ton	-
Boned Meat	5,010 ton	510 ton	200 ton

of the total milk production, 172,240 ton of cow milk will be processed and the remaining cow milk and buffalo milk will be either consumed domestically by livestock farmers or fed to calves.

Raw milk will be processed into UHT milk, butter, and white cheese.

2-4 Facilities Plan

(1) Facilities for Livestock Breeding

Loose housing barn 1 unit (20 m^2 per head) and hay storage space - open type with trough and water - trough, being surrounded by fence and roofed with slate.

Small truck: 1 unit for transportation of soilage, milk, etc.

(2) Milk Collecting Center

It is planned to establish a milk collecting center in each village (51 in total) with a bulk cooler, which will be operated and managed by the livestock growers' cooperatives. Farmers bring their milk to the milk collecting center by themselves after milking, which will be kept in the bulk cooler at low temperature to prevent spoilage. The factory shall be in charge of transporting milk from the center to its facilities.

It is recommended that about every 30 farms shall organize a kind of inspection association by themselves, in which farmers themselves shall carry out checking of milk quantity, quality and fat percentage, etc.

(3) Cattle Breeding Center

1) Function and Management

In considering that a large number of cattle (Friesian and Baladi) will be bred and fed in the area after the full development stage, it is proposed to establish a cattle breeding center for which main objectives are to produce frozen semen for artificial insemination and to maintain both bulls of Friesian and Baladi in good quality as well as to raise bulls for replacement and supplement. The proposed breeding center shall belong to and be managed by the public sector.

2) Artificial Insemination

The center will periodically collect semen and preserve frozen semen. Artificial insemination will be carried out by veterinarians visiting farmers' houses. Friesian frozen semen may be imported whenever necessary in order to produce superior genes.

It is anticipated that the center will provide a forum for and conduct experiments in transplantation of fertilized ovum and artificial pregnancies.

The center will be as follows;

Item	Dimension
No. of Sires (Bull)	13 heads
Staff	15 persons
Building Lot	Office 0.05 Fed.
	Cattle Shed 0.2 Fed.
Lot Requirement	1.5 Fed.

2-5 Institutional Set-Up

In order to smoothly operate the proposed animal husbandry plan, it is needless to say that the farmers' utmost efforts and positive action by livestock growers cooperatives are required, furthermore guidance and cooperation given by the central government as well as Governorate are equally very important. The following items are considered essential;

a) Extension Services

It is necessary to sufficiently mobilize the extension workers who can give guidance to farmers technically in terms of hygienic milking, checking system of milk quality, fodder cultivation and harvesting and so on. Especially dairy cattle farmers must be well attended to by the extension workers.

b) For attaining the goals of the animal husbandry plan, it is a basic requirement that all cattle to be fed in the Project Area be maintained in good health and have a satisfactory productivity. For this reason, it is recommended to establish an Animal Hygienic Service Center possibly managed by Governorate, in which the necessary veterinarian services and assistance will play an important role in preventing infectious diseases and Egyptian fever, guiding and implementing artificial insemination, extending animal hygienic principles and so on.

c) Guidance for Introducing Breeding Cattle

It is recommended that when importing Friesian cattle, a guarantine officer and an official buyer shall be dispatched to export coutries for checking quality of cattle as well as epidemic diseases, and shall select satisfactory cattle.

In case of introducing Baladi cattle, the same selecting system mentioned above should be applied, except that the necessary cattle shall be procured domestically through assistance and cooperation from the central government and Governorate.

ANNEX

E. FISHERIES

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E. FISHERIES

1. Present Fisheries

1-1 General

Various studies on the Lake Manzala have been made since early 1900's; most of them, however, were made from the academic viewpoints. During 1979 to 1982, a comprehensive study on the Lake Manzala fisheries was carried out (at pre-feasibility level), as a part of the Lake Manzala Study being funded by UNDP, with a prime objective of generating a land-use plan as a basis for development planning of the Lake and its environs. Therefore, the basic information of the Lake fisheries obtained thereby have been widely used for reference in carrying out the present study.

1-2 Physical, Chemical and Hydrological Conditions of the Lake

The Lake Manzala is located at the lowest of the east side Nile Delta and faces to the Mediterranean along its north periphery. Its main water body extends about 60 km from east to west and 25 km from north to south, but its water depth is limited within 1.5 m even at the deepest. The water body is blocked by several chains of islands so that it may be possible to divide the water body into several zones. Its bottom is quite flat being covered with soft silty clay.

Two openings to the Mediterranean at its northern periphery as well as at its eastern periphery near Port Said do not seem to be contributing as the significant sources of sea water. Under such circumstances, the environment of the Lake seems to be strongly influenced by the water balance between fresh water and sea water.

Because of its connections with the Mediterranean, the Lake water has traditionally been brackish: annual mean salinity levels have been continuously declining from 16,700 mg/L during 1921-26 to 9,000 mg/L during 1962-63, by almost 50 percent. During the rest of the 1960's, salinity levels remained relatively constant, but dropped to 4,100 mg/L in 1973 and to 2,900 mg/L during 1979 to 1920 (see Table E-1-1)

This pattern of salinity declining over the past 50 years has generally been attributed to the increases of the inflow of agricultural drainage water and the restrictions to the inflow of the sea water due to

Table E-1-1 Salinity Values in mg/L for Lake Manzala during the Period 1921 to 1979
(Northern Sector Excluded)

Region	Period							
	1921-26[1/]	1930-35[2/]	1062-63[3/]	1963-65[4/]	1967[5/]	1968[6/]	1973[4/]	1979[7/]
I	11,200	mean	2,300	2,600	2,300	2,400	1,200	1,600
II	24,800	three	21,000	18,400	17,500	16,600	11,500	5,400
III	17,200	locations	8,000	6,300	6,200	(7,900)	2,000	3,500
IV	13,600	not	4,600	5,900	3,400	4,800	1,700	1,000
V	28,600	specified	-	-	-	-	-	18,600
Mean Area I-IV	16,700	24,000	9,000	8,300	7,400	(7,500)	4,100	2,900
Range between years	12,800 to 19,400	17,400 to 33,200						
Concentration factor 8/	1:6.7			1:2.3				1:1.2

Notes:

1/ Ahmed Bey Fouad, 1926.

2/ Faouzi, 1933-35.

3/ Wakeel and Wahby, 1970.

4/ Shaheen and Youssef, 1978.

5/ Youssef, 1973.

6/ Bishara, 1973.

7/ Present Study.

8/ Ratio of highest mean monthly value for whole lake to lowest value.

9/ Refer to Figure H.2.1 for location of regions.

non-excavation of its connections with the Mediterranean during the late 1960's and a partial blockage of the connections from 1970 to 1973.

As of 1979 to 1980 period, the Lake water can be roughly divided into five zones according to the degree of salinity-level, as shown in Figure E-1-1. From this Figure, the water area coming under our fisheries study can be classified into two zones, the one is of low salinity water (less than 2,000 mg/L) belonging to North Hussinia portion and the other, of slightly brackish water (2,000 to 5,000 mg/L) belonging to South Port Said portion.

1-3 History and Characteristics of the Lake Manzala Fisheries

The fishery of the Lake has a long history of fish-stock changes induced by many decades of intensive fishing pressure being accompanied by extensive physical, chemical, and hydrological changes.

(1) Fishing Effort

The following three measures of fishing effort will be reviewed: a) total number of fishing boats; b) total number of fishermen; and c) fishing gear and fishing methods.

a) Fishing Boats

According to the government statistics, the number of licensed fishing boats was almost doubled from 1,300-1,400 to 2,500-2,800 during early 1960's to late 1960's. Allan (1967) estimated the total number of boats from field surveys at 4,220 (vs. 2,747 licensed boats). The Lake Manzala Study estimates the existence of the fishing boats (excluding trading boats) at 4,010 on the basis of extensive boat counts, interviews, and aerial survey counts in a course of May 1979 to April 1980, which seems to be quite persuading (see Table E-1-2)

b) Fishermen

The number of licensed fishermen which averaged at 7,000 to 8,000 during 1926-1935 increased to 8,000 to 9,000 during

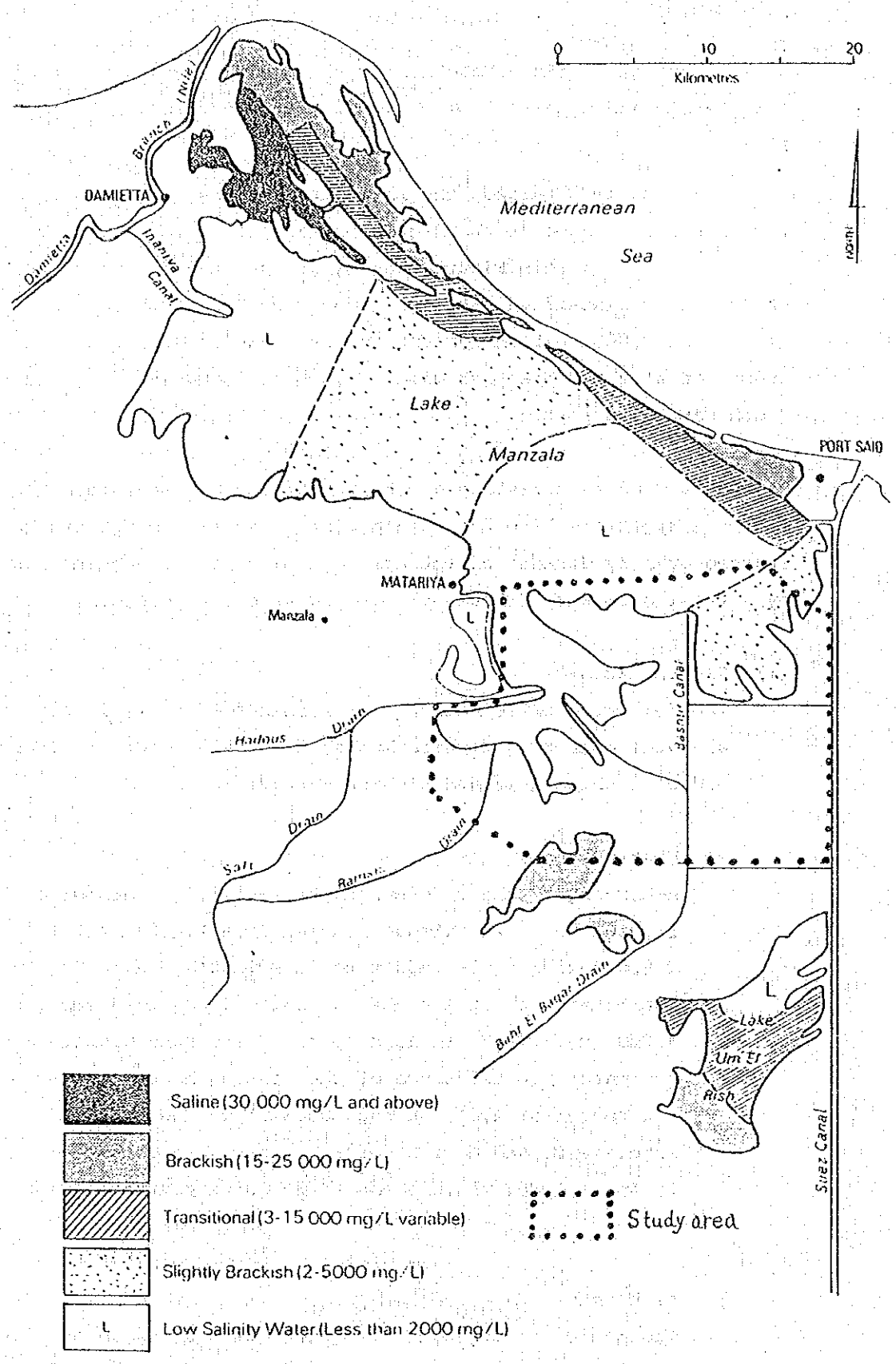


Figure E-1-1 Salinity Regimes

Table E-1-2 Estimates of Fishing Effort on Lake Manzala

Period	Mean Number of Boats		Mean Number of Fishermen		Data Source
	Licenced	Total Estimated	Licenced	Total Estimated	
1907-1919	1333 (range 1126-1781)				Wimpenny, 1929
1920-1929	1401 (range 1109-1914)		7465 1/		Wimpenny, 1929
1930-1935	1336 (range 1251-1449) (284/655/403) 2/		7448		Faouzi, 1935
1962-1965	2699 (range 2486-2817) (10/276/2413) 2/	3800 3/	9027	12,500 3/	Shaheen and Youssef, 1979
1964-1965		4220 (140/282/3798) 2/			Allam, 1967
1966-1973	2583 (range 2220-2806) (2/197/2384) 2/	3600	8492		Shaheen and Youssef, 1979
1966-1975	2577 (range 2220-2806)	3600 3/	8363	12,000 3/	Institute of Oceanography and Fisheries
1974-1978		3900		14,000	
1979	2817 (range 12/281/2524) 2/	3900 3/	9867	14,000 3/	Undersecretariat of Aquatic Resources
1979-1980		4010		16,591	Present Study

Notes: 1/ Data for 1928 and 1929 only.

2/ 1st Class/2nd Class/3rd Class Boats.

3/ Personal Communication, IOF Officials.

1960's to 1970's (Table E-1-2), Boats based at Matariya (which would be categorized to II class) averagely accommodated 6.5 fishermen in 1979 to 1980 and, thus, the figure of 16,000 to 17,000 based on the adjusted number of boats (4,010) is probably a reasonable one.

c) Fishing Gear and Fishing Methods

A summary of fishing gear and methods used on the Lake during the past 50 years reveals that two main methods have predominated throughout the period (see Table E-1-3)

- Seinenets: encircling or moving gear, usually small mesh (2.5 cm stretch or less), especially effective gear for mullet species;
- Trammelnets: low (less than 1 m) three-layered nets fished in stationary manner; mesh size of inner net usually 2.6 to 5.2 cm stretch measure; most effective for tilapia species.

The predominance of seinenets methods during the 1920's (Table E-1-3) reflects the importance of mullet species at that time, as does the high percentage of first and second class boats (Table E-1-2) which were needed to handle these nets. But during 1970's, the increase in effort has been largely geared to expansion of the tilapia fishery (i.e. in terms of III-class boats and the use of trammelnets).

It should be noted that tilapia fishing by "Hosha" method became popular in the middle of 1960's. Its catch occupied 25 to 30 percent of the total fish catch of the lake fisheries during 1979 to 1980 as described in the next section.

On the "Hosha" method, a shallow part of the lake is enclosed by constructing dike with an opening gate in the early stage of its operation. The gate is closed after the lake fish enter the enclosed water area. And then fishes are caught by draining the water by pumping.

Table E-1-3 Fishing Gear and Methods Used on Lake Manzala

Year	Fishing Methods Used	Number of Gear Units	Year	Minimum Legal Mesh Size (Meshes/50 cm/net)
1928[1/]	Seinenet Method		1913-17	20[2/]
	El Lawat	Summer - 590	1918	17
	Shebeak (El Habl)	Winder - 262	1919	15
			1920-23	28
1929[1/]	El Lawat	Summer - 345	1924	35
	Shebak		1925	26
			1926-33	35
	Trammelnet Method			
1928[1/]	El Nasha	Summer - 250		
		Winter - 290		
1292[1/]	El Nasha	Summer - 284		
	Ellegal Method			
	Gawabi (wire traps)			
1963[3/]	Seinenet Methods			
	Shebak (El Habl)			26
	El Lawat			26
	El Tawanis			26
	Trammelnet Methods			
	El Nasha			20
	El Taqem			26
	Khalawi El Ghotian			20
	Castnets			26
	Gawabi (wire traps)			17
	Illegal Methods			
	Tarweeta			
	Hosha			
1979	Present Study			
	Seinenets	515		26
	Hand	488		-
	Trammelnets	2,226		26
	Gawabi	7,320		17
	Castnet	335		26
	Hooks	38		-
	Illegal Methods			
	Tarweeta	1,547		
	El Gerba			
	Tara			

Notes: 1/ Wimpenny, 1928 and 1929, 2/ Faouzi, 1935
3/ Shaheen and Youssef, 1979.

(2) Fish Catch Statistics

We have three or four sources of fish catch data which may be considered most reliable. They are:

- 1907 to 1935: Government Reports on Fisheries .... Statistics of fish dispatched by railroad from about 20 centers around the Lake;
- 1956 to 1958: FAO .... Catch assessment survey;
- 1962 to 1966: IOF .... Continued FAO survey;
- 1979 to 1980: The Lake Manzala Study .... Catch assessment survey.

a) Fish Catch

A complete summary of available catch statistics from 1907 to 1979 are presented in Table E-1-4, E-1-5. The data most reliable are plotted against time in Fig. E-1-2. The graph indicates that catches during the period 1907 to 1966 ranges between 10 x 10^3 to 15 x 10^3 tons, although there is a 20-year gap in data between 1936 and 1956. Catches increased to about 20 x 10^3 tons during mid-1960's, and doubled to about 40 x 10^3 to 45 x 10^3 tons by the late 1970's. The open-water catch figure of 41 x 10^3 tons based on the catch assessment survey results for 1979 to 1980 does not include the "Hosha" production which is estimated at 15 x 10^3 to 20 x 10^3 tons.

The relative percentage of fish landed at the three main centers on the Lake from 1920's through 1970's are compared in Fig. E-1-3. What is evident is the increasing importance of Matariya as a fishery center. The percentage of the total catch landed at Matariya increased from 42 during 1922-1933 to 85 in 1979, or from 5,300 to 34,600 tons. This increase can largely be attributed to the expansion of tilapia fishery in the southern and the eastern parts of the Lake (the study area), resulting from high nutrient inputs through the southern drains.

According to the catch assessment survey by the Lake Manzala Study, the Lake water can be divided into seven regions based

Table E-1-4 Fish Catch Statistics for Lake Manzala
(1907 - 1935)

Year	Catch (t)	Year	Catch (t)	Year	Catch (t)
1907	10,343	1920	18,911	1930	12,156
1908	9,061	1921	10,028	1931	9,742
1909	12,910	1922	11,082	1932	11,325
1910	12,988	1923	11,292	1933	12,901
1911	15,170	1924	13,160	1934	14,360
1912	12,862	1925	11,477	1935	13,502
1913	11,230	1926	14,056	Mean	12,331
1914	8,496	1927	16,306		
1915	10,466	1928	15,156		
1916	10,857	1929	11,385		
1917	15,251	Mean	13,285		
1918	16,893				
1919	14,971				
Mean	12,423				

Source: Paget, 1922 and 1923;
Ahmed Bey Fouad, 1925 to 1927;
Wimpenny, 1928 to 1930;
Abou-Samra, 1932;
Faouzi, 1933 to 1936.

Table E-1-5 Fish Catch Statistics for Lake Manzala from 1957 to 1980 in Tonnes

Year	Ministry of Agriculture	I O F	CAPMAS	Others
1957	12,324[1/]			FAO 14,164[3/a] (9,566)
1958	10,956			15,646 (10,953)
1959	11,148			
1960	10,520			
1961	12,070			
1962	12,400	19,397		
	18,951[1/a]			
1963	11,285	19,410		
	20,112			
1964	12,440	21,862		
	21,870			
1965	10,310	19,166		
	19,321			
1966	13,594	25,129		
	28,370			
1967	13,870	26,649		
	25,029			
1968	12,581	24,757		
	24,407			
1969	8,726	21,972		
	20,596			
1970	8,234	20,463	21,977[2/b]	
	21,977			
1971	8,164	22,829		
	20,629			
1972		21,000		
1973	21,000[1/b]	22,131		22,131[2/c]
1974	20,000	39,800	27,851	39,800[2/a]
				27/851
1975	21,745	43,647	29,176	43,647
				29,176
1976	26,380	32,316	27,380	32,316
				22,960
1977	27,350	29,437		29,437
				Present Study 4/
1978	27,350	44,911		40,760
1979				

Notes:

1/ Undersecretariat of Aquatic Resources, Egyptian Ministry of Agriculture a) Central Statistics Dept. - catch estimates do not correspond with calendar years. b) Rough estimates only.

2/ Central Agency for Public Mobilization and Statistics a) Part III, September 1977. b) Statistics of Fish Production in the ARE for 1970 to 1971, January 1974. c) Statistics of Fish Production in the ARE No. 2257/mm/76.

3/ Panse and Sastry, 1960, FAO of the United Nations a) Statistical Survey Results. b) Official Government Results Quoted

4/ Present Study - May 1979 to April 1980. Open water fishing only.

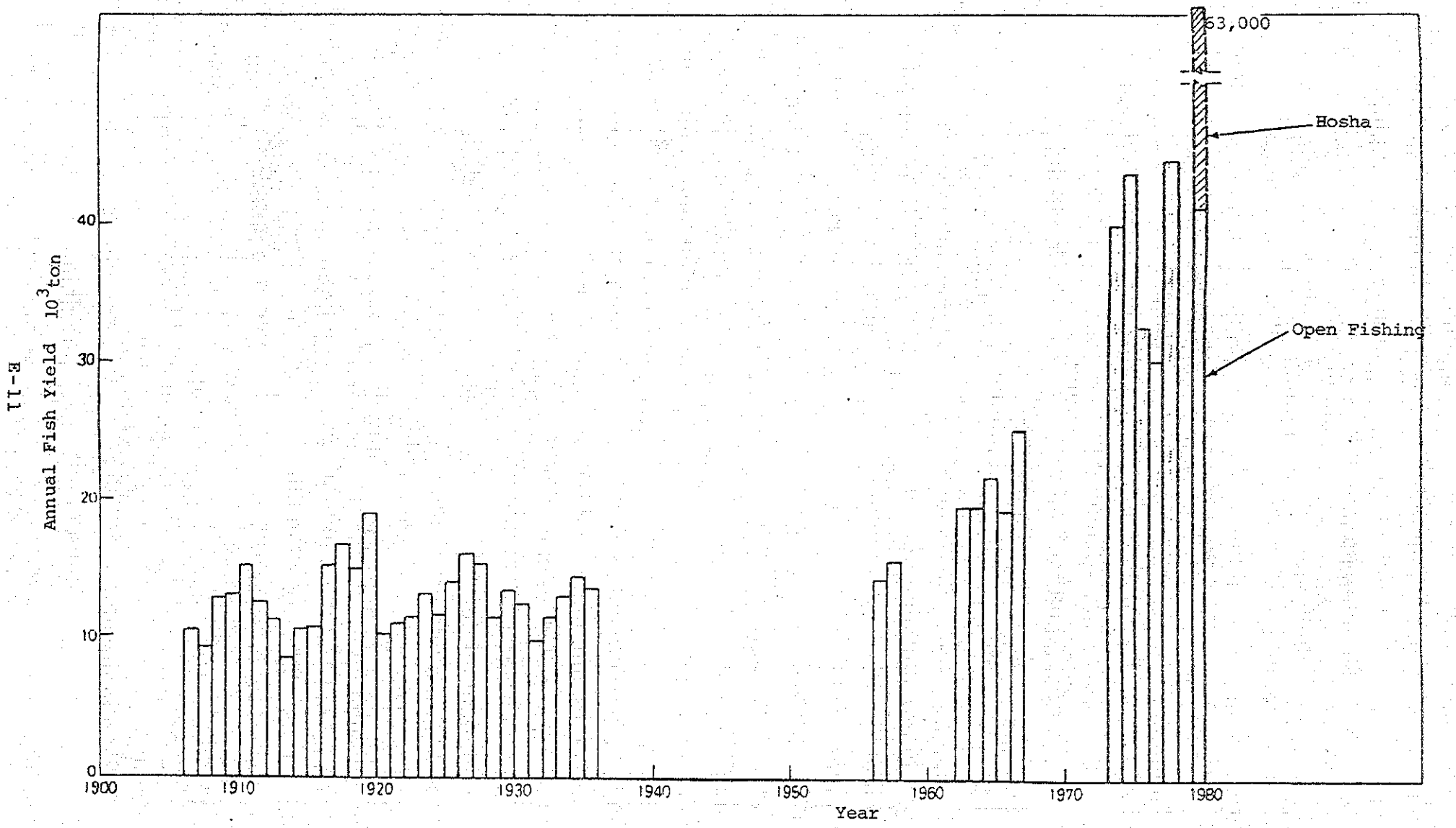


Figure E-1-2 Annual Fish Yields From Lake Manzala

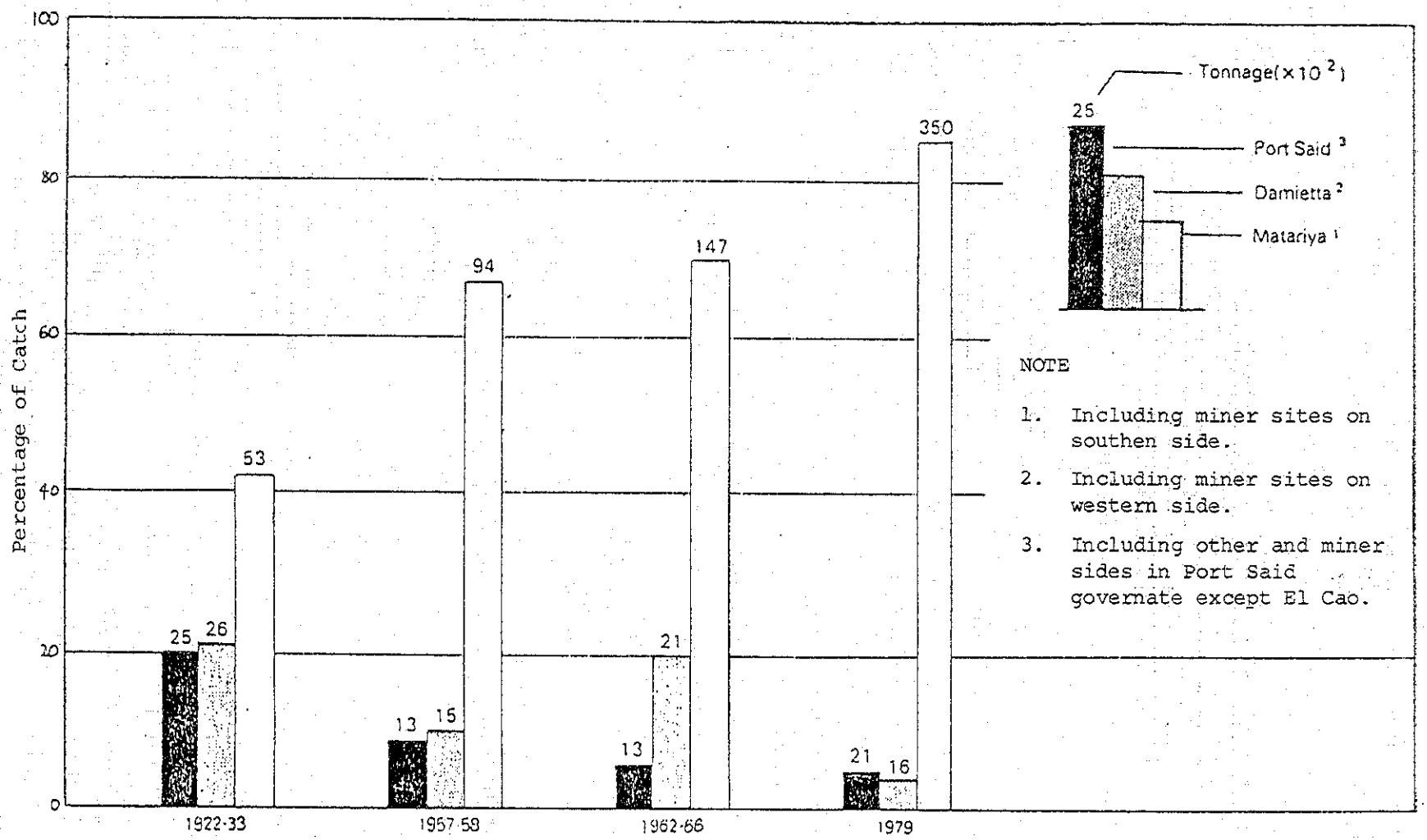


Figure E-1-3 Percentage of Total Fish Catch Landed at Matariya Damietta and Port Said on Lake Manzala

on natural geographical boundaries, and areas homogeneous in terms of yields and fishery characteristics, as shown in Fig. E-1-4.

b) Catch per Unit Effort (CPUE)

A comparison of CPUE from 1907 to 1979 is presented in Table E-1-6. Based on adjusted figures for effort (number of boats and fishermen), the catch per fisherman remained relatively constant between the 1920's and the 1960's at 1.6 to 1.9 tons. On the other hand, the number of fishermen increased from about 7,500 to 12,000 (i.e. an increase in effort by 60 percent). Increasing levels of effort accompanied by a stable CPUE may be due to:

- higher efficiency from the more advanced fishing gear and method;
- increase in fish stocks.

The latter was probably the most important factor, resulting from an increase in tilapia stocks in the 1950's and 1960's.

(3) Aquaculture (Fish-farming)

The Lake Manzala and its wetland fringe covers approx. 258 x 10^3 feddan, of which 97 x 10^3 feddan is devoted to aquaculture in some forms. The estimated production from these aquacultural operations in 1979 was about 27.4 x 10^3 tons. The catch was valued at approx. LE 10.5 x 10^6, directly employing some 12,000 men.

Fig.E-1-5 shows the regions of the Lake with respect to aquaculture as determined by an average annual production. According to the Figure, the present study area located in the south and east part of the Lake shows the most productive area for aquaculture.

Hosha is a major system of aquaculture on the Lake, operating over a total of about 34 x 10^3 feddan and producing more or less 25 x 10^3 tons/year, which is about 91 percent of the total production of aquaculture in the Lake. This system became popular in the late 1960's and although the Government categorizes this as an illegal fishing method from the viewpoint of fish fry protection.

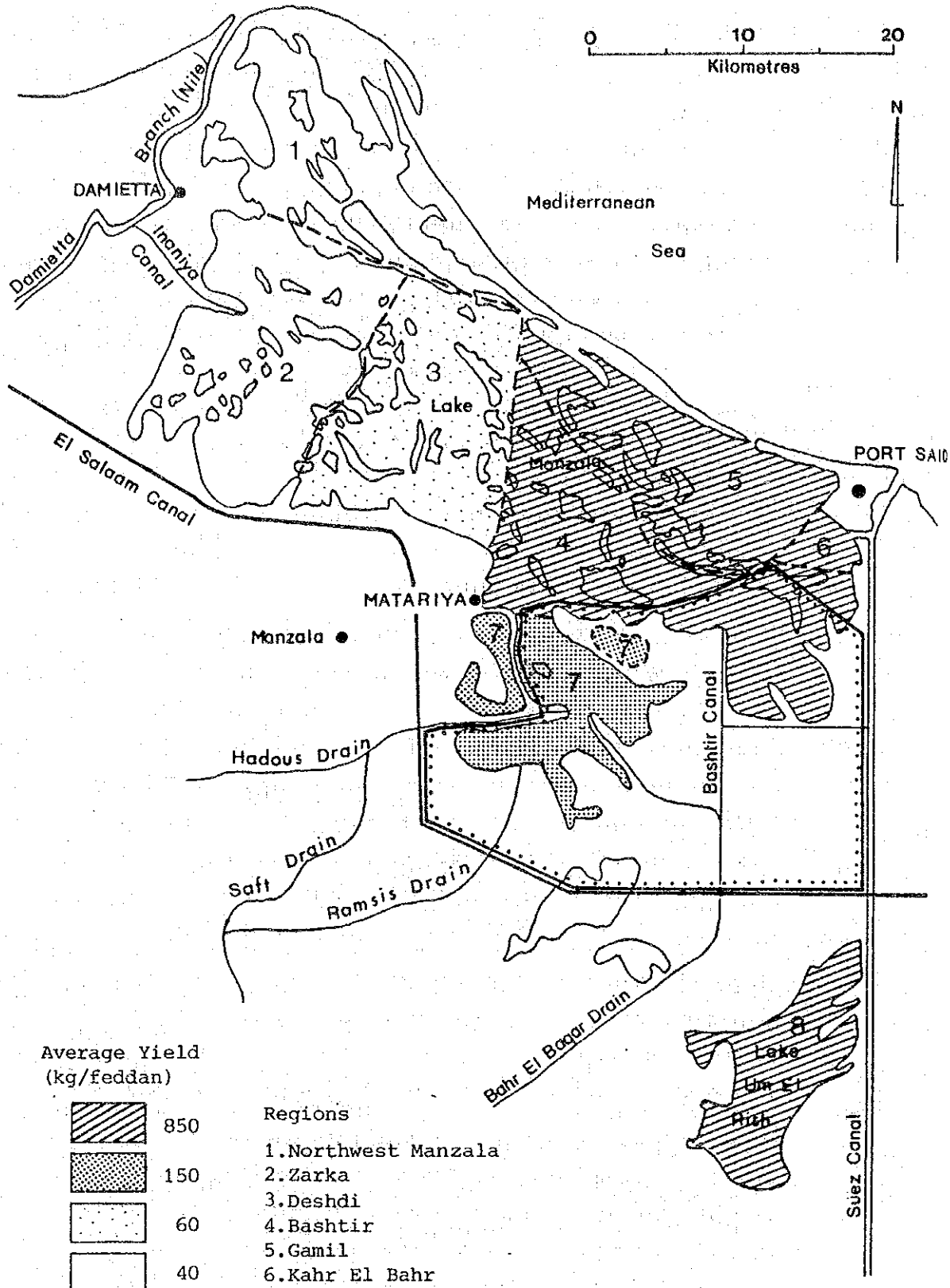


Fig.E-1-4 Open Fishing Regions And Yields

Table E-1-6 Estimates of Catch per Unit Effort (CPUE) for the Lake Manzala Fishery from 1907 to 1979

Period	Catch per Unit Effort	
	ton/boat	ton/fishermen
1907 to 1019[2/]	9.3	
1920 to 1929[3/]	9.7	1.8
1930 to 1935[4/]	9.2	1.7
1962 to 1965[5/]	7.4 (5.3)[1/]	2.2 (1.6)[1/]
1966 to 1973[6/]	9.0 (6.4)	2.7 (1.9)
1966 to 1975[7/]	9.4 (6.7)	2.9 (2.0)
1979[8/]	10.2	2.5

Notes:

1/ Figures in parenthesis are based on adjusted values for effort (i.e. number of boats and fishermen as presented in Table 2.7).

2/ Sources: Wimpenny, 1929

3/ Wimpenny, 1929

4/ Faouzi, 1936

5/ Shaheen and Youssef, 1979

6/ Shaheen and Youssef, 1979

7/ Institute of Oceanography and Fisheries

8/ Present Study

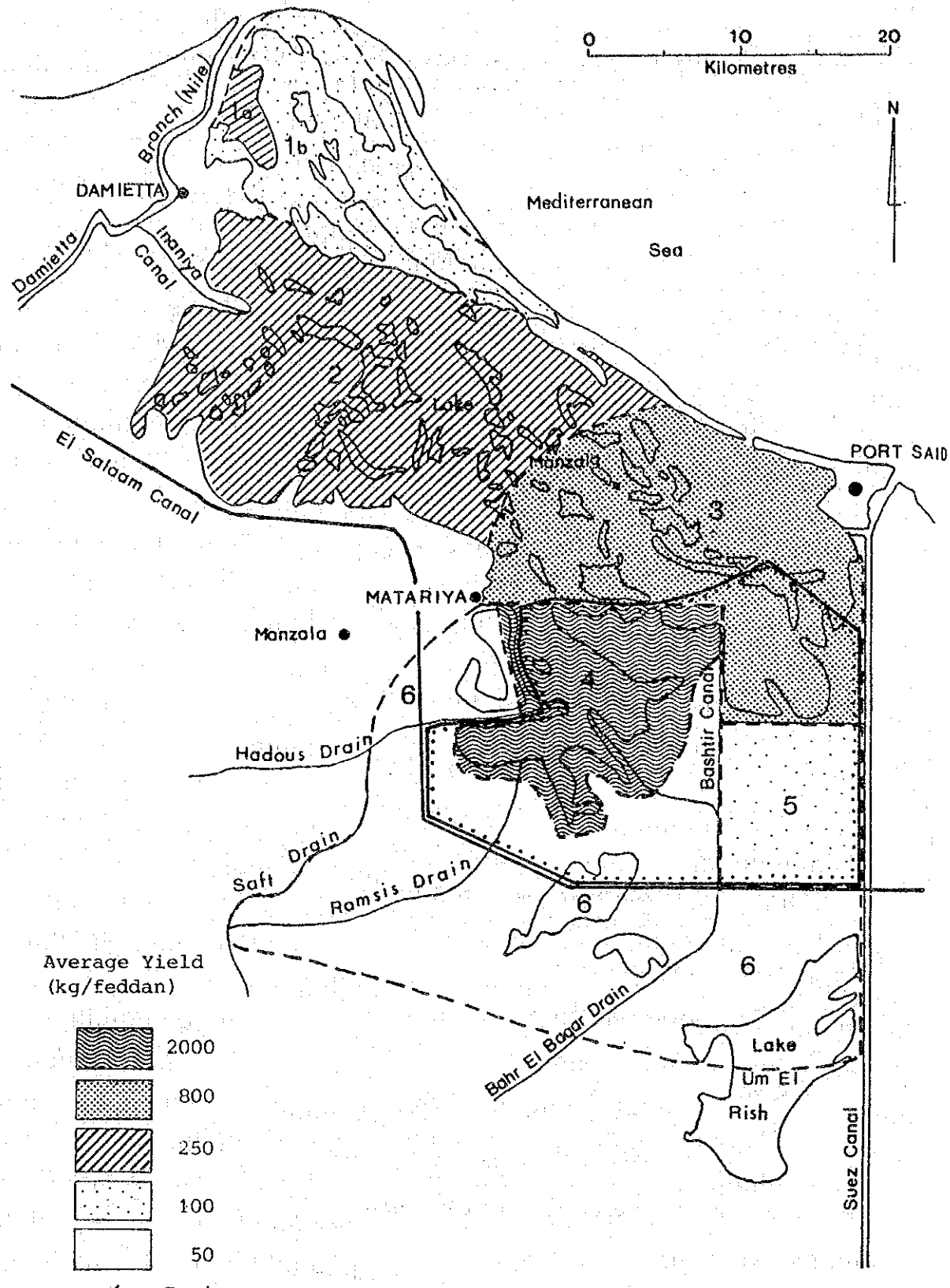


Fig. E-1-5 Closed Fishing Regions And Yield

Hosha method may not be very harmful, in the case of tilapia fishing, to the recruitment of its stock because of its breeding behaviour.

Other aquaculture systems are as follows:

a) Marine Fish Farms: enclosures built out from sand bars, islands and coastal strip in the north-western area of the Lake. The walls are formed of locally available salt bush and reeds trodden down between two rows of Eucalyptus branches driven into the sandy bed.

b) Shallow Pond Brackish Water Monoculture: being widely practised in the region south of Port Said as well as in the southern region of the average of about 90 feddan. They may consist of one or more ponds, with an individual pond size ranging from 10 to 20 feddan to the depth of 20 to 30 cm. In some area, they are devoted to smaller nursery ponds. It cultures primarily mullet species, although some farms are raising tilapia.

   In many cases, the farms are meant for transitional operation prior to conversion to agricultural farming, with the purpose of leaching the land of salt. At present, such practices are confined to the areas spreading along the drains which have been constructed with the ultimate purpose of agricultural irrigation. Water supply and drainage in and out of these farms is performed by pumping.

c) Deep Freshwater Polyculture: conventional deep pond freshwater polyculture utilizes ponds containing 1-meter deep water. This system has been newly introduced by the Government. As of 1982, two genuine land-based polyculture of this kind are witnessed, one is at the Government-owned and operated fish-farms equipped with 255 feddan of ponds at the south-eastern suburbs of the town of Manzala, and the other is at the southern outskirt of Port Said with 1,000 feddan of ponds facing the lake.

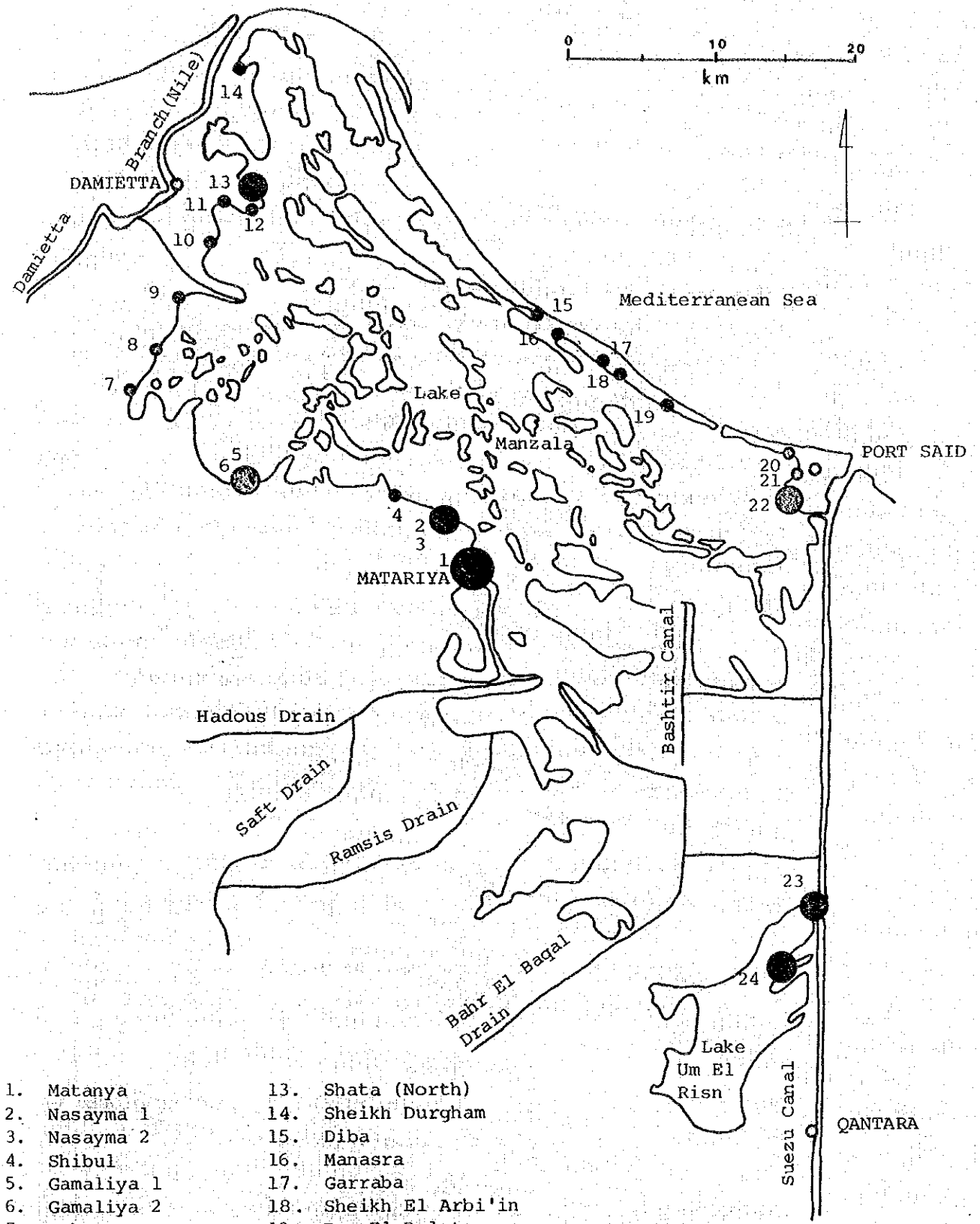
(4) Situations of Fisheries in the Study Area

As described in the above, the Lake fisheries has been changing from the brackish water base to the fresh water base during the past 50 years. At present, freshwater tilapia fishing is predominant in the water body of the Lake.

It can be clearly understood that the present Study Area covers the most productive regions of the Lake not only in terms of open-water fishing but also of aquaculture. Yet, all the fish-landing sites are located outside of the Study Area, as shown in Fig E-1-1 that means the open-water fishery is being operated by the "outsiders".

In the meanwhile, not less than 6,200 people are being provided with gainful employment by aquaculture in the Study Area, although they are designated as "squatters" according to the Governorate officials concerned.

Consequently, the lake part of the Study Area lies as the most important and productive area from the fisheries point-of-view and a wholesale reclamation entirely for the agricultural purposes would bring about a considerable negative benefit which should be taken into account for the economic evaluation of the project. In the social aspect, some appropriate measures would have to be taken in providing other venue of livelihood towards more or less 6,200 people now engaging in aquaculture and their families.



1.	Matanya	13.	Shata (North)
2.	Nasayma 1	14.	Sheikh Durgham
3.	Nasayma 2	15.	Diba
4.	Shibul	16.	Manasra
5.	Gamaliya 1	17.	Garraba
6.	Gamaliya 2	18.	Sheikh El Arbi'in
7.	Rahamna	19.	Boz El Balat
8.	Roda	20.	Eirket Sagartin
9.	Basarta	21.	Horeya
10.	Saiyala	22.	Qabuti
11.	Gheit El Nassara	23.	El Cap
12.	Shata (South)	24.	Um Khalaf

Fish Landing Sites

- over 2000 boats
- 100 to 250 boats
- less than 100 boats

Fig. E-1-6 Distribution of Ports or Fish Landing Sites

2. Fisheries Plan

2-1 Influence of Proposed Land Reclamation to Existing Fisheries

(1) Basic Way of Thinking of the Influence

The most productive fishing ground in Lake Manzala is formed in the water area and adjacent shoreline inside the Study Area (hereinafter mentioned as El Genki area), caused by discharges of agriculture drain waters which have heavy nutrient load. As shown in TableE-2-1, 84 percent of total nutrient load into Lake Manzala is discharged to El Genki area by the Hadous Drain (23 percent), Bahr El Baqar Drain (60 percent) and the Ramsis Drain (1 percent), respectively.

According to the basic idea on the drainage system of the present Study, above mentioned drain waters will be discharged into the adjacent water area of the north periphery of the proposed reclaimed land (hereinafter mentioned as Bashtir area). Consequently, it can be considered that the existing fish production system supported by the heavy nutrient load will be transferred to somewhere in Bashtir area.

For the evaluation of the proposed land reclamation, the following assessment on existing fisheries should be studied;

a) To assess whether existing fishing ground in El Genki area may be shifted to other water area with the same level of fish yield.

b) To estimate probable lag period of the new fishing ground to reach same level of fish yield in the El Genki area.

c) To assess whether the new fishing ground may be able to compensate for the same amount of net benefit as that of existing fisheries through open water fishing and Hosha fishing.

To perform these studies in detail, it is necessary to obtain information such as the dynamics of lake water stream, nutrient

Table E-2-1 Nutrient Load Discharging into Lake Manzala under Existing Conditions

Items	Flow (10^6 m^3/ year)	Percent of Total Flow	Nitrogen Concen-tration (mg/L-N)	Nitrogen Load (T/y-N)	Phosphorus Concen-tration (mg/L-P)	Phosphorus Load (T/y-P)	Nutrient Load (T/y)	Percent of Total Nutrient Load
Bahr El Baqar Drain	1,678	25	3.683	6,180	1.013	1,700	7,880	60
Hadous Drain	3,276	49	0.730	2,391	0.192	629	3,020	23
Ramsis Drain	525	4	0.633	160	0.143	36	196	1
El Sirw Pumping Station	847	13	1.144	969	0.181	153	1,122	8
Matariya Pumping Station	154	2	0.381	59	0.18	28	87	1
Fariskur Pumping Station	292	4	0.45	131	0.138	40	171	1
Port Said Sewage Treatment Plant	40	1	14.888	596	4.128	165	761	6
Inaniya Canal	156	2	Nutrient load has been neglected					
Total	6,695	100	N/A	10,486	N/A	2,751	13,237	100

Source: Lake Manzala Study Annex C Water-Resources (1982)

dispersion, energy conversion system of the lake ecology, etc. But this information is not available at present.

In this study, only a rough assessment of the said items was carried out by setting assumptions.

(2) To assess fish yield in the new fishing ground.

The study was carried out based on the following assumptions;

- By using the distribution boundary of aquatic plants which are dominant in low saline water as an indicator, the boundary of the new fishing ground can be fixed where the water is always kept in such low saline condition that tilapia fish can proliferate.

- The present dispersion pattern of drain waters from El Genki area will remain unchanged, which is greatly influenced by the distribution pattern of chains of islands in Bashtir area.

- Average water depth of Lake Manzala will remain unchanged, even after completion of the proposed land reclamation.

- The stagnant period of the total drain water discharged into El Genki area is the minimum period to compensate present fish yield which is highest out of the whole lake areas.

- Stagnant period is calculated by the following formula;

$$T = V/Q$$

where, T: stagnant period (month)
V: water volume of a fishing ground (m^3)
Q: total volume of monthly discharge from drains (m^3/month)

- Nutrient load of the drain water discharged from the proposed reclaimed land will be the same as that of Hadous Drain.

a) Probable Area of the New Fishing Ground

As shown in Fig. E-2-1, distribution boundaries of three types of aquatic plants (Eichornia crassipes, Typha domnigensis and Ceratophyllum demersum) which are dominant in low saline water, show overlapping in Bashtir area and western area of the Lake to which Inaniya Canal is connected. The distribution of Ceratophyllum demersum seems to be strongly restricted to the areas where the water may be kept in stable low saline condition.

After or during the construction of the proposed land reclamation, drain waters of Hadous Drain and Bahr El Baqar Drain will begin to discharge directly into the Bashtir area. Accordingly, it is expected that the Ceratophyllum area will expand to the distribution boundary of the other two types. At the same time, this boundary could be the minimum boundary of the new fishing ground as shown in Fig. E-2-2.

b) Comparison of Stagnant Period of Drain Waters between in El Genki Area and in the New Fishing Ground

The stagnant period of each case is calculated by the formula described in the aforementioned assumptions. All the necessary figures for the calculation are shown in Table E-2-2.

The estimated stagnant period in both areas are min. 0.17 to max. 0.34 month in El Genki and min. 0.26 to max. 0.43 month, in the new fishing ground, respectively. In other words, the new fishing ground has enough time to produce primary production and compensate for the same level of fish yield in El Genki.

c) Comparison of Nutrient Load between Both Fishing Grounds

Monthly nutrient load of El Genki area ranges from min. 630 tons to max. 1,083 tons in a year, which is slightly higher than that of the new fishing area which ranges from min. 617 tons to max. 993 tons as shown in Table E-2-3.

In spite of the slightly lower nutrient load, the new fishing ground would be able to cover the same fish yield as that of

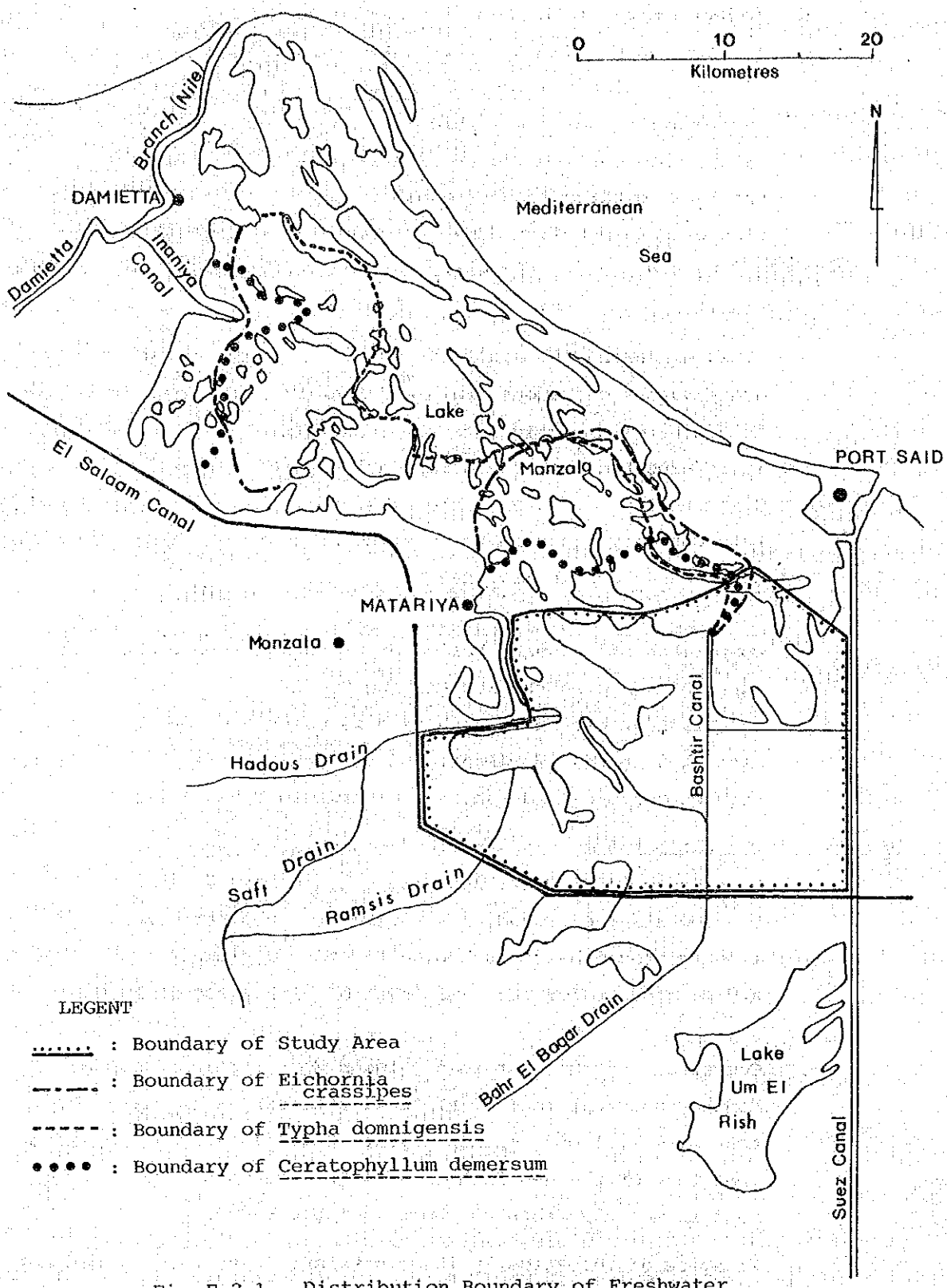


Fig. E-2-1 Distribution Boundary of Freshwater Dominant Aquatic Plants

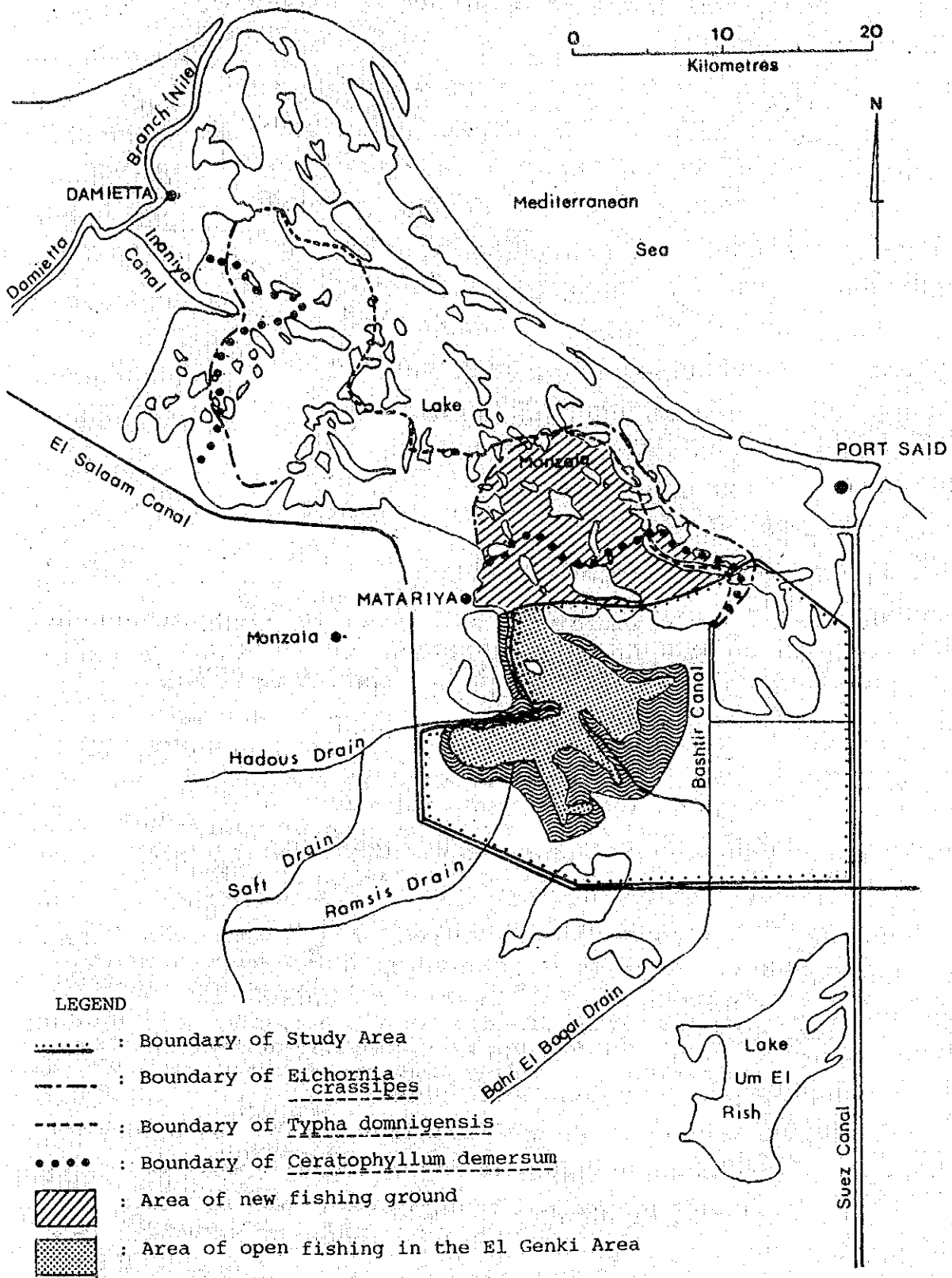


Fig.E-2-2 Boundary of New Fishing Ground

Table E-2-2 Values for Calculation of Stagnant Period

Items		El Genki Area	New Fishing Ground
V [1/] $= v_o + v_{h+m}$	($10^6 m^3$)	90.5	109.5
v_o	($10^6 m^3$)	58.0	97.0
v_{h+m}	($10^6 m^3$)	32.5	12.5
s_o	($10^4 m^2$)	5,800	9,700
d_o	(m)	1.0	1.0
s_{h+m}	($10^4 m^2$)	6,500	2,500
d_{h+m}	(m)	0.5	0.5
Q [2/] $= q_H+q_B+q_R+q_S$	($10^6 m^3$/month)	min.269-max.524	min.256-max.422
q_H [3/]	($10^6 m^3$/month)	min.158-max.343	min.102-max.208
q_B [3/]	($10^6 m^3$/month)	min.101-max.160	min.123-max.182
q_R	($10^6 m^3$/month)	min. 10-max. 21	-
q_S	($10^6 m^3$/month)	-	min. 31-max. 32

Remarks 1/: V = Total water volume of a fishing ground
v_o = Water volume of open fishing area
v_{h+m} = Water volume of hosha fishing and marsh area
V is assumed to be obtained by the following formula:

$$V = v_o + v_{h+m} = s_o \times d_o + s_{h+m} \times d_{h+m},$$

where, s_o = area of open fishing; d_o = water depth of open fishing; s_{h+m} = area of hosha fishing and marshes; d_{h+m} = water depth of hosha fishing and marshes.

2/: Q = Total monthly discharge to a fishing ground; q_H = Monthly discharge of Hadous Drain; q_B = Monthly discharge of Bahr El Baqar Drain; q_R = Monthly discharge of Ramsis Drain; q_S = Monthly discharge of proposed study area.

3/: Some water of Hadous Drain will be absorbed by El Salam Canal in accordance with proposed project and drain water of South Hussinia project will be discharged to Bahr El Baqar.

Table E-2-3 Comparison of Nutrient Load between El Genki Area and New Fishing Ground

Items	Monthly Water Discharge and Nutrient Load[1/]				
		El Genki		New Fishing Ground	
	U.N.L. mg/l-N,P	W.D. 10^6t	N.L. t	W.D. 10^6t	N.L. t
1. Hadous Drain	0.922	158-343[2/]	146-316[2/]	102-208[2/]	94-192[2/]
2. Bahr El Baqar Drain					
-Original	4.696	101-160	474-751	101-160	474-751
-From South Hussinia	0.922[3/]	-	-	22	20
3. Ramsis Drain	0.776	10- 21	8- 16	-	-
4. Drain from Study Area	0.922[3/]	-	-	31- 32	29- 30
Total		269-524	630-1083	256-422	617-993

Source: Lake Manzala Study, Annex C, Water Resources (1982) and Present Study, Irrigation and Drainage Sector (1983)

Remarks 1/ U.N.L. = Unit nutrient load
W.D. = Monthly water discharge
N.L. = Monthly nutrient load

2/ The drain discharge both from Hadous Drain and Bahr El Baqar Drain, the most influential discharge in the Lake, same monthly fluctuation that those become minimum in February and do maximum in September.

3/ Drain water of South Hussinia Project is planned to be discharged into Bahr El Baqar Drain. The nutrient load both of South Hussinia and proposed Study area is assumed to be same level as that of the Hadous Drain.

El Genki area, because it is considered that present nutrient load to El Genki area seems to be overloaded. Table E-2-4 shows a rough comparison of the unit translate nutrient load for fish production of one ton (hereinafter described as U.T.N.L.) between fishing grounds in the eastern region of the Lake and in the western region. The U.T.N.L. of the western region shows below half in the case of the eastern region. In other words, more than 50 percent of the present nutrient load in El Genki area seems to be overloaded, which is considered to be deposited to the bottom of the lake, escaping to the sea, used for the other ecological cycle, etc.

d) Conclusion

From viewpoint of enough stagnant period of discharged drain water and enough nutrient load, expected new fishing ground is considered to have a potential of fish production at least in the same level of El Genki area.

(3) To estimate the lag period of new fishing ground to reach the same level of the fish yield in El Genki Area

To estimate the lag period, the following studies were carried out;

- To estimate the lag period based on the growth period of tilapia species under some assumption,

- To estimate the lag period in the case of Lake Um El Rish into which drain water of Bahr El Baqar Drain was newly introduced three years ago to increase fish production.

a) Estimation of the Lag Period Based on the Growth Period of Tilapia Species

At present, the fish type component of the standing stock in Bashtir area shows a similar condition to that of El Genki area which consists of tilapia species of 85 percent out of total stock as shown in Table E-2-5. Accordingly, it was considered that the lag period of these areas including the new

Table E-2-4 Comparison of U.T.N.L. between Western Region and Eastern Region of the Lake 1/

Items	Fishing Ground	
	Western Region	Eastern Region
1. Annual nutrient load 2/ (ton/year)	1,293	11,183
2. Fish standing stock 3/ (ton/year)	12,495	43,480
3. U.T.N.L. (ton/fish 1 ton)	0.103	0.257

Remarks 1/ U.T.N.L. = Unit conversion nutrient load
Nutrient requirement to convert to a fish yeild of one ton.

Nutrient discharged to the Lake is used not only to the cycle of fish production but also to the cycle of aquatic vegetation, to be released to the sea, to be deposited to the Lake bottom, etc.

U.T.N.L. of this Table is used for a rough comparison between both region under the assumption that all the nutrient load is used to the cycle of fish production.

2/ Refer to Table

Annual nutrient load of the western region is from El Sirw Pumping Station, Fariskur Pumping Station and Inaniya Canal and that of the eastern region is from Hadous Drain, Bahr El Baqar Drain, Ramsis Drain and Mataria Pumping Station. The nutrient from Port Said Sewage Plant to the eastern region is discharged near the opening of the sea, so it was omitted.

3/ Refer to Lake Manzala Study, Annex H; Fisheries (1982).

Table E-2-5 Estimates of Total Fish Stocks (Tonnes) by Species for Stock Assessment Regions

Species	Stock Assessment Region						Total	
	1	2	3	4	5	6	(t)	(%)
Tilapia zillii	102	408	1,399	3,905	2,908	580	10,302	17.0
Sarotherodon nilotica	-	280	125	4,510	5,397	448	10,760	17.8
S. galilaea	-	30	4,756	484	7,519	4	12,793	21.1
S. aurea	-	340	1,749	4,666	6,236	670	13,661	22.6
Juvenile Tilapia[1/]	74	207	1,025	1,521	341	9	3,177	5.3
% Tilapia species	57	90	72	87	86	98		84
Mugil cephalus	-	-	-	-	52	-	52	0.1
Liza ramada	22	-	-	449	-	-	471	0.8
Liza saliens	-	18	-	-	-	-	18	<0.1
Clarias lazera	-	-	50	225	105	-	380	0.6
Bagrus bayad	-	-	75	17	943	-	1,035	1.7
Barbus sp.[2/]	-	-	17	-	1,048	54	1,119	1.8
Hemichromis bimaculatus	-	117	1,758	467	157	6	2,505	4.1
Haplochromus desfonrainesii	-	28	1,516	968	1,153	-	3,665	6.1
Antherina moobon	57	-	25	-	-	-	82	0.1
Anguilla anguilla	-	-	-	-	314	-	314	0.5
Cyprinodontidae[3/]	50	-	-	69	26	6	151	0.2
Sygnathidae[4/]	5	-	-	-	-	-	5	<0.1
TOTAL	310	1,428	12,495	17,281	26,199	2,777	60,490	100.0
Percent (%)	0.5	2.4	20.7	28.6	43.3	4.5	100	
Area (feddans)	12,400	18,800	83,300	57,600	26,200	18,500		

Notes 1/ Generally less than six cm.

2/ Mainly Barbus perince plus small numbers of B. neglectus.

3/ Three species (Aphanius dispr, A. fasciatus, and Gambusia affinis).

4/ Pipefish.

fishing ground would roughly correspond to the growth period of tilapia species.

Growth period of tilapia species was calculated under the following assumption.

- Length-weight relationship for tilapia species in Lake Manzala is summarized as follows;

  where Y = weight in grams, and
  X = length in cm

  Sarotherodon nilotica

  $$\log Y = -1.6842 + 2.9838 \log X$$

  S. aurea

  $$\log Y = -1.6339 + 2.8969 \log X$$

  S. galilaea

  $$\log Y = -1.6323 + 2.9393 \log X$$

  Tilapia zillii

  $$\log Y = -1.6814 + 2.9819 \log X$$

- Length-growth relation of them is summarized in Table E-2-6.

- Relative abundance by commercial size of tilapia species is similar for all species as shown in Fig.E-2-3. The weighed mean for all species is as follows;

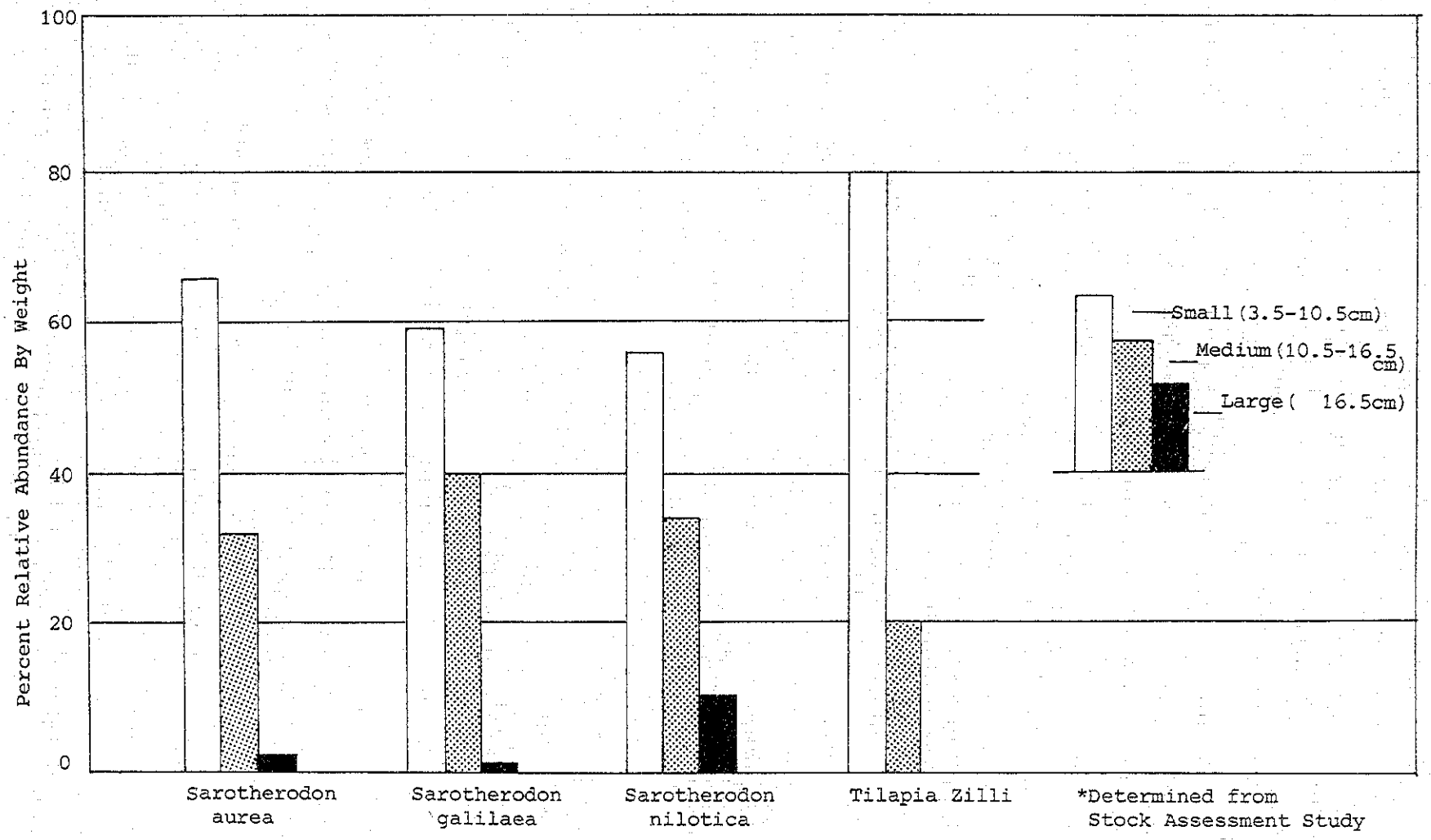
  Small (0 to 10.5 cm): 64%
  Medium (10.5 to 16 cm): 32%
  Large (greater than 16 cm): 4%

- At the end of 1st year after the new fishing ground is started, small size (below 10.5) will be recruited at the same rate in the initial stage.

Table E-2-6 Summary of Age and Growth Data for Tilapia Species in Bashtir Area

	Mean length at age 1_n (cm)				Age at First Maturity	Size at First Maturity (cm)
	1_1	1_2	1_3	1_4		
1. Sarotherodon nilotica	8.4	15.7	17.3	-	1	11-12
2. S. aurea	7.2	12.2	14.5	-	1	8-9
3. S. galilaea	6.5	11.7	13.7	15.6	1-2	10-11
4. Tilapia zillii	5.3	10.0	11.6	-	1	5-6

Source: Lake Manzala Study, Annex H; Fisheries (1982)



Source: Lake Manzala Study, Annex H; Fisheries (1982)

Fig. E-2-3 Relative Abundance Of Tilapia Stocks By Commercial Size Category

- During the 1st year, the exploitation rate of fishing will be kept at 60 percent of the standing stock, which is the condition of the present Lake fishing as shown in Fig. E-2-4.

- The lag period is estimated as the necessary growth period to reach the level of present standing stock of 700 to 1,300 kg/feddan in El Genki area as shown in Fig. E-2-5.

Under the above described assumption, it is calculated that within two years the present standing stock of tilapia species will reach the same level of El Genki area as shown in Table E-2-7.

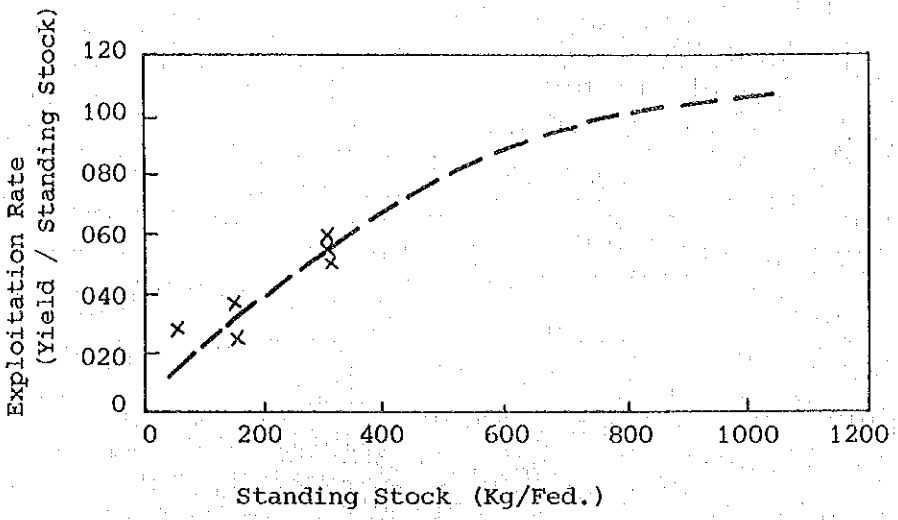
b) Lag Period Experienced in Lake Um El Rish

The northern part of Lake Um El Rish, an area of approx. 6,000 feddan, is presently a very productive fishing ground of tilapia with recorded yields of 400 to 500 kg per feddan. The saline southern section of the lake has virtually no fishery. This phenomenon is attributed to inflow of nutrient-rich Bahr El Baqar water from three years ago, which reduced the salinity and increased prductivity.
After interviewing fishermen at Um Khalaf fishermen village, following information was obtained;

- There has been a channel connecting with Bahr El Baqar Drain for 20 years, but its inflow is not strong.

- Another new channel was constructed about three years ago (1979 to 1980) and the salinity of the northern part of the lake has decreased since then.

- Before the construction of the new channel, various types of fish were caught, but, after the construction, most of them except the tilapia species and catfish disappeared.



Souce : Lake Manzala Study,Annex H; Fisheries(1982)

Fig. E-2-4 Relation of Exploitation Rate With Standing Stock in Lake Manzala

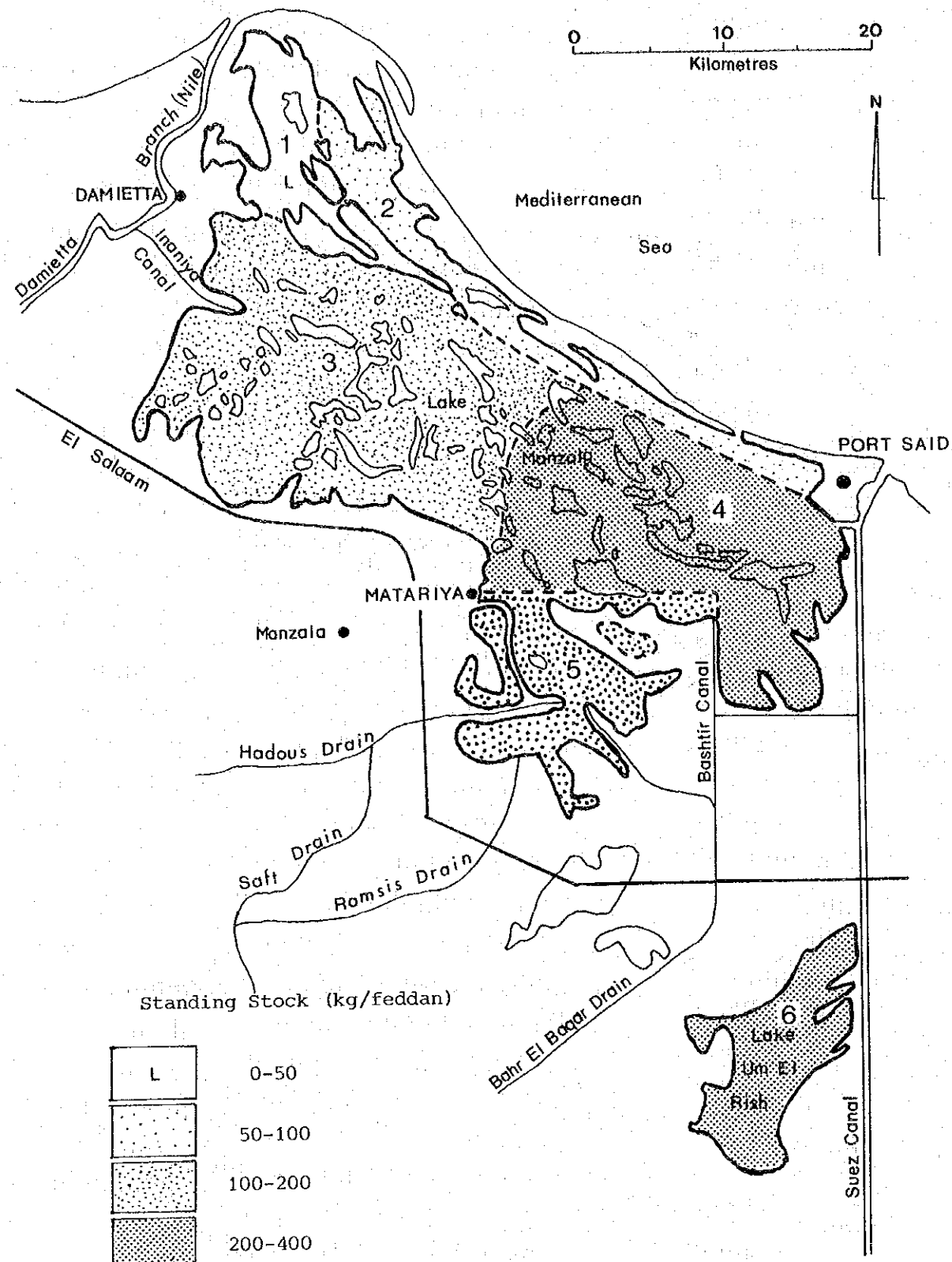


Fig. E-2-5 Fish Standing Stock Densities

Table E-2-7 Calculation Result of Annual Growth of Tilapia Species in the New Fishing Ground

(Unit: Kg/fed.)

Species Age Size (1_n)	(cm)	B. Wt. (gm)	Conversion Rate of Wt. Gain	I.S.S. 1/	S.S.at end of lst yr 2/	F.Y. of lst yr 3/	S.S.at beginning 2nd yr	S.S. at end of 2nd year
1. Sarotherodon nilotica								
1_1	8.4	11.9		43.4	-	-	43.4	-
1_2	13.2	69.5	5.84	21.7	254.3	152.6	101.7	254.3
1_3	17.3	102.3	1.47	2.7	32.0	19.4	12.6	149.7
1_4	-	(149.4)	1.46 1/	-	(4.0)	(4.0)	-	(18.4)
2. S. aurea								
1_1	7.2	7.1		50.1	-	-	50.1	-
1_2	12.7	32.6	4.59	25.1	230.6	138.4	92.2	230.6
1_3	14.5	53.7	1.64	3.1	41.3	24.8	16.5	152.0
1_4	-	(78.4)	1.46 4/	-	(4.6)	(4.6)	-	(22.7)
3. S. galilaea								
1_1	6.5	5.7		5.4	-	-	5.4	-
1_2	11.7	32.1	5.63	2.7	30.3	18.2	12.1	30.3
1_3	13.7	51.2	1.59	0.3	4.3	2.5	1.7	19.2
1_4	15.6	75.0	1.46	-	0.5	0.5	-	2.5
4. Tilapia zillii								
1_1	3.3	3.0		51.8	-	-	51.8	-
1_2	10.0	20.0	6.67	25.9	343.6	206.2	137.4	343.6
1_3	11.6	31.1	1.55	3.2	40.4	24.2	16.2	214.3
1_4	-	(45.6)	1.46 4/	-	(4.7)	(4.7)	-	(23.6)
Total	-	-	-	238.2	990.6	600.1	541.2	1,461.2

Remarks 1/ I.S.S. = Initial standing stock. It was allocated by size as follows; small - 64%, medium - 32%, and large - 4%.
2/ S.S. = Standing Stock; 3/ F.Y. = Fish Yield. Fish yield of lst year was assumed to be 60% of S.S.
4/ Assumed to be the same rate of that of S. galilaea.

- In spite of decrease in the number of fish types, the fish production suddenly increased to three times within a year.

From these informations, it is considered that the lag period of Lake Um El Rish was about one year.

c) Conclusion

Based on the results of above mentioned studies, the lag period of the new fishing ground is estimated at about 1 to 2 years. The fish yield of the 1st year would be limited to about 600 kg per feddan but that of the 2nd year could reach about 800 kg per feddan, which is almost the same level in El Genki area.

(4) To access the difference of production structure between present and new fishing ground

As described in the former chapter, following three kinds of fisheries activities exist in the Lake;

- Lake based open fishing,
- Lake based Hosha fishing, and
- Land based fish farming.

As shown in Table E-2-8, land based fish farming will be changed into agricultural farming after the Study area is reclaimed. On the other hand, other two activities will be continued in the expected new fishing ground. The open fishing area with the same level of fish yield in El Genki area will be increased to double, but the Hosha fishing area will be decreased by half because area where fishing is possible will be restricted to narrow bands along the existing islands.

On the other hand, the fish yield in El Genki area will be kept at the present level at least for one year even after the nutrient discharge is stopped and shifted to Bashtir area, because over-loaded nutrients which may be deposited on the bottom would cover the necessary amount of nutrient to keep the same level of fish yield. Accordingly, for overall project evaluation, the

Table E-2-8 Comparison of Production Structure between Existing and New Fishing Ground

Item[1/]	New Fishing Ground		Existing Fishing Ground		Balance	
	1st yr.	2nd yr.	N.H.	S.P.S.	1st yr.	2nd yr.
Open Fishing						
1. Area (10^3 fed.)	24.14	24.14	12.19	8.25	3.70	3.70
2. Yield (10^3 Kg/fed.)	0.45[2/]	0.70[2/]	0.85	0.15	-	-
3. A.P. (10^3 t/Yr.)	10.86	16.90	10.36	1.24	-0.74	5.30
4. Ave. F.P. (LE/Kg)	0.50	0.50	0.50	0.54	-	-
5. A.R. (10^6 LE/Yr.)	5.43	8.45	5.18	0.67	-0.42	2.60
6. A.P.C. (10^6 LE/Yr.)	1.57	2.44	1.50	0.25	0.18	0.69
7. A.N.B. (10^6 LE/Yr.)	3.86	6.01	3.68	0.42	-0.24	1.91
Hosha Fishing						
1. Area (10^3 fed.)	3.70	3.70	7.50	0.70	-4.50	-4.50
2. Yield (10^3 Kg/fed.)	0.40[2/]	1.20[2/]	2.00	0.80	-	-
3. A.P. (10^3 t/Yr.)	1.48	4.44	15.00	0.56	-14.08	-11.12
4. Ave. F.P. (LE/Kg)	0.50	0.50	0.50	0.55	-	-
5. A.P. (10^6 LE/Yr.)	0.74	2.22	7.50	0.31	-7.07	-5.59
6. A.P.C. (10^6 LE/Yr.)	0.27	0.81	2.74	0.12	2.59	2.05
7. A.N.B. (10^6 LE/Yr.)	0.47	1.41	4.76	0.19	-4.48	-3.54

Table (continued)

Item 1/	New Fishing Ground		Existing Fishing Ground		Balance	
	1st yr.	2nd yr.	N.H.	S.P.S.	1st yr.	2nd yr.
Fish Farming						
1. Area (10^3 fed.)	-	-	17.69	7.40	-25.09	-25.09
2. Yield (10^3 Kg/fed.)	-	-	0.05	0.10	-	-
3. A.P. (10^3 t/Yr.)	-	-	0.88	0.74	-1.62	-1.62
4. Ave. F.P. (LE/Kg)	-	-	0.50	2.50	-	-
5. A.R. (10^6 LE/Yr.)	-	-	0.44	1.85	-2.29	-2.29
6. A.P.C. (10^6 LE/Yr.)	-	-	0.18	1.20	1.38	1.38
7. A.N.B. (10^6 LE/Yr.)	-	-	0.26	0.65	-0.91	-0.91
Grand Total						
1. A.R. (10^6 LE/Yr.)	6.17	10.67	13.12	2.83	-9.78	-5.28
2. A.P.C. (10^6 LE/Yr.	1.84	3.25	4.42	1.57	4.15	2.74
3. A.N.B. (10^6 LE/Yr.)	4.33	7.42	8.70	1.26	-5.63	-2.54

Remarks 1/ A.P. = Annual production. Ave. F.P. = Average fish price, A.R. = Annual revenue, A.P.C. = Annual production cost, and A.N.B. = Annual net benefit

2/ (target fish yield, fish yield of existing fishing ground) - (original fish yield of new fishing ground)
Exploitation rate of the 1st year of new fishing ground is assumed to be 60% of the target fish yield.

afore-mentioned net loss during the 1st project year can be neglected.

(5) Conclusion of the Studies on the Influence to Proposed Land Reclamation to Existing Fisheries

As described in the former sections, all types of existing fisheries will be swept out by the land reclamation. But more or less 75 percent of the loss will be compensated by the fish production increase from the newly formed fishing ground in the Bashtir area.

2-2 Discussions on the Possibility of Fisheries Development

According to the policy of the Egyptian Government, all the reclaimed land in the present Study area shall be developed as an agricultural land except an area of which soil is unsuitable for agriculture.

Based on this government policy, the following possibilities of fisheries development were discussed in this chapter;

- To check whether land for fish farming is available or not,
- To discuss whether paddy cum fish farming can be recommended or not, and
- To discuss whether fish farming inside channels and drains can be recommended or not.

a) Availability of Land for Fish Farming

It was revealed by the present soil survey result that soil of all the portions in the Study area are suitable for agriculture. Consequently, the ideas of fish farming by using reclaimed land was abandoned.

b) Possibility of Paddy Cum Fish Farming

This was once practiced in Japan and became popular during early 1960's. Its target fish was mainly carp. The average yield was about 150 to 250 Kg/ha/season. But it was suddenly disappeared with the use of agricultural chemicals was strengthened during the same period. Nowadays, tropical ocean countries are making efforts to extend it. Their main problems are lack of fish fry and the lack of technical

propagation. The influence of agricultural chemicals has also begun to prevail.

In the above mentioned countries, paddy field are filled with water for at least for three months. But, in Egypt, the water supply is quite limited. Hence paddy fields are mostly kept in a moist condition. Consequently, this method of fish farming is not recommended even though without taking into consideration the negative influence of agricultural chemicals.

c) Possibilities of Fish Farming in Canals and Drains

Few examples are known of this type of fish farming of which fish is kept in cages without feed for some period. In Indonesia, this is a traditional fish farming method. But they are keeping fish (commonly carp) in the lower reaches of a river which contains debris and detritus in its flow. There are no cases of using canals and drains.

From the technical viewpoint of fisheries, cage fish culture may be possible even in such water area, but, from the technical viewpoint of irrigation, it is not recommended to put something in a canal which will cause an unstable water level fluctuation. On the other hand, fish farming in drains is also not recommended, because it has the risk of discharges of agricultural chemicals.

As a result, this type of fish farming is also not recommended.

d) Conclusion

Any types of fishery development is not recommended for the newly reclaimed area.