No. 9

THE ARAB REPUBLIC OF EGYPT

MINISTRY OF IRRIGATION

FINAL REPORT

ON

FEASIBILITY STUDY

FOR

THE SOUTH HOSAINIA VALLEY AGRICULTURAL DEVELOPMENT PROJECT

(ANNEXES)

VOLUME 1

MARCH 1981

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE ARAB REPUBLIC OF EGYPT

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JAPAN INTERNATIONAL COOPERATION AGENCY

GENERAL PLANNING MAP

LEGEND

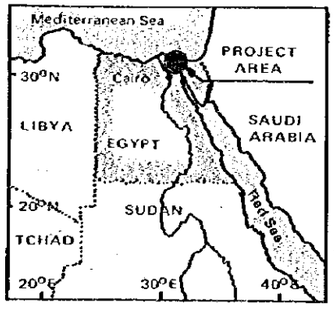
- DIVERSION FACILITY
- IRRIGATION CANAL
- DRAINAGE CANAL
- FEEDER ROAD
- VILLAGE ROAD
- SMALL VILLAGE
- SERVICE VILLAGE
- CENTRAL VILLAGE
- (P) PUMPING STATION FOR DRAINAGE
- (Pi) PUMPING STATION FOR IRRIGATION
- LIVE-STOCK CENTER

Bahr Saft drain

El Salam canal

Bahr Bagar drain

KEY MAP



SCALE

0 1 2 3 4 5 Kilometres

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NATIONAL ECONOMY

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Annex A

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ABBREVIATIONS AND GLOSSARY

ARE	:	Arab Republic of Egypt
B/C	:	Benefit Cost Ratio
CIF	:	Cost, Insurance and Freight
EIRR	:	Economic Internal Rate of Return
ET	:	Evapotranspiration
FAO	:	Food and Agriculture Organization
FC	:	Foreign Currency
FOB	:	Free on Board
FY	:	Fiscal Year (July 1st to June 30th)
IBRD	:	International Bank of Reconstruction and Development
JICA	:	Japan International Cooperation Agency
K	:	Potassium
LC	:	Local Currency
LE	:	Egyptian Pound = 1.4 US$ = 300 Japanese Yen
MOA	:	Ministry of Agriculture
MOI	:	Ministry of Irrigation
MOLR	:	Ministry of Land Reclamation
N	:	Nitrogen
O & M	:	Operation and Maintenance
P	:	Phosphorous
$, US$	:	Dollar, US$ = 0.74 LE

Units of Measurement

Length

mm	:	millimeter
cm	:	centimeter
m	:	meter
km	:	kilometer

Area

sq.cm, cm^2	:	square centimeter
sq.m, m^2	:	square meter
sq.km, km^2	:	square kilometer
MSM, $10^6 m^2$	:	million square meter

Volume

ℓ, lit	:	liter
cu.m, m^3	:	cubic meter
MCM, $10^6 m^3$	:	million cubic meter

Weight

g	:	gram
kg	:	kilogram
ton, m.t.	:	metric ton

Others

EL	:	elevation above mean sea level
MSL	:	mean sea level
FWL	:	full water level
HWL	:	high water level
LWL	:	low water level
sec	:	second
minu	:	minute
hr, hrs	:	hour or hours
min	:	minimum
max	:	maximum
%	:	percent
PPM	:	part per million
No.	:	Number
°C	:	degree centigrade
°F	:	degree fahrenheit
Cl	:	Chlorine
HP, PS	:	Horse Power
lit/sec	:	liter per second
m/s	:	meter per second

Conversion Factors

Unit	Comparison
Units of Length	
Millimeter (mm)	0.001 meter
Centimeter (cm)	0.01 meter
Meter (m)	100 cm
Kilometer (km)	1,000 meters
Units of Area	
Square centimeter (sq.cm)	0.0001 sq.m
Square meter (sq.m)	
Hectare (ha)	10,000 sq.m
Square kilometer (sq.km)	1,000,000 sq.m
Feddan	4,200 sq.m
Units of Volume	
Cubic centimer (cu.m)	0.001 cu.m
Liter (1,000 cu.m)	0.001 cu.m
Cubic meter (cu.m)	1,000 liters
Units of Weight	
Gram (g)	
Kilogram (kg)	1,000 g
Metric Ton (mt)	1,000 kg

Miscellaneous

1 cu.m per sec	=	1,000 liters per second (ℓ/s)
	=	35.3145 cu.ft per second (cfs)
	=	15,850 gallons per minute (gpm)
1 liter per second for 1 day	=	8.64 mm depth over one hectare
10 mm depth over 1 hectare	=	1.157 liters per second for 1 day
	=	3,532 cu.ft
1 horsepower (metric)	=	75 kg-m per second
	=	550 ft-lb per second
1 cu.m per day per feddan	=	0.238 mm/day = 2.38 ℓ/day/ha

A-1. GENERAL DESCRIPTION

1) Land

The Arab Republic of Egypt is located on the northeastern corner of the African Continent, and is contiguous to the Western Asia through the Sinai as well as to the European Continent beyond the Meditaranean Sea. She has played an important role as a strategic position for both traffic and military affairs.

Egypt is bordered on the south by Sudan in latitude 22° N., the west by Libya in Long. 25° E., the north by the Meditaranean Sea, and the east by the Red Sea. She has an area of about one million sq.km., and is located on the central portion of the desert which is stretching over the Arabian Peninsula through the Northern Africa.

Only four percent of the total land, or about 36 thousand sq.km. is presently developed and utilized as arable land and permanent residence, and most of all these land is located along the Nile River valley, on the Nile Delta and the oases which are scattered in the country.

As phrased by Herodotus, "Egypt is a gift of the Nile", the Nile River is flowing from Sudan, through the entire Egypt and to the Meditaranean Sea, forming the Delta, and plays a great important role as a water resource to Egypt.

2) Demography

According to statistics, total population in July 1978 is estimated at 38,448 thousand excluding 1,434 thousand of population abroad, of which 51 percent or 19,591 thousand is male and 49 percent or 18,857 thousand is female (See Table A-1-1). Although population density against total land is about 38 per sq.km., that against the arable land and the residential area (about 36 thousand sq.km.) is 1,074 per sq.km.

As shown in Table A-1-2, annual population growth rate is 2.4 percent since 1952 and also about 2.4 percent over the last ten years period. The growth rate of 2.4 percent per annum is not so high compared with those in other Afrian countries, but pressed the recent economic development in Egypt.

According to the population census in November 1976, about 44 percent or 16,089 thousand is dwelling in urban area and about 56 percent or 20,567 thousand does in rural area (See Table A-1-3). Recently it has been seen that population movement from rural area to urban area to seek employment opportunities, because the agricultural sector may not absorb incremental workable population in rural area.

In 1977, total labor force is estimated at 9,719 thousand of which about 42 percent or 4,103 thousand is engaged in the agricultural sector. While the total labor force grew at 2.2 percent per annum during the period between 1972 and 1977, the agricultural labor had slightly decreased from 4,134 thousand to 4,103 thousand during the same period (See Table A-1-5).

3) Administrative Boundary

Egypt is administratively composed of 25 governorate and governorate is sub-divided into districts. The project area is belonging to Sharkia governorate of which capital is Zagazig.

A-2. MACRO ECONOMIC PERFORMANCE

1) General

Since introduction of Egypt's "Open-Door Policy" in 1972, her economy has considerably improved through recovery of petroleum production as well as more output gained by such industrial sectors as metal goods, textile goods, foods and so on. On the other hand, it is the fact that there has happened many serious troubles or difficulties in her economy, namely, while importation of capital goods and intermediate goods has increased through more investment activities for economic development, growth of production was rather low in comparison with degree of investment expansion, and export found it hard to grow. Furthermore, to comply with stabilization of public welfare as well as population growth with 2.4 percent per annum, importation of consumer goods has increased, and eventually deficit in foreign trade balance has sharply increased.

2) Gross Domestic Product

As shown in Table A-2-1, G.D.P. in 1977 is estimated at L.E. 7,341 million and L.E. 5,780 million at current prices and at 1975 constant prices, respectively. The real growth of G.D.P. between 1973 and 1977 is 6.3 percent per annum. On the other hand, G.D.P. per capita in 1977 is L.E. 149.2 which is equivalent to US$381 by using the market exchange rate in 1977, and its real growth between 1973 and 1977 is 4.1 percent per annum.

Table A-2-2 shows sectoral output at current prices, in which annual growth rate of total outputs is estimated at 14.8 percent during the period from 1972 to 1977, and that in agricultural sector is 14.1 percent. As shown in Table A-2-3, structure in production has not changed so much.

Table A-2-4 indicates gross fixed capital formation, in which total amount in 1977 is L.E. 1,769.4 million, of which about 57 percent

or L.E. 1,005 million is formed in the commodity sector and other 43 percent or L.E. 764.4 million in the services sector.

3) Price Indices

Table A-2-5 shows price indices for both consumer prices and wholesale prices. Annual growth rates of these price indices during the period from 1973 to 1978 are calculated and summarized in the following;

Prices	Annual Growth Rate (%)
Consumer Prices (Urban)	10.9
Consumer Prices (Rural)	12.3
Wholesale Prices	10.7

A-3. FOREIGN TRADE

1) General

Since 1950's, Egypt's balance of foreign trade has shown a deficit, except two years of 1969 and 1973. Until 1972, the deficit was not so big amount by reason of the government's severe control on import, but it has sharply increased starting from 1974 due to rapid expansion of import for basic materials and intermediate goods, which was restricted under her wartime economy. In addition, since 1975 importation of capital goods as well as consumable goods has kept the total amount of import high level and annual excess of import amount over export's accounted for twice of the export amount (See Table A-3-1).

2) Export

Although Egyptian exoprt depends largely on raw cotton export, which accounted for over 50 percent of her total amount of export until the mid-1960's, and about 40 to 50 percent of that until the mid-1970's, its share has recently decreased to about 20 percent in 1979 (See Table A-3-1).

An export quantity of raw cotton has continuously decreased through 1970's, for which reason is raw cotton production had declining trend and domestic demand for raw cotton has sharply increased. Egyptian cotton is graded as good quality in the world market, of which price is 20 percent higher than that produced in Sudan.

Instead of raw cotton, since 1975 export of manufactured cotton like cotton yarn and cotton textiles has been developed by 20 percent of the total export amount, but domestic demands for such materials has also increased, and this export also showed decline trend in 1978.

On the other hand, export of fuel, especially, crude oil has recently increased its share in the total export amount, and export of crude oil would be very prosperous due to continuous expansion of its production.

Food products such as rice, vegetables, fruits, etc., occupies more than half of export for basic materials. Egypt is importing a large amount of foods and simultaneously exporting them, for which reason is her policy to earn foreign exchange by exporting such crops as rice and cotton with relatively higher prices and to import lower priced cereals like wheat, maize, etc.

Table A-3-2 summarizes the recent trend of Egyptian export by 21 items which are available in her tariff table. In 1979, export of mineral products occupies about 42 percent of the total export amount followed by textiles, 38 percent.

3) Import

Egypt is, without excention, importing most of all goods from basic materials to consumable goods. As mentioned already, Egyptian import had sharply increased from 1974 like reaction against severe restriction of import under her wartime economy, and once subsided in 1976, but again it has been increasing from 1977 thru 1979 (See Table A-3-1 and A-3-3).

In 1979, import of machinery, equipments and mechanical appliances has the biggest share, about 20 percent of the total amount of import, followed by about 13 percent of vegetable products, about 13 percent of such transport equipments as vehicles, aircraft, etc., and about 12 percent of base metals.

4) Balance of Payments

Egypt had kept her balance of payments even, by supplementing a deficit in balance of current account with a surplus in capital account. As reported in the previous section, Egypt's balance of trade had kept a deficit since long time, and exerted pressure upon her balance of current account. Especially, it was forced to close the Suez Canal by which Egypt had earned a considerable amount of foreign exchange, due to Israeli occupation of the Sinai Peninsular after the third Middle-East War in 1967. Also, revenues from tourism

had greatly decreased due to unstable political condition. In order to make up the deficit in balance of current account, short and medium term foreign loan had been introduced, but gradual expansion of the balance in her external debt had made amortization of principal as well as interest larger, and deteriorated the balance of capital account.

Recently, the balance of capital account has been considerably improved by introduction of foreign loans, but there happens a problem that the more foreign loans are introduced, the heavier burden is imposed on her external debt. And also, introduction of foreign loans may not always be connected with her economic development, because these foreign loans might be used to cover the deficit of the balance of capital account.

In any case, it is inevitable to improve her structure of balance of trade, that would take longer period.

A-4. ECONOMIC DEVELOPMENT PLAN

1) General

Before 1973, four series of medium and long term economic development plan were established, and implementation of comprehensive development had been tried, but every plan except the first Five-Year Plan, was not successfully accomplished due to a series of mid-east war as well as shortage of necessary capital.

Under such sircumstances, the Open-Door policy has been launched as foundation in her economic policy in 1971. It was inevitable to implment a comprehensive development plan in order to reconstruct her exhausted economy under the wartime economy as well as to make her economy stable. In this regards, the 18-month transition plan was established for the preparation of her launching long-term development plan, and it was scheduled to commence five-year plan from January 1976.

2) 18-Months Transition Plan (July 1974 - December 1975)

Its planned objective was annual growth rate of nine (9) percent in her economy with L.E. 1,630 million of total investment. It was scheduled to expend 90 percent of the total investment, or L.E. 1,470 million during a year of 1975, of which about one-fourth or L.E. 370 million was considered to be prepared domestically and other three-fourths or L.E. 1,100 million was expected to be met by foreign currency portion. But it was said that only about US$1,200 million of foreign currency was flown into Egypt during the plan period, and hence the plan was not completely achieved with other internal affairs.

Under such situation, it was announced that a new five-year plan would be commenced from 1978.

3) New Five-Year Plan (1978-1982)

(i) Planned target

The main objective of the new Five-Year Plan is to accelerate her economic development and it is planned to create more employment

opportunity by expanding in quantity her national economy with maximum utilization of introduced external investment in both public and private sector.

Targeted annual growth of gross national products is 11.6 percent during the plan period, and it is planned to increase real G.D.P. per capita of L.E. 160 in 1977 to L.E. 250 in 1982. The planned key factors are shown in Table A-4-1.

(ii) Investment program

In the new Five-Year Plan, total amount of investment is estimated at about L.E. 12,300 million, of which about L.E. 10,000 million would be invested in the public sector and the rest, L.E. 2,300 million in the private sector. The investment program for the public sector is shown in Table A-4-2, by which it is recognized that the mining and industry sector as well as the transport and communication sector are given the highest priority, followed by the services sector and the power sector.

Investment strategy during the plan period is summarized below;

- In order to obtain quicker returns, on-going projects which are presently being invested, are given the highest priority.
- To renew the existing projects of which operation is restricted by reason of idle facilities and redemption.
- As for newly proposed projects, only those projects like fertilizers, construction materials and so on which can play an important role for the government's development strategy, are given higher priority.
- To promote and encourage participation of both domestic and foreign private investers to productive projects.
- To aim improvement of living standard of rural people through regional development.

(iii) Budet during the plan period

According to the planned budget of both current and development, it is scheduled that a deficit in the current budget will be L.E. 8 million in 1980, and the budget will have a surplus of L.E. 181 million in 1981 and further L.E. 240 million in 1982 (See Table A-4-3). This is greatly contricuted by revenues from Suez Canal as well as oil products, and it is expected that tax revenue will increase by promotion of industrializaion.

On the other hand, the development budget would not cover its expenditure even by incorporating foreign loans and direct external investment into the budget, and depend on supply of credit from domestic enterprises and individual as well as foreign private banks, amounting to L.E. 806 million in 1982.

Table A-1-1. Population Estimates (July 1978)

(Unit in thousand)

Governorate	Male	Female	Total
1. Cairo	2,700	2,578	5,278
2. Alexandria	1,232	1,177	2,409
3. Port-Said	140	131	271
4. Suez	107	97	204
5. Damietta	296	287	583
6. Dakahlia	1,448	1,412	2,860
7. Sharkia	1,397	1,344	2,741
8. Kalyubia	909	843	1,752
9. Kafr-El-Sheikh	740	730	1,470
10. Gharbia	1,213	1,179	2,392
11. Munufia	909	877	1,786
12. Behera	1,331	1,308	2,639
13. Ismailia	189	181	370
14. Giza	1,307	1,230	2,537
15. Beni-Suef	586	574	1,160
16. Fayum	612	584	1,196
17. Menia	1,111	1,045	2,156
18. Asyut	912	863	1,775
19. Suhag	1,013	1,001	2,014
20. Qena	895	884	1,779
21. Aswan	321	327	648
22. Red Sea	33	26	59
23. New Valley	46	43	89
24. Matruh	62	60	122
25. Sinai	82	76	158
Total	19,591	18,857	38,448

Source: Statistical Yearbook, July 1979

Note: Population abroad (1,434,009) is not included.

Table A-1-2. Estimated Population and Increase

(Unit: thousand)

Year	Population	Increase
1952	21,437	494
1960	25,832	595
1961	26,579	747
1962	27,257	678
1963	27,947	690
1964	28,659	712
1965	29,389	730
1966	30,146	757
1967	30,830	684
1968	31,542	712
1969	32,271	729
1970	33,017	746
1971	33,780	763
1972	34,560	780
1973	35,358	798
1974	36,175	817
1975	37,011	836
1976	37,866	855
1977	38,845	979
1978	39,882	1,037

Source: Statistical Yearbook, July 1979

Table A-1-3. Urban and Rural Distribution of Population

Governorate	Urban	Rural	Total
1. Cairo	5,084,463	-	5,084,463
2. Alexandria	2,318,655	-	2,318,655
3. Port-Said	262,620	-	262,620
4. Suez	194,001	-	194,001
5. Ismailia	165,698	186,191	351,889
6. Behera	653,458	1,863,834	2,517,292
7. Damietta	142,815	414,300	557,115
8. Kafr-El-Sheikh	291,859	1,111,609	1,403,468
9. Gharbia	766,337	1,527,966	2,294,303
10. Dakahlia	655,272	2,077,484	2,732,756
11. Sharkia	530,354	2,090,854	2,621,208
12. Munufia	336,691	1,374,291	1,710,982
13. Kalyubia	684,586	989,420	1,674,006
14. Giza	1,379,277	1,039,970	2,419,247
15. Fayum	276,428	863,817	1,140,245
16. Beni-Suef	276,193	832,422	1,108,615
17. Menia	430,830	1,624,909	2,055,739
18. Asyut	470,032	1,225,346	1,695,378
19. Suhag	405,291	1,519,669	1,924,960
20. Qena	391,052	1,314,316	1,705,368
21. Aswan	229,657	390,275	619,932
22. Red Sea	47,948	8,469	56,417
23. New Valley	34,407	50,238	84,645
24. Matruh	51,036	61,736	112,772
25. Sinai	10,104	-	10,104
Total	16,089,064	20,567,116	36,656,180

Source: Statistical Yearbook, July 1979

Note: Preliminary results of population census Nov. 1976
Table does not include population abroad (1,425,000) and population in occupied zone of Sinai (147,000).

Table A-1-4. Sex Distribution of Population

Governorate	Male	Female	Total
1. Cairo	2,606,999	2,477,464	5,084,463
2. Alexandria	1,190,729	1,127,926	2,318,655
3. Port-Said	136,186	126,434	262,620
4. Suez	102,464	91,537	194,001
5. Ismailia	179,874	172,015	351,889
6. Behera	1,269,368	1,247,924	2,517,292
7. Damietta	283,426	273,689	557,115
8. Kafr-El-Sheikh	708,064	695,404	1,403,468
9. Gharbia	1,165,492	1,128,811	2,294,303
10. Dakahlia	1,385,392	1,347,364	2,732,756
11. Sharkia	1,337,017	1,284,191	2,621,208
12. Munufia	871,843	839,139	1,710,982
13. Kalyubia	869,879	804,127	1,674,006
14. Giza	1,246,592	1,172,655	2,419,247
15. Fayum	583,152	557,093	1,140,245
16. Beni-Suef	560,073	548,542	1,108,615
17. Menia	1,060,578	995,161	2,055,739
18. Asyut	871,099	824,279	1,695,378
19. Suhag	966,925	958,035	1,924,960
20. Oena	857,308	848,060	1,705,368
21. Aswan	306,898	313,034	619,932
22. Red Sea	31,634	24,783	56,417
23. New Valley	43,445	41,200	84,645
24. Matruh	57,959	54,813	112,772
25. Sinai	6,508	3,596	10,104
Total	18,698,904	17,957,276	36,656,180

Source: Statistical Yearbook, July 1979

Note: Preliminary results of population census Nov. 1976
Table does not include population abroad (1,425,000) and population in occupied zone of Sinai (147,000).

Table A-1-5. Development of Labour

(Unit: '000)

	1972	1973	1974	1975	1976	1977
I. Commodity Sector						
Agriculture	4,133.7	4,163.8	4,212.4	4,217.9	4,067.8	4,103.5
Industry	1,086.9	1,112.4	1,132.6	1,158.8	1,181.4	1,226.5
Petroleum			16.9	18.3	18.6	18.7
Electricity	35.4	35.3	38.3	41.2	47.0	53.9
Construction	348.4	302.3	315.2	447.4	480.0	457.0
Sub-total	5,604.4	5,613.8	5,715.4	5,883.6	5,794.8	5,859.6
II. Service Sector						
Transportation & Communication	385.5	401.8	396.6	404.2	414.4	444.3
Finance and Trade	828.9	864.3	883.2	966.4	1,014.2	1,050.6
Housing	137.9	138.0	139.1	142.9	144.0	145.1
Public Utilities	40.6	41.5	43.0	50.0	53.4	54.0
Other Services	1,713.4	1,800.3	1,853.1	1,988.2	2,083.9	2,165.4
Sub-total	3,106.3	3,245.9	3,315.0	3,551.7	3,709.9	3,859.4
III. Grand Total	8,710.7	8,859.7	9,030.4	9,435.3	9,504.7	9,719.0

Source: Statistical Yearbook, July 1979

Table A-2-1 National Accounts

(Unit: L.E. Million)

	1973	1974	1975	1976	1977
At Current Prices					
Exports	531	890	894	1,034	1,470
Government Consumption	1,020	1,101	1,213	1,571	1,576
Gross Fixed Capital Formation	462	640	1,228	1,385	1,769
Increase in Stocks	40	90	100	195	281
Private Consumption	2,339	2,871	3,281	3,863	4,505
Imports	-729	-1,395	-1,831	-1,772	-2,260
Gross Domestic Product	3,663	4,197	4,886	6,276	7,341
Net Factor Payments Abroad	-29	-112	-148	-158	-202
Gross National Expenditure	3,634	4,085	4,738	6,118	7,139
At 1975 Constant Price					
Gross Domestic Product	4,530	4,674	4,886	5,386	5,780
(Rate of Increase (%))	-	3.2	4.5	10.2	7.3
Per Capita G.D.P. (L.E.)	127.2	128.3	131.2	142.2	149.2
(Rate of Increase (%))	-	0.9	2.3	8.4	4.9
Population (million)	35.62	36.42	37.23	37.87	38.74

Source: IMF-IFS October 1980

Table A-2-2. Development of Production (At Current Prices)

(Unit: L.E. Million)

	1972	1973	1974	1975	1976	1977
I. Commodity Sector						
Agriculture	1,297.8	1,486.2	1,846.6	2,052.0	2,407.0	2,511.0
Industry	2,437.8	2,642.2	2,939.7	3,347.0	3,751.0	4,231.0
Petroleum			290.3	386.0	575.0	698.0
Electricity	60.9	56.7	60.7	89.0	97.0	110.0
Construction	316.0	277.3	340.0	542.0	636.0	715.0
Sub-total	4,112.5	4,462.4	5,477.3	6,416.0	7,466.0	8,265.0
II. Services Sector						
Transportation & Communication	247.2	260.0	291.4	386.0	535.0	609.0
Finance and Trade	377.8	417.8	718.7	801.0	861.0	1,033.0
Housing	128.1	130.8	133.7	137.0	144.0	155.0
Public Utilities	22.8	23.6	26.7	30.0	34.0	35.0
Other Services	1,219.4	1,332.4	1,490.4	1,603.0	1,945.0	2,086.0
Sub-total	1,995.3	2,164.6	2,660.9	2,957.0	3,519.0	3,918.0
III. Grand Total	6,107.8	6,627.0	8,138.2	9,373.0	10,985.0	12,183.0

Source: Statistical Yearbook, July 1979

Table A-2-3 Sectoral Share in Production

(Unit: %)

	1972	1973	1974	1975	1976	1977
I. Commodity Sector						
Agriculture	21.2	22.4	22.7	21.9	21.9	20.6
Industry	39.9	39.9	36.1	35.7	34.2	34.7
Petroleum			3.6	4.1	5.2	5.7
Electricity	1.0	0.8	0.7	1.0	0.9	0.9
Construction	5.2	4.2	4.2	5.8	5.8	5.9
Sub-total	67.3	67.3	67.3	68.5	68.0	67.8
II. Services Sector						
Transportation & Communication	4.0	3.9	3.6	4.1	4.9	5.0
Finance and Trade	6.2	6.3	8.8	8.5	7.8	8.5
Housing	2.1	2.0	1.7	1.5	1.3	1.3
Public Utilities	0.4	0.4	0.3	0.3	0.3	0.3
Other Services	20.0	20.1	18.3	17.1	17.7	17.1
Sub-total	32.7	32.7	32.7	31.5	32.0	32.2
III. Grand Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Statistical Yearbook, July 1979

Table A-2-4. Gross Fixed Capital Formation (At Current Prices)

(Unit: L.E. Million)

	1972	1973	1974	1975	1976	1977
I. Commodity Sector						
Agriculture	55.1	57.6	54.2	94.6	98.4	138.5
Industry	152.9	154.3	189.9	268.7	352.1	512.4
Petroleum			44.1	114.3	183.0	212.7
Electricity	25.8	30.3	30.0	53.3	59.4	99.3
Construction	5.5	5.0	10.6	30.2	78.8	42.1
Sub-total	239.3	247.2	328.8	561.1	771.7	1,005.0
II. Services Sector						
Transportation & Communication	75.6	123.0	187.0	378.6	371.7	440.6
Finance and Trade	2.9	2.7	5.2	15.7	25.9	28.9
Housing	37.1	37.0	46.6	155.5	104.2	140.6
Public Utilities	15.9	22.8	28.7	46.1	45.0	60.6
Other Services	34.2	29.3	43.9	70.9	66.4	93.7
Sub-total	165.7	214.8	311.4	666.8	613.2	764.4
III. Grand Total	405.0	462.0	640.2	1,227.9	1,384.9	1,769.4

Source: Statistical Yearbook, July 1979

Note: Including the portion of foreign partner.

Table A-2-5. Price Indices

(1965/66 = 100)

	1973	1974	1975	1976	1977	1978
Consumer Prices (Urban Area)						
Food Stuffs and Beverages	130.8	152.9	171.5	196.8	225.0	246.5
Housing	105.8	106.5	107.6	109.8	109.4	110.1
Clothing	113.3	124.2	136.7	145.3	172.7	225.2
General Number of Cost of Living	122.4	135.7	148.9	164.2	185.1	205.6
Consumer Prices (Rural Area)						
Food Stuffs and Beverages	138.3	162.2	185.4	211.9	234.9	270.6
Housing	111.8	116.5	115.4	112.9	111.9	112.2
Clothing	125.4	145.9	168.5	189.4	215.2	244.7
General Number of Cost of Living	131.2	149.6	167.9	187.8	206.7	234.2
Wholesale Prices						
Food Stuffs and Beverages	140.4	162.8	180.1	205.7	225.4	241.4
Petroleum and Fuel	128.0	136.5	143.5	154.3	159.1	168.6
Medicines	107.9	107.9	108.6	110.2	148.1	158.3
General Number of All Items	128.8	147.2	158.3	170.7	186.6	214.1

Source: Statistical Yearbook, July 1979.

Table A-3-1 Balance of Foreign Trade

(Unit: L.E. Million)

	1971	1972	1973	1974	1975	1976	1977	1978	1979
1. Exports	343.2	358.8	444.2	593.3	548.6	595.5	668.5	679.8	1,287.8
Cotton	174.9	162.0	191.9	279.1	201.0	149.1	182.3	131.5	267.3
Long staple	126.7	100.0	109.3	154.1	124.3	119.0	136.5	99.5	174.7
Long-Medium Staple	43.0	54.4	82.6	125.0	76.8	35.7	45.8	32.0	92.6
Rice	24.8	22.1	26.2	39.7	24.4	31.0	23.4	19.9	22.1
2. Imports (c.i.f.)	399.9	390.8	361.1	920.1	1,539.3	1,489.8	1,884.3	2,632.2	2,686.0
3. Imports (f.o.b.)	363.5	355.3	328.3	836.5	1,399.4	1,354.4	1,713.0	2,392.9	2,441.8
4. Balance (1-2)	-56.7	-88.7	83.1	-326.8	-990.7	-894.3	-1,215.8	-1,952.4	-1,398.2

Source: International Financial Statistics October 1980, IMF

Table A-3-2. Amount of Export

(Unit: L.E. 1,000)

Item	1973	1974	1975	1976	1977	1978	1979
1. Living animals & its products	1,563	1,126	1,132	4,077	5,129	5,621	9,393
2. Vegetable products	70,597	78,345	69,359	93,804	97,856	81,900	95,070
3. Fats, oils & its products	182	52	616	116	332	130	729
4. Prepared foodstuffs, beverages, tobacco	14,807	20,380	28,303	22,756	27,106	26,177	30,233
5. Mineral products	50,091	54,782	55,443	152,595	164,105	190,515	537,191
6. Products of chemical industries	9,385	11,853	23,823	18,006	22,113	21,228	20,874
7. Artificial resins, plastic materials, etc.	279	56	98	58	165	505	469
8. Raw hides & skins, furskins, etc.	2,127	2,740	5,138	5,477	4,685	5,179	14,963
9. Wood & its products, wood charcoal, etc.	288	261	397	558	628	198	343
10. Paper-making materials, paper, etc.	1,644	3,589	4,537	4,460	6,946	4,536	5,181
11. Textiles & textile articles	275,018	394,888	322,025	266,525	312,070	286,571	488,359
12. Footwear, headgear, umbrella, etc.	5,801	8,240	14,156	4,256	5,431	5,529	3,354
13. Articles of stone, plaster, cement, etc.	448	649	739	547	523	568	458
14. Pearls, jewellery, etc.	1,175	153	749	285	253	186	154
15. Base metals & articles thereof	4,938	8,729	11,602	13,215	15,727	40,215	73,006
16. Machinery, mechanical appliances, etc.	1,735	1,745	2,186	1,134	1,197	1,844	3,276
17. Vehicles, aircraft & parts thereof	953	1,094	3,368	3,215	389	6,353	852
18. Optical, cinematographic instruments, etc.	291	503	672	731	1,027	576	550
19. Arms & ammunition, parts thereof	20	8	9	42	-	15	-
20. Miscellaneous manufactrued articles	2,834	4,092	4,225	3,592	2,790	1,902	3,320
21. Works of arts, antiques, etc.	21	14	8	1	6	6	38
Total	444,197	593,299	548,585	595,450	668,478	679,754	1,287,813

Source: Statistical Yearbook, July 1979 and Monthly Bulletin of Foreign Trade, April 1980.

Table A-3-3. Amount of Import

(Unit: L.E. 1,000)

Item	1973	1974	1975	1976	1977	1978	1979
1. Living animals & its products	7,670	9,732	17,934	39,249	54,911	95,175	109,721
2. Vegetable products	77,389	310,042	328,152	274,785	267,887	366,570	360,438
3. Fats, oils & its products	16,758	47,313	136,575	39,189	35,096	69,240	94,693
4. Prepared foodstuffs, beverages, tobacco	13,372	42,137	72,932	78,071	82,997	155,405	143,197
5. Mineral products	10,780	31,030	115,705	84,129	80,260	96,735	129,872
6. Products of chemical industries	53,574	122,192	197,542	126,921	164,038	210,966	195,780
7. Artificial resins, plastic materials, etc.	10,125	22,844	38,737	43,933	58,404	87,455	81,251
8. Raw hides & skins, furskins, etc.	3,127	3,708	4,339	3,066	2,673	4,045	3,335
9. Wood & its products, wood charcoal, etc.	11,603	30,876	53,436	42,144	112,027	114,694	104,278
10. Paper-making materials, paper, etc.	11,836	32,924	61,769	60,682	57,776	63,923	55,744
11. Textiles & textile articles	16,877	21,972	29,710	55,422	78,291	62,483	77,295
12. Footwear, headgear, umbrella, etc.	47	182	541	1,700	2,239	1,487	2,202
13. Articles of stone, plaster, cement, etc.	3,555	4,976	14,935	20,224	24,196	39,610	32,752
14. Pearls, jewellery, etc.	68	255	272	465	432	7,520	2,033
15. Base metals & articles thereof	32,100	70,700	141,683	134,949	173,565	235,334	322,442
16. Machinery, mechanical appliances, etc.	51,722	78,593	169,793	280,145	389,463	575,436	548,346
17. Vehicles, aircraft & parts thereof	35,940	84,378	139,820	178,022	261,283	389,832	354,711
18. Optical, cinematographic instruments, etc.	4,083	5,255	12,120	21,113	27,439	41,113	47,539
19. Arms & ammunition, parts thereof	8	20	517	519	1,515	1,182	840
20. Miscellaneous manufactured articles	380	989	2,811	5,177	9,782	13,970	19,739
21. Works of arts, antiques, etc.	3	-	3	3	4	5	4
Total	361,017	920,118	1,539,326	1,489,908	1,884,278	2,632,180	2,686,212

Source: Statistical Yearbook, July 1979 and Monthly Bulletin of Foreign Trade, April 1980

Table A-4-1. Production Targets of The Five-Year Plan

(Unit: L.E. Million)

	1975	1976	1977	1978	1979	1980	1981	1982
Sectoral Output								
Agriculture & Irrigation	2,053	2,126	2,196	2,270	2,350	2,432	2,517	2,605
Industry & Mining	3,346	3,516	3,750	4,102	4,500	4,986	5,524	6,120
Oil	386	508	609	800	980	1,286	1,687	2,214
Electric Power	89	98	119	135	153	173	193	217
Construction	520	520	630	735	807	940	1,093	1,259
Transport & Communication	386	519	580	668	739	857	995	1,154
Commerce & Finance	801	877	927	983	1,046	1,114	1,186	1,263
Housing	137	144	150	160	176	194	214	236
Public Facilities	30	32	35	39	43	48	53	59
Services	1,603	1,706	1,800	1,910	2,140	2,342	2,563	2,805
Total	9,351	10,046	10,796	11,802	12,934	14,372	16,025	17,932
Growth Rate (%)	...	(7.4)	(7.5)	(9.3)	(9.6)	(11.1)	(11.5)	(11.9)
Investment	4,673	5,022	5,350	5,842	6,241	6,817	7,525	8,357
(Investment of Imported Goods)	762	673	832	940	950	1,010	1,123	1,245
Output/Investment (%)	(50)	(50)	(50)	(49.5)	(48.3)	(47.4)	(47.1)	(46.7)
Value added	4,678	5,024	5,446	5,960	6,693	7,555	8,500	9,575
Growth Rate (%)	...	(7.3)	(8.3)	(9.4)	(12.3)	(12.4)	(12.5)	(12.6)
Income from abroad (net)	93	204	224	238	254	260	300	350
Indirect Taxes	751	800	982	1,083	1,141	1,231	1,331	1,438
Subsidy (-)	669	480	407	400	437	477	520	569
Gross National Product	4,853	5,548	6,245	6,861	7,651	8,569	9,611	10,794
Growth Rate (%)	...	(14.3)	(12.6)	(9.9)	(11.5)	(12.0)	(12.2)	(12.3)

Source: The Five-Year Plan

Table A-4-2. Sectoral Investment Program in Government and Public Sector

(Unit: L.E. Million)

	1978	1979	1980	1981	1982	Total	Share(%)
Agriculture	65.4	74.9	79.2	85.1	91.1	395.7	(3.9)
Irrigation / Drainage	86.7	93.8	98.3	102.0	102.4	483.2	(4.7)
Industry / Mining	344.1	374.1	457.9	573.2	663.2	2,412.6	(23.7)
Oil	75.0	91.8	117.3	129.3	149.0	562.4	(5.5)
Electric Power	122.6	172.2	223.8	211.7	193.7	924.0	(9.1)
Construction	32.0	42.5	44.6	46.3	48.4	213.8	(2.1)
Transport / Communication	370.5	431.4	479.5	497.4	528.5	2,307.3	(22.6)
Suez Canal	119.0	128.0	148.8	47.0	32.0	474.8	(4.7)
Commerce / Finance	30.7	40.9	48.1	45.6	50.5	215.8	(2.2)
Housing	85.0	111.5	120.4	133.5	134.6	585.0	(5.8)
Public Facilities	94.6	124.4	133.5	133.5	135.0	622.8	(6.1)
Services	158.5	179.5	201.6	216.6	221.8	978.0	(9.6)
Total	1,584.1	1,865.0	2,153.0	2,223.0	2,350.3	10,175.4	(100.0)

Note: Including foreign investment with official exchange rate

Source: The Five-Year Plan

Table A-4-3. Current and Development Budget during Plan Period

(Unit: L.E. Million)

	1978	1979	1980	1981	1982
Current Budget					
Direct Taxes	468	522	636	710	793
Individual Income Tax	174	192	211	232	255
Corporation Income Tax	294	330	425	478	538
Indirect Taxes	1,083	1,141	1,231	1,331	1,438
Surplus in Public Sector	150	190	293	331	374
Revenues from Suez Canal and Pipeline	160	187	240	296	360
Revenue from Oil	148	300	400	420	450
Revenue total	2,009	2,244	2,796	3,256	3,605
Ordinary Expenditure	1,727	1,882	2,051	2,235	2,436
Salary & Wages	1,018	1,156	1,260	1,374	1,500
Commodity Expenditure	709	773	842	918	1,000
Subsidy	400	437	477	520	569
Transfer Revenue & Expenditure (net)	192	225	276	320	360
Expenditure total	2,319	2,544	2,804	3,075	3,365
Balance of Current Budget	Δ 310	Δ 300	Δ 8	181	240
Development Budget					
Surplus in Social Insurance	342	371	407	446	495
Foreign Loan	454	538	581	497	365
Revenue total	486	609	996	1,124	1,100
Public Investment	1,584	1,865	2,153	2,223	2,350
Loss in Cordial Treatment Rate	75	88	95	71	56
Expected Amount of Foreign Investment	84	90	153	298	500
Necessary Amount of Domestic Procurement	1,574	1,863	2,095	1,996	1,906
Loan Amount 1/	1,089	1,254	1,099	872	806

Note: 1/ Loan to be provided by domestic enterprises, individual and foreign private banks.

Source: The Five-Year Plan

ANNEX B

NATURAL CONDITIONS

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Annex B

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B-1. TOPOGRAPHY

1) Location of the Project Area

The Project Area is a wide area of 31,400 ha (about 74,700 feddans) in the soil desert, extending 25 km from east to west and 15 km north to south with the center of the crossing point in lat. 31°N and long. 32°E.

The Project Area is bounded east by the Bahr Baqar, the main drainage canal in the East Delta, west by the Bahr Saft, one of the branches of the Bahr Hadous, north by the EL Salam canal that is under construction by the Ministry of Irrigation as the main water source for the Project Area, and south by the boundary between the existing reclaimed land and the soil desert.

2) Present Land Use

The total land area of the Project is 31,400 ha (about 74,700 feddans), including the existing cultivated lands of 2,500 ha (about 6,000 feddans), inundated areas of 12,200 ha (about 29,000 feddans), cultivable waste lands of 16,500 ha (about 39,300 feddans) and others of 200 ha (about 400 feddans) for the right of way for canals, etc.

The inundated area seasonally varies in its water surface area being subjected to the change in water level of the Manzala Lake situated north of the Project Area; the acreage of the water surface decreases in the summer season while increases in the winter season. The above-quoted acreage of 12,200 ha was estimated based on the sti-uation in October.

Although the cultivable waste lands, consisting of the soils transported by the Nile (alluvial lands), are fertile, the lack of the irrigation water has left the area uncultivated.

3) Topographic Condition

The Project Area gently inclines towards northeast by the slope of about 1/5,000 to 1/10,000 and its topography can be specified into two: one is the flat plain represented by the inundated area in the northern part and the other low hillock lands at elevation ranging from about EL. one to three meters extending in the southern part.

The flat plain, developing at elevation ranging from EL 0.25 to EL 0.5 meters, is observed along the drains running around the Project Area and along the Ramses drain running through the center of the Project Area from southwest to north. Since this area, being very flat and inclining slightly towards north, is inundated for most of the year and tends to show comparatively low soil salinity with that of the high-lying lands. Shut-out of the water to the area from the Manzala Lake will facilitate the development of the area.

On the other hand, the hillock area provides continuous low hillocks at elevation ranging from about EL. one to three meters, and several small hills with an elevation of some ten meters are observed among hillocks. There are a few historic remains in this hillock area, which are to be excluded from the development programme for preservation. Several hollow lands among the hillocks provide salt lakes the size of which is as small as below some ten hectares in the water surface area. As discussed in the Chapter on Soils, a considerable salt accumulation has been observed in the top soils in this area. (Refer to topographic map)

B-2. RIVERS AND CANALS

The rivers and the canals related to the Project Area are the Nile (Damietta branch), the El Salam canal, Bahr Hadous drain, Bahr Saft drain, Ramses drain and Bahr Baqar.

1) Damietta Branch

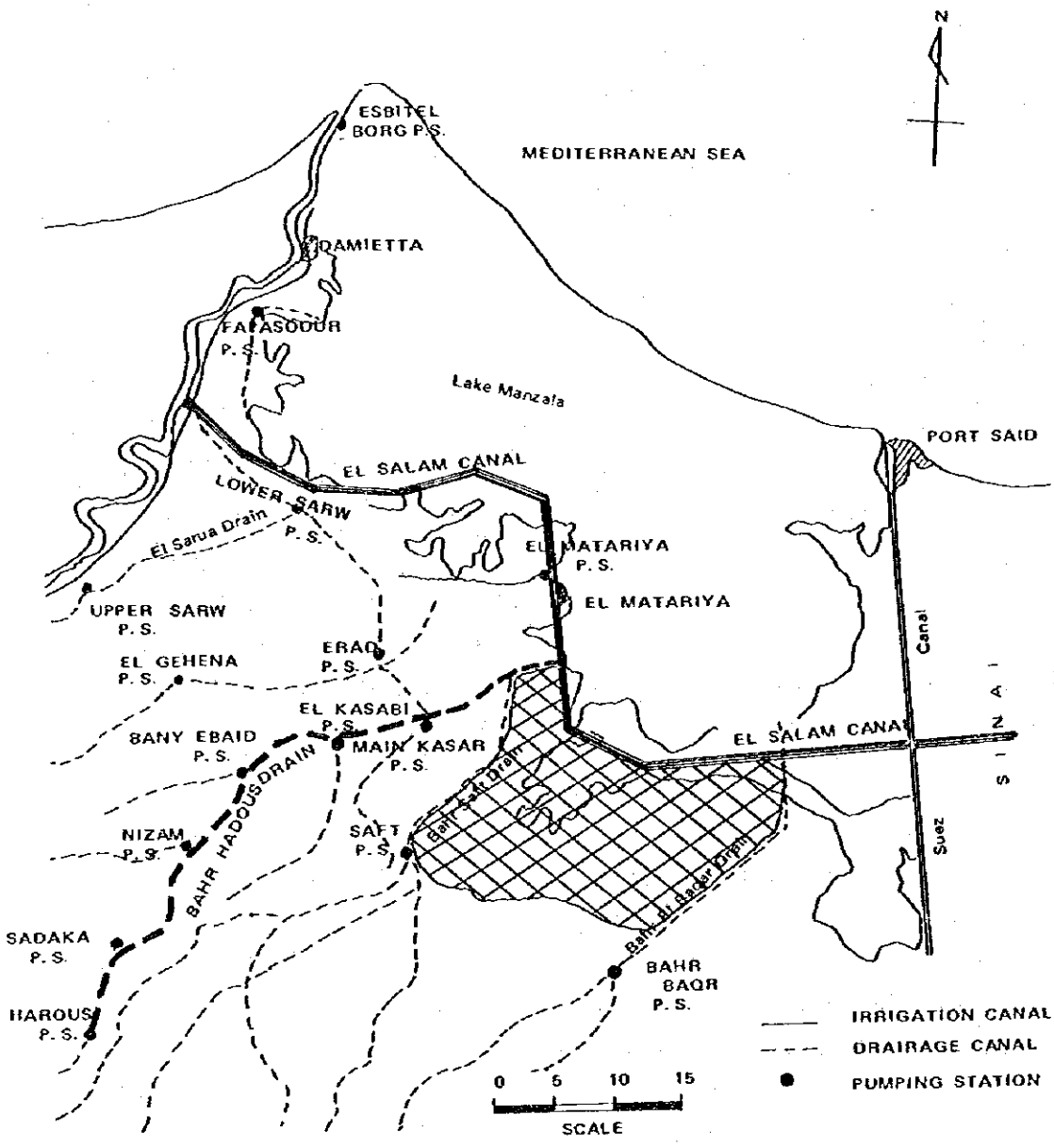
The Damietta branch of the Nile, which is a source of fresh water to be supplied to the El Salam canal, runs from south to north 80 km west of the Project Area. The ten meters high estuary dam was constructed at the river mouth of the Damietta branch at the nearly same period when the Aswan High Dam was provided. This estuary dam has completely shut out the sea-water. The diversion water to this branch river is regulated in its discharge by the Delta Barrage located about 20 km north of Cairo. The Damietta branch, providing the Zifta Barrage (about 80 km north of Cairo), is regulated in its discharge through that Barrage. (Refer to Fig. B-2-1). Since no water level control facilities are installed with the estuary dam, currently a temporary waste water way with capacity of 46 cu.m/sec (4 MCM/day) and Enania canal have functioned to eliminate the surplus water in the Damietta branch. (Refer to Fig. B-2-2 and B-2-3)

2) El Salam Canal

The El Salam canal, which is now under construction, is the canal that irrigates an area of about 250 thousand hectares (about 600 thousand feddans) including the Project Area. The canal construction works are staged into two, the first stage, covering about 80 km between the aforesaid Damietta branch and the Suez canal, will be completed by 1984, while the second stage aims at extending the canal up to the Sinai area as well as enlarging the dimensions of the El Salam canal.

The Ministry of Irrigation has a plan to install pump units within few years so that even partial irrigation can be secured for the proposed irrigable areas to be turned into farm lands as early as possible. (Refer to Fig. B-2-4 and B-2-5)

Fig. B - 2 - 1, Proposed El Salam Canal and Bahr El Hadous Drainage Network



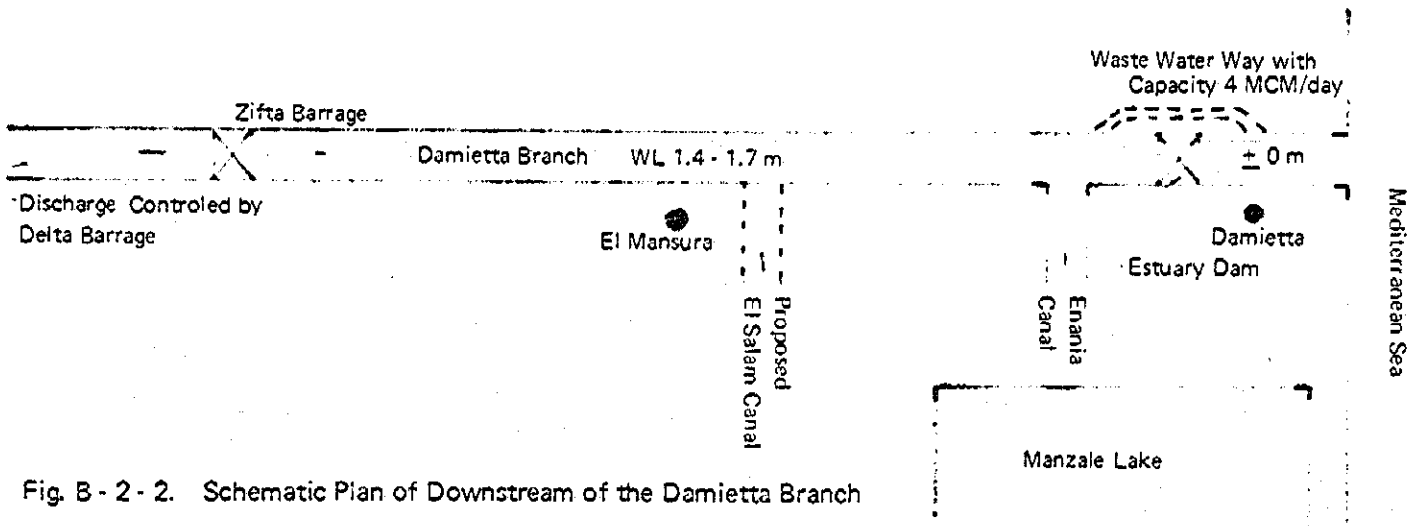


Fig. B - 2 - 2. Schematic Plan of Downstream of the Damietta Branch

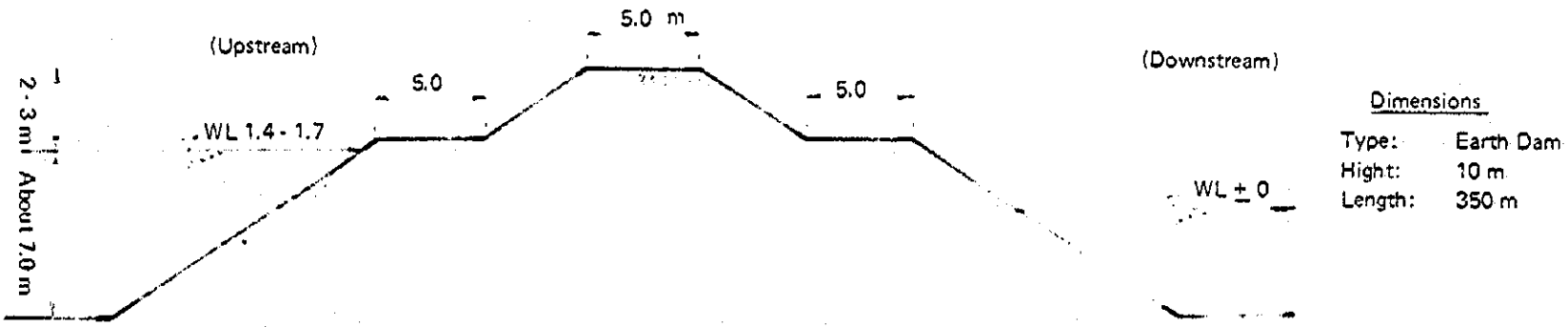
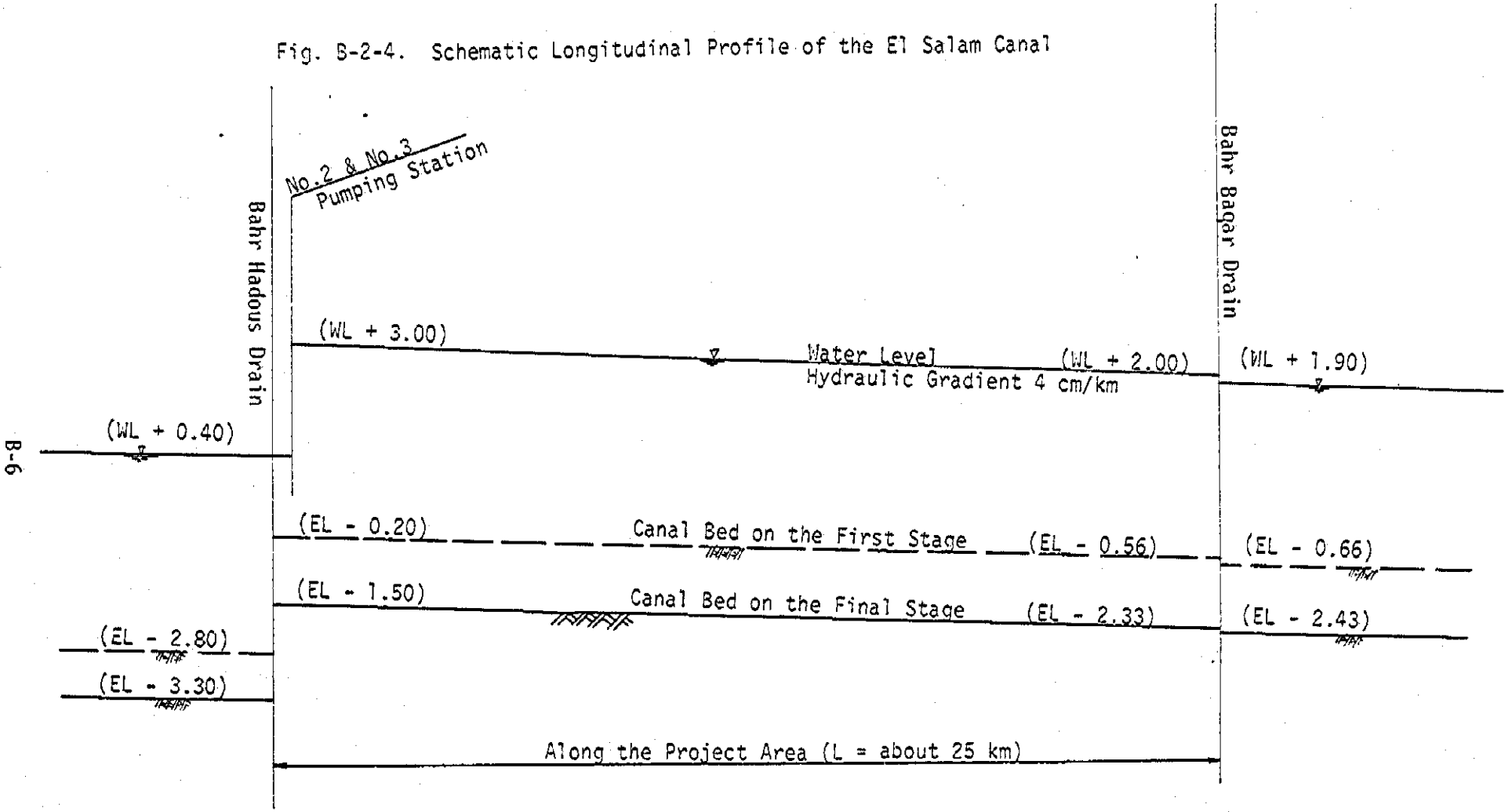


Fig. B - 2 - 3. Cross Section of Estuary Dam on the Damietta Branch

Fig. B-2-4. Schematic Longitudinal Profile of the El Salam Canal



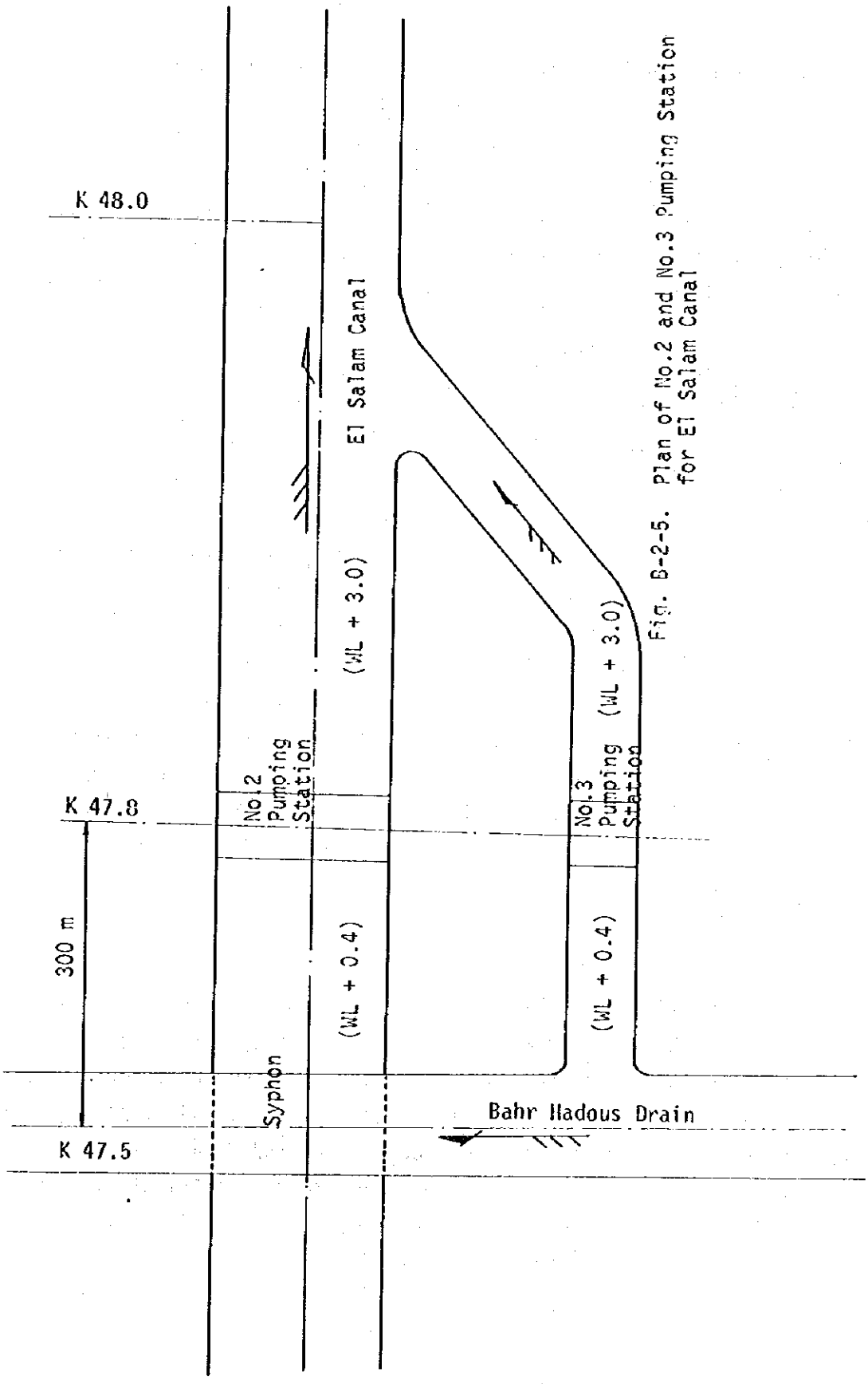


Fig. B-2-5. Plan of No.2 and No.3 Pumping Station for El Salam Canal

The water resources for this irrigation programme depend upon the fresh water diverted from the Damietta branch of the Nile and the drain water to be supplied through the Bahr Sarw and the Bahr Hadous and these waters are used for irrigation of the proposed area after mixing with each other at the maximum rate of 1:1. Such mixing of the waters results in reasonable salinity concentration rate in water by nearly 800 ppm which falls in a range applicable to the irrigation use. (See Appendix B-1)

3) Bahr Hadous Drain

The Bahr Hadous drain is one of the major drainage canals in the East Delta, commanding a catchment area of about 2,300 sq.km with an annual runoff of about 3,000 MCM. The water quality analysis indicates that the water is required to be diluted by fresh water for irrigation use due to having the salinity concentration ratio ranging from 1,200 to 2,700 ppm and the Sodium Absorption Ratio (SAR) ranging from 12 to 22 on an average. Particularly, in February when the run-off discharges decrease in amount, these values come to utmost, and the monthly discharges observed in a period from July to September come to its peak by 300 MCM/month (≒ 116 cu.m/sec). The water quality under the present situation can not fit for irrigation water, but can serve as the leaching water in the early stage. (Refer to Fig. B-2-6, B-2-7 and Appendix B-2)

4) Bahr Saft Drain

The Bahr Saft drain, one of the major drainage canals for the farm lands in the upstream area (the southern part) and a branch of the above-mentioned Bahr Hadous drain, annually discharges the water of about 740 MCM. This drain is the western boundary of the Project Area and other areas. The farmers settled down in the area along the drain utilize the drain water in order to cultivate the 0.5 - 1.0 km width lands for cropping paddy, cotton, maize, etc. (Refer to Fig. B-2-7, Appendix B-3).

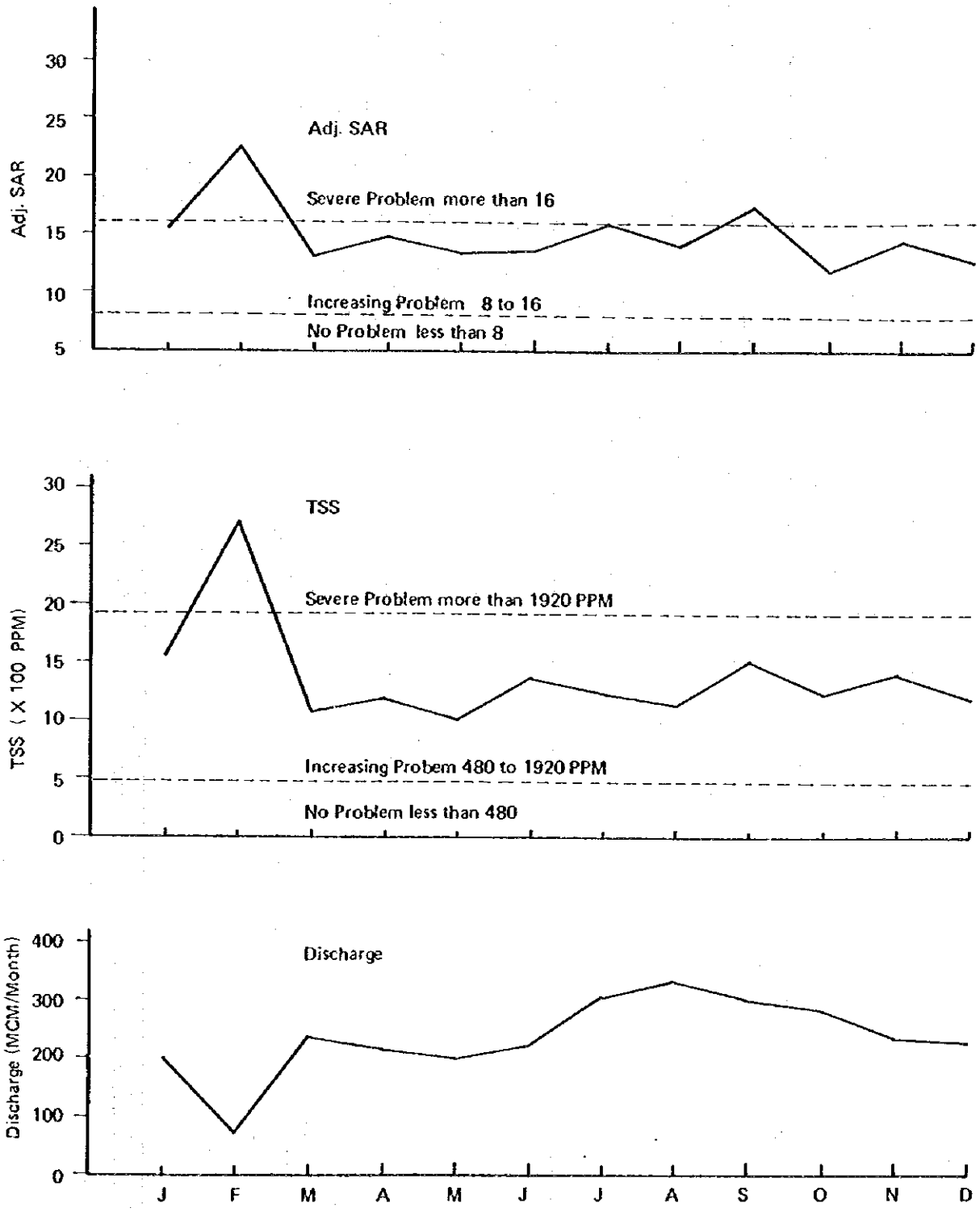


Fig. B - 2 - 6. Water Quantity and Quality at Most Down Stream Reach of Bahr Hadous (1978)

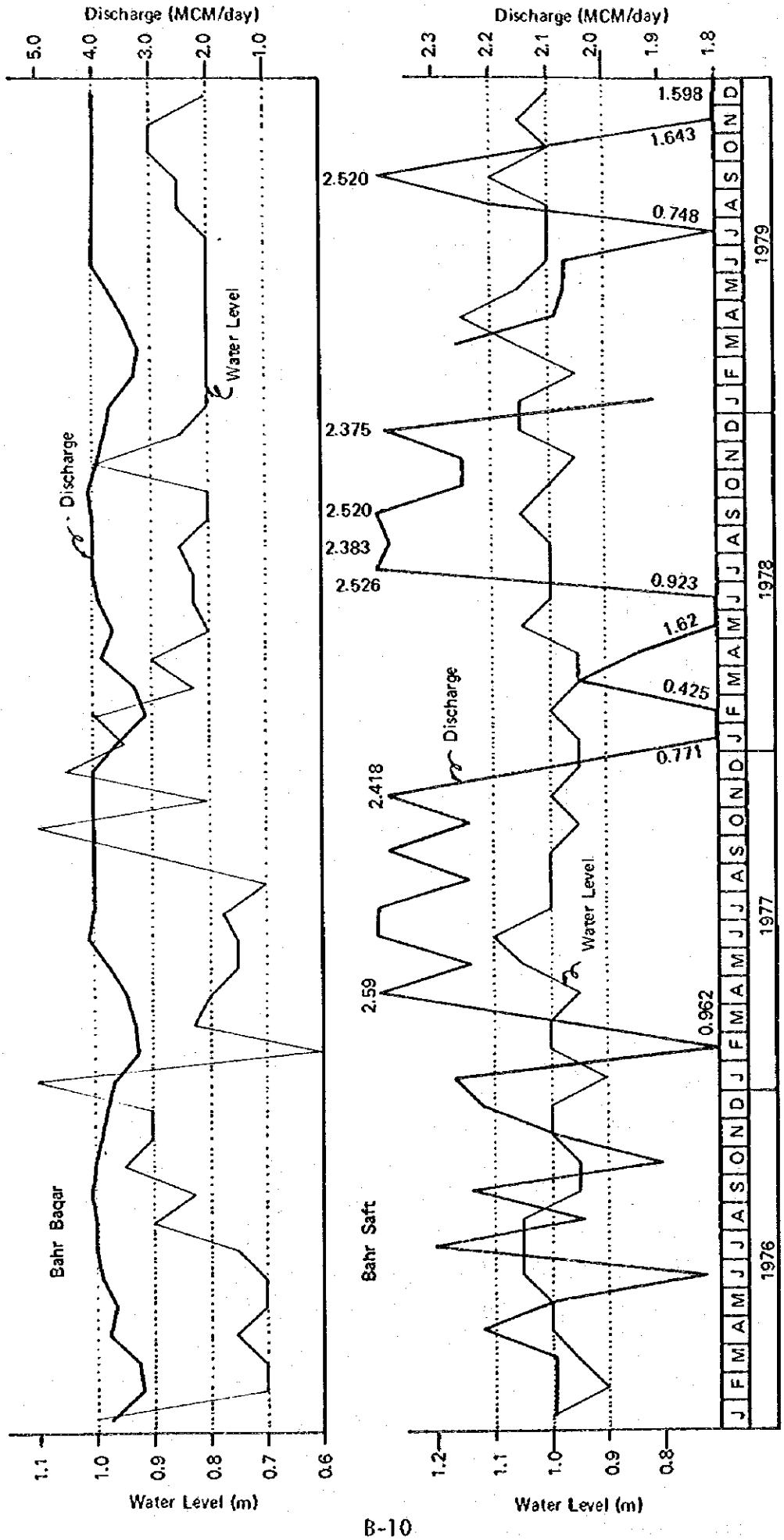


Fig. B - 2 - 7. Water Level and Discharge of Bahr Baqar and Saft Drain

5) Ramses Drain

The Ramses drain, branching off from the Bahr Saft drain at the north of San El Hagar village, flows down through the Project Area from southwest to north. This drain was constructed as a linking canal through navigation for the low-lying lands with San El Hagar and those villages located along the shore of the Manzala Lake. However, the recent construction and improvement of the road networks around the Project Area have decreased the importance of the drain as navigation canal. Because road networks had been constructed for the vehicle transportation around the Project Area. In the El Salam canal construction plan, this drain will be closed at the cross point.

6) Bahr Baqar Drain

The Bahr Baqar drain, the eastern boundary of the Project Area, functions to drain the sewage waters emitted mainly from Cairo, the national capital, and many other villages and settlements in the East Delta. The discharge usually keeps constant in its monthly amount to reach 1,400 MCM per annum. The waters discharged through the drain is not suitable for irrigation with strong malodor given off. These waters currently unsuited to irrigation, however, could be recycled as irrigation water when proposed sewage treatment plants would be constructed.

B-3. METEOROLOGY AND HYDROLOGY

B-3-1. General Meteorology

Climate in Egypt can be roughly classified into two: the semi-tropical climate prevailing in the southern part in the considerably arid zone and the Mediterranean climate prevailing in the northern mild zone. The Project Area, being in the northern part of the country as mentioned in section B-1, belongs to the Mediterranean climate zone.

Furthermore, the country is specifically divided into nine agro-climatological areas as follows:

1. Coastal Area
2. Central Delta Area
3. Desert Delta Area
4. Giza Area
5. Area in Lat. 29° - 27.5°N
6. Area in Lat. 27.5° - 26°N
7. Dakhla Area
8. Khanga Area } Lat. 26° - 25°N
9. Aswan Area Lat. 25° - 24°N

(Refer to Fig. B-3-1)

The Project Area is situated in a agroclimatological area of No.1 the Coastal Area or No.2 Central Delta Area.

In the northern part of the country, there are in general four seasons in a year just like in Japan; they are the spring for March - May when sand storms blow, the summer for June - August when the daily maximum temperature exceeds 40°C, the autumn for September - November when it sometimes rains and the cool winter for December - February when the lowest temperature is recorded throughout the year.

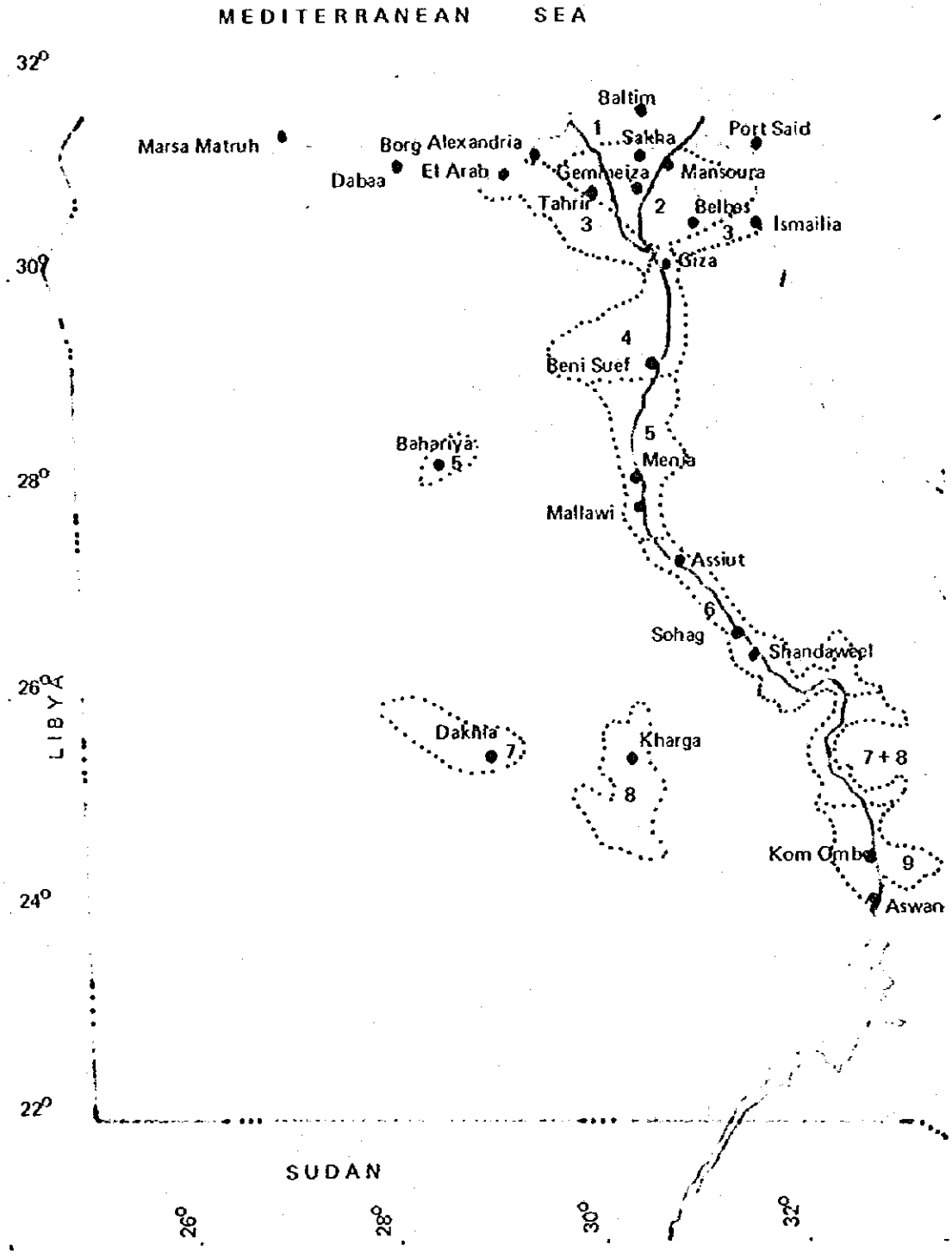


Fig. B - 3 - 1. Agroclimatological Area

Source: Research on Crop Water Use, Salt Affected Soils and Drainage in ARE, FAO, 1975

1) Weather Stations and Observation Period

The weather station, none of which has been found in the Project Area, is selected at El Mansoura among several stations in the vicinity of the Project Area so as for the weather records for the recent ten years (1969 - 1978) to be adopted.

2) General Meteorology

(i) Temperature

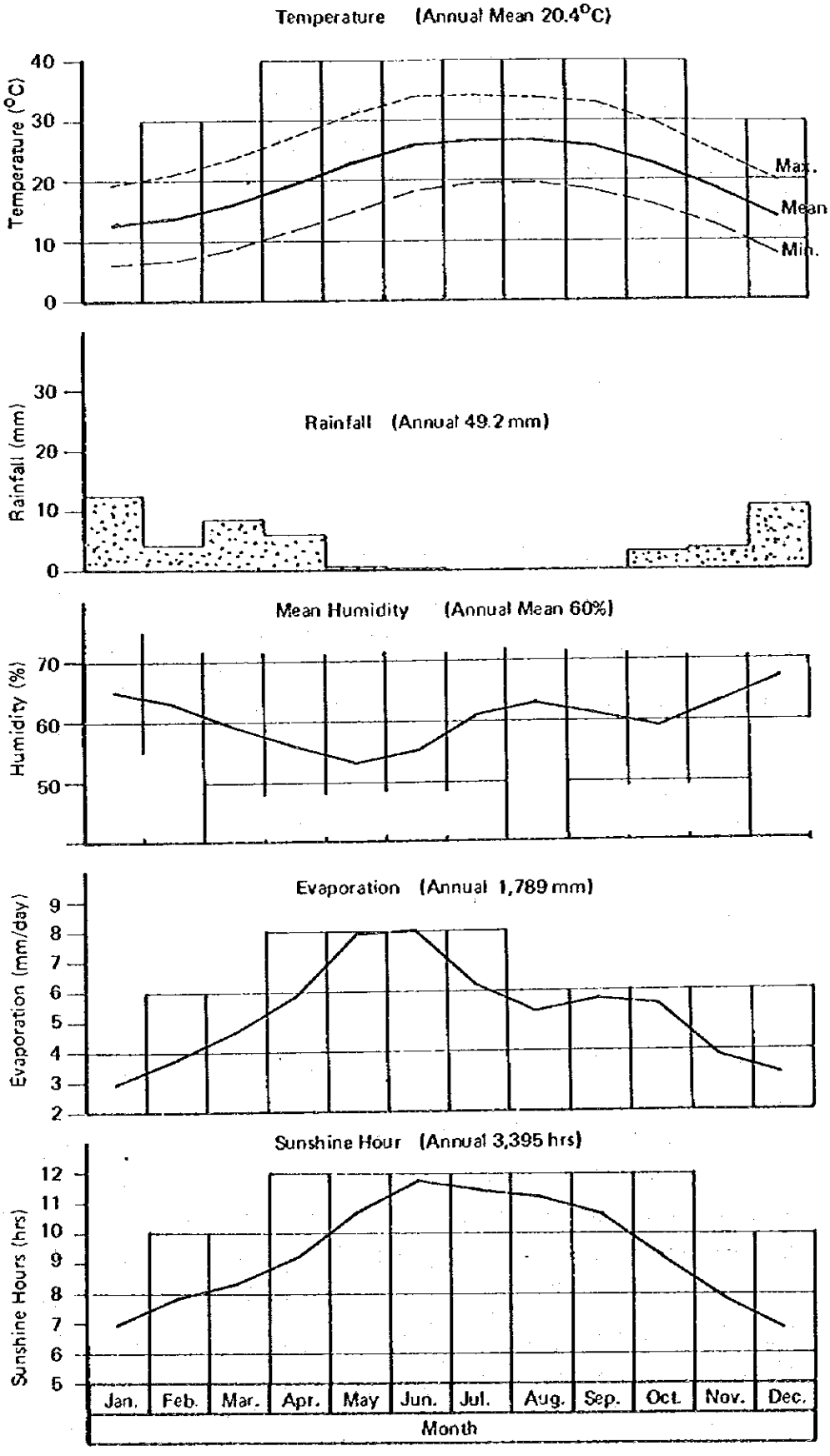
The anuual mean temperature is moderate by 20.4°C, although the monthly mean temperature for three months from June to August exceeds 26°C. On the other hand, the monthly mean in January shows the lowest in a year by 12.6°C. The monthly maximum temperature shows a similar tendency to the monthly mean temperature; that is, for five months from May to September, the monthly maximum mean exceeds 30°C, whereas the monthly maximum in January is 19°C. The monthly minimum mean temperature, showing a similar tendency to the monthly mean temperature is high in the summer season, whereas low in the winter season, particularly low by 6°C in January. There is no remarkable secular change observed in temperature for the last decade. In June, the daily maximum temperature rises over 45°C, which sometimes causes high temperature injuries to nursery of crops. (See Fig. B-3-2)

(ii) Rainfall

The annual average rainfall is about 50 mm, about 50 percent of which concentratively takes place in December and January.

In the summer season, May to September, almost no rainfalls are observed. The annual rainfalls have a considerable fluctuation from year to year, and for the last ten years, only 18.4 mm were observed in 1976, whereas 89.1 mm in 1971; the rainfalls in 1971 are five time as much as those in 1976. The monthly rainfalls also vary in amount from year to year. Under such little and unstable rainfalls, rainfed agriculture is not expected to be successfully carried out. (Refer to Fig. B-3-2)

Fig. B - 3 - 2. Meteorological Conditions



Station: El Mansoura, Observation Period: 1969 to 1978

The raining days with 0.1 mm rainfall count 16 days throughout the year, about half, seven days, of which appear in December and January. Furthermore, raining days with over 1.0 mm rainfalls count 13 days throughout the year, six days of which appear in December and January.

(iii) Humidity

Annual mean humidity is 60 percent, and three months from April to June are the most dry months of the year, the average humidity during which is indicated by some 50 percent. However, the humidity by 50 percent is rather high as compared with some 30 percent observed in the southern arid zone. (Refer to Fig. B-3-2)

(iv) Evaporation

The annual average of daily evaporation is measured by 4.8 mm/day, which can be converted into total 1,739 mm/year. The maximum evaporation is observed in June by 8.0 mm/day, while the minimum in January by 2.9 mm/day. The fluctuation in evaporation has a similar tendency to the fluctuation in temperature. The annual average evaporation in the Project Area is estimated at 1,800 mm which is relatively lower than that observed at more than 2,000 mm in the southern part of the country. (See Fig. B-3-2)

(v) Sunshine hours

The annual average sunshine hours are estimated at 9.3 hrs/day which is totaled to more than 3,400 hrs. in a year. This value is about 70 percent higher than that of 2,000 hrs. in Japan and this means that the country land is considered suitable to agriculture with plenty of sunshine throughout the year. Especially, for five months from May to September, the sunshine available exceeds ten hours a day. (Refer to Fig. B-3-2)

Regarding the wind, there is no remarkable change observed in direction and speed between the summer and winter seasons. Only in the spring season, the wind speed increases to around four meters per second on an average, slightly more than two to three meters in other seasons. The wind direction is from northwest to north or northeast in the seasons except for the winter when the southwesterly wind often blows. (Refer to Fig. B-3-3, more detail observation data are shown in Appendix B-4)

B-3-2. Specific Meteorology

The maximum daily rainfall recorded took place on October 27, 1937, by 48.0 mm/day. The maximum temperature recorded was on June 18, 1933, by 46.8°C and the second highest in May, 1941, by 45.5°C, while the minimum temperature recorded was 0°C on February 17, 1934. These records are quoted from the data covering 30 years from 1931 to 1960.

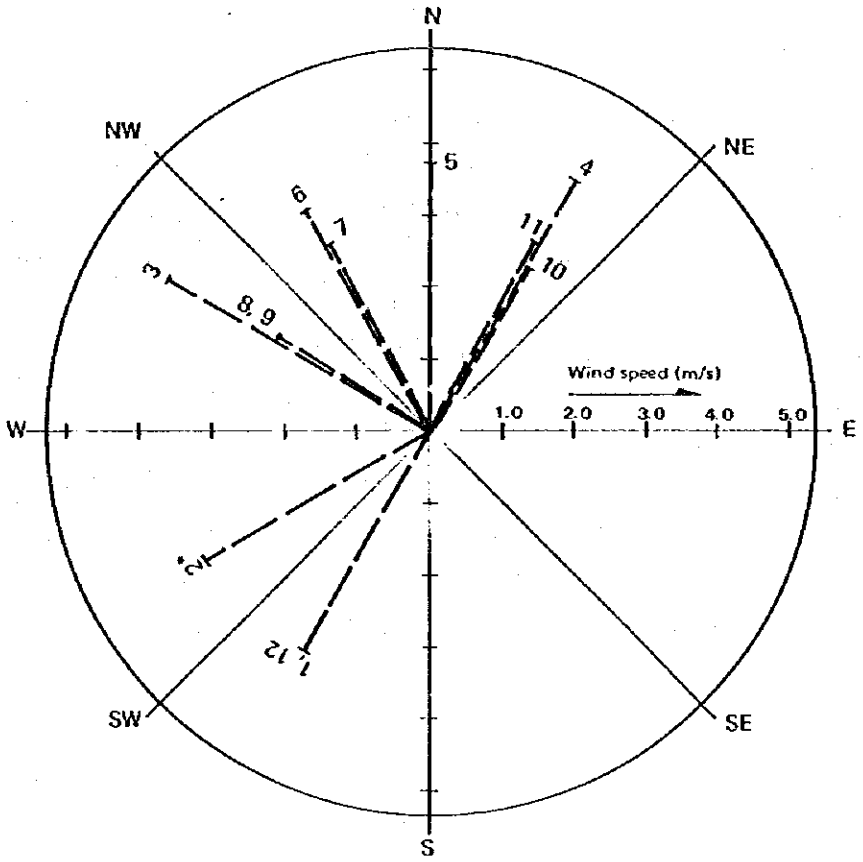
No data are recorded on such natural calamities as typhoons and torrential rains. In April or May, there are sand storms taking place several times, which, lasting less than a day long, have caused no serious damage to the crops grown in the Area.

B-3-3. Hydrology

1) General

As mentioned in B-2, rivers, drains and canals related to the Project are five courses including the El Salam canal, and the discharges of these flows have been observed at the respective pumping stations or drainage outlets. Most of these discharges have been found affected by the diverted water amount from the Nile. The barrages, pumping stations and main branch canals under the control of the Ministry of Irrigation have been halted in their operation in diversing, flowing and lifting waters every winter (in February in the case of the last year) for giving the operation and maintenance services. Under the situation, the discharges of almost rivers and canals decrease in February. In the other seasons except above

Fig. B - 3 - 3. Wind Direction and Speed



Station: El Mansoura

Observation period: 1969 to 1978, 10 years

Note: * Month 1 – Jan., 2 – Feb., ...

mentioned month, the discharges and the water levels fluctuate so little that these rivers and canals are said to be under best-control.

(i) Bahr Hadous drain

The Bahr Hadous drain, which is one of the major water sources of the El Salam canal, commands a drainage area of about 2,300 sq.km, almost equivalent to that of the Kumano river (2,360 sq.km) in Japan. This drain is the largest drain in the East Delta, pouring into the Manzala Lake with total annual outflow of about three billion cubic meters. The Bahr Hadous, as well as the other drains, decreases in its discharge in February when the discharge is reduced to 72 MCM/month, about 30 percent of the monthly average discharge of 237 MCM/month. The specific discharge is measured by about four cu.m/sec/sq.km which is larger than about one cu.m/sec/sq.km of the average specific droughty discharge in Japan. (Refer to Table B-3-1)

(ii) El Salam canal

The basic plan of the El Salam Canal Project defines that out of the above-mentioned discharges, 35 MCM/month (15 percent of the average discharge or about 50 percent of the monthly discharge in February) will be diverted for recycling use in the first stage, while about 220 MCM/month (93 percent of the average discharge) in the final stage.

(iii) Bahr Saft drain

The Bahr Saft drain is the branch drain located at the mostdownstream portion of the Bahr Hadous, and its annual average discharge amounts to about 740 MCM/year, which is converted to 63 MCM/month. In February, the monthly discharge decreases in its amount to 1/5 - 1/3 of the monthly average discharge in the similar tendency of the discharge in the Bahr Hadous drain.

Table B-3-1. Water Quality of Bahr Hadous and Saft Drain

	(1978)											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Bahr Hadous[1/]												
Discharge (MCM/month)	201	72	238	213	201	220	307	333	303	285	238	230
TSS (PPM)	1,540	2,704	1,071	1,192	1,021	1,334	1,254	1,130	1,489	1,231	1,404	1,194
Adj. SAR	15.4	22.5	12.9	14.6	13.3	13.5	15.7	14.0	17.4	11.8	14.3	12.6
Bahr Saft[2/]												
TSS (PPM)	1,151	3,680	1,152	896	960	1,168	1,088	1,131	1,184	1,088	1,344	1,184
Adj. SAR	11.1	31.5	13.3	22.8	11.7	16.9	15.5	13.2	14.8	6.5	6.3	12.1

Note: 1/ Most down streem reach

2/ At Bahr Saft pumping station

(iv) Bahr Baqar drain

The Bahr Baqar drain, the major draining river in the East Delta, has the annual average discharge of about 1,380 MCM/year, which is converted into the monthly average of 115 MCM/month. Like the other drains, the Bahr Baqar drain decreases in its discharge in February. In this case, however, the daily average discharge decreases to about three MCM/day, almost 80 percent of the monthly average basis daily discharge of four MCM/day. This may be caused from the fact that the discharge of the Bahr Baqar largely consists of sewage water as compared with those in other drains.

(v) Ramses drain

Absence of the observation data of discharge for the Ramses drain is unabled to provide detailed information on this drain, and the survey and study made in this time have allowed to estimate the discharge capacity by about six cu.m/sec (about 0.5 MCM/day).

2) Water Quality

The water quality discussed in this paragraph is only concerned with the irrigation water, and the quality for the potable water is discussed in the other annex on Rural Development.

Qualitative suitability of water for irrigation is determined through the comprehensive study on crops, irrigation method, farming, farm management, climate, soils, etc. The allowance of water quality for irrigation use varies from crops to be grown and their growing stages and furthermore will vary from crop breeding. (See Fig. B-3-4, B-3-5)

The FAO's guideline of water quality for irrigation indicates the standard values as shown in the following Table B-3-2. According to this standard, the water quality in the Bahr Hadous drain is specified into the class of "Increasing Problem". Being the case as

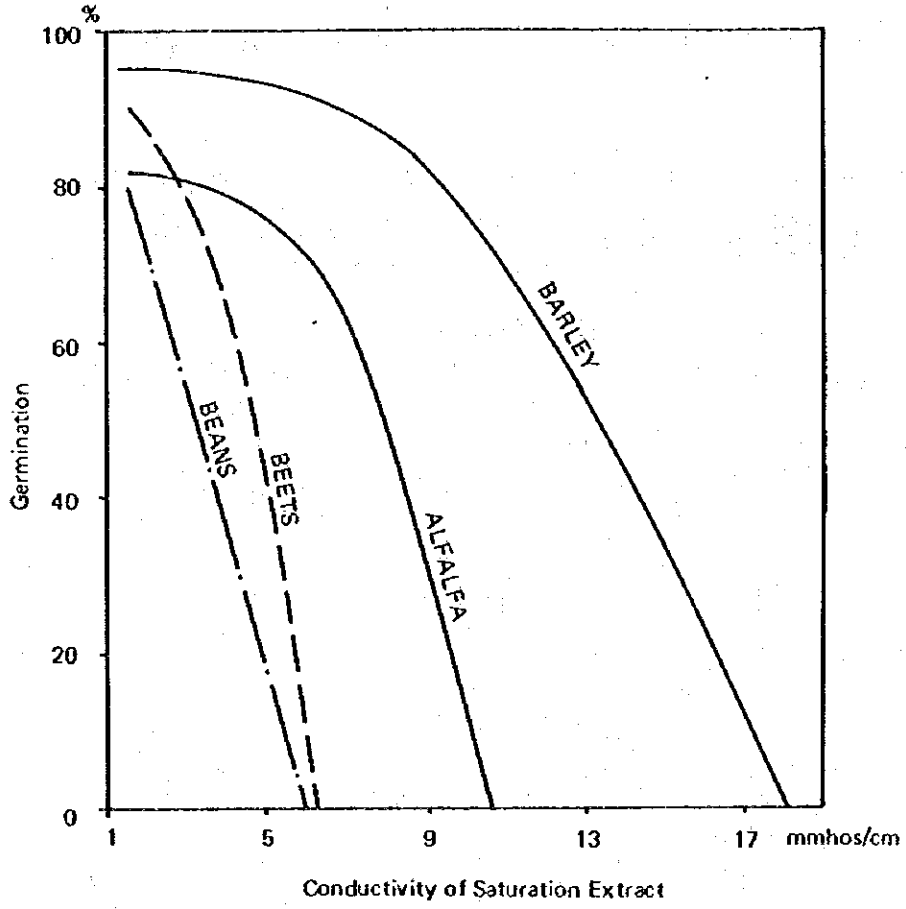


Fig. B - 3 - 4.
Percent Germination of Four Crops, as Related to the Conductivity of the Saturation Extract of the Soil, under Laboratory Conditions
(Ayers and Hayward, 1949)

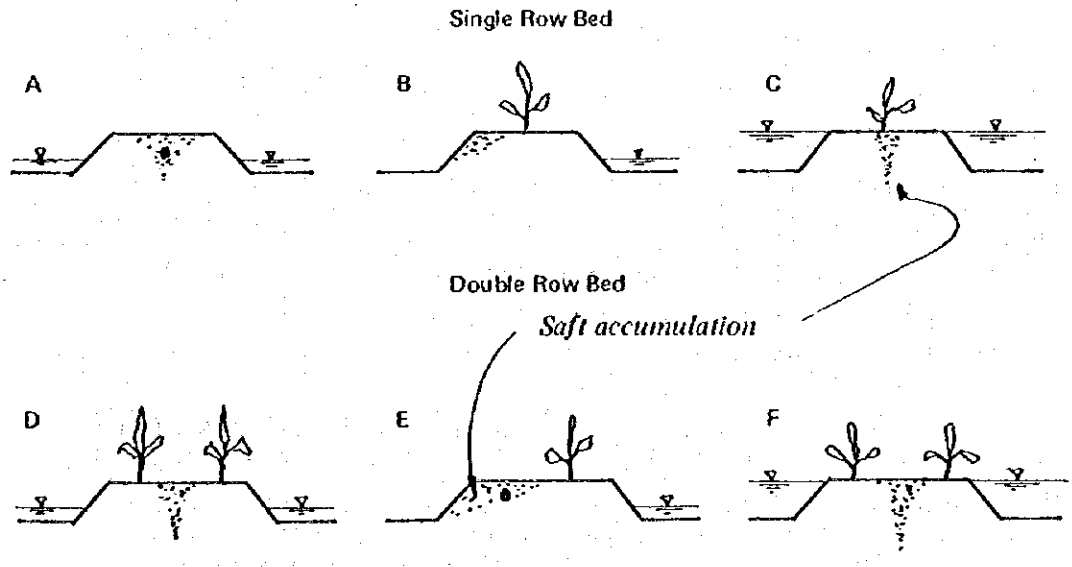


Fig. B - 3 - 5. Flat Top Beds and Irrigation Practice
(Bernstein, Fireman and Reeve - 1957)

Table B-3-2. Guidelines for Interpretation of Water Quality for Irrigation

Irrigation Problem	Degree of Problem: No. Problem	Increasing Problem	Severe Problem
Salinity (affects crop water availability)			
ECw (mmhos/cm)	< 0.75	0.75-3.0	> 3.0
Permeability (affects infiltration rate into soil)			
ECw (mmhos/cm)	> 0.5	0.5-0.2	< 0.2
adj.SAR [1/] [2/]			
Montmorillonite (2:1 crystal lattice)	< 6	6-9 [3/]	> 9
Illite-Vermiculite (2:1 crystal lattice)	< 8	8-16 [3/]	> 16
Kaolinite-sesquioxides (1:1 crystal lattice)	<16	16-24 [3/]	> 24
Specific Ion Toxicity (affects sensitive crops)			
Sodium [4/] [5/] (adj.SAR)	< 3	3-9	> 9
Chloride [4/] [5/] (meq/l)	< 4	4-10	> 10
Boron (mg/l)	< 0.75	0.75-2.0	> 2.0
Miscellaneous Effects (affects susceptible crops)			
NO_3-N (or)NH_4-N (mg/l)	< 5	5-30	> 30
HCO_3 (meq/l) [overhead sprinkling]	< 1.5	1.5-8.5	> 8.5
pH	[Normal Range 6.5 - 8.4]		

1/ adj.SAR means adjusted Sodium Adsorption Ratio.

2/ Values presented are for the dominant type of clay mineral in the soil since structural stability varies between the various clay types (Rallings, 1966, and Rhoades, 1975). Problems are less likely to develop if water salinity is high; more likely to develop if water salinity is low.

3/ Use the lower range if ECw < 0.4 mmhos/cm;
Use the intermediate range if ECw = 0.4 - 1.6 mmhos/cm;
Use upper limit if ECw > 1.6 mmhos/cm

4/ Most tree crops and woody ornamentals are sensitive to sodium and chloride (use values shown). Most annual crops are not sensitive.

5/ With sprinkler irrigation on sensitive crops, sodium or chloride in excess of 3 milliequivalents per liter (meg/l) under certain conditions has resulted in excessive leaf absorption and crop damage.

< means less than

> means more than

such, the water of this drain will not be applicable directly to irrigation.

Furthermore, according to the Classification of Irrigation Water in the Agricultural Handbook by USDA, the water in this drain is specified into the classes from C3 - S3 to C4 - S4. (Refer to Fig. B-3-6).

The symbols of "C" and "S" in this case are defined as follows:

HIGH-SALINITY WATER (C3) cannot be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected.

VERY HIGH SALINITY WATER (C4) is not suitable for irrigation under ordinary conditions, but may be used occasionally under very special circumstances. The soils must be permeable, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching, and very salt-tolerant crops should be selected.

HIGH-SODIUM WATER (S3) may produce harmful levels of exchangeable sodium in most soils and will required special soil management —— good drainage, high leaching, and organic matter additions. Gypsiferous soils may not develop harmful levels of exchangeable sodium from such waters. Chemical amendments may be required for replacement of exchangeable sodium, except that amendments may not be feasible with waters of very high salinity.

VERY HIGH SODIUM WATER (S4) is generally unsatisfactory for irrigation purposes except at low and perhaps medium salinity, where the solution of calcium from the soil or use of gypsum or other amendments may make the use of these water feasible.

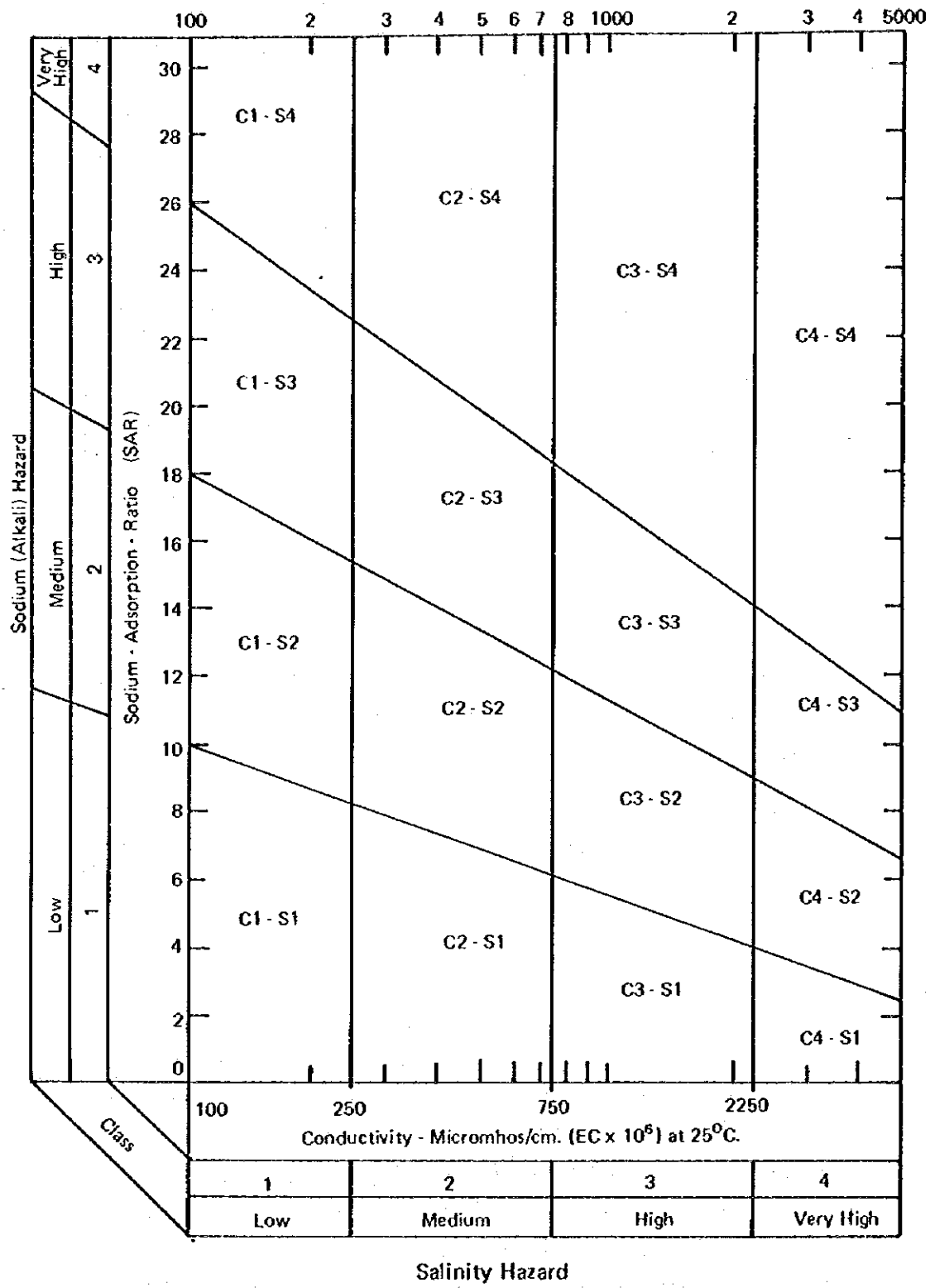


Fig. B - 3 - 6. Diagram for the Classification of Irrigation Waters

Source : Agriculture Handbook 60, U.S. Dept. of Agriculture

Under the circumstances, the irrigation with the waters in this drain without any treatment is expected to cause considerable harm to the crops. As the basic plan of the El Salam canal provides a scheme to introduce fresh water of the Nile and to mix it up with the water in this drain for the use as irrigation water.

Since the field survey and water quality analysis carried out this time have revealed that the waters in other branch drains like the Bahr Saft, Ramses drain, etc. show the values of C and S almost in the same levels as those of the Bahr Hadous, the said waters will not be applicable without any treatment. (Refer to Annex C)

According to the soil analysis for the Project Area, the soils have very high salinity concentration in a range from 30 mmhos/cm to 88 mmhos/cm. Lowness in salinity concentration (1,000 - 2,000 ppm) of the waters in the rivers and drains as compared with that of these soils permits the water to be used as leaching water for the newly reclaime lands. (Refer to Table B-3-3). This is proved by the fact that the farm lands extending along the Bahr Saft drain are grown to various crops under irrigation with the water of this drain.

Table B-3-3. Average Salinity in Soil

Soil Series	Soil Type	Acreage ha	Acreage feddan	Acreage %	EC mmhos/cm	Salt %
Clay Swamp	Ms 1	5,400	12,860	17	43	2.8
	Ms 2	1,490	3,200	5	66	4.2
	Ms 3	6,180	14,700	20	30	1.9
sub-total		13,070	30,760	42	39	2.5
Port Said	Ps 1	4,980	12,180	16	73	4.7
	Ps 2	2,340	5,570	7	81	5.2
	Ps 3	2,640	6,280	8	64	4.1
	Ps 4	1,170	2,790	4	88	5.6
	Ps 5	1,400	3,330	5	86	5.5
sub-total		12,530	30,150	40	75	4.8
Manzala	Ma 1	2,050	4,870	6	82	5.2
	Ma 2	3,090	7,350	10	77	4.9
	Ma 3	660	1,570	2	52	3.3
sub-total		5,800	13,790	18	76	4.8
Total		31,400	74,700	100	61	3.9

Note: EC x 640 = PPM

Source: Soil Analysis by MOLR (soil laboratory)

Appendix B

Appendix B-1

Summary of the "Peace Channel" Project

The following Summary Report on the study of the Peace Channel Project is translated from the Arabic version.

Summary of the "Peace Channel" Project

In a preface to my study prepared by the Ministry of Irrigation of Arab Republic of Egypt, President Anwar El-Sadat, writes that the Suez Canal Region, with its unique world situation, should not stop at the western edge of the "Canal", but that its future populousness and prosperity be expanded into the heart of the Sinai within a comprehensive plan so that it becomes truly a land of a new life and a guiding pattern to Egypt as we wish before the end of this century.

Engineer Mohammed Abdel Hadi Samahi, Minister of Irrigation and State for Sudanese Affairs stated in his introduction to the study that the constant increase in the population of Egypt, year after year, had become one of the most difficult problem which confronts and threatens the development programes; it necessitated such a great departure to implement programes of agricultural expansion, both vertically and horizontally to meet the needs of a people which look forward to an increased satisfaction of its necessities.

The Minister added that the Nile has been and will continue to be the essential element and original given of life and civilization in its valley and that Egypt's name was associated with the Nile since "Egypt is the gift of the great Nile", and to increase the surface of the Arab lands, the high Dam was constructed to ensure a comprehensive revival in both agriculture and industry.

Agriculture development, he said, continued to be the main creator of economic development of the country and shall remain to be so for a very long time thus contributing to the agricultural industrialization and the formation of new communities in the reclaimed lands.

If water resources occupy nowadays a prominent place in the world's interests, as the foundation for agricultural development, it was natural for Egypt to start to exploit this national wealth outside the valley and the Delta by drawing a new agricultural map for Egypt to ensure

the nourishment and feeding of its people and offer new opportunities for work.

With the return of peace in Sinai, an entirely new place was opened in May 1971 following the Rectification Revolution for Liberation, constitution and rehabilitation reformation of the human-being, beginning with the Eastern part of the Delta which extends from the Eastern and Western sides of the Suez Canal to the Sinai region, where water resources are so abundant as to effect a successful and settled agricultural development; it was thus necessary to lay down an integrated and consistent plan to utilize every drop of water from the various sources such as the fresh water from the Nile branch at Domietta, the drained water suitable for irrigation as such or mixed with fresh water, rain water on the north-east coast which can be used as it is or stored in the valleys, the ground water in the Sinai which can safely be drawn for irrigation and drinking and other development purposes.

From all these various sources, the use of available drain water proves important in this region it requires a dual investment in that benefit to a degree, can be derived from drained water to irrigate and from fresh to expand the selection of surfaces for horizontal expansion in conformity with the quantity, quality of available water becomes important, it so consorts with the ideal conditions of the region north of Delta in general and with the region east of the Delta in particular to deduct a certain expanse from the northern lakes, drain it, reclaim it and add it to the productive agricultural land since the lake's land is characterized by its good soil, economic costs of reclamation, its speedy response to cultivation and by its reaching the maximum productivity in a very short time as compared to other parasite, limey or sandy lands.

The Minister concluded by saying that the peace channel project is one of the important executive projects which the Ministry of Irrigation is undertaking to translate the water horizontal expansion policies to the year 2000 into an actual and effective plan in beginning with one of the most important region for future horizontal expansion,

which represents the eastern door of Egypt and the wide horizon, to effect a comprehensive development by absorbing, without any limitations, efforts, funds and labour with immediate benefits and support to the national economy.

1. "The Peace Channel" Project

Between the Notion and the Decision.

Attention was drawn to Sinai and the east of the Suez Canal for a picture of the future of this great expanse of land when rehabilitated and constructed as the basis of new society and exploiting a new source of permanent wealth for the country.

Since the horizontal expansion of agriculture in Sinai requires the transportation of irrigation water to it, in addition to what is available of other sources such as rain and ground water it was necessary to have an integrated look linking the east of the Suez Canal and Sinai with the west of the Suez Canal from the viewpoint of the comprehensive development projects in view of the organic ties of the two sides as they encompass a single region i.e. the region of the eastern Delta being an integrated strategic region.

When the horizontal expansion was first conceived in the eastern Delta region some few years ago, there was a proposal (suggestion) to feed the north-east region of the Delta and the north of Sinai with fresh water from the Nile through a new channel drawing its water from "Jareshour Viaduct" (to be constructed at the site of the present Dam) on that branch of the Nile at Domietta.

This channel is not an attentive or a substitute to the expansion and deepening of the "Ismailia Channel", work which began a few years ago by the Ministry of Irrigation in accordance with pre-determined phases of execution, but they are two integrated projects designed to provide irrigation water to waste areas east and west of the Suez Canal; it represents the greatest horizontal expansion decided within the framework of the horizontal expansion plan in Egypt until the year

2000 so that the proposed expansion in this region would reach approximately 1.50 million feddans (Egyptian acres).

Field studies were pursued and numerous plans were suggested and discussed in relation to the course of "The Peace Channel" the water drainages and the areas to be irrigated.

In 29 November 1978, the Minister of Irrigation decided to establish a technical committee to study the projects relating to the horizontal expansion of the region lying east of the Delta, to lay down an integrated plan of the sources of irrigation waters and to plan to public water courses for irrigation and draining, the site of the necessary pumps to raise and run the water to determine the water disposals and the priorities for the execution of the projects.

The committee laid down the broad lines of the project "The Peace Channel" its course and decided to complete the detailed studies of the project along the following bases:

1) Determined that the total areas to be irrigated by "The Peace Channel" is approximately 600 thousands feddans of which 200 thousands feddans is located in the west side of the Suez Canal representing the first phase of the project 400 thousands feddans in "SAHL EL TINA" and in the coastal area between "ROMANA" and "AREISH" till the QANTOURY division WL 5.00 in Sinai, representing the second phase of the project.

2) "The Peace Channel" draws its water from the right bank of the Domietta branch of the Nile at 204 kilometer in front of the Fareskour Viaduct to be built on the Nile branch at the site of the present Dam.

3) The water level of the Nile water in front of the Fareskour Viaduct will be drawn at WL 1.70.

4) The water levels behind "The Peace Channel" source will be WL 1.50 at the maximum requirements.

5) Agreement on the general plan for the course of "The Peace Channel" as outlined in the attached maps, after ensuring that this course is distant from the salt mines region.

6) The longitudinal hydraulic slope of the water of "The Peace Channel" will be 6cm/kilometer.

7) The longitudinal slope of the channel bed in the neighbouring distance of "BOHEIRET EL MANZELA" will be 3cm/kilometer to avoid an increase in the depth and its consequent difficulty of executing certain industrial work.

8) The reutilization of some of the drained water of "BAHR HADOUSS", the lower "SARCO" in irrigation mixed it with fresh water in "The Channel".

9) It was determined to mix drain water with fresh water by a proportion of 1:1.25 (fresh water: drain water), provided that periodic analysis of the water is carried out during the period of cultivation and the amendment of the proportion of the mixture in the light of any evolution in the characteristics of both the water and the soil.

10) "The Peace Channel" project is to be executed in two phases: the first phase is in a hydrological sector to absorb the necessary mixture of drain and fresh water to irrigate 200 thousand feddans in west side of the Suez Canal. The second phase is to expand the irrigation area at additional 400 thousand feddans in Sinai. Thus the total area to be irrigated would finally be 600 thousand feddans by applying the irrigation water from "The Peace Channel".

Accordingly, "The Peace Channel" project has a well defined features and objective following the approval of its broad lines, since subsequently the technical competent organs have taken over the task of preparing the detailed plans and studies, as well as the executing documents and work programmes.

2. The Geography of the Project

The project is situated in the area between latitude 40° 30' and 25° 31', and longitude 45° 31' + 45° 33'.

"The Peace Channel" crosses, in its course, the governorates of Domietta, Dakahlia, Sharkia, Port-Said and northern Sinai.

The horizontally expanded area to be irrigated covers 200 thousand feddans in the west side of the Suez Canal in the following governorates:

Domietta, Sharkia, Port-Said

and

400 thousand feddans in the east side of the Suez Canal in the governorate of north Sinai.

3. Description of the Project:

3-1 "The Peace Channel" draws its waters from the Nile branch at Domietta at 204 km in front of Fareskour Viaduct to be built at the present site of the earthy Dam. The water level behind the source of "The Peace Channel" is established at WL 1.50.

3-2 The source of "The Channel" was chosen at this site to avoid inhabited areas and to conduct "The Channel" along the course of some existing water courses, which would facilitate the execution of the work and prevent, as far as possible, the fragmentation of agricultural lands, as well as to exploit the present bridges, especially that the majority is suitable for motor traffic.

3-3 "The Peace Channel" runs in the south-east direction along EL HERNA drain until the pumping station of the lower "SARW" drain in order to utilize around two MCM per day of the water of the drain to be mixed with the water of "The Peace Channel". This feeding will be accomplished through the free flow from the drain to "The Channel" at 13.50 km on "The Channel".

3-4 According to the hydraulic slope of 6 cm/km agreed by the committee, the water level at 17.50 km on "The Channel" will reach WL 0.05 where a pumping station will lift the water level from WL 0.05 to 2.25 in conformity with the topography conditions of the region and the technical requirements to design "The Channel".

3-5 "The Channel" behind the pumping station runs an eastern direction parallel to the Long Sea Drain, leaving 100 meters between the utilities of "The Channel" and drain to cover the line of filtration.

3-6 "The Channel" crosses at 34.65 km the "Long Sea Drain" and proceeds in a southern direction and continues until it crosses BAHR HADOUS drain at 48 km where a lifting and mixing-station will be constructed from WL 0.05 to WL 3.00 on "The Channel".

3-7 "The Channel" behind the lifting and mixing station, proceeds in a southern direction and curves towards the east until it meet the Suez Canal at km 27.8 (numbered Suez Canal) whereby the length of "The Channel" from its source until this spot is in approximately 82 km.

3-8 The water of "The Peace Channel" will be carried through a conduit under the Suez Canal to the proposed extended lands to be irrigated in the Sinai.

4. Natural characteristic of the region of the project:

4-1 Climate: It is considered to be the prevailing climate of the mediterranean basin.

The following tables show the temperature, humidity, evaporation, rains, speed of wind according to the meteorological stations at Mansoura, Ismailia and Port-Said.

Under these meteorological conditions, it can be said that the region is fit for cultivation of many crops through the year.

Climate observations of the meteorological station at Mansoura

Data		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Max. daily temperature	(°C)	19.1	20.6	23.2	27.2	33.3	33.3	32.7	33.5	32.6	28.8	25.9	21.3
Max. monthly temperature	(°C)	28.5	34.2	38.5	42.5	45.5	46.8	41.3	40.6	42.0	40.5	36.9	31.5
Min. daily temperature	(°C)	7.1	7.5	9.4	12.0	15.6	18.7	20.5	20.6	19.1	17.2	14.0	93
Min. monthly temperature	(°C)	0.4	-	2.0	4.2	6.2	13.0	16.0	10.2	12.3	10.4	5.2	2.7
Av. daily temperature	(°C)	11.9	12.3	15.2	17.7	21.4	25.2	25.8	25.8	24.0	21.9	18.2	13.7
Av. humidity	(%)	70	68	66	58	52	57	69	71	78	77	71	71
Rate of evaporation	(mm/day)	2.5	3.8	4.6	7.1	9.3	9.8	6.4	5.2	5.7	5.6	4.1	3.3
Rainfall	(mm)	10.2	8.5	5.6	2.5	4.3	0.5	-	-	0.1	4.5	6.2	10.5
Max. daily rainfall	(mm)	20.0	20.5	27.0	24.3	35.3	25.0	-	-	4.0	48.0	45.0	22.0
Av. wind speed	(km/h)	10.7	12.0	11.8	11.5	10.5	9.4	7.4	5.7	6.3	6.8	8.7	10.9
Hourly rate of sun-shine	(hrs)	10.4	11.1	12.0	12.9	13.7	14.1	13.9	13.2	12.4	11.4	10.6	10.2

Table 1) Climate Observation of the meteorological station at Ismalia
Latitude 03°31' Longitude 23°31'

Item		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Maximum daily temperature	(°C)	19.9	21.1	23.9	28.7	31.2	35.1	35.1	30.1	37.8	30.8	25.7	21.6
Maximum monthly temperature	(°C)	26.9	28.5	32.9	40.0	43.9	46.0	40.8	39.9	38.5	37.2	26.5	28.4
Minimum daily temperature	(°C)	7.1	7.7	9.9	13.0	12.1	19.5	20.9	12.2	19.2	16.4	12.8	8.9
Minimum monthly temperature	(°C)	0.2	4.2	4.6	6.8	11.0	16.0	18.2	18.1	10.2	9.7	5.2	4.8
Average daily temperature	(°C)	12.7	13.6	16.4	20.3	23.2	26.9	27.4	27.4	28.5	25.4	22.4	14.4
Average humidity	(%)	61	63	40	38	41	43	53	55	52	58	61	6
Rate of evaporation	(mm/day)	4.2	5.0	7.5	10.6	10.1	11.9	10.3	9.3	7.8	7.1	4.5	4.1
Rainfall	(mm)	8.4	2.1	7.3	0.5	4.6	-	-	-	-	2.9	9.6	3.1
Maximum daily rainfall	(mm)	8.0	3.6	6.0	1.8	6.0	-	-	-	-	11.1	23.0	3.0
Average wind speed	(km/hr)	-	-	-	-	-	-	-	-	-	-	-	-
Rate of hourly sun-shine	(hrs)	10.5	11.2	12.0	12.9	13.6	13.9	13.8	13.2	12.4	12.4	10.7	10.3

Climate observations of the meteorological station at Port-Said

Item		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Maximum daily temperature	(°C)	18.1	18.1	20.2	22.2	25.6	28.5	30.4	30.8	29.7	27.3	24.1	19.8
Maximum monthly temperature	(°C)	25.0	32.5	35.0	38.3	44.9	41.2	38.0	36.9	35.9	37.0	35.3	28.5
Minimum daily temperature	(°C)	11.4	12.0	13.6	16.8	19.6	22.4	24.1	24.9	23.8	21.8	18.5	13.6
Minimum monthly temperature	(°C)	0.1	2.2	0.9	8.2	11.7	18.6	20.3	22.0	18.8	14.4	9.6	7.5
Average daily temperature	(°C)	14.3	14.8	16.4	18.8	22.0	25.0	26.7	27.3	26.1	24.1	20.9	16.3
Average humidity	(mm.)	73	70	78	71	71	72	73	73	70	69	72	74
Rate of evaporation	(%)	4.7	5.4	6.5	6.4	6.8	7.4	7.5	7.3	7.8	7.9	5.9	4.5
Rate of rainfall	(mm)	12.4	11.3	8.5	2.7	2.6	-	-	-	0.2	7.3	9.1	17.6
Maximum daily rainfall	(mm)	11.6	15.3	10.9	22.8	19.5	-	-	-	5.4	39.6	18.0	47.7
Average wind speed	(km/hr)	17.2	19.1	20.5	17.9	15.2	13.7	12.6	10.2	11.7	13.9	16.1	17.4
Hourly rate of sun-shine	(hrs)	10.4	11.1	12.0	12.9	13.7	14.1	14.0	13.3	12.4	11.4	10.7	10.2

4-2 The topography:

The area in the west side of the Suez Canal represents a part of the Nile Delta. The Manzala lake (BOUHAIRAT EL MENZELA) covers the northern greater part of this area slopes from the south to the north where the elevation in the south parts of the area is a few meters above the sea level and its slopes gradually till it falls a few meters below the sea level at the extreme north.

No detailed topographical maps are available due to the immersion of most of the area by the lake's waters, and therefore, the draining of the 'agreed' areas of the lake will call for the establishment of such maps required by the land reclamation projects as well as by the studies of the water courses for irrigation and drainage to be set up in the region.

As to the areas east of the Suez Canal and in Sinai, surveys will be undertaken as soon as the land reclamation project is begun there; these are essential prerequisite to ascertain all previous changes.

4-3 Classification of the soil:

The region of the project contains different qualities of the soil: salty mud, sandy mud, limey sand. This provides a wide choice of crops, different methods of irrigation suitable to the soil and plant and the water used.

There follows a classification of the soil in the region and the results of chemical analysis.

4-3-1 EL Heisseiniah Plain, south of Port-Said and south of Matareia

4-3-2 The northern coastal plins in Sinai

4-3-3 The salt mine regions in Sinai

5. The areas chosen for horizontal expansion which depend on the waters of "The Peace Channel" are:

50 thousand feddans south of Port-Said
62 thousand feddans north of Heisseneiah Plain
2 thousand feddans in the area confined between the "Peace Channel" and the "Long Sea Drain".
135 thousand feddans in SAHL/EL TINA in Sinai
265 thousand feddans in the coastal region of Sinai between RAMANA and AREISH up to QANTOUR+(5.00).

The total is 600 thousand feddans, of which 400 thousand are in the Sinai and are subject to modification in the light of studies relating to the soil, its suitability for cultivation, the levels of irrigation and lighting required, and other engineering specifications of the irrigation and draining project.

6. Suggested agricultural relations:

These areas shall be used for the cultivation of crops that help the soil, raise its fertility in the early years and others of economy crops.

6-1 Rotation in salty mud lands in the early years

Table (1)

Season	Percentage	Crop
Winder	33%	wheat and barley
	34%	rough alfalfa
	33%	alfalfa
Summer	34%	cotton
	33%	rice
	33%	maize

6-2 Rotation in muddy sand and limy sand lands in the early years

Table (2)

Season	Percentage	Crop
Winter	22%	vegetables
	22%	rought alfalfa
continuous	34%	citrus
	22%	berceem
Summer	22%	vegetable
	22%	peanut
	sunflower	

Water requirements:

The determination as to the area to be reclaimed depends on ascertaining the quantity and suitability of the available water resources.

The assessment of the need for water in the expanded regions is the basis for planning and designing the source to obtain the most economic production.

The water consumption by the vegitation, the adequancy of irrigation and the need for water to wash the salts require study.

The average of water consumption by the proposed crops in any region depends on the type of crop, the meteorological elements especially these average rate of rainfall, the monthly temperature, the monthly percentage of sunshine in relation to the total hours of daylight in the year, the degree of relative humidity and the speed of the wind, the degree of elevation or lowering the ground water level in the area where roots can provide a part of the need for humidity and thus determining the quantities need by the crops for water.

The average of consumption by the various crops can be ascertained from the results of field experimentations or by following the known derivative equations including Blaney-Criddle's equation, Her Grievez's Penman's and Thorn Zwet.

All of these equations follow some elements which determine average of water consumption for crops, thus the results vary from one to other for example the Blaney equation determine the water consumption to the crop according to temperature and length of the day and lab water consumption as follows:

$$U = K.P. (0.457t + 8.13)$$

Where,

U- Water consumption for crop per Mll/month

K- Water consumption of crop

P- Percentate of sun shining per hour in the month to total day hours in the year

t- Average monthly temperature "percentage"

All these factors are measurable but the water consumption factor of crop is estimative and vary from crop to crop according to following factors:

1- Seasons of seeding crops

2- Depth and spreading of roots

3- Thickness of plant's cover and shape of leaves

4- Distances between trees and its highs and directions. All factors require a difference in factor K value for every crop.

The value of a certain crop consumption is instable during its growth according to difference in plant thickness and depth of roots it the begining and the end of seasons.

This study provides examples. It gives the average value of the consumption factor (K) by the Blaney-Criddle's equation for some crops as following table:

Crop	Value of Belini factor
Cotton	0.60 - 0.70
Burceme	0.80 - 0.90
Maize	0.85 - 0.95
Summer vegetables	0.65 - 0.75
Rice	1.00 - 1.10
Beetroots	0.65 - 0.75
Surgar Cane	0.80 - 0.90

As a result of the calculations of water consumption by the suggested crops in the agricultural relation in the project regions, it is possible to establish the water requirements of the main crops in the expanded region where the soil is salty muddy in the west side of the Suez Canal; these will be taken as a basis for the calculation of the water sector and the hydraulic design of the course of "The Peace Channel".

In accordance with the traditional and prevailing system of irrigation the total water requirement in the field by feddan, as per suggested rotation, is 7,000 cubic meter per year. The Ministry of Irrigation, however, now pursues through the evaluation of irrigation in Egypt a policy of reducing the rationing of water to the various crops to meet the need of the plants and vegetation to achieve the most appropriate and economic use of the irrigation water according to the actual conditions of the soil, the quality of water and climate with due regard to the introduction of modern developed methods such as irrigation by sprinkling and by dropping which can be widely applied in the new expanded lands.

There follow two tables showing the water requirements of the main crops in the east region of the Delta and field requirements for water in cubic meter per feddan per month.

Season	Gross Cropping Ratios (%)	Crop	Field requirements for water in cubic meter per feddan/month												Water requirements of crops throughout growth season cu.m/feddan
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
Winter	33	Wheat & Barley	-	350	365	330	-	-	-	-	-	-	160	400	1,605
	34	Alfalfa	-	-	-	-	-	-	-	-	-	325	690	690	1,705
	33	Burceme	-	670	690	765	220	-	-	-	-	335	690	695	4,065
Summer	34	Cotton	-	350	325	305	420	420	655	750	375	-	-	-	3,180
	33	Rice	-	-	-	-	-	180	2,260	1,780	2,630	1,950	-	-	8,800
	33	Beet-root	-	-	-	-	-	545	750	935	470	-	-	-	2,700
Field water requirements for crops in agricultural season in cubic meter/ feddan throughout the year in case of using additional surface irrigation.			-	455	460	470	455	1,220	1,220	1,160	650	215	515	600	7,420

8. Water resources:

8-1 The expansion depends on the east of Delta and Sinai on the following sources of water;

(a) Water available from the "High Dam".
(b) Drain water, as it is or after mixing with channel's waters.
(c) Ground-water that can be safely drawn especially in the Sinai.

8-2 The use of drain water for irrigation needs to be determined according to the condition under which it is used.

The elements that affect the suitability of the waters for irrigation are:

(a) Total concentration of salts
(b) Soluble salts (examples given)
(c) Harmful salts with excess concentration
(d) Availability of irrigation water, priority of irrigation availability of other water resources with reduced salinity which assets washing.
(e) Physical and chemical characteristics of the soils
(f) Adequacy of the drainage methods
(g) Agricultural services and the use of fertilizers
(h) Climatic conditions

The Draining Research Institute carried out a study of the characteristics of the "lower Sarw" and HADOUS Drains and their outflows on the basis of conditions under which their waters would be used in order to determine their suitability for irrigation.

8-3 BAHR HADOUS DRAIN:

During 1978 the studies showed:

(a) It pours in BUHAIRET EL MANZALA and its discharge water amounts to 2.84 Billion cubic meter per year;

(b) The least period of outflow (the winter weir) which takes place in February. The amount of drain water brings about a change in its salinity;

The drain water is reduced from 237 million cubic meter per month as a general rate to 72 million cubic meter during the month of February.

The salinity increase from 1385 parts to the million as a general rate per year to 2704 in February.

The proportion of sodium increases in February to 22.5.

1 table and 3 graphs showing change of discharge and characteristics of water in BAHR HADOUS during year 1978 at outflows.

During 1978

Month	Monthly Discharge (MCM)	Rates of Salinity (p.p.m.)	Ratio of Sodium
January	201	1,540	15.4
February	72	2,704	22.4
March	238	1,071	12.9
April	213	1,192	14.6
May	201	1,021	13.3
June	220	1,234	13.5
July	307	1,254	15.7
August	323	1,330	14.0
September	303	1,489	17.4
October	285	1,289	11.8
November	238	1,404	14.3
December	230	1,194	12.6
Total	2,841	16,622	
Average	237	1,385	

The suitability of waters of irrigation was thus to be determined by its capacity to create salinity and the problems of permeability of the soil.

The waters of HADOUS Drain was found to be of average suitability throughout the year, except February.

The proportion of mixed water to be considered as 1,380 parts per million from the Drain and 250 parts per million from the waters of Nile.

8-4 "EL SARW" Drain: .

The Sarw drain water during 1977 which pours into EL MANZALA lake amounted to 533 million cubic meters per year.

The least period of outflow (the winter weir) occurs in February it reduced the drain water, but the ratio of salinity increases in March:

- The monthly discharge of the Drain is reduced from 44 million (yearly average) to 23 million cubic meters in February.
- Salinity increases from 926 parts to 1,449 parts per million in March.

Two tables and 3 graphs show changes in drain water outflows and characteristics of "lower SARW Drain" at its mouth.

Date	Electric conductivity degree ML/centimeter at 25cC.M	Degree of concentration of salt Part/Mil P.P.M.	Salts/Mm per Lt.								Sodium ratio SAR
			CATION				ANION				
			Sodium	Putasium	Mg.	Calauim	Cloride	CS	P.C	C.	
15/1/77	1.1	796.37			1.35	2.85	2.85	4.95	3.4		3.72
6/2/77	1.56	1,006.85	0.6		1.28	3.16	10.91	1.17	3.9		5.38
27/2/77	1.0	1,270.8	0.9		6.8	4.3	6.3	13.45	0.25		5.36
3/3/77	2.27	1,449.35	1.2		5.8	4.2	6.85	11.45	3.75		5.36
15/3/77	1.0	640.0	0.8		4.4	3.7	4.6	2.0	3.3		0.9
3/4/77	1.7	1,151.5	0.9		3.7	4.3	8.8	5.7	3.4		4.45
15/5/77	0.78	501.7	1.8		2.2	2.3	2.4	1.4	3.5		2.8
19/9/77	1.8	1,186.1	1.8		8.5	3.4	7.4	7.1	4.2		2.8
3/10/77	1.35	858.55	3.3		0.3	2.9	5.4	3.75	4.35		1.5
20/10/77	1.0	636.6	2.5		1.8	3.1	1.1	1.8	5.4		1.4

Changes of Water characteristics at the mouth
of "The Lower SARW"
throughout 1977

Month	Salinity Million CM per month	Salts ratio part/per mil.	Sodium Ratio
January	36	796	3.72
February	23	1,006	5.38
March	45	1,449	5.36
April	39	1,151	4.45
May	59	503	1.90
June	49	1,065	2.17
July	55	1,001	2.52
August	58	920	2.25
September	67	1,189	2.80
October	50	858	1.50
November	39	636	1.40
December	14	540	1.23
Total	534	11,114	
Average	44	926	

The drain waters of the lower SARW, at the month, is considered suitable for irrigation most of the year.

The Research Institute advises that irrigation waters be mixed at the ratio of 1 to 1 with fresh water.

The percent of the sodium must be between 1.23 and 5.38 that means it must be on the limitation which makes any in convenience during the excution.

Table showing calculation of the amounts of water to be drawn (a) from the Nine (b) from "the lower SARW" and (c) HADOUS Drain to irrigate the limit of "the peace Channel" considering that salinity does not exceed 800 parts per million.

Month	Water requirement Monthly	Water requirement Daily MCM	Total Salt t	The Nile Discharge	The Nile Concentration PPM	The Nile Total Salt t	EL SARW Discharge	EL SARW Concentration	EL SARW Total Salt	HADOUS Discharge	HADOUS Concentration	HADOUS Total Salt	Mixed Water Discharge	Mixed Water Concentration t	Mixed Water Total Salt PPM
Jan.	240	8	6,400	4.0	250	1,000	1.0	800	800	3.0	1,540	4,620	8	6,420	802
Feb.	300	11	8,000	4.6	250	2,125	0.5	1,000	500	2.0	2,704	5,408	11	8,033	730
Mar.	305	10	8,000	4.0	250	1,000	1.0	1,449	1,449	5.0	1,071	5,355	10	7,804	780
Apr.	310	10	8,000	5.0	250	1,250	1.0	1,151	1,151	4.0	1,200	4,800	10	7,201	720
May	305	10	8,000	2.5	250	625	1.5	503	754	6.0	1,021	6,126	10	7,254	725
Jun.	570	19	1,520	9.5	250	2,375	1.5	1,065	1,598	8.0	1,330	10,640	19	14,613	766
Jul.	570	19	15,200	9.5	250	2,375	1.5	1,000	1,500	8.0	1,255	10,040	19	13,915	732
Aug.	540	18	14,400	8.5	250	2,125	1.5	920	1,380	8.0	1,130	9,040	19	12,545	697
Sep.	520	14	11,200	7.5	250	1,875	2.0	1,190	2,380	4.5	1,490	6,750	14	10,955	782
Oct.	160	5	4,000	1.5	250	375	1.5	860	860	2.0	1,290	2,580	5	3,715	743
Nov.	340	11	8,800	5.0	250	1,250	1.0	635	635	5.0	1,400	7,000	11	8,885	807
Dec.	390	13	10,400	5.0	250	1,250	0.5	540	270	7.5	1,190	8,925	13	10,715	824

Table showing monthly outflow required from feeding source

Month	Drain Waters			Fresh Water	
	The lower SARW	HADOUS Drain	Total	The Nile	Total
Jan.	30	90	120	120	240
Feb.	15	55	70	230	300
Mar.	30	150	180	125	305
Apr.	30	125	155	155	310
May	45	185	230	75	305
Jun.	45	240	285	285	570
Jul.	45	240	285	285	570
Aug.	45	240	285	255	540
Sep.	60	135	195	225	420
Oct.	45	65	110	50	160
Nov.	30	155	185	155	340
Dec.	15	150	240	150	390
Total	430	1,950	2,340	2,115	4,450

Note: Outflow in MCM per month
Ratio of mixture 1.1 : 1

Estimated according to the needs of the main crops in the expanded region in the East side of the Delta, provided the degree of concentration of salinity does not exceed the allowable rates for irrigation.

8-5 Ratio of the mixture:

(a) After mixing the water, salinity is not to exceed 817 parts to a million for HADOUS Drain.

(b) The maximum proportion of salinity of the mixture is very suitable in the prevailing temperature in Egypt, with due caution to provide deep drainage. The following table shows the degree of salinity that crops can resist at 25°C as reported by the Bureau of Reclamation, Denver, U.S.A.

(c) The waters of the "lower SARW" was used to the maximum extent as it was less saline than that of HADOUSS Drain". The water from EL SARW will be drawn from 0.5 million cubic meters per day at the beginning to reach 2 millioin cubic meters per day, as appropriate, at the mouth in Lake Manzala.

(d) The proportion of the Nile waters to be used will be very high during the month of February because of the high salinity of the drain waters and in order to wash the soil.

Table showing the degree of resistance various crops to salinity at 25°C.
Source: Report of the Bureau of Reclamation, Denver, U.S.A.

Crop	Ratio of salinity not effecting production		Ratio of salinity which reduces production by 10%	
	CM	P.P.M.	CM	P.P.M.
Cotton	10	6,000	17	10,000
Wheat	7	4,500	15	9,000
Rice	5	3,000	9	5,500
Beans (Egyptian)	4	3,000	7	4,500
Soya Beans	5	3,000	10	6,000
Spinach	5	3,000	9	5,500
Tomatoes	4	2,000	9	5,500
Cabbages	3	1,900	8	5,000
Potatoes	3	1,900	8	5,000
Sweet Potatoes	3	1,900	8	5,000
Pepper	3	1,900	7	4,500
Onions	2	1,300	5	3,000
Carrots	1	650	5	3,000
Alfalfa	3	1,900	10	6,000
Beetroots	10	6,000	18	11,000
Green Beans	2	1,000	4	2,000

8-6 Natural water resources

Irrigation water in Sinai has to sources:

Rami water and Tonents. Ramis are centered in the northern coast and usually lessen in the South and East so that the annual rate are suits to 50 millimeters, on the coast in the north the rates reach mm West of Areish increase gradually as we proceed east to 200 mm at RAFH, resulting in Toments sloping to the Gulfs of AKABA and SUEZ feading the sand dunes and penetrating the underground water reservoir. The Sinai Peninsula can be divided into four hydrological regions:

- The North region
- Wadi El Aerish basin
- The torrential pooling region in the Gulf of Suez
- The pooling region in the Gulf of Akaba.

The first two regions only related to the studies of "The Peace Channel".

These follow a description of each of the abovementioned four hydrological regions

8-7 The sources of the transported waters:

The Sinai Peninsula is organically linked with the expansion west of the "Canal" local sources in Sinai are not sufficient to expand cultivation.

The Nile waters must be used in support through arteries under the Suez Canal of which "The Peace Channel" is one artery which will cross the "Canal" at 27,800 km.

9. Hydraulic design of "The Peace Channel" section

(All details were given earlier in this "summary")

Please see page 5 and 6.

Description	Water inclination	Depth of water m	Width of bottom per m	Distance to K- from K		Weir
	6	3.60	32	13,500	mouth	1st
Mixture from lower Sarw of pumps discharge	6	4.05	36	17,000	13,500	2nd
Bahr HADOUS mixing drain	5	3.75	44	48,500	17,500	
	3.5	4.50	60	49,000	48,500	3rd
	3.5	4.45	56	53,750	48,000	
	3.5	4.35	54	63,135	53,750	
	3.5	4.00	52	67,415	63,127	
	3.5	3.90	50	72,325	67,415	
	3.5	3.70	48	77,000	72,325	
	3.5	3.50	46	81,725	77,000	

A table showing specification
of the profile of "The Peace Channel"

==========

It was decided that the designing waters in main channels to be in the least at 50.0" and 10.30l in branches so that the salinity can not effect the waters, thus two pumping stations will be constructed for lifting water of El Salam Channel. One at SARW. The 17.5 km and the other at 58.15 km on the Channel.

The course of the channel was chosen to be near the existing water courses for using the present bridges as paved roots by covering the leaking line between channel and nearby drains.

Observations	Statements of industrial works: Result meter	Foundation level	Pavements: Width m	Pavements: Level	Road: Width m.	Road: Level	Pattern of Salam channel: Bottom Width m.	Bottom Level	Flood water level	Kilometer site	Explanation of the work	No.
Bridge on piles railway level above culvert level concrete ground and natural	.85	-	1.50	3.51	12	3.10	32	2.30	1.65 / 1.60		Nile discharge bridge	1
	.85	-	-	-	-	-	32	2.26	1.54	1,050	Delta railway	2
	-	2.76	-	-	12	3.04	32	1.54	1.54	1,070	Culvert of Shark awa	3
	-	2.80	2.00	3.15	12	3.00	32	2.30	1.53 / 1.50	1,100	Mouth bridge under asphalt Mansoura Domietta	4
Bridge on piles above culvert level bridge on piles above culvert level	.85	-	1.5	2.88	12	2.73	32	2.55	1.23	5,350	Concrete bridge	5
	-	3.17	-	-	12	2.63	32	2.67	1.13	7,200	Ghavamia culvert	6
	.85	-	1.50	2.74	12	2.59	32	2.71	1.09	8,000	Concrete bridge	7
	-	3.21	-	-	12	2.59	32	2.71	1.09	8,000	Karam culvert	8
	-	3.28	-	-	12	2.52	32	2.78	1.02	9,100	Khash culvert	9
	-	3.29	-	-	12	2.51	32	2.79	1.01	9,200	Hagaga channel culvert	10
	.85	-	1.50	2.42	12	2.27	32	3.03	0.77	13,350	Concrete bridge	11
	-	3.79	-	-	12	2.26	32 / 36	3.04 / 3.29	0.76	13,500	Channel's feeder from pumps discharge of lower SARW and culvert discharge under channel	12
	-	-	-	-	12	2.00 / 3.75	32 / 44	3.95 / 1.70	0.05 / 2.25	17,500	Lifting pumps No.1	13

Industrial Works

Observations	Statements of industrial works: Result meter	Foundation level	Pavements: Width m	Pavements: Level	Road: Width m.	Road: Level	Pattern of Channel: Bottom: Width m.	Bottom: Level	Flood water level	Kilometer site	Explanation of the work	No.
Bridge on piles above culvert level	.85	-	1.50	4.73	12	4.58	44	1.72	2.23	17.550	Discharge pumps bridge No.1	14
Bridge on piles	.85	-	1.50	4.52	12	4.37	44	1.93	2.02	22,150	Bridge concrete	15
Bridge on piles above culvert level	.85	-	1.50	4.52	12	4.97	44	2.33	1.62	30,000	First side channel right bank	16
	-	3.07	-	-	12	2.88	44	2.57	1.38	34,850	Tawil drain culvert under Salam channel	17
	-	-	-	-	12	2.88	44	2.57	1.38	35,250	Second side channel left bank	18
Bridge on piles	.85	-	1.50	3.62	12	3.47	44	2.83	1.12	40,150	Concrete bridge under Gamalia road 70 tons	19
Bridge on piles	.85	-	0.50	3.61	4	3.48	44	2.84	1.11	40,180	Bridge Delta Materia Gamalia	20
							44	2.87	1.08	40,950	Port-Said railway Manzala	21
Above culvert level		3.39	-	-	12	2.56	44	2.89	1.06	41,250	South Tawil drain's culvert under Salam channel	22
	-	-	-	-	12	2.20 / 2.07	44	3.10 / 3.23	0.70 / 0.57	47,125	Peace channel culvert under bahr Hadous drain	23
	-	-	-	-	12	2.00 / 4.53	44	3.30 / 1.47	0.50 / 3.03	47.700	Lifting station No/2	24

Industrial Works

Observations	Statements of industrial works: Result meter	Foundation level	Pavements: Width m	Pavements: Level	Road: Width m.	Road: Level	Pattern of Channel: Bottom Width m.	Bottom Level	Flood water level	Kilometer site	Explanation of the work	No.
Bridge on piles	.85	-	1.5	4.68	12	4.53	44	1.47	3.03	47,750	Discharge bridge station no/2	25
	-	-	-	-	12	4.50	35/60	1.50	3.0	48,500	Feeder of channel from Bahr Hadous drain via mixing station	26
	-	-	-	-	12	4.48	60/56	1.52	2.98	48,000	Source of Ramses channel right left	27
	-	-	-	-	12	4.29	56/54	1.68	2.79	53,750	Source of Mohsen island	28
Bridge on piles	.85	-	1.50	4.44	12	4.28	54	1.68	2.79	53,780	Concrete bridge	29
	-	-	-	-	12	4.07	54	1.85	2.57	58,625	Source of Sharkia bank	30
	-	-	-	-	12	3.92	54/52	2.01	2.42	63,125	Om batikh source	31
	-	-	-	-	12	3.92	52	2.01	2.42	63,125	Snakes head island channel's source	32
Bridge on piles	.85	-	1.50	4.06	12	3.91	52	2.02	2.41	63,150	Concrete bridge	33
	-	-	-	-	12	3.84	52/50	2.16	2.34	67,415	Source of Bahr Zaza channel	34
	-	-	-	-	12	3.56	50/48	2.33	2.06	72,125	Source of Ghozlan's island channel	35
Bridge on piles	.85	-	1.50	3.71	12	3.56	48	2.33	2.06	72,150	Concrete bridge	36
	-	-	-	-	12	3.55/3.40	48	2.33/2.43	2.05/1.90	72,325	Channel's culvert under Bahr Baqar drain	37

Industrial work

Observation	Statements of industrial works						Pattern of Channel			Kilometer site	Explanation of the work	No.
	Result meter	Foundation level	Pavements Width m.	Pavements Level	Road Width m.	Road Level	Bottom Width m.	Bottom Level	Flood water level			
	-	-	-	-	12	3.21	$\frac{48}{46}$	2.62	1.71	77,000	Source of channel	38
Bridge on piles	.85	-	1.50	3.35	12	3.20	46	2.62	1.70	77,050	Concrete bridge	39

10-2 Hydraulic data of major industrial works

Mouth bridge

K.M Site	1.100
Maximum forward level	1.53
Backward level	1.50
Minimum backward level	1.30
Maximum balance difference	4.00
Number of openings	5
Width of openings	0.5 m

No. of Units				Absorption level		Discharge			
Extra	Basic	Mini.	Maxi.	Mini.	Maxi.	m^2	mm^3 day	Site	Station
1	4	1.80	2.25	0.50	-	127	11	17,500	station 1/1
1	4	2.70	3.00	0.50	-	127	11	48,500	station 2/2
1	3	2.70	3.00	0.68	-	93	8	48,500	mixture station /3

11. Estimated costs

11-1 Expropriation and survey work relating to lifting, and compensation for wastage.

Cultivation L.E 1,500,000

11-2 Industrial Works

Amount in thousand Egyptian pounds

Serial No.	Kind of work	Unit per No.	Q'ty	Unit Cost	Value
1.	Viaduct at source under asphalt road	"	1	3,000	3,000
2.	Concrete bridges 70 tons load	"	12	200	2,400
3.	Over Bahr El Bakar drain	"	1	2,300	2,300
4.	Bridges for Delta Railways	"	2	150	300
5.	Bridge for Port-Said, Mansoura	"	1	2,000	2,000
6.	Source of lower El Sarw pumps and culvert El Sarw Drain	"	1	1,500	1,500

Serial No.	Kind of work	Unit per No.	Q'ty	Unit Cost	Value
7.	Culvert of the under bahr Hadous Drain	"	1	2,000	2,000
8.	Culverts for secondary channels	"	3	200	600
9.	Culverts for secondary Drains	"	4	100	400
10.	Sources for Drains	"	12	75	900
11.	Coverings	3m	20,000	1,030	600
Total	Estimated costs of industrial work				16,000

11-3 Soil Works

Serial No.	Kind of work	Unit per No.	Q'ty	Unit Cost	Value
1.	Digging and scraping the course to km 82	3 mm	8,000,000	0.002	16,000
2.	Soil works & transport	3 m	1,500,000	0.005	700
Total	Estimated costs of soil work				23,500

11-4 Lifting mixture stations

per 1,000 pounds

Total		Mixture station		Station 2		Station 1		Article
F	L	F	L	F	L	F	L	
17,500	-	4,500	-	6,500	-	6,500	-	Mechanical electrical equipments
1,500	-	500	-	500	-	500		Equipments of diversion station
-	1,800	-	600	-	600	-	600	Electrical line
600	150	200	50	200	50	200	50	Supervision of construction and customes charges
-	5,700	-	1,500	-	2,100	-	2,100	
-	720	-	220	-	250	-	250	Transportation storage construction and iron work
1,2-0	3,500	200	2,500	500	3,000	500	3,000	Construction of pumps station
-	1,200	-	-	-	700	-	500	Inhabitation area
-	2,130	-	730	-	600	-	800	Emergency
20,800	20,200	5,400	5,600	7,700	7,300	7,700	7,300	Total value of articles
41,000		11,000		15,000		15,000		Total estimated expenses

11-5 Culvert for the Channel
under the Suez Canal

Estimated cost	38,000,000

Total Estimated costs of the Project

1. Expropriation & Compensation	1,500
2. Industrial work on the course of the water	16,000
3. Soil work on the stations	235,000
4. Lifting & Pumping stations	41,000
5. Culvert for "The Channel" under Suez Canal	38,000
Total Estimated costs of the Project	120,000

12. Monetary of low for the Project

In millions of E. Pounds

	Local	Foreign	Total
Fifth year 1984	11	1	12
Fourth year 1983	27	8	35
Third year 1982	20	15	35
Second year 1981	14	8	22
First year 1980	13	3	16
Total Costs	85	35	120

The distribution of the needed allocation over the years of the execution of the project was established in accordance with the time table.

A table describing the various work to be done in accordance with the distribution of the financial allocations needed throughout the period of execution 1980 - 1984

= = = = = = = = = = = = = = = = = = =

13. The execution of the project will begin in 1980 and complete in 1984.

13-1 Surveys & compensation.

Lifting will begin in the first year and will terminate around the end of first half of the second year, and compensation work will continue to the end of the fourth year.

13-2 Earth works will be divided into two stages:

(1) From 12.50 km to 72 km length of 54.5 km will take two and a half years.

(2) From the Nile to 17.5 km length 17.5 from 72 km to 82 km, length 10.0 (total (2) 22.5) will take one and half year Earth work 82 km will take 4 years.

The digging of the water course will be done in two parallel lines.

13-3 Tables show the industrial work to be done in two stages.

Executive Period		to		From		km site	Descriptions of works	m
Year	Month	Year	Month	Year	Month			
2	-	2nd	3	1st	4	13,500	Feeder of channel from lower Sarw and culvert discharge	1
							Concrete bridges	2
						17,550	pumps station discharge bridge -1	1
						22,150	bridge 22,150 km	2
						40,150	bridge of Material Gamalia	3
1	6	2nd	12	1st	7	47,750	discharge bridge no -2	4
						53,780	Concrete bridge	5
						63,150	----------	6
1	-	3rd		2nd	1	40,180	Delta Mataria Gamalia railway bridge	3
							Culverts for drains	
1	-	3rd	6	2nd	7	34,850	North Tawil drain	1
						41,250	South Tawil drain	
							Mouths of branches	5
						30,000	Source of side channel right bank, first	1
						35,250	First side channel left bank	2
1	-	3rd	9	2nd	10	49,000	Source of Ramsis channel right bank	3
						49,000	Source of Ramsis left bank	4
						53,750	Source of Mahsam channel	5
						58,625	Source of Bar Sharkia channel	6
						53,125	Om El Batik source	7
2	-	4th	12	3rd	1	1,100	mouth bridge	1

Executive Period		to		From		km site	Descriptions of works	m
Year	Month	Year	Month	Year	Month			
							Concrete bridges	2
							ile bridge	1
						5,350	concrete bridge	2
1	6	4th	12	3rd	1	8,000	- - - - - -	3
						13,350	- - - - - -	4
						72,150	- - - - - -	5
						77,050	- - - - - -	
							Culvert for channels	3
1	-	4th	12	3rd	1	47,125	under Bahr Hadouss	1
2	-	5th	6	34d	7	72,325	under Bahr Bakar drain and manial bridge	2
							Railway bridges	4
1	-	4th	12	4th	1	1,050	Delta railway	1
2	-	4th	12	3rd	1	40,950	Port-Said Manzala	2
							Culverts for branches	5
						1,070	Sharkawia	1
1	-	4th	6	3rd	7	8,000	Karam channel	2
						9,200	Hagaga channel	3
							Culverts for branch channel	6
1	-	4th	6	3rd	7	7,200	Ghanamia drain	1
						9,100	Fashn drain	2
							Sources of branch channels	7
						63,150	Snake's head	1
						17,415	Zaza source	2
-	9	4th	9	4th	1	72,125	Gezlan island	3
						77,000	- - - - - - -	4
						81,725	- - - - - - -	5

13-4 Stone coverings begin in the second year.

13-5 Pumping stations (for lifting & mixing water) will take four years.

13-6 Culvert of the channel under the Suez Canal:

The first year will start with preparatory studies of contracts and finalization of contract procedures.

Execution of the works will start from the beginning of the third year and will last three years.

These follow one table detailing the time table for the execution of the project over the five year period.

14. Economic Benefits of the project:

The study of the economic benefits of the project was confined to the works of the first phase which includes the areas located west of the Suez Canal, totalling 195 thousand feddans as follows:

50	thousand feddans	South of Port-Said
62	" "	North of Heisseniah Plain
73	" "	South of Heisseniah Plain
8	" "	South of Mataria
2	" "	Area confined between "The Peace Channel"
195	" "	and "The long sea Drain"

14-1 The channel and industrial works

On the assumption that the wear and tear of the mechanical and electrical works is 25 years and of the civil works 50 years and that the rate of interest in the case of paying installments over 50-year period is 12% and over a 10-year period is 8%, the price of a kilo watt per hour is 17 millions (0.002).

The construction costs up to 82 km are divided into 50% for the areas of the first phase and 50% for the second phase i.e. "The areas located east of the Suez Canal, amounting to 400 thousand feddans."

14-1-1 Amortization of Capital

The estimated costs of the project:

(in thousands of L.E.)

Description of works	Estimated Costs Local	Foreign	Total
1. Expropriations & compensation	1,500	-	1,500
2. Industrial works	13,000	500	13,500
3. Earth works	23,500	-	23,500
4. Pumping stations	8,370	19,600	27,970
Mechanical & Electtical works Civil works	11,830	1,200	13,030
Total	58,200	21,300	79,500

Annual amortization of fund:

Mechanical & Electrical	0.1275 x 27,970 = 3,566
Civil works	0.1204 x 51,530 = 6,204
Total amount	= L.E. 9,770 thousand

14-1-2 Operation and maintenance costs

- Drained lifting station No.1:	2,545 million m^3/p.a. statically 1.75 meters.
- Drain of lifting station No.2:	2,545 million m^3/p.a statically 2.5 meters.
- Drain of lifting and revising station No.3:	1,905 million m^3/p.s. statically 2.32 meters.

Electric consumption of station No.1	15.8 x 0.6 kw hour
" "	22.5 x 0.6 kw hour
" " of mixing station	15.7 x 0/6 kw hour
Total consumption of Electricity	54 x 0/6 kw hour

Total costs of consumption of electricity 670 thousand L.E.

14-2 Irrigation, drainage and road networks

Irrigation, drainage and roads networks, between 1980 & 1984, will start at the beginning of the project and be completed before the end of the fifth year.

14-2-1 The estimated costs of the networks of irrigation and drainage area:

L.E 100 per feddan to to p.a. interest over 10 years.

14-3 It was estimated that the cost of feddan per annum is 16 L.E including that for lifting equipments, operation and maintenance.

14-4 Land reclamation and cultivation

14-4-1 Reclamation work's phase:

After achieving the irrigation and drainage networks over a 5-year period, the levelling, addition of agricultural improvements fertilizers, deep flowing and creadsing operation under the said and washing will begin and last 1-1/2 year, the cost per feddan in this period is 60 L.E.

14-4-2 & 3 There follows a detailed description of the method of reclamation and cultivation and selection of the appropriate crops.

Two tables are given to show both the period, the season, the type of crop during the years needed for reclamation and for normal cultivation.

Crop	Percentage	Season	Year
Rice	100%	summer	second
Alfalfa	100%	winter	third
Rice	100%	summer	
Alfalfa	100%	winter	fourth
Rice	100%	summer	

14-4-4 A table indicating the reclamation and cultivation costs, the type of crops
The costs per feddan

Annual costs	Cost of area	Per-centage	Cost of feddan	The Crop	Season	Year	Period
	60	100	60	Levelling deep flouring	year and	First 1/2	Reclamation
60				Washing	half	second	
100	100	100	100	Rice	summer	2nd	Agricultural reclamation
	64	100	64	Alfalfa	winter	3rd	
164	100	100	100	Rice	summer		
	64	100	64	Alfalfa	winter	5th	Natural
	50	50	100	Rice	summer		
189	57	50	150	Vegetable			Crops
	21	33	64	Alfalfa	winter	6th	
	43	67	64	Alfalfa permanent	summer		
	33	33	100	Cotton			
164	67	67	100	Rice			

841 Total costs of agriculture and reclamation of a feddan per 6 years.

Natural agriculture rotation
After 3 years of agricultural reclamation, it would come to following rotation;

Crop	Percentage	Season	Years
Alfalfa	100		5th
Rice	5o	summar	
Vegetables	50		
Alfalfa permanent	33	winger	
Alfalfa	67		
Cotton	33		
Rice	67	summer	

A table showing the calculation of the production during the phase of reclamation and cultivation of the lands per feddan.

Total expenses per feddan	1,188 L.E.
Production per feddan over 6-year period	1,266 L.E.
Returns per feddan over the 6-year period	78 L.E.
Returns from the total area	15,210,000 L.E.

Reclaimed lands begin to bring about returns from the fourth year.

At the end of the sixth year the total costs and expenses will be covered with the exception of construction cost of the main course, irrigation and drainage networks, which will be amortized in annual instalments. After deducting these costs the return will be about 15 millions L.E. until the end of the sixth year.

14-5 Annual returns (natural agriculture)

Production per feddan per annum	397.00 L.E.
Total expenses for feddan per annum	26.75 L.E.
Costs of irrigation drainage network	14.90 L.E.
Costs of irrigation	16.00 L.E.
Agricultural costs	164.00 L.E.
Total costs per feddan	221.65 L.E. per annual

175.35 L.E. returns per annum per feddan for the traditional crops and of other crops.

The total annual return will be increased 34 million for 195 thousand feddan.

14-6 That is about 34 million L.E. per annum for the total area of the first phase amounting to 195 thousand feddan (west Suez Canal).

14-6-1 Total costs of the project to the culvert of Suez Canal

	L.E. 79,500 million
Operational and maintenance costs	L.E. 6,030 million
Total costs of construction & operation of the main course	85,430 million L.E.
Total costs for operation and interest over 9 years	152,548 million L.E.
50% for the first period irrigation and drainage 100 L.E. per feddan with 8% interests	42,765 million L.E.
14-7 Total costs of reclamation and cultivation over 9-years period	259,935 million L.E.
Grand Total	412,483 million L.E.
Total returns per feddan over 9-year period	479,115 million L.E.
Total costs and expenses	412,483 million L.E.
Net returns	66,632 million L.E.

Thus the project proved economically beneficial and advantageous.

- The expenses & costs will be covered in 9 years as soon as the first phase is completed, including the period needed for reclamation and cultivation.

- The feddans will give a profit of no less than 175 L.E. per annum in the case of traditional cultivation and more in the case of selection of other crops.

- The crop composition includes alfalfa which will help in the feeding for the annual increase in its profits

15. Evaluation of the project

15-1 Horizontal Expansion

"The Peace Channel" Project will greatly add the economic potentialities to the Egyptian national income, since the surface that will be added to the cultivated land amount to 595 thousand feddans, that are 10% of the present cultivated area.

15-2 Exploitation of the Drain water:

This is considered a drain investment as the drain water used for irrigation and for the provision of fresh water.

15-3 The new communities

Adoption of scientific development in the reclamation of lands and their exploitation will result in establishing new industrial and agricultural communities in addition to the distribution of the population outside the Nile Valley.

15-4 Food security:

The land exploitation system encompasses the following bases:

(a) Harmonization of land characteristics and the crops whose cultivation proves successful.

(b) Provision of necessary foodstuffs specially vegetables.

(c) Provision of vegetables in big amount to some factories, presents in future the help in food preservation.

(d) Ensuring the continued improvement and increase in production by these lands through the cultivated crops.

(e) The crop composition proposed for the project includes the production of animal feed such as alfalfa to ensure the integration of crop and animal husbandries, and the animal husbandry will include.

(1) breading cattle for milk production

(2) by breading sheep for mutton production

(3) fattening cattles for meat production

(4) breading poultry for eggs production

In other words, this plain is to provide for necessary animal foodstuffs especially milk, meat, eggs and the installation of milk products factories as well as to use also the animal's residue as fertilizers, and improving and increasing the productivity of the land.

Finally, having completed the study of "The Peace Channel" which included its economic usefulness, from one side only which is the agriculture, and having shown the importance of the Project it is possible to study the economic benefit of the other project whether industrial or animal breading etc. which increase the value of the project economically and generally. This Project will increase the income return to the economic of the country and ensure the food safety and security and help the population density, provides new opportunities for work, in addition to developing the national wealth.

Appendix B - 2. Monthly Discharge of Bahr Bagar

(Unit: MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1976	116.3	92.8	100.8	114.0	113.2	117.0	124.0	124.0	123.0	124.0	117.0	117.8	1,383.9
1977	113.2	91.0	102.3	103.5	116.3	123.0	124.0	124.0	120.0	124.0	120.0	124.0	1,385.3
1978	111.6	86.8	102.3	115.5	113.8	117.0	124.0	124.0	120.0	127.1	117.0	117.8	1,376.9
1979	114.7	92.4	99.2	102.0	114.7	120.0	124.0	124.0	120.0	124.0	120.0	124.0	1,379.0
Mean	114.0	90.8	101.2	108.8	114.5	119.3	124.0	124.0	120.8	124.8	118.5	120.9	1,381.3
Daily 1/	42.6	37.5	37.8	42.0	42.7	46.0	46.3	46.3	46.6	46.6	45.7	45.1	43.8

Note: 1/ cu.m/sec

(cont'd)

Appendix B - 2. Water Levels & Discharges of Bahr Baqar

Month	1976				1977			
	Level (m)		MCM/day Discharge		Level (m)		MCM/day Discharge	
	Max.	Min.	Average	Min.	Max.	Min.	Average	Min.
Jan.	1.00	1.00	3.750		1.30	0.90	3.650	
Feb.	0.80	0.60	3.200		0.50	0.40	3.250	
Mar.	0.80	0.60	3.250		0.95	0.70	3.300	
Apr.	0.80	0.70	3.800		0.80	0.80	3.450	
May	0.90	0.60	3.650		0.80	0.70	3.750	
Jun.	0.90	0.50	3.900		0.90	0.60	4.100	
Jul.	0.90	0.60	4.000		0.90	0.65	4.000	
Aug.	0.90	0.90	4.000		0.70	0.70	4.000	
Sep.	0.90	0.75	4.100		0.90	0.90	4.000	
Oct.	1.00	0.90	4.000		1.20	1.00	4.000	
Nov.	0.90	0.90	3.900		0.80	0.80	4.000	
Dec.	0.90	0.90	3.800		1.20	0.90	4.000	

(cont'd)

Appendix B - 2. Water Levels & Discharges of Bahr Baqar

Month	1978				1979			
	Level (m)		MCM/day Discharge		Level (m)		MCM/day Discharge	
	Max.	Min.	Average	Min.	Max.	Min.	Average	Min.
Jan.	1.10	0.80	3.600		0.80	0.80	3.700	
Feb.	1.20	0.80	3.100		0.80	0.80	3.300	
Mar.	0.85	0.80	3.300		0.80	0.80	3.200	
Apr.	0.90	0.90	3.850		0.80	0.80	3.400	
May	0.90	0.70	3.670		0.80	0.80	3.700	
Jun.	0.85	0.80	3.900		0.80	0.80	4.000	
Jul.	0.90	0.75	4.000		0.80	0.80	4.000	
Aug.	0.90	0.80	4.000		0.90	0.80	4.000	
Sep.	0.80	0.80	4.000		0.90	0.80	4.000	
Oct.	0.80	0.80	4.100		0.90	0.90	4.000	
Nov.	1.20	0.80	3.900		0.90	0.90	4.000	
Dec.	0.90	0.80	3.800		0.80	0.80	4.000	

Appendix B - 3. Monthly Discharge of Bahr Saft Drain

(Unit: MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1976	64.9	58.6	64.9	67.2	64.9	55.4	71.3	63.1	67.2	58.9	62.8	69.4	768.6
1977	70.3	25.9	64.9	77.7	69.4	72.5	75.0	69.4	72.5	69.4	72.5	64.5	804.0
1978	54.9	11.9	63.5	58.3	50.2	27.7	78.3	73.9	75.6	69.8	67.5	73.6	705.2
1979	59.2	-	70.2	62.6	64.2	62.2	54.2	68.2	75.6	65.1	49.3	49.5	680.3
Mean	62.3	32.1	65.9	66.5	62.2	54.5	69.7	68.7	72.7	65.8	63.0	64.3	739.5
Daily 1/	23.3	13.3	24.6	25.7	23.2	21.0	26.0	25.6	28.0	24.6	24.3	24.0	23.4

Note: 1/ cu.m/sec

Appendix B - 3. Water Levels & Discharges of Bahr Saft Drain

Month	1976				1977			
	Level (m)		MCM/day Discharge		Level (m)		MCM/day Discharge	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	1.00	1.00	2.240	1.944	0.90	0.90	2.296	2.240
Feb.	0.90	0.90	2.240	1.944	1.10	0.90	1.692	0.160
Mar.	1.00	0.90	2.240	1.944	1.00	1.00	2.240	1.944
Apr.	1.10	0.90	2.240	2.240	1.00	0.90	2.940	2.240
May	1.00	1.00	2.240	1.944	1.10	1.00	2.240	2.240
Jun.	1.10	1.00	1.944	1.750	1.20	1.00	2.596	2.240
Jul.	1.10	1.00	2.450	2.150	1.00	1.00	2.596	2.240
Aug.	1.10	1.00	2.130	1.944	1.10	0.90	2.240	2.240
Sep.	1.00	0.90	2.240	2.240	1.10	0.90	2.596	2.240
Oct.	1.00	0.90	1.900	1.900	1.00	0.90	2.240	2.240
Nov.	1.10	0.90	2.240	1.944	1.10	0.90	2.596	2.240
Dec.	1.00	1.00	2.240	2.240	1.00	0.90	2.220	1.944

Appendix B - 3. Water Levels & Discharges of Bahr Saft Drain

Month	1978				1979			
	Level (m)		MCM/day Discharge		Level (m)		MCM/day Discharge	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	1.00	0.90	2.246	1.296	1.10	1.00	2.526	1.296
Feb.	1.10	0.90	0.600	0.250	1.00	0.90	-	-
Mar.	1.00	0.90	2.150	1.944	1.10	1.00	2.526	2.000
Apr.	1.00	0.90	1.944	1.944	1.20	1.10	2.526	1.650
May	1.10	1.00	1.944	1.296	1.10	1.00	2.200	1.944
Jun.	1.00	1.00	1.296	0.550	1.00	1.00	2.200	1.944
Jul.	1.10	0.90	2.526	2.526	1.10	0.90	2.200	1.296
Aug.	1.00	1.00	2.526	2.240	1.00	1.00	2.200	2.200
Sep.	1.10	1.00	2.520	2.520	1.10	1.10	2.520	2.520
Oct.	1.10	0.90	2.250	2.250	1.00	1.00	2.200	2.000
Nov.	1.00	0.90	2.250	2.250	1.10	1.00	1.990	1.296
Dec.	1.10	1.00	2.526	2.224	1.00	1.00	1.996	1.200