

**ISMAILIA GOVERNORATE  
THE ARAB REPUBLIC OF EGYPT**

**FEASIBILITY REPORT  
ON  
THE TENTH OF RAMADAN  
AGRICULTURAL DEVELOPMENT PROJECT**

**MAIN REPORT**

**SEPTEMBER 1982**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

AFT

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国際協力事業団	
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## PREFACE

It is with great pleasure that I present this Report on Feasibility of the Tenth of Ramadan Agricultural Development Project to the Government of The Arab Republic of Egypt.

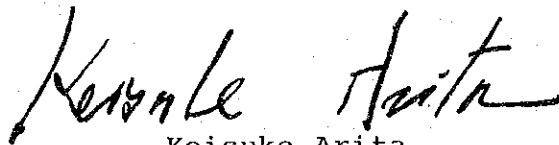
This report embodies the result of a feasibility study which was carried out (in the Eastern Desert area, Ismailia Governorate) from February 2 to April 4, 1982 by a Japanese survey team commissioned by the Japan International Cooperation Agency following the request of the Government of the Arab Republic of Egypt to the Government of Japan.

The survey team, headed by Dr. Yoshizo Mochizuki, had a series of discussions on the project with the officials concerned of the Government of the Arab Republic of Egypt and conducted a wide scope of field survey and data analysis.

I hope that this report will be useful as a basic reference for development of the project.

I wish to express my deep appreciation to the officials concerned of the Government of the Arab Republic of Egypt for their close cooperation extended to the Japanese team.

September, 1982



Keisuke Arita

President

Japan International Cooperation Agency





LETTER OF TRANSMITTAL

Mr. Keisuke ARITA  
President,  
Japan International Cooperation Agency,  
Tokyo, Japan

Dear Sir;

We have the pleasure of submitting herewith the feasibility report on the Tenth of Ramadan Agricultural Development Project in Ismailia Governorate in compliance with the agreement between the Government of the Arab Republic of Egypt and the Ismailia Governorate, and the Government of Japan.

The objectives of the study are to improve the present socio-economic subsistence level in the region through introduction of irrigated agriculture to an area covering about 9,000 hectares of desert area and to contribute to the national food production program.

To attain the objectives, the survey team conducted a field investigation and preliminary studies from February, 1982 to April, 1982 under the general advices of the Supervisory Group. The results of the field survey were summarized into the Interim Report and submitted to the Government of Egypt at the end of March, 1982.

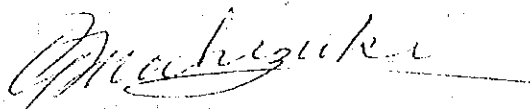
After coming back to Japan, the team made additional studies and analyses. All the results of the field investigation and study at home were compiled into the Draft Feasibility Report on the Tenth of Ramadan Agricultural Development Project, which was submitted to the Government of Egypt in August 1982. With regard to the draft report, discussion meetings were held in Cairo and Ismailia City from August 10 to 17, 1982 with the officials of the Ministry of Economic Cooperation of Egypt and the Ismailia Governorate. They approved the proposed development plan and all the parties concerned in Egypt, the officials and the farmers (the Cooperative Society) to be benefited are eager for the realization of the project under the technical guidance and assistance of Japan.

It is our sincere hope that the project be proceeded to the next stage of the detail design for the early realization of the project in line with the recommendations presented in this report.

In submitting this report, we wish to express our sincere appreciation and gratitude to the personnel of your Agency, the Japanese Embassy in Egypt and the officials of the authorities concerned of the Government of Egypt and of the Ismailia Governorate for the courtesies and cooperation afforded to us during our field survey and home office work.

September, 1982

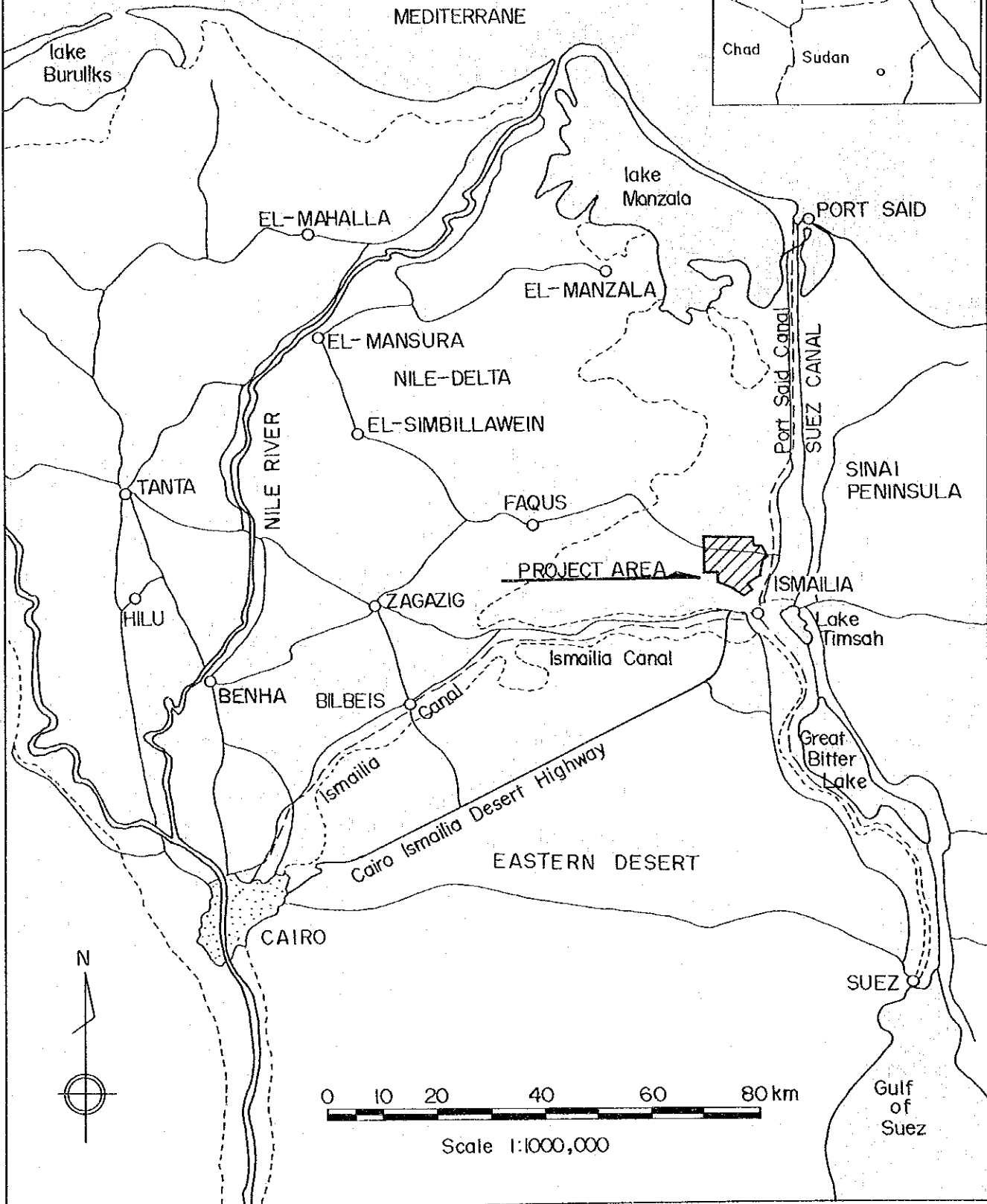
Very truly yours,



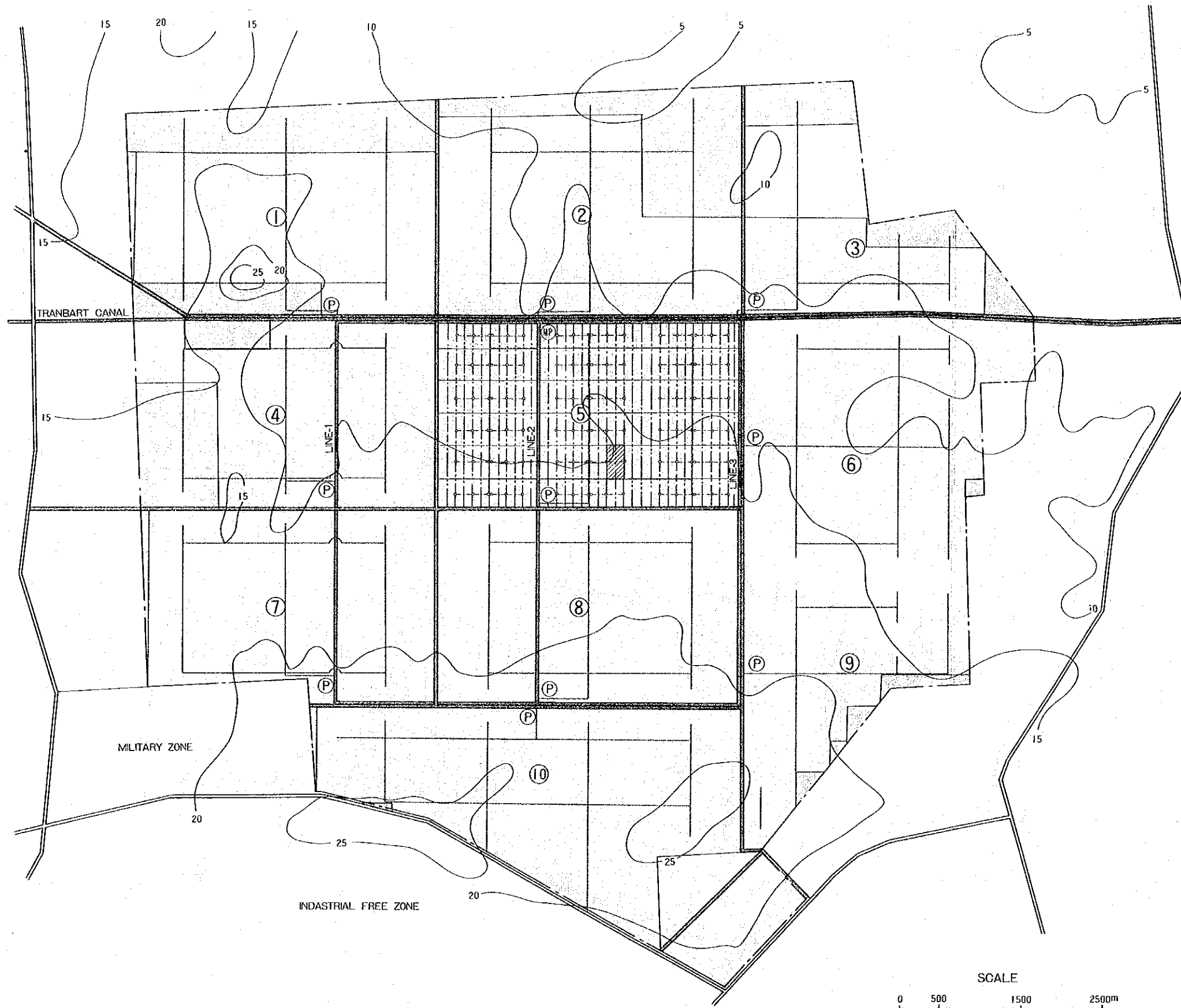
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Yoshizo Mochizuki  
Leader for Feasibility Study Team  
on Tenth of Ramadan Agricultural  
Development Project  
(Director of the Taiyo Consultants  
Co., Ltd.)

# LOCATION MAP

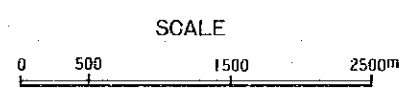


# GENERAL PLAN OF THE 10TH OF RAMADAN AGRICULTURAL DEVELOPMENT PROJECT



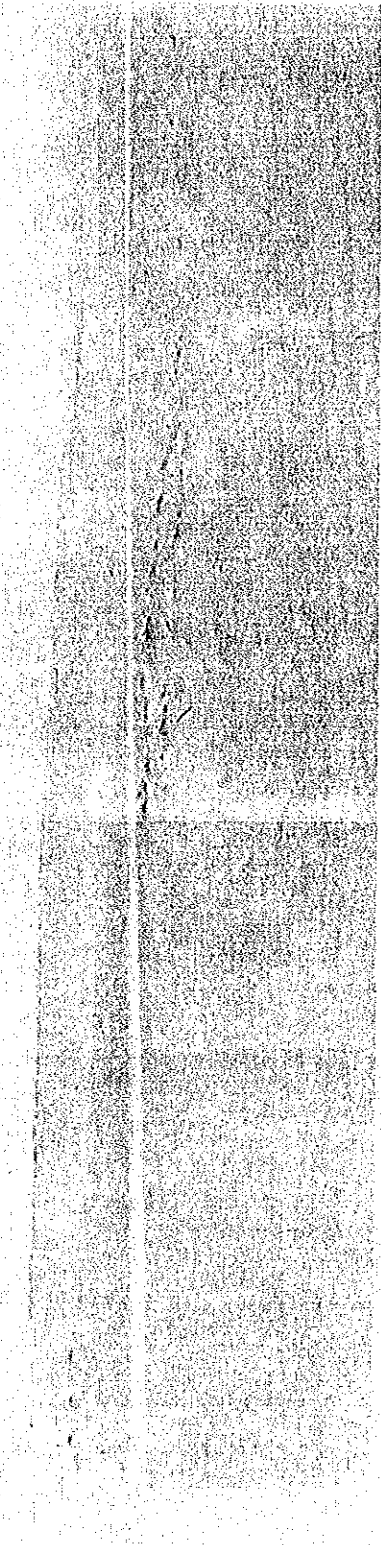
## LEGEND

- PROJECT BOUNDARY
- == TRUNK ROAD
- == OPEN CANAL
- == MAIN PIPE LINE
- SECONDARY PIPE LINES
- BRANCH PIPE LINE
- ⊙ MAIN PUMP STATION
- ⊙ BOOSTER PUMP STATION
- ① BLOCK NUMBER
- ° HYDRANT
- ▨ FARM UNIT (20Fed)
- SETTLEMENT AREA
- COOPERATIVE FACILITIES
- LAND FOR CULTIVATION
- LAND FOR TRAINING, RESEARCH, etc
- COOPERATIVE MANAGEMENT
- RESERVE AREA



ISMAILIA GOVERNORATE		
IN THE ARAB REPUBLIC OF EGYPT		
10TH OF RAMADAN		
AGRICULTURAL DEVELOPMENT PROJECT		
GENERAL PLAN		
OF THE 10TH OF RAMADAN		
AGRICULTURAL DEVELOPMENT		
DATE	JUN 1982	DWG NO
JAPAN INTERNATIONAL COOPERATION AGENCY		

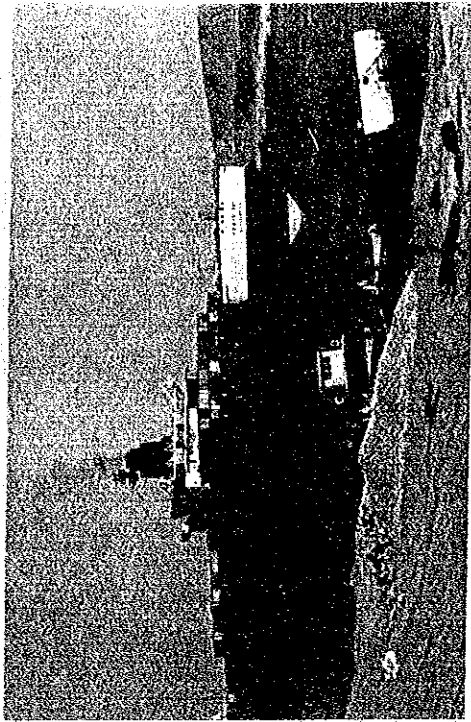




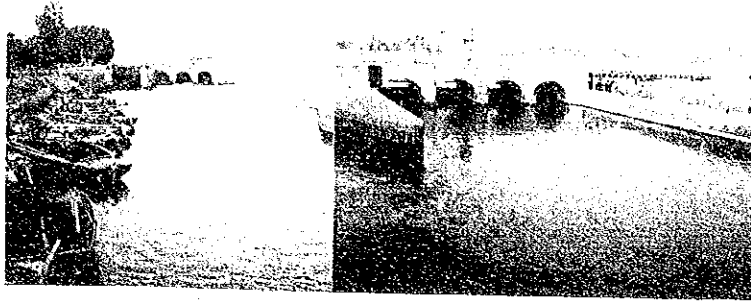
View of The Project Area



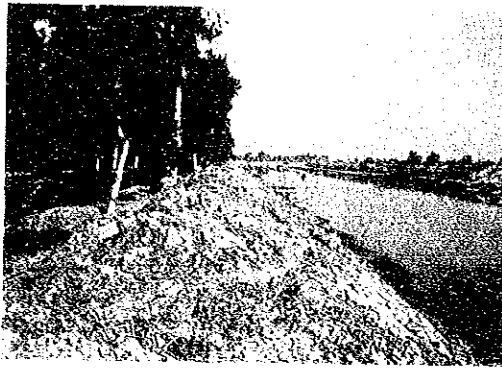
Ismailia City (Capital of the Ismailia Governorate)



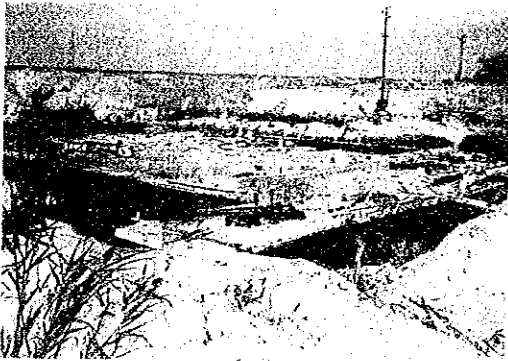
Suez Canal. (About 10 km East from the Project Area)



Ismailia Canal (Intake Gate from the Nile River, Cairo)



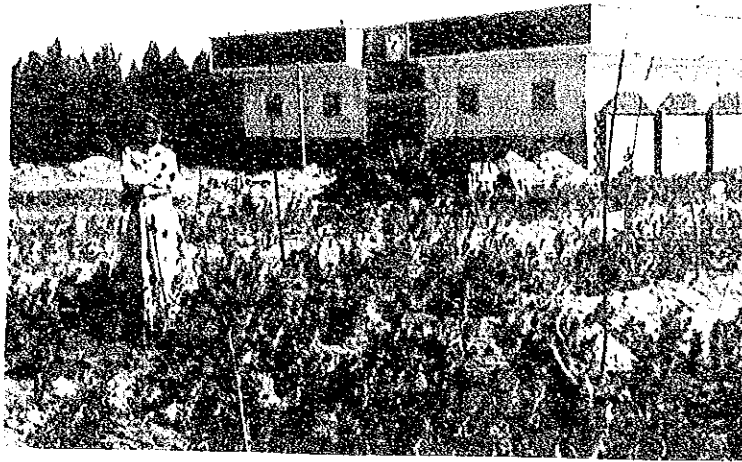
Ismailia Canal (In Sharkeya Governorate)



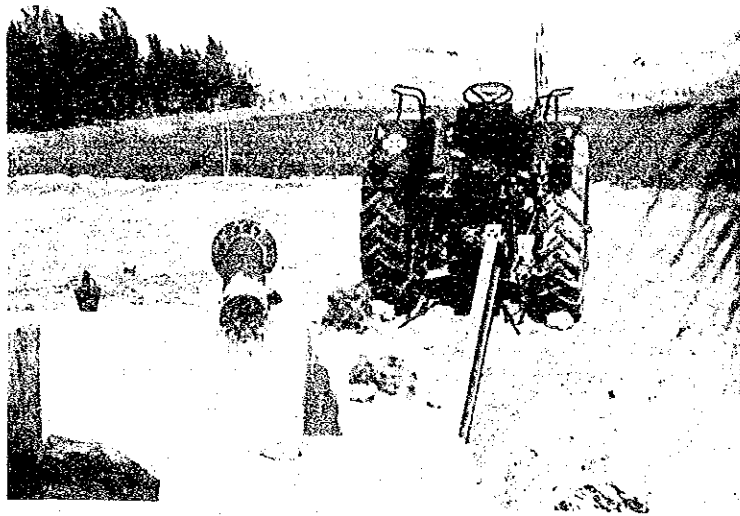
Construction of Salhya Canal (Diversion from Ismailia Canal)



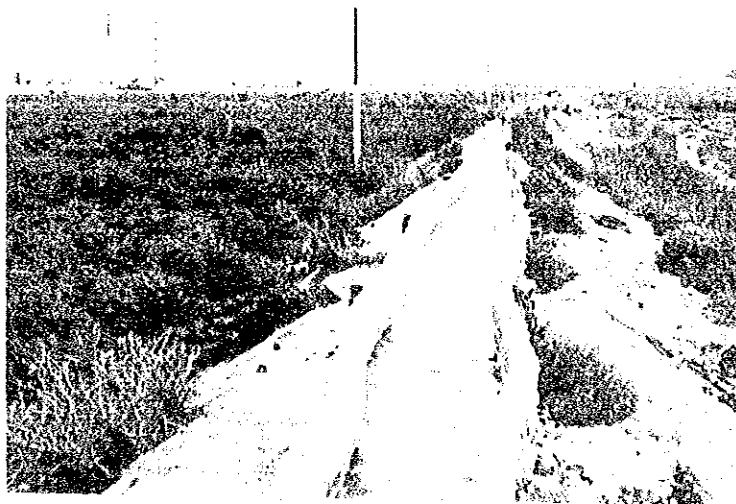
Excavation of Salhya Canal



Pilot Farm of the Project (March 1982)

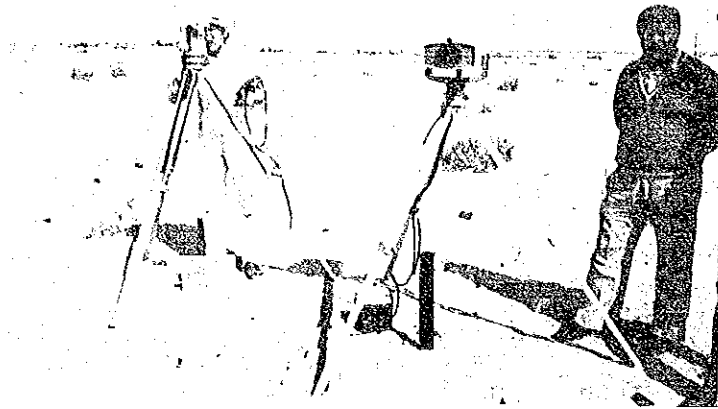


Existing Farmer's Well (March 1982)



Onfarm Irrigation (March 1982)





Topographical Survey



Measurement of Grandwater Level



Electric Resistivity Survey



Measurement of Water Quality  
(pH: EC, etc.)

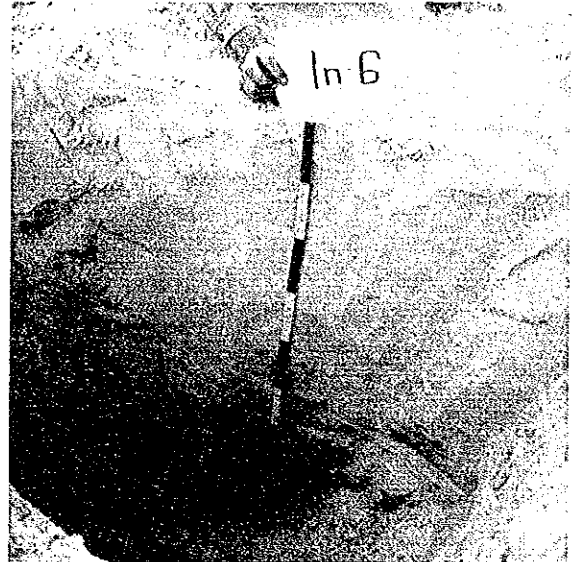


Intake Rate Test

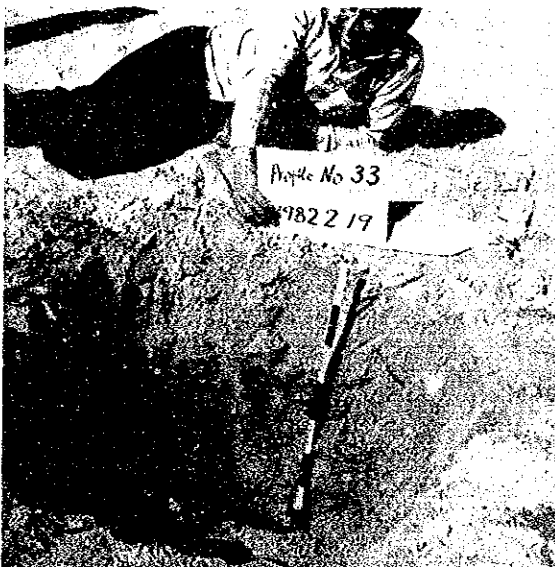
Field Survey (1)



One of the Major Soil Series (Yh)



One of the Major Soil Series (Rd)



One of the Major Soil Series (Yk)



Tentio-meter Measurement (Pilot Farm, Barley Fields)



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  - A. PROJECT ORGANIZATION
  - D. CONSULTING SERVICE
  - E. COST ESTIMATE
  
- VI. ECONOMIC JUSTIFICATION AND FINANCIAL ANALYSIS

## ABBREVIATION AND LOCAL UNITS

CAPMAS	Central Agency for Public Mobilization and Statistics
EEC	European Economic Community
FAO	Food and Agriculture Organization
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
MOI	Ministry of Irrigation
MOLR	Ministry of Land Reclamation
GDP	Gross Domestic Product
GNP	Gross National Product
CIF	Cost, Insurance, Freight
FOB	Free on Board

km	kilometer
m	meter
cm	centimeter
mm	millimeter
t	ton
kg	kilogram
g	gram or acceleration of gravitation
m <sup>2</sup>	square meter
m <sup>3</sup>	cubic meter
ha	hectare
ℓ	litre

m <sup>3</sup> /sec	cubic meter per second
mmho	millimho
kwh	kilowatt hour
KVA	kilovolt ampere
EC	electrical conductivity
L	length
Q	discharge
H	head
Fig.	figure
i.e.	that is (id est)
LE	Egyptian Pound
∅	diameter
°C	centigrade
hr	hour
min	minute
sec	second
%	percent

1 US Dollar (US\$1.00) = 0.82 Egyptian Pound (LE 0.82)

1 US Dollar (US\$1.00) = 242 Japanese Yen (JY 242)

1 Egyptian Pound (LE 1.00) = 303 Japanese Yen (JY 303)

1 feddan (fed) = 0.42 ha

1 ardeb = 198 liters

1 knot = 1,852 m/hr = 0.5144 m/sec

## I INTRODUCTION



## I INTRODUCTION

### 1. Background

The Egyptian Government as part of its Agricultural Development Policy is promoting the development of desert lands in order to increase the rate of self-sufficiency in food stuffs and also expansion of the opportunities for employment. As a direct result of such promotion the Egyptian Government has requested the Government of Japan for technical cooperation and support. In response to this request the Japanese Government dispatched a Preliminary Study Mission in December 1981 to determine the concrete details of cooperation.

The Preliminary Study Mission selected and surveyed the Tenth of Ramadan District in Ismailia Governorate as an agricultural development project area.

Subsequently, this development project received the approval of the Egyptian Government and in order to carry out the feasibility study of the Project, the Japan International Cooperation Agency (JICA) dispatched this Feasibility Study Team in February, 1982.

### 2. Objectives and Scope of the Study

The purpose of the study is to formulate the agricultural development plan for the Tenth of Ramadan District, Ismailia Governorate and to investigate the feasibility of the Project's technical, economical and financial aspects.

The study is divided into two parts; field work in Egypt and home work in Japan. Field work consisted of collection of data, interview survey, land survey, soil survey and land-use survey which were used to establish the plan for the Project.

The home works carried out in Japan are as follows:

- (1) Description of the Plan including Features, Scale and Layout of Facilities
- (2) Determination of the Agricultural Development Plan
- (3) Basic Design of Facilities
- (4) Drawing up of the Implementation Program
- (5) Estimation of Costs and Benefits
- (6) Economic Justification and Financial Analysis

The results were compiled together as the Feasibility Study Report on the Tenth of Ramadan Agricultural Development Project.

The Report consists of two volumes, the Main Report and its Appendix.

3. Member assigned to the Project

Tabulated hereinafter are the Supervisory Group, Team Members and Personnel concerned to the Project.

Supervisory Group Assigned to the Project

1. Chief Advisor  
(Mr. Narumi YAMADA)  
Director,  
Planning Department,  
Chugoku-Shikoku Regional  
Administration Office,  
Ministry of Agriculture,  
Forestry & Fishery (MAFF)
2. Advisor (Agro-economy)  
(Mr. Toshiaki SUGIYAMA)  
Deputy Director,  
Regional Planning Division,  
Planning Department,  
Tokai Regional Administration  
Office,  
MAFF
3. Advisor (Agronomy)  
(Mr. Noboru KAJI)  
Senior Officer of Water  
Resources Engineering,  
Resources Division,  
Planning Department,  
Chugoku-Shikoku Regional  
Administration Office,  
MAFF
4. Advisor (Irrigation)  
(Mr. Yoshiaki OTUBO)  
Senior Officer of Agricultural  
Civil Engineering,  
Planning Division,  
Construction Department,  
Tokai Regional Administration  
Office,  
MAFF
5. Advisor (Economic  
Evaluation)  
(Mr. Seiji NAGASU)  
Deputy Manager,  
1st Division,  
Loan Department I,  
The Overseas Economic  
Cooperation Fund (OECE)



Personnel Concerned to the Project in the Governorate  
and the Cooperative Society

- |                           |                                                  |
|---------------------------|--------------------------------------------------|
| 1. Mr. Abd El Monem Emara | Governor of the Ismailia Governorate             |
| 2. Mr. Mohamed Matar      | General Secretary of the Ismailia Governorate    |
| 3. Mr. Mohamed Nehela     | Chairman of the Project                          |
| 4. Dr. Mohamed A. Sucker  | Board of Directors of the Project                |
| 5. Mr. Abdullah Kisk      | - do -                                           |
| 6. Mr. Mohamed Abdallah   | - do -                                           |
| 7. Mr. Ahmed El Tawil     | - do -                                           |
| 8. Mr. Ali Joseph         | - do -                                           |
| 9. Mr. Bahaa Soliman      | Technical Advisor and Coordinator of the Project |

Team Member Assigned to the Project

1. Team Leader  
(Dr. Yoshizo MOCHIZUKI) 2 February - 4 April
2. Agronomy  
(Mr. Katura KARIYA) 9 February - 4 April
3. Agronomy & Land-use  
(Mr. Kenichi HAYASHI) 2 February - 4 April
4. Livestock Farming  
(Mr. Shingoro NODA) 2 February - 2 March
5. Agro-economy  
(Mr. Gakuji KIMURA) 16 February - 4 April
6. Geology  
(Mr. Yuji UNE) 9 February - 4 April
7. Soil  
(Dr. Shigeru MISONO) 2 February - 4 April
8. Irrigation & Drainage  
(Dr. Masateru MIZUNOE) 2 February - 2 March
9. Land Consolidation  
(Mr. Ryosuke SAKANASHI) 2 February - 4 April
10. Settlement Planning  
(Mr. Takao SAKAMOTO) 2 February - 4 April
11. Design & Cost Estimation  
(Mr. Makoto YOKOZAWA) 2 February - 4 April
12. Survey & Design  
(Mr. Ichiro MAKUTA) 2 February - 4 April



## II BACKGROUND



## II. BACKGROUND

### A. NATIONAL ECONOMY

(1) With the cessation of the so-called Fourth Middle East War in 1973 and the ensuing diplomatic maneuver, Egypt could honourably terminate the hostilities with Israel which had lasted for 7 years since the outbreak of the War in 1967. The Open Door Policy declared in the following year (1974) heralded the start of a new stage of Egyptian national economy. Economic cooperation with the countries of the West has since been increased, the State enterprises and the private ventures have been invigorated, the Suez Canal has been widened, new oil wells have been developed in the Western Desert, and many other novel projects have been implemented. Thus, economic development in Egypt is taking place with a quickening tempo and in a well-planned manner.

(2) Looking back at the past trend in the growth of GDP of Egypt, it has been rather stagnant or barely coping with her population-increase: 2.6% from 1952 to 1960, 3.4% in the first half of the 1960's, and 1.8% in the latter half of the 1960's. Since 1975, however, the growth of GDP, receiving momentum from the new economic policy, jumped up to 9% and started exceeding 10% since 1977. Industry-wise composition of GNP in 1978 for instance was, agriculture and irrigation (25.9%), mining and manufacturing (16.9%), petroleum industry (8.6%), Suez Canal (2.6%), etc., according to the Year Book. The petroleum industry also began prospering rather abruptly. The remittances from the emigrant technicians and labourers and the income from tourism are significantly contributing to the growth of her GDP.

(3) An economic development plan is a frame-work into which the economic policy of a country is embodied from time to time. Egypt's case may be sketched as follows:

Revolution in 1952 ushered in a new atmosphere in the

country to formulate the First Industrial Plan (1957 - 1960) based on the principles of "Egyptianization", in general), and "nationalization" of key industries, in particular. This was later made more comprehensive and precise into the First Five Year Plan (1960 - 1965).

The Second Five Year Plan (1966 - 1972) which followed could not attain its self-imposed targets due to the failures in mobilizing the funds required. With the emergence of the Sadat Government, the Income Doubling Ten Year Plan (1971 - 1980) was introduced but miscarried under the stress of the Middle East War. With the return of peace, the Government determined to bring back buoyancy to the suffocated economy of the country through an increased inflow of external assistance and foreign capital as well as reanimation of the private business activities. Accordingly, economic development policy was established on the basic strategy which incorporated such imminent tactics as:

- (i) importance given to the tightening of economic cooperation with the Arab countries;
- (ii) inducement to foreign capital investment and introduction of advanced technology from abroad;
- (iii) encouragement for expansion of export-oriented industries to pay for increasing food imports;
- (iv) establishment of a Free Trade Zone;
- (v) development of petroleum resources and tourism, and,
- (vi) due emphasis on social development.

These were concretized in an integrated manner in terms of the New Five Year Plan (1978 - 1982). Through the mid-term reappraisal of the same emerged the current Five Year Plan (1980 - 1984).

(4) As mentioned in the preceding sub-section, the development plans depend on the circumstances under which they are formulated and the targets which are set for attainment within a given period of time through a specific strategical approach selected from amongst many alternatives. Comparison between the First Five Year Plan (1960 - 1965) and the New Five Year Plan (1978 - 1982) of their pattern of investment in relative terms will bring forth characteristics of each and differences between the two. Such a comparison may not be meaningless, although the total investment made under FFYP (LE 1,500 million) and that proposed for NFYP (LE 10,175 million) is 1:6.8 and, even after taking into consideration the lowering of net value of the Egyptian Pound in the course of the intervening 17 years, the difference in the absolute amount of investment cannot be ignored:

"In between the two, top priority is invariably given to manufacturing industry (26.7% under FFYP and 23.7% under NFYP), to be followed by transportation and communications (17.9% and 22.6%). Energy naturally claims a sizable slice of the investment pie in both cases but, while it was in terms of electric power (7.4%) under FFYP, it is in terms of petroleum (5.5%) under NFYP. Large-scale civil engineering work which attracted big investment was Aswan High Dam under FFYP (6.5%) but Suez Canal under NFYP (4.7%). Investment in irrigation-drainage and agriculture was much bigger under FFYP (17.0%), and extremely heavy if that for Aswan High Dam should be included (total 23.5%), compared with 8.6% only under NFYP. The characteristic feature of FFYP is that it took up social infrastructure very seriously as is shown by its investment share of 10.7%."

Turning to the 'output' side, growth of GDP during the current Five Year Plan (1980 - 1984) is expected to be at an annual rate of 10.2% on an average, thus amounting to LE 16,425 million at the end of the Plan period. While higher growth rates than the said average are assumed with Petroleum, Construction, Suez Canal and Service industries including



Tourism, that with Agriculture is quite modest at 3.2% per year so that its share in the total GDP at the end of the Plan period will be lowered to 18.3%.

(5) Strategical guidelines for agricultural development under the New Five Year Plan are as follows:

- (i) vertical expansion of agriculture through better drainage, land improvement, dissemination of scientific production techniques and other appropriate measures;
- (ii) priority to the development projects of shorter gestation period;
- (iii) priority to productivity-increase in the existing farmland and the land already reclaimed;
- (iv) lowering of cost for new land reclamation work and dependence on private efforts excepting construction of main irrigation-drainage networks, and
- (v) promotion of export-oriented agriculture such as fruits and vegetables and encouragements to the peasantry for participation in such production.

In depth study and discussion will be made in the following Section.

## B. AGRICULTURAL SECTOR

(1) Population-increase in Egypt in the recent past has been remarkable and, indeed explosive, since after its Revolution in 1952: 9.7 million at the end of the last century became twice as large in some fifty years' time, that is 20.9 million by 1951, a year preceding the Revolution, and it was again doubled within the following thirty years, that is 40 million or over in 1980 (estimate), with an accelerated tempo of 26.7 million in 1961, 33.8 million in 1971, and 36.7 million in 1976 (census). In the post-Revolutionary period, the population growth rate has been as high as 3% per year which is attributable to high birth rate (45.2% in 1952 and 38.7% in 1978), on the one hand, and the declining mortality rate (17.8% in 1952 and 10.6% in 1978) due to the improved medical care made available among the people, on the other.

(2) Agricultural development which took place in the meanwhile has been note-worthy: land reclamation was enthusiastically propelled in the post-Revolutionary period, bringing 915,000 feddan of new land under plough between 1950 and 1978 as against 125,000 feddan during half-a-century pre-Revolutionary period. Side by side with such horizontal expansion, strenuous efforts for intensification of farming were made toward improvements of varieties and fertilizer-application as well as pest control which are now bringing rewards through the construction of Aswan Dam in 1902, the completion of Aswan High Dam in 1970 and the Agrarian Reform. Nevertheless, population pressure on agricultural land could have hardly been mitigated inspite of the sizable expansion of farmland from 5.1 million feddan in 1897 to 6.0 million feddan in 1975. The population-farmland ratio which was 2 persons/1 feddan in 1897 increased to 6.6 persons in 1980, and is assumed to be 10 persons or over by the end of this century.

(3) Increasing population pressure on farmland or deterioration of population-farmland ratio is responsible, on the one hand, for concentration of job-seeking population in the

urban area and, on the other, for tightening of food situation in the country. Enlargement of urban population from 20% or so at the end of the last century to 44% in 1976 accompanied unwelcome socio-economic symptoms such as under-employment and social unrest among the urban poor. It may be mentioned in this connection that the productivity-increase achieved by the country during the last 25 years from 1952 to 1977 was 100:907 in agricultural sector and 100:928 in industrial sector. The negligible superiority of the latter on the former seems to betray the real cause of such a concentration of population in the urban area that it has substantially been due to an elimination of surplus population in the rural area rather than due to absorption of necessary labour for industrial expansion.

(4) Food balance in the country has traditionally been sought along the policy of encouraging export of specialized farm products through expansion of commercial agriculture to pay for foreign cereal imports. Steady population increase, however, has helped enlarge unfavourable trade gap year after year culminating in 1978 at a heavy excess of imports amounting to 1,952 million pounds as an adverse balance between 2,632 million pounds-worth of imports as against 680 million pounds-worth of exports. Contribution by the agricultural sector to her export drive is no doubt significant as it claims about 60% of the gross export in terms of value i.e., 401 million pounds including textile products of agricultural origin, and 114 million pounds excluding them. Thus, agriculture remains the most important export industry. The other side of the coin tells a different story because, out of the total imports, as much as 686 million pounds consist of the farm products (749 million pounds inclusive of textile products), far beyond the total agricultural exports, along with the more sizable industrial goods. Hence the traditional policy of encouraging commercial agriculture so as to earn enough foreign exchange to pay off the food imports has not been successful.

(5) GNP of Egypt which amounted in 1977 to 7,139 million pounds excluding the transfer from abroad was made up by nearly 30% of that from the agricultural sector which employed in the same year 42.2% of the entire labour force in the country (12.8% by mining and industrial sector). But, as will be known from the national statistics pertaining to the distributed wage which, though averaging at LE276.1 as a whole, was polarized between LE414.6 for mining and industry and LE110.2 for agriculture, Egyptian agriculture is characterized by low productivity and surplus population which it is forced to somehow employ.

(6) Structural aspect of agricultural production has not been made crystal clear from the statistical information made so far available. Based on a fairly well-founded conjecture, it may be assumed as follows: total farmland excluding State Farms is 5,572,000 feddan, being shared by 3,358,000 owners (as of 1975) at the average holdings of 1.66 feddan or, the average holdings per agriculturally employed person would be 1.46 feddan, the figure which has been arrived at by dividing entire farmland (6,000,000 feddan) by the total persons engaged in agriculture. In the light of the 1972 statistics, however, 43% of the farmland was under tenancy and, in fact, many landlords are being engaged in farming by themselves through employment of labourers. This makes it difficult to identify the net owner-farm households. A different picture may be drawn from assumptions: one assumption based on 1.5 working members per household would visualize 2,736,000 households with average holdings of 2.0 feddan each, while another assumption based on 2.0 working members per household might suggest 2,052,000 households each with 2.7 feddan holdings. Incidentally, redistribution of farmland made effective through the Agrarian Reform resulted at 2 to 5 feddan, variable according to family size and land productivity. Allocation of the reclaimed land among the settlers is also

gauged within the same range of 2 to 5 feddan, at the maximum.

(7) Under the circumstances as briefed in the above, development efforts directed at the two strategical sectors of industry and agriculture have been made in a planned manner particularly since the First Five Year Plan was taken up in 1960. Under the New Five Year Plan (1978 - 1982), 86% of the gross investment amounting to 10.17 billion pounds, that is 879 million pounds, is ear-marked for agriculture and irrigation in view of accelerating agricultural development towards the three pronounced long-term objectives of: (1) assurance of food production and supply, (2) improvement of the balance of payments, and (3) absorption of urban population to rural area. Policy guidelines meant for the above aims are spelt out as follows: (1) upliftment of productivity of the existing farmland, (2) upliftment of productivity of the reclaimed land, (3) new reclamation of available land, and (4) overall development of agriculture. Detailed specifications as to the practical approaches are made under each heading. For instance, upliftment of productivity of the existing farmland is proposed to be attained through such methods as the improvement of irrigation-drainage systems; amelioration of soils; mechanization; multiplication and diffusion of HYVs; improvement of storage, packaging and transportation of farm products; restructuring and improvement of cropping as well as rotation systems; preservation of farmland against engulfment by urban and/or industrial zones, etc. Productivity of the reclaimed land is to be increased through such measures as an early completion of the reclamation works on hand; full implementation of the cultivation programmes; improvement of management and auditing systems of the State Farms; disposal of the fragmented State-owned lands by sale; modernization of the large-scale State Farms, etc. The specific measures provided for new reclamation and

settlement work will be discussed later in this Section. For an overall development of agriculture, the strongly recommended policy-measures include the expansion of export-oriented farm production; strengthening of research and experiment activities; diffusion of fertilizers and agrochemicals; training of extension personnel; strengthening of farmers organizations; effectivation of rural credit; re-examination of farm price policies; pooling of cropping practices; rejuvenation of land fertility, etc.

### C. AGRICULTURAL DEVELOPMENT AND DESERT DEVELOPMENT

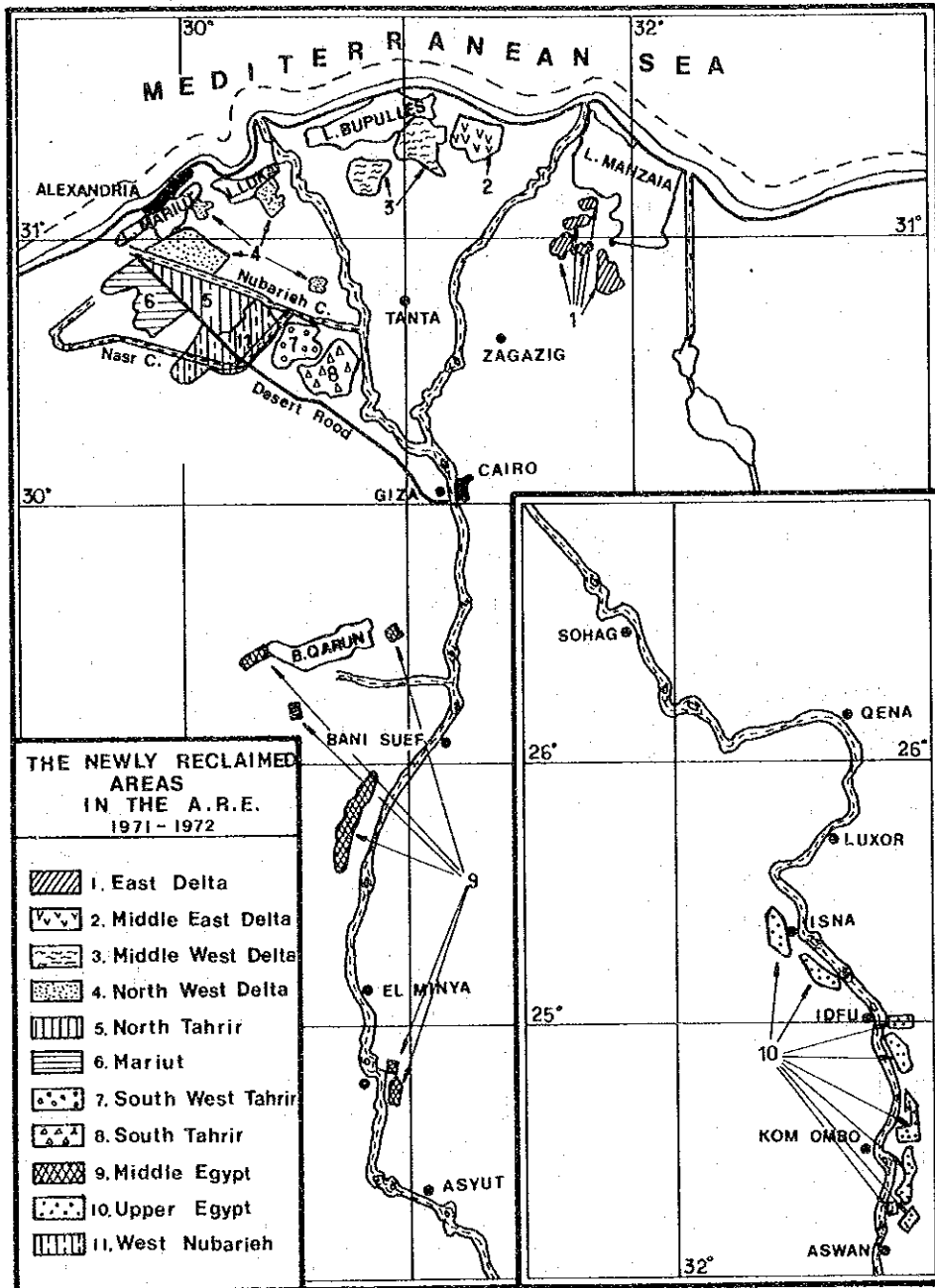
(1) Rainfall water being scarcely dependable, securing of a source of water takes precedence over all other conditions for horizontal expansion of agriculture in Egypt. No doubt the Nile water is there to be utilized first of all, but all possible efforts including repetitive use of drainage expansion of arable land.

Completion of Aswan High Dam in 1970 enabled the Egyptians to make fuller use of the Nile water which could have been productively utilized, till then, less than half of its total discharge (40 billion m<sup>3</sup> out of 72 billion m<sup>3</sup>) was available for cultivation of 6 million feddan of land along the Nile Valley and in the Deltaic area, the rest amounting to 32 billion m<sup>3</sup> being drained into the Mediterranean Sea. Since then, as a result of the storage capacity of the High Dam increasing upto 20 billion m<sup>3</sup>, even after diverting 12 billion m<sup>3</sup> to Sudan, the remaining 8 billion m<sup>3</sup> opened a new possibility to developing 1.3 million feddan of additional land in Egypt.

As for groundwater, its endowment was ascertained in the Western and Eastern Deserts through various hydrological surveys so that 81,000 feddan is being irrigated thereby: UN technical assistance aimed at identification of its location and available quantity is on going. Along the Mediterranean Sea coast to the north, 150 - 200 mm/year of rainfall water is being utilized for cultivation of water-saving crops such as fig, olive, barley, etc. on 150,000 feddan of armland and of pasture grass on 2.0 million feddan of pasture land. Between 1960 and 1973, 895,000 feddan of land was put under production by use of Nile water, 788,000 feddan of which was newly reclaimed and 67,000 feddan is being fragmented among the existing farmland.

As stated in the above, the stabilized water supply from the Aswan High Dam enabled to convert about 1.0 million feddan of land from 'basin irrigation' to 'perennial irrigation', thus contributing to raise its land-use ratio two-fold.

Fig. II.C.1 The Newly Reclaimed Areas in The A.R.E. (1971 - 1972)



source: Dr. Salah El Abd, "Nile Resettlement", 1974,



Consequently, the farmland under 'basin irrigation' was diminished to 824,000 feddan.

(2) Land Reclamation in Egypt has been and still is administered by the Ministry of Land Reclamation, as a supreme body of responsibility, and executed, though with some changes, by three General Authorities and one General Organization. They are General Authority for Land Development (GALD), General Authority for Desert Development (GADD), General Organization for Land Reclamation (GOLR), and Egyptian Authority for Utilization and Development of Reclaimed Land (EAUDRL).

GALD is a planning body concerning irrigation-drainage systems, reclamation, new villages and social systems, while GADD is assigned for exploration of groundwater and studies on suitable plant production and animal husbandry in the desert area. GOLR attends to the auditing of various land reclamation companies, and EAUDRL takes care of reclamation projects beginning from the nurturing of land productivity prior to land distribution among the settlers and ending in the provision of various services required for improvement of their agricultural production and social welfare. Some 700,000 feddan of land under reclamation, in the Delta as well as along the Nile Valley, comes under EAUDRL which divides such land under its administration into 11 Zones with 70,000 feddan each comprising of 5,000 feddan-wide farms which again contain 5 sub-farms made up of 1,000 feddan each. Such type of regimentation is meant for the more effective and efficient socio-economic activities.

(3) Land reclamation works are to proceed through the three stages of Construction, Agriculture and Social, one after another in the said order, towards 14.5 million feddan of land which has been categorized as reclaimable as a result of soil survey. Construction stage covers: (i) construction of irrigation-drainage canals of different dimensions, (ii) land levelling, (iii) construction of bridges, weirs, cables,

culverts, etc., and (iv) preparation of livelihood environments including the settlers colonies, public facilities and roads.

Agricultural stage involves, first of all, the classification of land, for instance, into saline, alkaline, sandy, etc., to decide appropriate measures to be adopted for their improvement physically, chemically and biologically. Land improvement measures include leaching for saline land, application of gypsum to alkaline land, and application of mud to sandy land. Alfalfa and berseem are sown thereafter and then select the kind of crops well responding to the physical as well as biological improvements attained in the soils. Thus, the minimum targeted yield is made obtainable within 3 to 6 years.

Social stage consists of settlement and organization. Settlers need to meet such qualifications as nationality (Egyptian), agricultural experience over 2 years, previous ownership of less than 5 feddan preferably none, sound health, non-criminal, age limit ranging from 21 to 50, family size less than 5 members, literacy, etc. After travelling free of charge, they are each provided with a plot of land upto 5 feddan to till, one minimum furnished house to live in, and one pregnant cow to take care of. One settlement will be comprised of 200 settlers' families and 300 of them will be organized into one Agricultural Cooperative Society. Community Development Council will also be established to look after their own social activities. Schools, hospitals, post offices and other public facilities are provided by the Government.

(4) Standardized land reclamation and settlement procedures introduced in the above are those adopted by EAUDRL. In addition, various patterns of land reclamation, settlement, and their operation and management are being witnessed including the followings:

(a) Permanent Settlement of Nomadic Tribesmen

On the Mediterranean coast runs a belt which is extending for a length of 480 km with an average width of 25 km, from a point 25 km west of Alexandria to the Libyan border. This belt contains 3.8 million feddan of land of relative humidity with 100 - 150 mm annual rainfall, and 100,000 feddan out of 350,000 feddan of its arable land is suitable for rain-fed farming. Barley used to be cultivated on most of this land (900,000 feddan) and fig, olive, tomato, onion, pulses and others on the rest, primarily for the cultivators' own consumption, as they could obtain the main source of income from rearing sheep, goats, camels and fowls. With the enactment of the Desert Law of 1958, tribal land began to be re-distributed among individual plots each covering a minimum of 10 feddan per household. Permanent settlement of the nomads was also sought by digging wells, some of them being equipped with windmills, on their behalf. By 1970, 50% of the tribesmen who counted about 80,000 in 1966 were settled and 75% of the tribal land came to be individually owned. Their mode of settlement assumes different patterns: while some are in a concentrated manner, the others are either scattered or lineal in shape. Agricultural Cooperative Societies were also organized. Permanent settlement of the nomadic tribesmen is under the administration of GADD.

(b) Transmigration and Settlement of the Nubians

With the completion of Aswan High Dam and the creation of the Nasser Lake, some 50,000 Nubians who had been residing in a 500 km-long valley extending from Aswan to Sudan border were to be transmigrated to the southern part of Aswan, in one direction, and to the neighbourhood of Khartoum, in another direction. The Egyptian Government undertook to accommodate the Nubians who were destined to the south of Aswan by reclaiming 35,000 feddan of land in two parts (27,000

feddan at Kom Ombo and 8,000 feddan at Esna) to be allocated among them at 2 to 5 feddan per family, together with construction of houses for 15,868 families. Their settlement started since 1963 and, as far as Kom Ombo is concerned, 61% of the migrant Nubian families were settled and given land totalling 20,131 feddan as against 15,000 feddan which they held prior to transmigration, by 1971. This settlement area is also controlled by EAUDRL and belongs to Zone No. 10.

(c) Land Reclamation and Settlement in General

The land settlement schemes under EAUDRL assume diversified patterns in accordance with different land conditions under which their development is planned. They happen to be in the wasteland spreading around the established farmland, on the lowly situated marshy lands or salt lakes below sea-level in the north which need to be drained, on the riverine terraces along the Nile, and sometimes in desert area. EAUDRL's 11 Zones are distributed in the following manner: 5 Zones being fed by Nubarieh Canal and Nasr Canal along the Cairo-Alexandria Desert Road, 4 Zones in the lowland extending between the Mazala Lake in the north to the Mariut Lake south of Alexandria, and one Zone each in both Middle Nile and Upper Nile.

The settlers' origin is also multifarious: in the lowland projects nearby the established agricultural area the settlers simply move in from the neighbouring villages, while the projects in the forlorn desert need to collect settlers from far-off corners of the country. In the latter case, colonies meant for the nomads are also included where it is necessary to provide elementary trainings in farming, farmers' organization and social norms, side by side with rendering of all kinds of public services. Allocation of the reclaimed land is made as provided for in the Agrarian Reform Law,

that is 2 to 5 feddan per family, but in different forms of tenure either as individual ownership or as tenant land. Priority is recently claimed to be given to the university graduates and the retired government servants.

(d) State Farms

These are run by the State, and those occupying large acreage in the remote area are now encouraged to be operated as the modernized State Farms. Ismailia Agricultural Development Co., extending over the two Governorates of Ismailia and Sharkia is one of them. The designing and construction supervision of its entire complex, which was meant for desert development to the extent of 19,000 feddan by drawing water from Ismailia Canal, was done by the Yugoslavian consulting firm under the Yugoslavian Government assistance to Egypt. Since it started operation in 1978, 10,000 feddan has been put under farming which is done in a mixed type of animal husbandry, horticulture and agriculture. Its total staff numbering 463 includes 29 agronomists and veterinarians. Out of 1,360 cows, 350 are producing milk, 400 are fattening and the rest are grazing. Orchards are planted with orange, lemon, apricot and others. Potatoes, tomatoes, watermelon and strawberry are cultivated, together with fodder crops such as alfalfa, berseem and sorghum. Farming is mechanized by a fleet of 54 tractors. All the staff are accommodated on the site. Irrigation is done by sprinklers.

(e) Governorate's Farm

In the Governorate of Sharkia, a fattening station which was first established for rearing of meat cattle gave impetus for desert development primarily for multiplication and fattening of herds. Four-stage development depending on groundwater for irrigation was planned at its commencement in 1976, with the ultimate targets

of 13,000 feddan under plough and 10,000 cattle to be reared. By now, 3,000 feddan of desert land has been developed and cattle have been increased to 3,500 head. The principal line of production is beef cattle but it is well combined with production of vegetables and fruits, plus dairy production. 20 office workers and 100 technicians are being employed. Mechanized operation which is aimed at by this enterprise is enjoying the Japanese Government's commodity aid in terms of machinery. It started with surface irrigation but is now adopting the sprinkler, side-wheel sprinkler and drip methods as required.

(f) Company Farm

The Arab Contractors, a private concern which has been undertaking on contract basis the land development and other large-scale civil engineering and construction works entered the farm management business in the desert area in the Governorate of Ismailia. Their venture consists of two farms called Salhya Pilot Agricultural Projects, the one on the northern bank and the other on the southern bank of Ismailia Canal, to the extent of 23,000 feddan and 33,000 feddan, respectively. Their construction was started in 1978 and completed in January 1982. Both farms which now entered the operation stage are being irrigated by the Canal water which after being pumped up is distributed through the center pivot system by sprinklers at the corners of the field and the drip method in the orchard. In the northern farm, there are equipped 74 center pivots to irrigate 6,000 feddan for fodder crops, 8,000 feddan of orchard and 2,500 feddan of vegetable crops. It has an ambitious plan to breed 10,000 large cattle, raise 400,000 hens (for eggs), process farm products and build greenhouses for year-round vegetable cultivation. 60 tractors are ready for mechanized farming. There are 760 employees at present and a new village of 1,000 houses is under construction on the site.

(g) Land Reclamation Cooperative Societies

Reportedly authorized by the law enacted in 1964. They aim at: (i) mobilization of idle private capital for land reclamation, (ii) creation of employment opportunities on behalf of the landless farmers, and (iii) provision of the ground for training in farm management for the employed landless farmers to prepare themselves for future independent farming. The area under their command is regulated according to the size of the land distributable among their membership: it may not be more than 5,000 feddan if land allocated per member is less than 5 feddan, but may be more than 5,000 feddan in total if the allotted land is more. This kind of Cooperative Society has been organized all over the country but their total number is still less than 100 by now. Adleya Society in Sharkia and Tenth of Ramadan Society are two examples of the so-called large-scale Society. Adleya Society which is in the initial stage of its development aims at distribution of 10 feddan per member and irrigation of its command area will be made by use of groundwater through sprinkler and drippig methods.

(h) Individual Farms

Individual reclamation is also being encouraged but within a ceiling of 200 feddan per farm. In the Governorate of Ismailia, individual reclamation is generally undertaken either in the vicinity of the established agricultural area or in the desert along the canals and roads because of an easier access to water source and traffic. Among them is witnessed a large-scale farm extending over 350 feddan being equipped with center pivot. Canal water or groundwater is the source of irrigation but these two are sometimes combined for use. Majority is adopting surface irrigation system. This type of land development

being done through one's own exertion, its tempo of reclamation is rather slow but steady by means of quick turnover and/or recovery of capital through production and marketing of cash crops from the very beginning which is made possible by generous input of barnyard manure.

(5) Aforementioned trends of land reclamation and settlement in Egypt may be summarized as follows:

(i) From Alluvial Land to Desert Land

It was generally believed that 3.5% of the entire land of Egypt (8.36 million feddan) is made up of the alluvial land emerging along the Nile Valley and in the Delta including lowly situated marshy land. It was identified through a survey in 1961 that 1,441,000 feddan of the alluvial land referred to in the above was left barren, of which 1,214,000 feddan was State-owned and the remaining 227,000 feddan privately owned.

Land development efforts were naturally focused at such unutilized alluvial land, because of irrigation conveniences, at the initial stage of the land reclamation drive in Egypt but, as it went on, it had to be gradually expanded towards the desert land on the diluvial plateau. This implied an advancement of reclamation activities from the neighbourhood of the established villages to the forlorn wastes in the far-away deserts and also a shift of the quality of soils to be handled from comparatively more favourable to less favourable which is mainly made up of sand.

Apart from such geographical and technological implications, new development strategy had to be adopted on the ground that, though the name 'desert development' remained the same, the theatre of operation is now shifting from the fringe areas of the Nile Valley and Delta to the once frontline-turned-occupied area, as in



Ismailia and Sinai, during the Middle East War. Thus, special consideration is called for not only the construction of the reclamation projects and the farm management technology but also their administration as well as establishment and operation of new social networks in the settlement area.

(ii) Diversification of Water-Use Practices

Every effort is being made to bring the maximum space of wasteland under reclamation and development by means of the more efficient utilization of the Nile water, the greatest water source in Egypt, through construction and operation of dams and the more effective use of groundwater and repetitive use of drainage water, or the combination of the two. Such trends naturally urge diversification of irrigation system and the equipment appurtenant to it from the universally accepted flooding or surface irrigation to the more water-saving devices such as sprinkler, drip and center pivot methods.

At the same time, it is being felt with an increasing seriousness that a wise choice of the crops which satisfactorily meet the double purposes of water saving and maintenance of fertility of the soil is imperative in the desert area and in this connection preference to fodder crops and introduction of animal husbandry based on them is taking place in a big way. Thus, a complex type involving animal husbandry and horticulture is becoming the characteristic feature of the agricultural management pattern in the desert, irrespective of the kind of operational entities.

(iii) Multifariousness of Managing Agencies

Land reclamation activities which were initiated by the State have been increasingly taken over, understandably due to budgetary restrictions, by so many

companies, cooperative societies and individuals, and the Governorates also stepped in to sponsor some of the large-scale projects. As each type of these concerns adheres to its own administrative principles, the pattern of management and operation of land reclamation and settlement projects is undergoing a considerable diversification along with its diffusion to the remoter parts of the country. Even those sponsored by the State cannot stand aloof from such trends and the individual allotment system once ruling there seems to be gradually re-directed to the State Farm style which more or less suggests, if not categorically, a sort of collectivism.

(6) Future reclamation policy is shown in the current Five Year Plan. According to its proposal, 776,650 feddan of waste-land is to be reclaimed during 1980 and 1984 as specified in the below:

Agency	Size of Land	(%)	Number of Projects	Average Size per Project
State	375,120 fed	48.3	24	15,630 fed
Governorate	4,660 "	0.6	2	2,330 "
Cooperative	379,780 "	48.9	35	10,850 "
Private	17,090 "	2.2	5	3,420 "
776,650 fed		100.0	66	

The role to be played by the Reclamation Cooperative Societies under the Plan as shown in the above table is already quite heavy, but it does not fully explain the true nature of the job which they are expected to do and its quantum. 375,120 feddan assigned to the State undertakings includes 222,800 feddan of desert land which is not meant for agricultural development but for afforestation depending on rainfall water. The remaining 553,850 feddan of

land to be agriculturally developed by use of the Nile water is spreading on the alluvial area in the Delta (100,900 feddan) and on the riverine terrace along the Nile Valley plus desert land (453,000 feddan). Thus, as far as the land proposed for agricultural development is concerned, the share expected to be borne by the Reclamation Cooperative Societies goes as high as nearly 70%. This shows the great hopes entertained by the Reclamation Cooperatives in agricultural development of the country through desert reclamation.

### III THE PROJECT AREA



### III THE PROJECT AREA

#### A. LOCATION AND NATURAL FEATURES

##### (1) Location and Size

The Tenth of Ramadan Agricultural Development Project site is located approximately 110 km east of Cairo in a desert area bordering Ismailia City. The location is latitude  $30^{\circ}40'N$  and longitude  $32^{\circ}10'E$ .

The Project site extends roughly 10 km from east to west and 9 km from south to north. The area of the Project is 21,524 feddans (9,040 ha).

To the east of the Project, there is Port Said Canal which is about 1.5 km away and Suez Canal which is about 8 km away. These canals run parallel to each other. Salhiya National Highway lies 2.5 km inside the northern boundary of the Project area and runs from east to west.

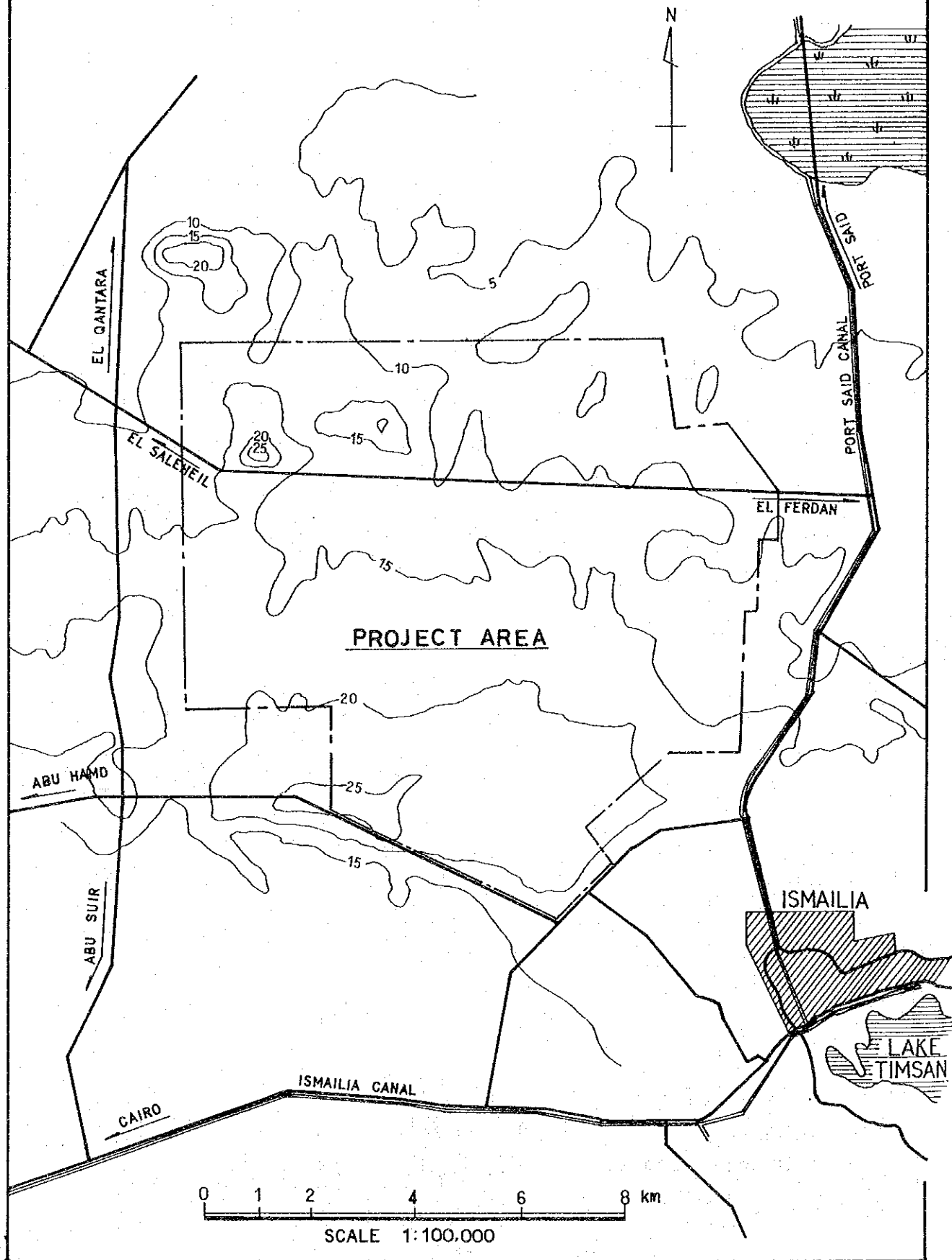
##### (2) Topography

In the Project area, the highest point of elevation is 27 meters and is located near the southern boundary. The lowest point of elevation is 6.0 meters and is near the northern boundary. Therefore, there is about a 1 to 500 moderate downward slope running from south to east. In the north-west of the Project area, there are some undulated areas, but they do not prevent farming. There also exists a deep gravelly area and an oasis in the north-east of the Project area. These are not considered applicable for farming.

##### (3) Roads

The existing roads around the Project area are the bypass road lying to the south of the Project area that links Port Said and Cairo, the road running to the east

Fig. III.A.1 LOCATION MAP



of the Project area that links Ismailia and Port Said, the Salhya road which runs through the Project area and the road lying west of the Project area that links Abuhamad and Ismailia.

The roads that lie to the south, east and north are from 7 m to 10 m wide and are main paved roads. The road running to the west is a 5 m wide paved road.

All of these roads are expected to be used as transportation roads for the Project.

#### (4) Canals

There is no canal that connects to the Project area, and Tolonbaht Canal which branches off from Salhya Canal is planned to be the irrigation water source for the Project area.

The outline of Salhya Canal Project which is higher-ranking project is as follows.

Salhya Canal is a new canal which starts from the left bank of Ismailia Canal at 74.2 km downstream from the point where Ismailia Canal branches off from the Nile. Proposed irrigation area of Salhya Canal is altogether 440,200 feddan including the Sinai Peninsular area.

Canal	Area (fed)	
Salhya Canal	17,000	
Left Branch	5,000	
Tolonbaht Canal	16,800	
Branch No. 1	12,900	
No. 2	21,400	84,300 fed
No. 3	18,400	
End Part	14,800	
Hossania Canal	39,400	
End Part of Salhya Canal	44,500	
<hr/>		
Sub-total (Salhya)	190,200	
South Arish (Sinai P.)	250,000	
<hr/>		
Total	440,200	

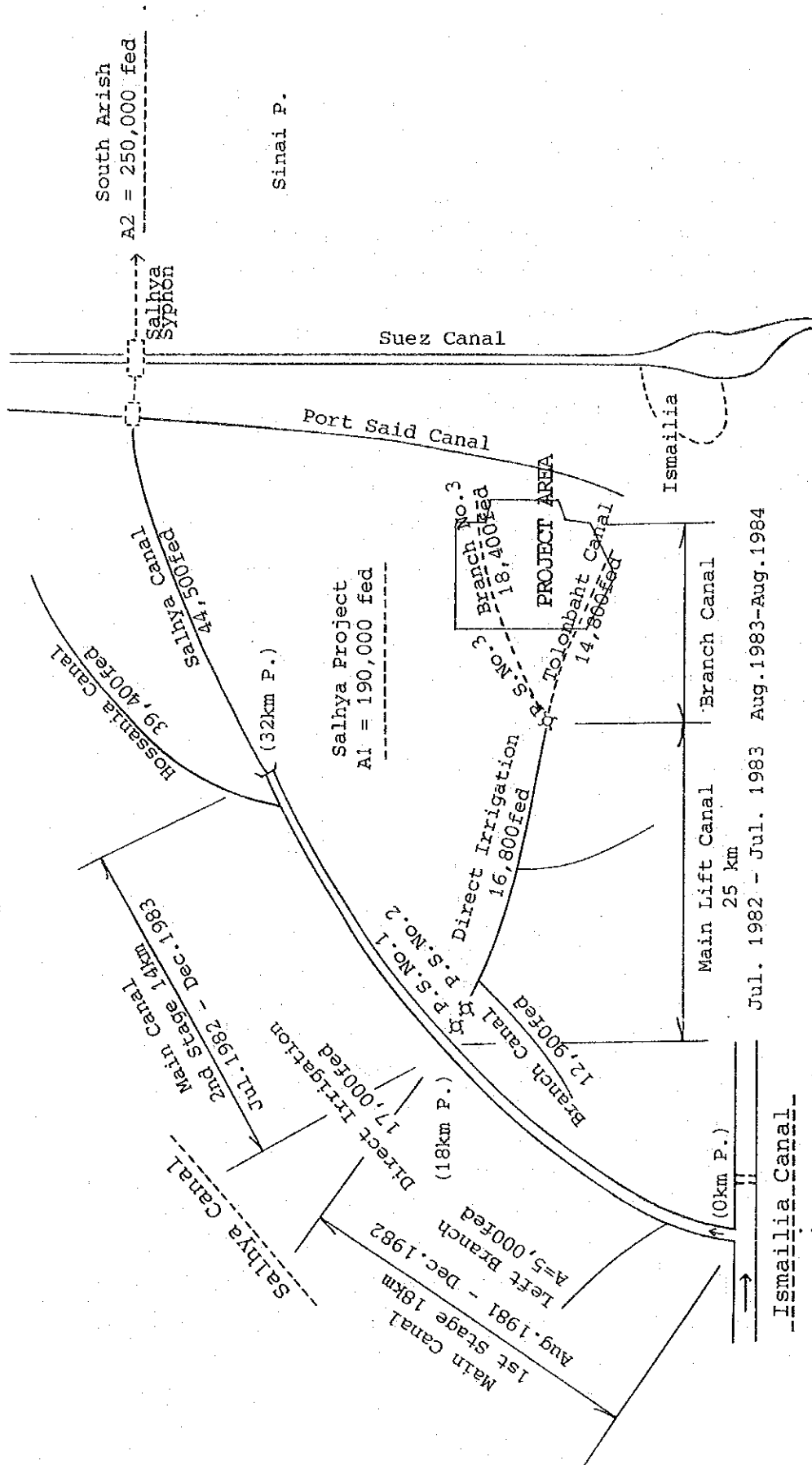


The first section of the work is planned for 190,200 feddan which spreads over the west of Suez Canal excluding the Sinai Peninsular area. And the water discharge for this 190,200 feddan is 56,269 m<sup>3</sup>/sec. at the intake of Salhya Canal.

The maximum irrigation area of Tolonbaht Canal is 84,300 feddan, and the irrigation requirement is 27,464 m<sup>3</sup>/sec.

The works are being carried out by the Ministry of Irrigation and the work schedule of commencement and completion is as follows:

Salhya Canal	1 stage	18 km	Aug. 1981 - Dec. 1982
"	"	2 stage	14 July 1982 - Dec. 1983
Tolonbaht Canal	main part	25	July 1982 - July 1983
"	"	end part remainder	Aug. 1983 - Aug. 1984



Tolonbaht Canal

74.2km Point of  
Ismailia Canal  
from Nile River

Jul. 1982 - Jul. 1983 Aug. 1983-Aug. 1984

Completion of Tolonbaht Canal  
is planned on End of 1984

Fig. III.A.2 Illustration of Tolonbaht Canal

## B. CLIMATE

The Project area is located on desert land about 30 km to the east of the Nile Delta and 8 km to the west of the Suez Canal. This area lies between the Temperate and the Subtropical zones, though the annual average temperature is 21.8°C just as the Tropical zone.

### (1) Temperature

In the three winter months of December, January and February, the average daily lowest temperature is below 10°C and the mean daily temperature is also below 20°C. The lowest month in temperature is January with average daily low temperature of 7.8°C and without any frost. Conversely the summer months, June, July and August, have 29.1°C of mean daily temperature. The highest appears in August with 36.1°C average daily maximum temperature.

From this view point, the Project area can be said suitable for agricultural use throughout the year.

### (2) Humidity

The annual fluctuation in humidity is not very large, 30% in summer, 50% in winter and 40% in other seasons. The daily differences in humidity are also 30% - 40% in day time and 52% at night. Dew falls on places with vegetation. This dew possibly provides additional water to desert land. Also, low humidity can function to suppress evaporation.

### (3) Wind Speed

The wind speed is moderate throughout the year, about 4 to 7 knots (1 knot = 0.5144 m/sec). However, during the middle of March and early April, there are strong winds from the west and the south-west directions (so-called "Khamasine") and shifting sand particles in the wind. Shelter woods are indispensable to protect agricultural crops from wind damage.

(4) Rainfall

The average annual precipitation scarcely amounts to 33.3 mm (on the average for 5 years). Most of the rain comes in the winter time, December to February. At any rate, available rainfall for crops can be considered negligible.

(5) Evaporation

The average annual evaporation for the recent five years is 2.650 mm/year or 7.3 mm/day. On a monthly basis, the maximum is 11.8 mm/day occurring in June and the Minimum 4.3 mm/day occurring in January. The obvious thing is the fact that there are distinct differences between the Nile Delta and the desert areas.

Port Said, Ismailia and Suez cities are located in the same longitude with 1° different in latitude between them. Zagazig and Ismailia cities are placed on the same latitude but 30' different longitude. The differentiation of evaporation values between the above four cities is shown in the following:

Port Said	7.2 mm/day (September)
Ismailia	11.8 mm/day (June)
Suez	15.4 mm/day (June)
Zagazig	7.0 mm/day (June)

Port Said represents relatively low temperature and evaporation values because it is located along the sea coast. The noticeable thing is the fact that Zagazig, located on the east side of the Delta, shows low evaporation and Suez remote from the Delta shows high evaporation, 15.4 mm/day. This par evaporation value is parallel to the water consumption of crops and is to be used as a basic value to determine the water requirements.

(6) Daylight Hours

The Daylight hours or the bright sunshine hours are very significant to estimate the water requirement

theoretically. The former can be astronomically calculated, but the latter can be only decided through observation. Generally, sunshine hours are very long in Egypt and may be assumed to be more than 90 percent of the daylight hours.