エジプト国北シナイ農村総合開発計画
事前調査報告書

昭和63年4月

国際協力事業団

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序　文

エジプト国においては，その自然条件の故に，ナイル河の恩恵を受ける範囲においてのみ文明と農業の発達が可能であった。この結果，全国土面積約100万km²のうち，現在既耕地及び居住地として開発・利用されているのはわずか4パーセントにすぎず，そこに全人口4,600万人（1984年）のほとんどが集中している状況にある。このため，年率2.5パーセントを越える人口増加，出稼ぎ労働者の大量帰国等とも相まって，エジプト国政府は，人口集中に起因する社会問題対策，人口の地方分散，新規雇傭の創設，農産物自給率の向上，農産物輸入状況の改善といった多くの政策的課題を抱えているところである。

一方，シナイ半島は古来よりアジアとアフリカを結ぶ回廊として重要な位置を占めてきたところ，第四次中東戦争の結果，1982年にようやくイスラエルより全面返還され，現在シナイ開発庁によって道路，電力，上水道等の社会インフラ整備が進められているが，新規雇傭につながる産業がほとんどないため今だに人口が20万人にも満たない状況であり，この地域の戦後復興と，より積極的な開発を推進することが急務となっている。

これらをふまえ，エジプト政府は農業生産の水平的拡大即ち耕地面積の拡大と，人口の地方分散，雇傭の創設等を総合的に図り，もって北シナイ地域の開発に資するべく，ナイル河口ダミエッタよりエル・サラム水路を建設し，スエズ運河を横断したかんがい用水を当地域まで導く一大プロジェクトを計画するに至った。このうちスエズ運河までの部分は既に事業が進行中であるが，運河以東については明確な計画内容が未定であることから，エジプト政府として，エル・サラム水路による北シナイ地域の農業開発を基本とした農村総合開発計画（かんがい開発，農用地開発，アグロインダストリー，新農村建設，漁業開発等）を策定し事業実施を図ることを目的として，1986年8月，日本国政府に対し本件技術協力要請を行ったものである。

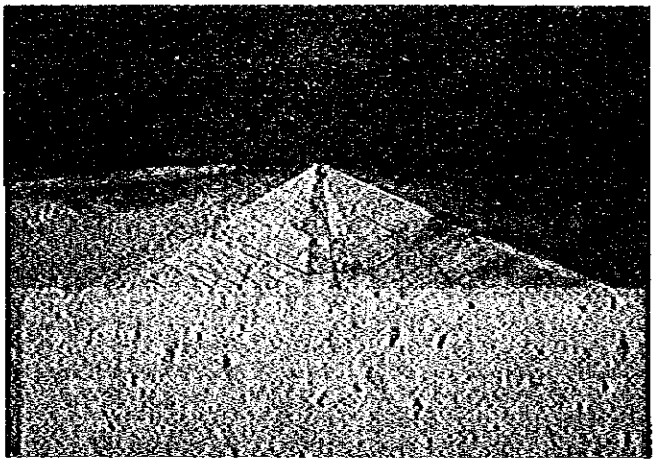
これに対し日本国政府は国際協力事業団を通じ，北海道開発局農業水産部課長補佐　鈴木善博氏を団長とするコンタクト調査団を1987年3月10日より22日まで13日間，更に（財）日本農業土木総合研究所常務理事　坂根　勇氏を団長とする事前（S/W）調査団を同年10月23日より11月4日まで13日間にわたりそれぞれ派遣し，現地踏査及び先方関係機関との協議を行った。

本報告書は上記調査結果をとりまとめたものであり，今後の北シナイ農村総合開発計画のための基礎資料として関係者に広く活用されることを願う次第である。

最後に，調査実施に際して御支援と御協力を賜った関係各位に対し，ここに深甚なる謝意を表するものである。

1988年4月

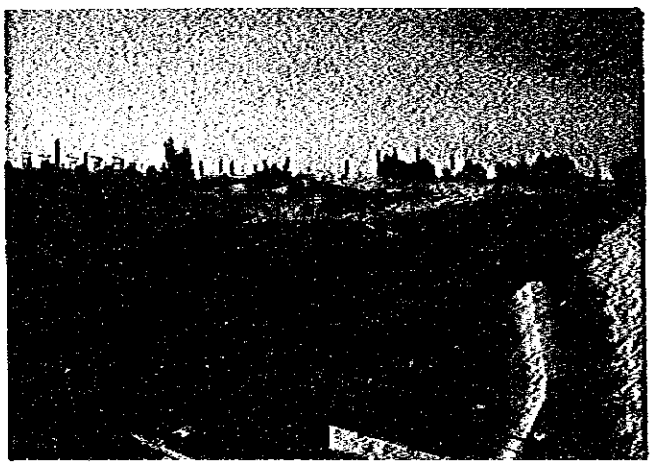
国際協力事業団
理事　山極榮司



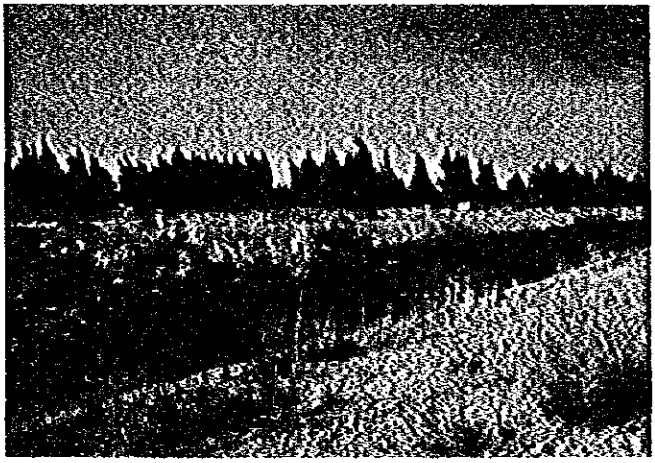
シャルキア州カッターラプロジェクト（本件調査対象地域外）において建設中の農業用水路

同カッターラプロジェクトにおけるスプリングラーかんがい

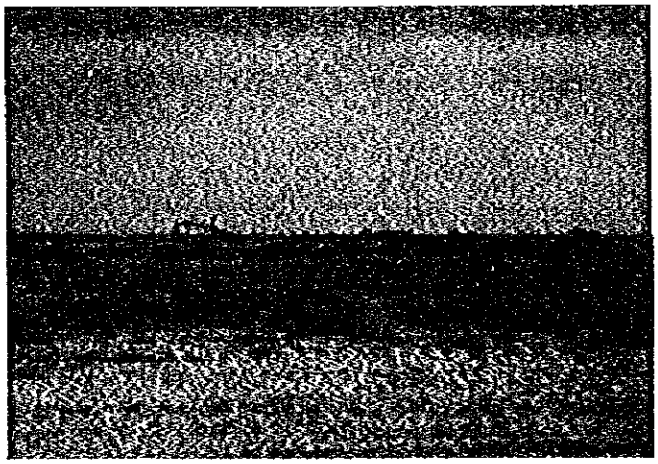
ゴムパイプによる節水かんがい例。水は樹木の根本にのみかんがいされる。



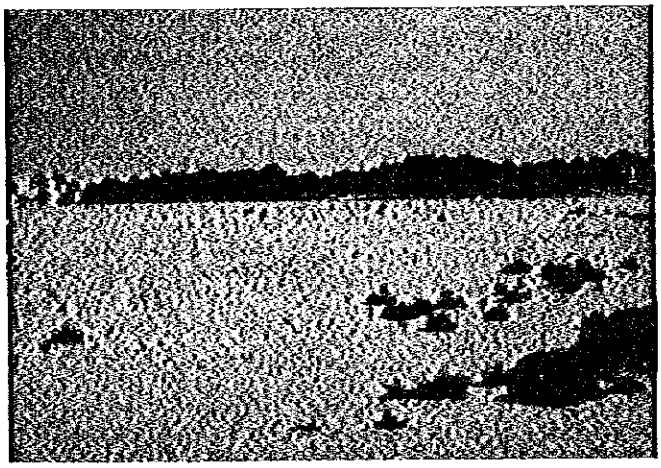
イーストビターレイクプロジェクト（本件調査対象地域外）における用水路。右奥のスエズ運河をサイホンで越えて導水され，この地点でポンプアップする。



イーストビターレイクプロジェクト
用水路



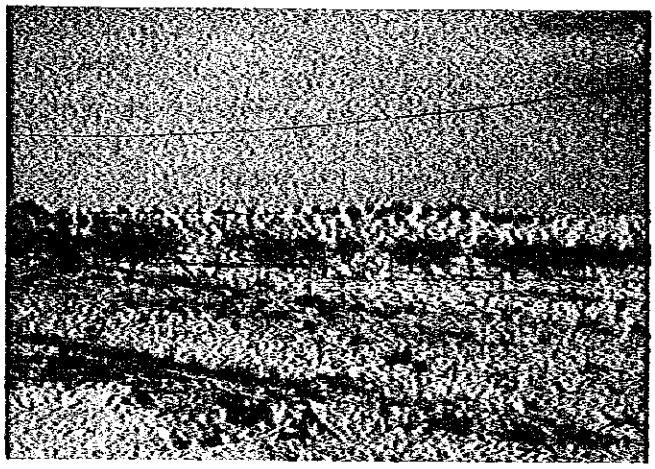
イーストビターレイクプロジェクト
遠方にみえるのがセンターピボット
方式によるかんがい施設



ティナプレーン（ティナ平原）
砂漠のなかに所々ナツメヤシ等がみ
られるのみである。

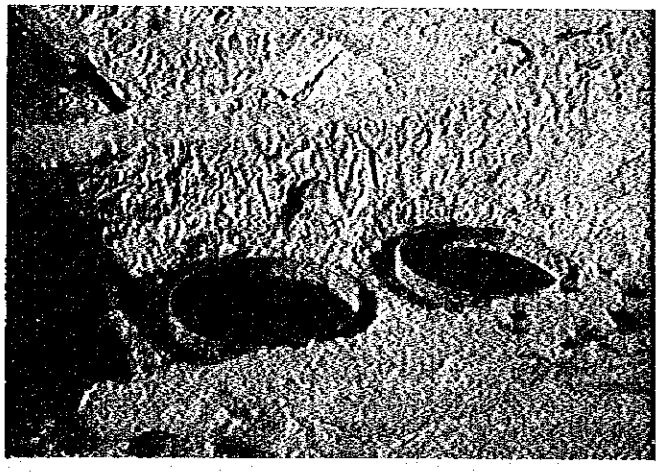
ティナプレーンにおける塩類集積状況
表面はほとんどコンクリートのように
固結しており極めて堅い。

対象地域内ではこのような塩田も
みられる。



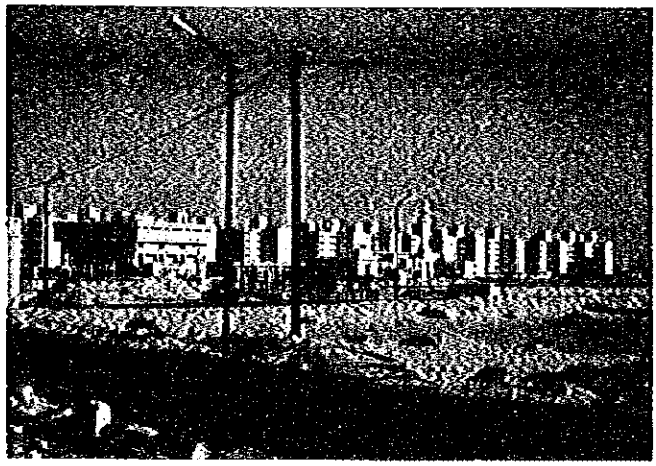
ラファ近郊の営農状況
天水及び地下水が水源であり，かろ
うじて栽培が可能となっている。

ラファ近郊でみかけた農家
トラクター，給水車等比較的経営
規模は大きい。

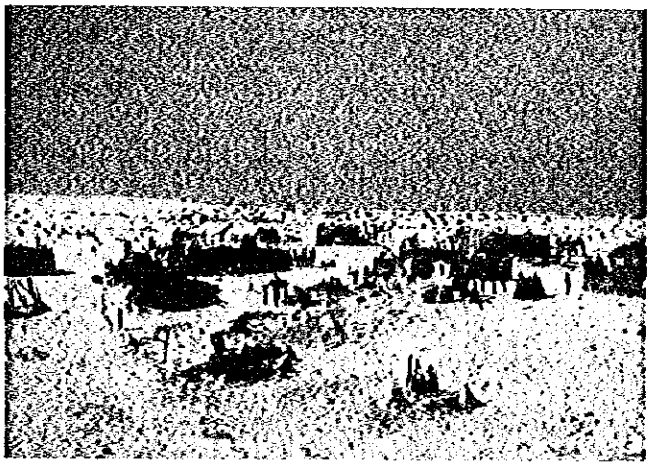


エル・アリシュ郊外のかんがい用
貯水施設
地下水面まで掘り下げて貯水する。

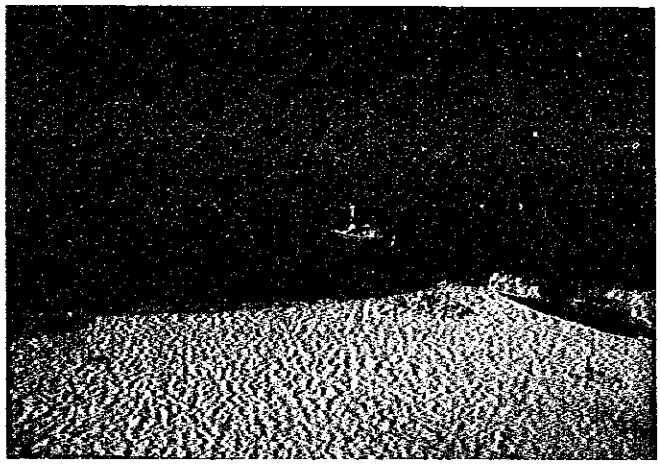
ラファ郊外のシナイ開発庁営育苗施設。
同様の施設が北シナイに6ケ所あるとの説明であった。



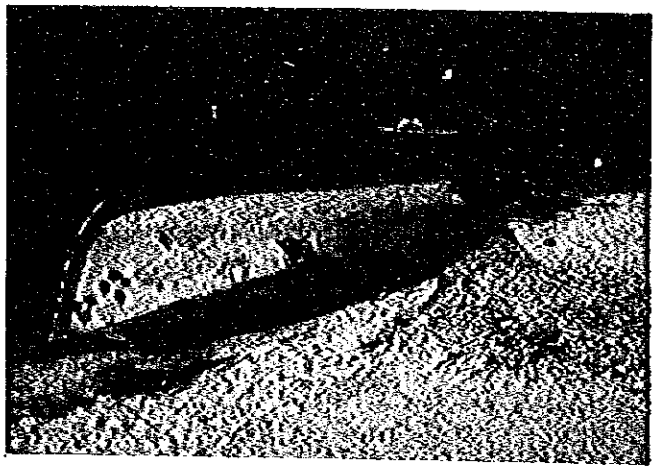
エル・アリシュ近郊におけるニュー・コミュニティ開発
類似のものが幹線道路に沿っていくつかみられる。



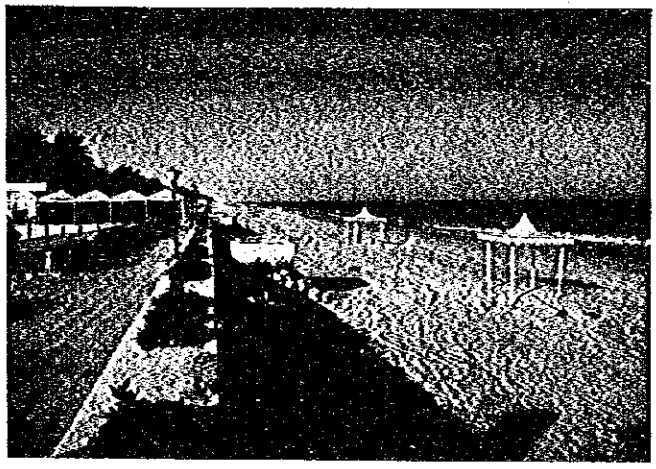
ベドウィン族の住居



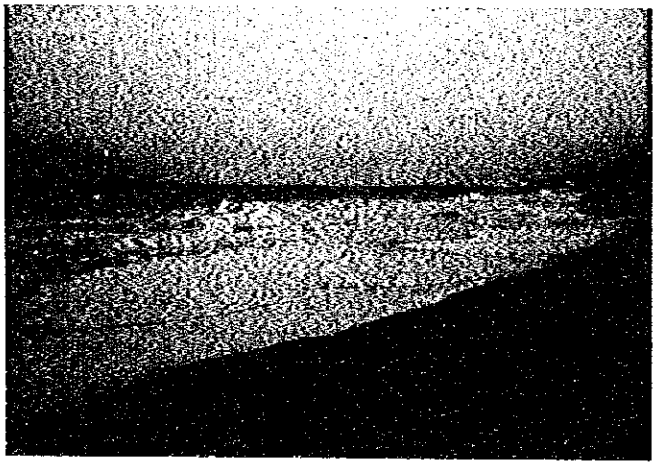
バルダウィル湖
漁業と共にレジャー面でのポテンシャルも期待できる。水深は極めて浅い（3m以下）。



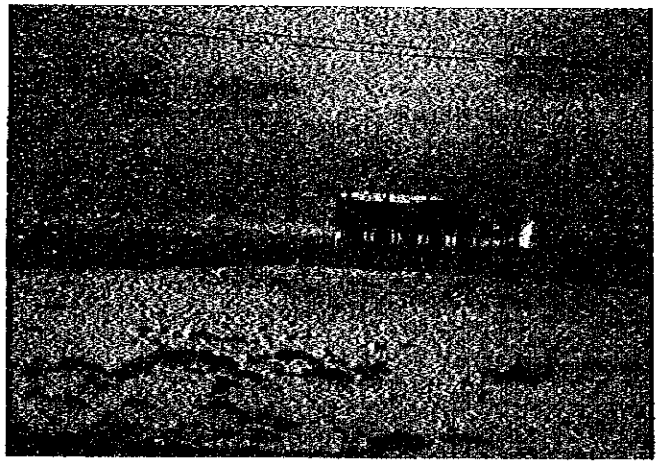
バルダウィル湖
午前と午後の漁の間にあたり人影は
まばらである。



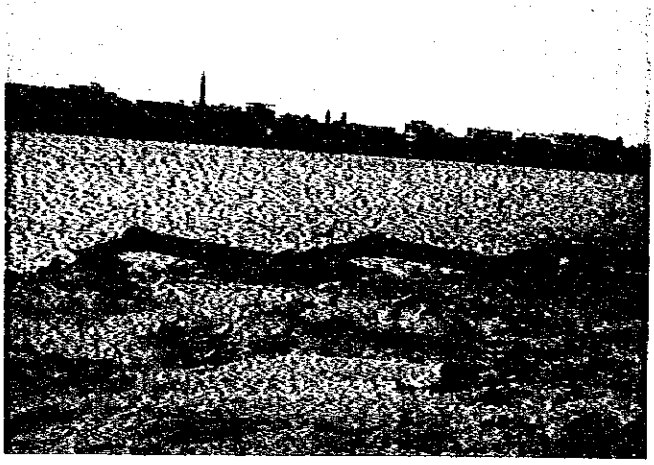
エル・アリシュにおける海浜
リゾート地
右側は地中海



地中海の夕暮れ



ビル・エル・アブド近郊にある
ディーゼル発電施設
エル・アリシュ郊外にも１ケ所
みかけられた。



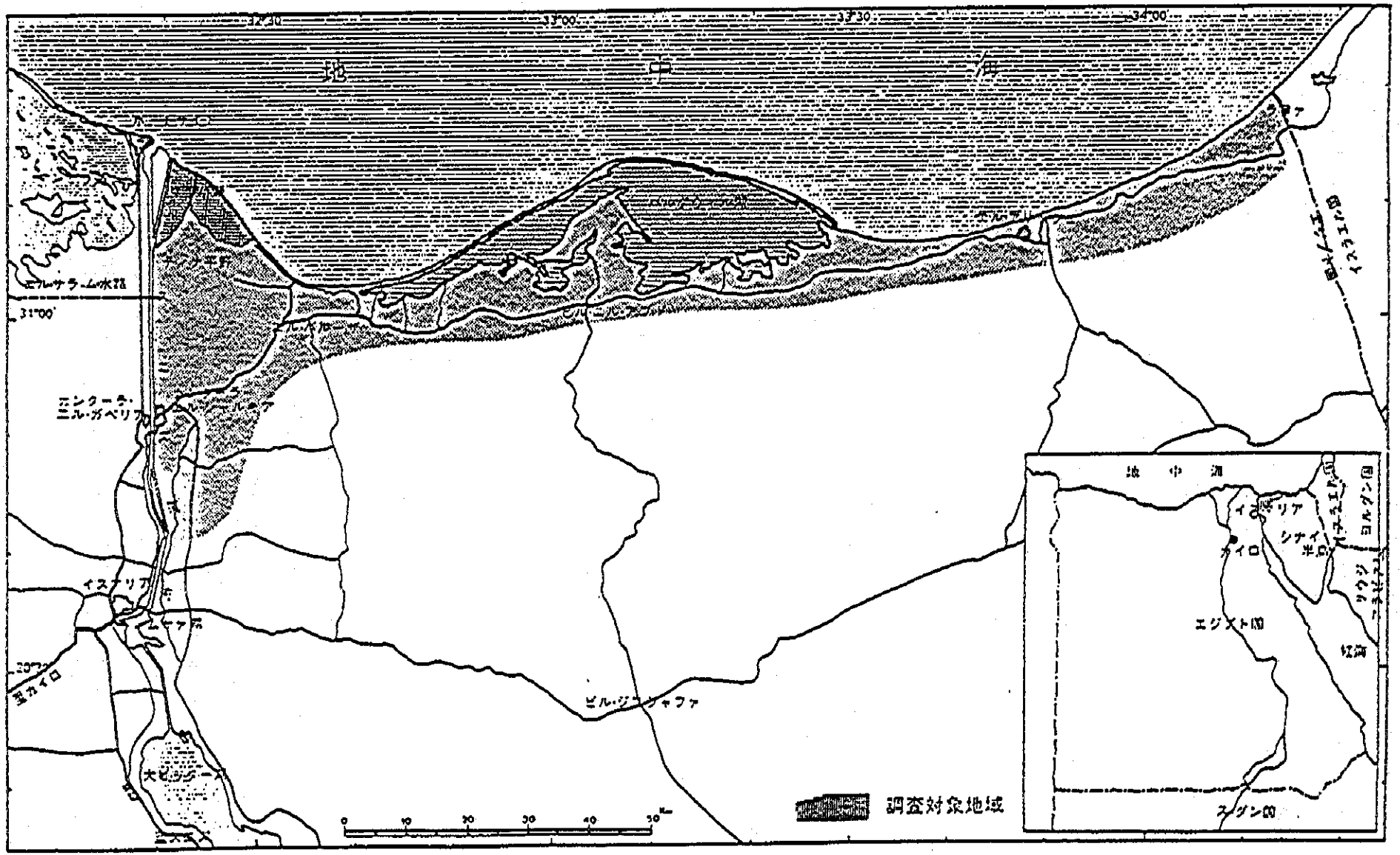
スエズ運河を渡る上水道用サイホン
（シナイ半島側カンタラ地点）
給水先はビル・エル・アブド又はエル・アリシュ

幹線道路沿いにエル・アリシュまで
延びる上水道パイプライン

11月2日　S/W署名
El-Nagar 開発省第1次官及び
坂根事前調査団長

スエズ運河光景

北シナイ農村総合開発計画調査　位置図



目　　次

第1部

コンタクトミッション

（昭和62年3月10日～22日）

第1章　序　　章

1．要請背景

エジプト国は歴史的，自然条件的にみて，ナイル川の恩恵を受ける範囲においてその発展が可能であった。全国土面積約100万km²のうち，現在既耕地・居住地として利用されているのはわずか4％にすぎず，耕地面積は約640万フェダン（1フェダン＝約0.42ヘクタール）である。

この限られた地域に1984年時点で4,600万人の人口の大部分が居住していることから人口の都市集中による様々な社会問題が発生している。さらに年2.5％という近年の急激な人口増加の結果西暦2000年には総人口6800万人になると予想されており，政府として穀物自給率（40％）の改善，雇傭機会の創設，人口の地方分散といった多くの課題を抱えている状況である。

これに対するひとつの手段として，農業生産においては水平及び垂直拡大，即ち耕地面積の拡大と単位面積当りの生産量の増大という両面から各種施策を講じているところであり，特に水平的拡大については，ナイル川の水を河口ダミエッタで取水し，スエズ運河方向に導水して更に運河を越えて北シナイ地域までを開発するというエル・サラム水路計画が既に一部実施されている。但し現在実施中の部分はナイル川よりスエズ運河西岸までであり，運河横断以降の具体的計画はまだ策定されていない。

一方，シナイ半島は古来よりアフリカとアジアを結ぶ回廊として重要な位置にあり，近年では数次にわたる中東戦争の舞台ともなっている。この第四次中東戦争の結果，1982年にイスラエルより全面返還されたが，エジプト政府としてこの地域の復興を図ると共により積極的な開発を推進していく必要性が生じている。なお現在シナイ半島では返還後設立されたシナイ開発庁により道路・電力・上水道等社会インフラの整備が進められているが人口はまだ20万人程度でそのほとんどが北シナイ地域の2～3の地方都市に集中している状況である。

以上を背景として，エジプト政府は北シナイ地域において農業を中心とした総合開発計画を策定し，人口の分散，農業生産の増大，及び地域の復興を図るべく本件技術協力をわが国に対し要請したものである。

2．調査の目的

背景で述べたとおり，エジプト国政府は食糧自給率の向上，雇傭機会の創設，人口の地方分散等を図るため未だ開発のほとんどなされていない北シナイ地域を対象とした開発計画策定を要請するに至った。従ってその内容は下記の如く多岐にわたると共に先方関係省庁も多く，加えて行政機構改革もあったため先方実施機関があいまいであること等から，コンタクト調査団を派遣し，これらの確認を行うこととなった。

○主な調査内容

1）エル・サラム水路東伸計画

2）ティナ平原等の農業開発計画

3）内水面漁業開発計画

4）アグロインダストリー導入計画

5）農村開発（地域インフラ）計画

6）観光・レジャー開発

7）以上にかかるM/P及び優先プロジェクトについてのF/Sの実施

コンタクト調査においては先方関係機関との協議及び現地踏査を通じて次の事項を明確にすることを方針とした。

1）要請に至った背景・経緯

2）先方T/Rに関する内容及び関連資料の有無

3）本格調査実施の妥当性及び方向づけ

4）先方実施機関の確認

5）S/W標準パターンの確認

3．調査団の構成

(1) 鈴木　善博　（総括／農村計画）　北海道開発局農業水産部農業計画課長補佐

(2) 稲田　幸三　（協力政策）　外務省経済協力局開発協力課

(3) 宗岡　一正　（かんがい排水）　農林水産省構造改善局事業計画課係長

(4) 相馬　厚司　（農業・土壌）　農林水産省農蚕園芸局果樹花き課研修指導官

(5) 熊丸　敦郎　（漁業）　茨城県内水面水産試験場主任研究員

(6) 荒井　博之　（業務調整）　JICA農林水産計画調査部農林水産技術課

4．調査日程

日順	月　日	曜日	調査日程	調査内容
1	3月10日	火	成田→	出発
2	11	水	→カイロ	カイロ着
3	12	木	表敬・打合せ	関係機関表敬
4	13	金		資料収集，団内打合せ
5	14	土	カイロ→北シナイ	現地踏査，シナイ開発庁
6	15	日	北シナイ→カイロ	現地踏査，北シナイ州
7	16	月	協議	協議
8	17	火	〃	農業省・かんがい省協議
9	18	水	〃	協議，M/M署名
10	19	木	報告	大使館，JICA等帰国報告
11	20	金	カイロ→	カイロ発
12	21	土		
13	22	日	→成田	帰国

5．面会者リスト

(1) 在エジプト日本国大使館
　① 山田公使
　② 安村一等書記官
　③ 鹿籠一等書記官
(2) JICAエジプト事務所
　① 橋本所長
　② 小森副参事
(3) JICA派遣長期専門家
　① 坂元雄次（GARPAD所属）
(4) （その他エジプト政府側についてはS/Wミッション時とほぼ同様であるので省略）

第２章　協議概要

先方政府との協議は，予め調査団が用意した「開発構想骨子」「調査フロー概念図」及び「S/W標準パターン」を基に行なわれた。この結果，両者間でおおむねの合意が得られたが(1)調査対象地域並びに(2)観光開発について先方より強い要望が出された。

(1) 調査対象地域

先方は①エル・サラム水路計画の拡大（分岐）変更及び②エル・アリシュ～ラファ地域の重要性に鑑み，当初T/Rに示された調査対象地域の拡大を要望した。その概要は次のとおり。(図参照)

① エル・サラム水路計画の拡大（分岐）変更

T/R提出時点ではエル・サラム水路本線は東方へ伸びる路線のみであったが，その後計画変更し，南方向にも分岐することを考慮しているため，この地域を対象地域として追加するよう要請があったものである。

これに対し調査団として，そもそも本件計画の基本はエル・サラム水路により供給される用水次第であり分岐量が決定されない限り，水路の全体計画（マスタープラン）を策定することも不可能であるとの判断から先方要望を了承した。

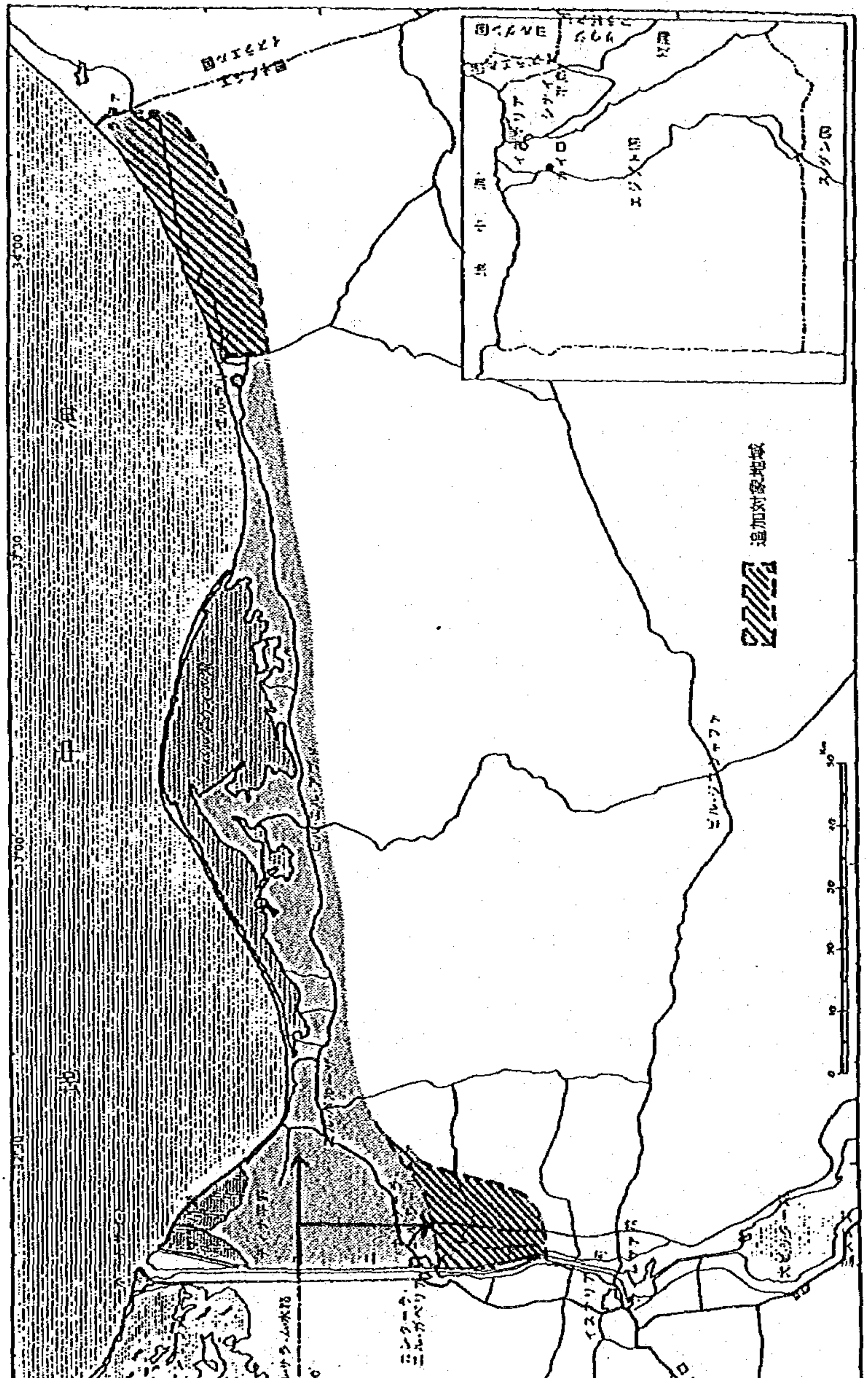
② エル・アリシュ～ラファ地域の追加

先方は「北シナイ地域はエル・アリシュではなく，ラファまでである」と前置きしたうえで同地域は地下水，降雨量が他地域と比べて豊かでありかつイスラエル国境に近いことから外交上の重要性もあり，政府として既に開発レポートもとりまとめている（CICCASレポート）ので，この地域を含めて北シナイ地域全体を統一的総合的視点から見た開発計画を策定してほしい旨要望があった。

調査団側で検討した結果，既に土壌調査等も終了していることから大幅な作業量の増につながらず，かつ北シナイ地域全体の開発方針の整合をとるためにもこの追加を了承した。

(2) 観光開発の取り扱い

調査団より，日本側のスタンスとして観光開発は農村／社会開発計画の項目で包括的にとり扱い単独の調査項目から削除したい旨説明を行った。しかしながら先方は基本的に農村総合開発計画であることには理解は示しつつも，観光はエジプトの貴重な産業のひとつであり是非ともT/Rどおり単独にとり扱って欲しいとの要望を繰り返した。更に具体的な観光開発調査の内容としては観光開発ポテンシャルの概定（海浜リゾート・レクリエーション等）であると述べたことからF/S調査対象とはならないこと及び地域の人口動向・農畜産物需給バランス，社会インフラ整備との関連等から地域の開発基本構想（マスタープラン）の一項目としてとりあげることを了承した。


追加対象地域

附属資料（I）

1．Minutes of Meeting (M/M)

2．先方政府要請T/R

1. Minutes of Meeting (M/M)

MINUTES OF MEETING

1. In response to the request of the Government of the Arab Republic of Egypt for Master Plan Study and Feasibility Study of priority sub-projects on North Sinai Integrated Rural Development Project of Egypt (hereinafter referred to as "the Study"), the Government of Japan decided to dispatch, through Japan International Cooperation Agency (hereinafter referred to as "JICA") responsible for the implementation of the technical cooperation programmes of the Government of Japan, the contact survey mission headed by Mr. Yoshihiro Suzuki to Egypt from March 11, to 20, 1987, so as to discuss and exchange views on the Study with authorities concerned of Egyptian side.

2. Both sides have agreed upon the Basic Study Concept (see Annex I)

3. In this connection, both sides have also agreed upon;
   1) Scope of Work of the Study shall be formulated based on the standard Scope of Work which was agreed between Embassy of Japan and Ministry of Planning and International Cooperation (see Annex II)

   2) The environmental and ecological study shall be included in the Master Plan Study.

   3) The period of the Study shall be about two years.

4. List of attendance on discussions is attached in Annex III.

Cairo, 18th March 1987

Mr. Yoshihiro Suzuki
Leader, Contact mission
JICA

Dr. Eng. Ali Mahmoud Abu Zeid
Chairman of Coordination Committe
Chairman of Central Development Authority
Ministry of Development, New Communities, Housing and Utilities

ANNEX I

THE BASIC STUDY CONCEPT

1. TITLE

Master Plan Study and Feasibility Study of priority sub-projects on North Sinai Integrated Rural Development Project in Arab Republic of Egypt.

2. OBJECTIVES

(1) To formulate a Master Plan on Integrated Rural Development and to identify the priority of sub-projects in North Sinai.

(2) To conduct a Feasibility Study on high priority project(s) to be identified in the course of the Master Plan Study.

3. STUDY AREA

The study area covers the North Sinai region from the Suez Canal to the eastern border (Rafa) along the Mediterranean coast (see location map attahced)

4. BASIC DEVELOPMENT COMPONENTS OF THE MASTER PLAN

(1) Agricultural Development
   a. Land Use
   b. Land Reclamation (including the guideline of land tenure)
   c. Irrigation and Drainage System
   d. El-Salam Canal (including syphon(s) under Suez Canal)
   e. Farming System

(2) Fishery Development
   a. Propagation and Aquaculture
   b. Fisheries Facilities

(3) Agro-industry and supporting bussinesses

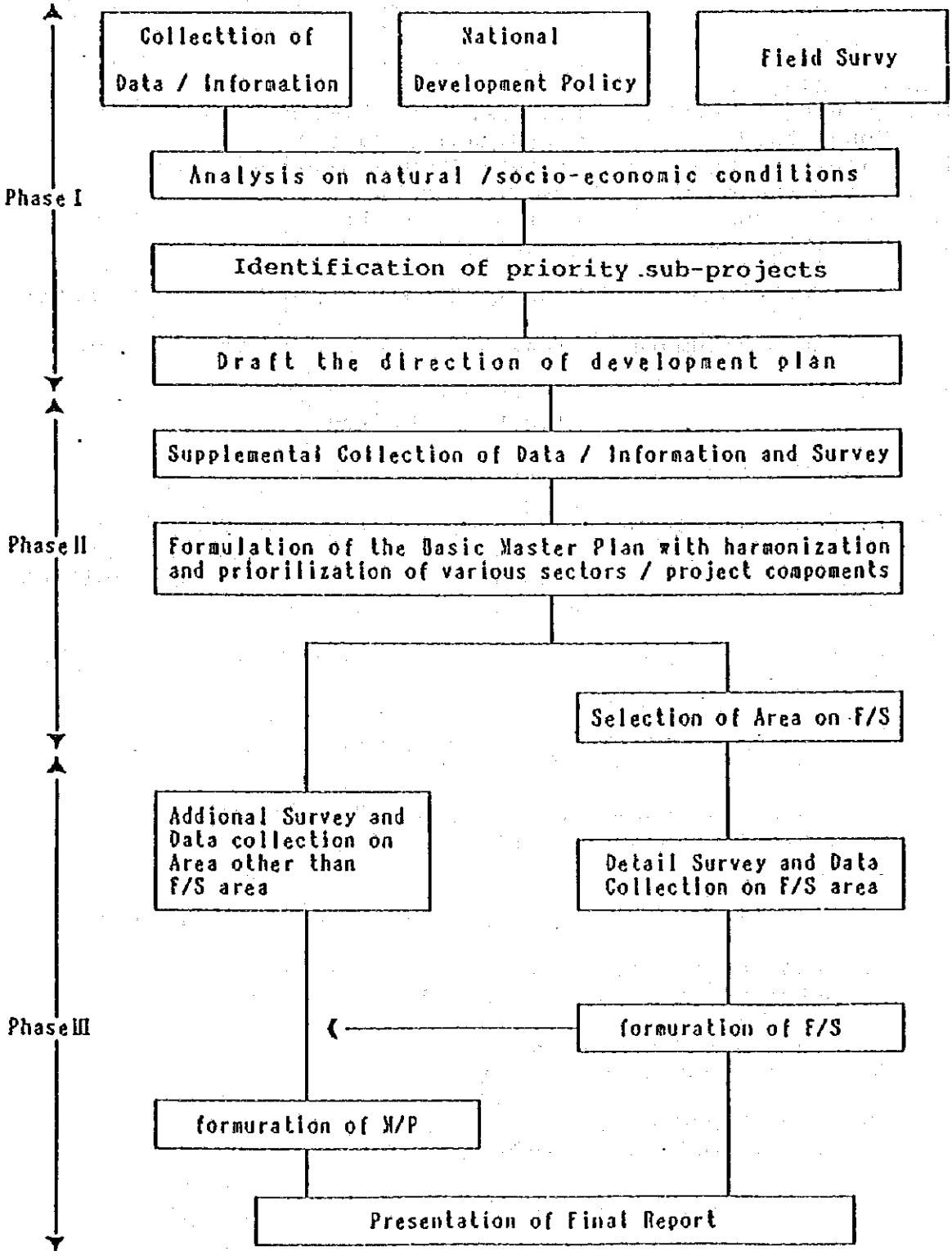
(4) New-Communities Development
   a. Reconstruction of the existing communities
   b. Development of New Communities
   c. Social infrastructures

(5) Tourism Development

5. FEASIBILITY STUDY

6 Flow of the Study copmponents

The Study will be devided into 3 phases



ANNEX III

LIST OF ATTENDANCE

1. CONTACT MISSION

Mr. Yoshihiro Suzuki	Leader/Rural Planning
Mr. Kouzo Inada	Coordination Policy
Mr. Kazumasa Muneoka	Irrigation/Drainage
Mr. Atsuo kumamaru	Fisheries/Aquaculture
Mr. Koushi Souma	Agriculture/soil
Mr. Hiroyuki Arai	Coordination

2. Mr. Yuji Sakamoto — Technical Advisor, GARPAD JICA Expert

3. Mr. Hironobu Yasumura — First Secretary, Embassy of Japan

4. Mr.Takeshi Komori — Deputy Resident Representative, JICA Egypt Office

5. Egyptian Coordination Committee of the Study

i) Dr. Eng. Ali Mahmoud Abu Zeid, Chairman of Central Reconstruction Authority, Ministry of Reconstruction, New Communities, Housing and Utilities

ii) Ministry of Reconstruction, New Communities, Housing and Utilities :-

Mr. Eng. Mohi El-Deen El-Tieb El-Nagaar
Head of Foreign Finance Sector.

General Eng. Mohamed Abdel Mounem El-Katury
Chairman of Sinai Development Authority

Mr. Eng. Rushudy Faheem
Head of Execution sector of Sinai Development Authority

Mr. Eng. Salah El-Deen Mohamed Abu El-Ezz
Director General, Central Development Authority

Mr. Eng. Hamed Sharhabeel
Sinai Development Authority

Mr. Eng. Ahmed Amin
Sinai Development Authority

iii)Ministry of Agriculture and Land Reclamation

Dr. Magdy Abbas Saleh (on behalf of Chariman)
General Authority of Fish Resources Development

Dr. Samir Ramzy Nagmoush
Undersecretary of State, General Authority for Rehabilitation Projects and Agricultural Development.

IV) Ministry of Irrigation

Mr. Eng. Kamal El-Desuky
Deputy Minister of Ministry of Irrigation for Horizontal Expansion

Mr. Eng. Ibrahim Zaki
Undersecretary of State for Suez Canal and Sinai

2. 先方政府要請T/R

REQUEST
FOR
TECHNICAL ASSISTANCE
TO
MASTER PLAN STUDY AND FEASIBILITY STUDY
OF
PRIORITY SUB-PROJECTS

PROJECT TITLE	NORTH SINAI INTEGRATED RURAL DEVELOPEMENT PROJECT OF A.R.EGYPT
REQUESTING AGENCY	MINISTRY OF DEVELOPMENT, NEW COMMUNITIES AND LAND RECLAMATION
PROPOSED SOURCE OF ASSISTANCE	JAPAN

CONTENTS

LIST OF TABLES

1. INTRODUCTION

1.1. Background

The national land of Egypt accounts for about one million square kilometers (238 million feddans). However, only 4 percent of it is utilized for agricultural, industrial, and residential purposes, and such populated parts are mostly concentrated in Nile Valley, Nile Delta and around oases scattered in deserts.

The total population is 48 million. Most of them live in this particular areas, causing the continuous population pressure with the annual growth rate of 2.5 percent, thus leading to phenomenological urban concentration despite of political claims for adjusting and rectifying distribution patterns.

Due to the swelling population, Egypt is importing a huge amount of foodstuffs despite that the Government has fostered a straneous effort for food security through both horizontal and vertical agricultural development. Simultaneously, the Government is facing the necessity to create employment opportunity for the increasing number of working population.

Under the on-going Five Year Plan, El Salaam Canal is under construction to divert Damietta Branch of the Nile River for irrigation of West of Suez Canal Area (Phase I Project).

The Government is going to include in the next Five Year Plan (1967/88 - 1991/92) El Salaam Canal Extension Project to Sinai (Phase II project) as a priority project so as to create reclaimed land for agriculture on fertile Tina Plain, applying the precious water in the most economic way. There is no room of doubt that Phase II of this canal project will give a great impact for development to the social and economic activities in North Sinai. It is, therefore, high time now to carry out a master plan study in the entire area of North Sinai which could be served by this canal so as to formulate the development guideline, and furthermore, to make feasibility study of priority sub-projects, which will be selected in the course of master plan study, as soon as possible even in parallel with the master planning study, if deemed necessary and appropriate.

With all such measures, the North Sinai Integrated Rural Development Project (hereinafter referred to as the "Project") will enable to present population and future immigrants to enjoy rural life and welfare offered to them, help mitigate the population pressure, and at the same time establish deep rooted industrial activities based on products and resources of agriculture, livestock and fishery, thus creating another new opportunity for local employment.

Such situations would undoubtedly motivate and orient to convey El Salaam Canal water to North Sinai through syphone across Suez Canal for the first inaugurative action of the whole Project.

A master plan formulation and a feasibility study on priority sub-projects of the Project will surely serve for the financialization of the ambitious Project of paramount importance.

In accordance with the directives of the Ministry of Development attaching an important role to land reclamation to be strongly stressed in the next Five-Year Plan (1987/88 - 1992/93), the Project Planning Unit (P.P.U.) under the General Authority for Rehabilitation Projects and Agricultural Development (GARPAD) is now planning to commence a feasibility study for the development of a part of Tina Plain, covering more or less 50,000 feddans mostly located in southern part of the Plain. The feasibility study would formulate land reclamation and its related components, which would not include the necessary study for the El Salaam Canal Extension beginning from the Syphone under the Suez Canal.

1.2. Previous Studies

The following two major studies on master planning are available;

(1) Master Plan for Water Resources Development and Use, March 1981, UNDP and IBRD
(2) Land Master Plan, 1986, Euroconsult and Pacer Consultants

The following studies have been so far conducted for development of Sinai Area;

(3) Sinai Development Study Phase I, June 1983, Dames and Moore, USAID
(4) Reconnaissance Soil Survey of North Sinai, 1984, REGWA
(5) Semi-Detailed Soil Survey of North Sinai, 1984, REGWA
(6) Preliminary Feasibility Study for Agricultural Development of North Sinai, 1986, REGWA

Accordingly, making full use of these elaborated studies, a guideline could be formulated, and priority sub-projects could be selected and established based on these studies and formulated guidelines. The new Five-Year Plan is going to start soon. Now there is an opportunity ripe to be seized for finalizing the grandiose and interdisciplinery project.

2. THE PROJECT AREA

2.1. Natural Resources

(1) Location, Topography, and Geology

Facing the Mediterranean Sea, the Project Area shows a narrow strip linking Port Fuad, Qantara, and El Arish, and occupies about 500,000 feddans inclusive of 180,000 feddans of Bardawil Lake.

The coastal plains of the Project Area has a comparatively new geomorphic formations created by sea invasion after the Post-Miocene to Pliocene periods when the entire greater gulf of Suez area was formed. Surface alluvial deposits (0 to 20 m) were formed quite recently (Quarternary) as fresh as Pleistocene and Holocene comprising of sand dunes, loess like deposit. Tina Plain in west of Balouza is a part of typical recent delta deposits of the Nile River, partly covered by sand drift of Pleistocene origin. These areas have a very deep tertiary bed rocks formed below 20 to 30 meters from soil surface. Free saline water board is usually found at the depth of 0 to 10 meters.

(2) Soils

The soils of North Sinai Coastal Area consist of two major groups. One is found in Tina Plain. It is derived from old Nile delta and lagoon (lacustrine) deposits with high salt content (almost saturated or oversaturated) layers. Their texture ranges silty to clayey potentially convertible into highly productive soils through proper desalinization. The other group is widely distributed over the coastal plains. It is derived from aeolian and alluvial deposits. This group, mainly coarse to fine sand, is further subdivided into two types having medium and high salinity. Irrigation is easily applicable to the latter sub-group. However, salt accumulation problem can arise specially in the former sub-group.

(3) Climate

The climate conditions of North Sinai are those characterizing the desert area of Egypt, that is, aridity with long hot rainless summer, and mild winter with scarce amount of rainfall. The other seasons are also caharaterized by unstable climate, Khamasien storms and sometimes heavy rainfall.
The temperature at El Arish in winter ranges between 8.5 and 21.4 ^{o}C. In summer the mean minimum temperature is 21 ^{o}C while the mean maximum temperature reaches 30.5 ^{o}C.

Annual precipitation shows general steady decrease from north to south. It reaches less than 105 mm per year at El Arish. In winter the maximum rainfall is recorded in December and January where the rainfall may reach 40 mm in one day. In summer, no rain is recorded while occasional rainfall may exist in autumn months. It is expected that rainfall in the coastal zone is different from that of the inland areas. Moreover, rainfall shows regional decrease to west. It is about 105 mm at El Arish, 33.3 mm at Ismailia and 73.3 mm at Port Said on the border of Suez Canal.

With regard to relative humidity, it reaches about 70 percent along the coastal area (El Arish), and shows gradual decrease westwards and southwards until it reaches 63.6 percent and 33.6 percent at Port Said and Ismailia, respectively.

(4) Ecological Conditions

The natural vegetation in the Project Area is very poor. A striking feature is the bareness of the major parts. Only palm trees and brush plants are observed in wadis and in hollows between sand dunes. Hallophytic plants also grow in the sabkhas and salt-affected lands. Barley is cultivated in a very small scale, and is restricted to certain areas, depending on local precipitation and occasional floods.

Malaha Lake and Bardawil Lake are large salt water lagoons. The influx of water from the Mediterranean Sea is very important to the ecology of these lakes' systems because it maintains the salt concentration at tolerable levels.

Both lakes are the internationally recognized breeding, resting, and feeding areas for wintering and migratory birds such as flamingo, etc.

The lagoon in the central area is a good source of fish like sparus aurata, etc.

2.2. Social Resources

(1) Population

North Sinai is quite thinly populated except El Arish, capital of North Sinai Governorate, and the northeast coastal zone where 90 percent of population in North Sinai Governorate is concentrated. The vast inland area is inhabited by the limited number of beduin earning their living by breeding livestock.

CAPMAS census of North Sinai Governorate conducted in 1982 shows the following populations;

- o Population 136,600
- o Family size 5.5
- o Age below 12 years old 37.5 %

Presently rural communities in different scales are under rehabilitation, expansion, or construction along Qantara - El Arish Highway.

(2) Social Infrastructures and Public Services

a) Road ----- Transportation and traffic to North Sinai are mainly made by truck and vehicle. They go across Suez Canal by ferry boat at Qantara and Ismailia, or through Ahmed Hamdy Tunnel located at Suez. A paved trunk road runs along the northern coastal area connecting Qantara and El Arish. Branch roads, some are paved and the others are not, extend from this trunk road to the shore.

b) Electricity and Telecommunication ----- Power generators dotted in North Sinai narrowly meet the present power demand of Markaz. However, their capacity is not enough to meet the future demand. As for telecommunication, micro-wave is mainly used by governmental offices. Telecommunication facilities for inhabitants are hardly available.

c) Water Supply and Sewage ----- Groundwater has been lifted to supply potable water at El Arish and neiboring areas. However, it is insufficient to meet the present demand. Presently a water supply system is under construction, accordingly. This sytem intakes 30,000 cubic meters of Ismailia - Port Said Canal water daily, and sends it to El Arish crossing Suez Canal by syphone. There is no sewage system in North Sinai. That of El Arish is under planning.

d) Education and Medical Facilities ----- These facilities are insufficient. These are under strengthening.

e) Airport and Hotels ----- An airport is located in El Arish. The number of tourists visiting Sinai Peninsula is gradually increasing recently. Tourist hotels with resort facilities are open to receive them at El Arish.

2.3. Development Potentials

(1) Nile Water for Sinai

As mentioned above, El Salaam Canal Project, Phase I, will be completed soon. The extension of this canal to Sinai will give

a great impact to the social and economic activities in the service areas. It is no doubt that the peace water (El Salaam Canal water) will make the area prosperous and flourishing.

(2) Potentially Fertile Soil of Tina Plain

REGWA soil survey data clearly shows that in old days the low lying area extending from Qantara - El Arish highway toward north till Malaha Lake on the east bank of Suez Canal was submerged by the Nile water in every flooding season. This area is part of Nile Delta having "excellent" soils formed by the old Nile, which could be converted into rich farm lands as seen in Nile Delta although the soil salinity shall technically be improved for this purpose.

(3) Bardawil Lake Coastal Area

The natural vegetation observed along Qantara - El Arish highway suggests that the climate in this area is favorable for cropping. Some inhabitants have experimentally raised olive successfully. With El Salaam Canal water, this area could be developed to be rich agricultural lands cultivated with various crops.

(4) Resources of Malaha and Bardawil Lakes

Presently a considerable number of inhabitants is getting their living by fishery at these two lakes although fishery itself is primitive. The water depth of both lakes is 2 meters at maximum. Modernized fishery inclusive of aquaculture could be introduced. Agricultural and community development to be made in future could directly or indirectly improve fishery production in these lakes, for instance, by providing the lakes' fish with nutrients.

In addition to the economic development, the natural environment specially for sanctuary of migratory birds shall be reserved, which may contribute to tourism development.

(5) New Rural Communities

As a key measure to cope with the population problem in a long term, the Government is developing new rural communities in desert and coastal zones. The Project aims to provide present inhabitants as well as new settlers with fertile farm lands by reclaiming the above-mentioned areas by using El Salaam Canal water, and make agriculture-based industries take deep roots in the areas. It is expected that new rural communities with upgraded welfare under the Mediterranean sea climate will

contribute to the Governmental policy to eliminate urban over-population pressure in Egypt.

3. INTEGRATED RURAL DEVELOPMENT

3.1. Development Concept

3.1.1. Necessity and Objective

As mentioned above, the necessity for rehabilitation of North Sinai region as a whole has been stressed because this area has a high potential for integrated development.

Although several constraints exist at present hindering rural development, i.e.,

- o Lack of local water resources from surface runoff and underground aquifers
- o Catastrophic damages in social infrastructures caused by the war during last decade
- o Accumulated salts on the surface and in soil layers limit growth of vegetation and cattle holding capacity.

Given the following advantages, the Project with El Salaam Canal will mostly overcome such negative factors;

- o Locationally short distance from Cairo, Port Said and other urbanized areas,
- o Meteorologically mild climate expectable of some rainfall during winter,
- o Pedologically fertile virgin soils and geologically rather stabilized coastal plains extended vastly,
- o Demographically increasing trend of population implying high potential for systematic colonization.
- o Politically already initiated Government efforts cited above,

Accordingly, North Sinai region should ideally be dedicated to fulfil what the Government sincerely pursues, i.e., self sufficienty of staple food, well balanced population density and creation of new employment opportunities.

However, the extension of El Salaam Canal to North Sinai entails to add a heavy economic burden, and if the project is singly oriented to only agriculture, it could hardly recover the cost. It is to get rid of such handicap and to realize above-mentioned national policy targets that an integration of hardly feasibile and more promising development components into a economically viable comprehensive rural development project should be reviewed as a Master Plan. Fortunately, there are promising components like fishery development or agro-industries and tourism.

Judging from all these factors, time seems to have matured to finalize a Master Plan so as not to miss already created momentum and inertia within the proposed Area.

3.1.2. Development Strategy

(1) The Goverment of Egypt has attached great importance to the Project to be accomplished by 2000, and its fundamental strategy lies in serial area development from west to east as the Canal water is conveyed.

(2) It follows that the starting point is Tina Plain and the development area gradually extends to Coastal Plains. Since it would take a long period and require a great cost to implement the whole Project, a phased development process should inevitably been introduced.

(3) The strategy also requires that costly Canal water and heavily-invested project facilities should be most efficiently utilized throughout all phases without any idle period, waste or abuse of water, land and other resources.

(4) With a view to satisfying such efficient phased project formulation, various maneuvers including selection of priority sub-projects, a series of comparable alternatives would be needed for economic evaluation and decision making. It would be relevant to remind that the only and the best answer often goes out of orbit, especially in the case of time-consuming project, because factors contributed to the answer are subject to change as time proceeds.

(5) Besides the orderly alignment of construction works, such phased planning as education, extension of techniques, organizing of production and other economic activities should be timely incorporated into the whole basket.

3.1.3. Agricultural Development

Three fundamental aspects would be worthwhile to be reviewed in introducing modern agriculture into the Project Area;

(1) Land demarcation, land use, water distribution, progressive crop rotation sequences for a decade be elaborated with reference to;

- Trial to raise crops or fruit trees presently conducted by local inhabitants in the Project Area;
- Successful or bitter experiences by commercial scale plantation enterprises in El Arish or other examples under similar conditions;
- Existing eco-systems, such as xerophytes, hallophytes, salutary salt tolerant, natural oases vegetation as useful indicators for land demarcations;
- Flat or convex slope topography, little salt hazard in top soil free from salt accumulation.

(2) Livestock production should be combined with agro-horticultural activities, because the former provides feeds, while the latter supplies manure for improving soils.

(3) The third point of concern is the fertile Tina Plain. Fairly heavy construction investment would be required (otherwise possibly returns to mere salt heap) for radical soil salinity measures. However, it turns out to be cheaper in the long run, resurrecting highly productive Delta.

3.1.4. Fisheries Development

Coastal fishery activities can not be overlooked because they are one of the major means of subsistance as far as the Project Area is concerned. Particularly, coastal lakes and lagoons like the Lake Malaha and the Lake Bardawil now play a role as fishing grounds, fishing boat harbors and immediate markets. Moreover, commercial basis aquaculture (closing fishery) is presently undertaken in Malaha lake by dredging open channel to the Mediterranean and seasonally sealing it with fences and nets.

When agricultural activities along the coast are launched on

its orbit and get in full swing, these lakes and lagoons gradually become eutrophicated with drainage disposals, which would never fail to raise fish productivity or change aquatic flora and fauna in them. A proper fishery development project should be established in which on-going primitive, oligotrophic nature of fishing is improved to technically oriented one (inclusive of modern marine fish farming) based on sea or slightly brackish water with the construction of permanent opening channels to the Meditarrenian.

3.1.5. Agro-industries and Marketing

Given a large share of agricultural and fishery products is scheduled as commodities exported to either urban zones or overseas markets, quality control would become indispensable in line with the introduction of agro-industries and marketing facilities in the Project Area.

- For fresh marketing; size and quality standardization and unification of varieties for contract-planting;

- Improvement for lasting freshness including harvesting method, packaging, cold storage and transportation;

- Device for shifting marketing seasons for competitiveness against other producing areas or countries;

- For drying and processing; standardization as cited above, avoiding labour competition with other crop;

- Selection of really remunerative varieties, methods of processing --- how much extent should values be added;

- How to supply purified water, electricity, spare parts and skilled labour, how to ensure regular feeding of raw materials and regular transportation for marketing;

- Synchronized introduction of larger facilities (plants) with underneath canal tunnel (sooner or later canal ferry becomes a big bottleneck for the entire North Sinai Development, so it would be worth considering a multi-purpose tunnel for water pipes, vehicles, electricity and sightseeing);

- Scrutinized review for introduction of agro-industries having little to do with local raw material supply.

3.1.6. Tourism Development

This is one of the state-wide promising future enterprises in this area because a vast virgin area still remains unexploitedly for both domestic and international tourism purposes; and these tourism courses would be able to be packaged with the world famous resources of tourism like Pyramids.

In so far as stabilized supply of quality water, electricity and cooking materials is guaranteed and access paved roads are available, hotel or camping sites would not be confined to city centers. Rather, places amidst natural beauty, closer to beaches or grandiose sand dunes would be preferred to. Visitors would also expect fresh catch, fresh meat or fresh desert fruits obtained from the Project Area for their dining tables.

In parallel with tourism development, enough protective measures should be taken to preserve natural resources and eco-systems to which visitors are attracted.

3.1.7. Community Development and Social Infrastructures

- This Project would be in full bloom only when immigrant from other areas firmly settle in the colonized villages, hence it would be necessary to provide enough accommodation facilities to attract them and encourage them for toiling farm practices;

- Additional social services such as cooperative headquarters, public markets, marine patrol/resque stations, maternity or nursery depots, or dispensaries;

- How to treat social infrastructures in economic analyses;

- How to establish farmers' organizations;

- How to allocate lands to immigrant familty (allotment formula)

- How to organize cooperative activities, agricultural extension,veterinary services, agricultural machinery manangement and maintenance (including repairshops) rendered for supporting and integrating farmers activities.

3.2. Subject of the Study (Master Planning)

3.2.1. Delineation of the Study Area

The Sinai Peninsula covering a land area of over 60,000 km^2, is divided into five sub-regions, namely Northwest, Northeast Coast, Northeast Upland, Southwest, and Southeast. The Study Area under the Master Plan covers a part of Northeast Coast and Northwest sub-regions, having total area of about 500,000 feddans (210,000 ha) and several settlements such as Qantara, Gilbana, Baloza under Port Said Governorate, and El Arish, El Mazar, Negila, Bir El Abd, Romana under North Sinai Governorate.

3.2.2. Topographical Studies (Master Planning)

At present, topographical maps with scale of 1:5,000, 1:10,000, 1:25,000 and 1:100,000 are available. While the topo-maps with scale of 1:25,000 are enough to cover master planning, additional survey would be required, if necessary.

3.2.3. Soil Studies

The semi detailed soil survey covering about 350,000 feddans (147,000 ha) of land area was carried out by the General Company of Researches and Ground Water (REGWA) in 1984. Field survey was conducted systematically, by traversing the area at 0.5 km intervals. Total number of soil profile is 6,794 with an average depth of 150 cm, among which 680 profiles were taken with depth of 300 cm as a representative profile. The soil profiles were thoroughly examined and morphologically described in the field, according to the method outlined by FAO in 1970.

The soil survey together with the results of laboratory analyses could cope with any information to be required by the study as master plan level, except groundwater dynamics in the Project Area.

3.2.4. Meteoro-hydrological Studies

In order to establish technically sound plan for farming system, irrigation/drainage system, new community, including sand arrestation, and to make an environmental assessment, it is necessary to collect and to study the following items;

- Climatological norms such as temperature, humidity, rainfall, evaporation, wind speed and direction, etc.;
- Water quality analysis;

- Hydrological data relating to groundwater and its quality, storm or torrent , etc.

- Hydro-geological study on groundwater.

3.2.5. Agro-Socio-Economic Studies

At present, there exist one governorate capital (El Arish), two big towns, four small towns and three distinct settlements, having total estimated population of about 75,000. Extent and population of these towns and settlements have been expanding and increasing rapidly. The related study should cover the present function of these communities, including prevailing economic activities and restrictions for further development.

3.2.6. Land Use Planning

Since the Project aims to develop the North Sinai area through implementation of agricultural and fishery based Project(s) to be backed up by other various sectors/components, it is essential to grasp future potential of optimum land use pattern including phasing of the pattern, coping with the primary objective of the Project.

3.2.7. Farming System

It is obvious from the results of the semi-detailed soil survey (REGWA) that the Project area except two big lakes (Malaha and Bardawil) is suitable for development of agriculture including animal husbandry as far as necessary water resources be provided. Being a base of the master plan study, proposed cropping pattern(s) and rotation(s) should be determined including phasing for land reclamation period as well as afterwards, through an alternative studies taking into consideration the following items;

- Locally limiting factor such as water resources, soils and climatic conditions;

- Demand by not only local consumption but also national requirement as food security, and domestical and international marketability;

- Labour balance and degree of mechanization, etc.

The proposed agricultural development will be made over the vast virgin land with many settlers, so that it is essential to provide necessary institutional set-up such as research and experimental farm, extension services, farmers' cooperatives,

agricultural credit services and so forth.

3.2.8. Irrigation and Drainage System.

Irrigation water available for the Project is only to be supplied by the El Salam Canal and is limited. Therefore, it is fundamental to establish the best plan of water utilization through thorough alternative studies on optimization and maximization of the limited water resource, including phasing of the development and irrigation method. On the bases of the water use plan, studies shall be carried out concerning with determination of size and construction method for syphone under the Suez Canal, alignment of the El Salaam Canal and so on.

Regarding the planning of drainage system, it is required to make the best alternative for eliminating salinity in the soils, especially in Tina Plain where drainage condition is very poor because of high groundwater table. It may be also necessary to make counterplan for preventing sea water intrusion.

3.2.9. Fishery Development

From viewpoints of lesser capital requirement as well as quicker yielding, fishery development in the existing lakes of Malaha and Bardawil has quite big potential. Therefore, careful studies should be carried out on the following aspects;

- Existing fishery resources and fishing activities in the lakes;
- Natural and environmental condition of the lakes;
- Coastal engineering including opening of lake to sea for circulation of fresh sea water;
- Possibility of introducing aquaculture;
- Possibility to construct inner harbour in the Bardawil Lake, etc.
- Establishment of fishery development center and fishery cooperatives.

3.2.10. Agro-Industry and Marketing

As mentioned in the previous section, it is also pre-requeste to develop the captioned sector from viewpoints of increasing

the value added in the regional economy as well as providing more employment opportunities through which the economy will be more activated, resulted in making the Project economically and financially more viable and attractive. Of course, depending upon development of other sectors, studies to be undertaken in the master plan are;

- Marketability of the Project output both domestically and internationally;

- Assessment of technological level of this sector prevailing in the country, including managerial and financial performance;

- Possibility to establish agro-industries such as packing, processing, cooling/freezing and preserving for fruits, vegetables, fish, etc.

- Planning for supporting businesses such as agriculture mechanization, including workshops input distribution system, marketing facilities, etc.

3.2.11. New Community Development

In order to make the Project fruitful, planning of new community is considered one of the key elements, because after completion of the Project construction, it will require a big number of new settlers who are responsible for successful operation and management of the Project. Therefore, new community should be sufficiently attractive to the settlers. In this connection, the following studies are needed in the master plan;

- Existing institutional policy and arrangement for new communities;

- Possibility of further development of the existing communities such as Bir El Abd, Qantara and El Arish to proposed community center;

- Layout of community centers and sub-centers, and sattelite villages with their size and function, taking into consideration the proposed development sequence and the settlement program. Especially, community centers will have functions of agro and/or fishery processing industrial centers as well as agricultural and fishery supporting service center such as machinery services or ice making.

3.2.12. Social Infrastructures

Studies to be included in the component are;

- Existing level of social infrastructures provision, especially in the existing communities;

- Establishment of guidelines for provision of social infrastructures as the Basic Human Needs, harmonized with new community development, especially for road, electricity, water supply, sewage, communication and social services such as eduction, hospital/clinic, mosque and so on.

3.2.13. Tourism Development

El Arish is now being developed as an international resort, based on which possibility of tourism development in the Project area shall be examined in the following points;

- Development potentiality from viewpoints of natural conditions, including location, landscape, ecology, environment, etc;

- Required measures and facilities for promotion of tourism, with sufficient harmony with other sectors' development.

3.2.14. Environmental Studies

Since Malaha and Bardawil Lakes are internationally famous for many kind of birds of visiting. The present condition is now being kept in good, because level of development in these area is still quite low, that means there exist no trouble/problem in environmental condition. But the implementation of the Project may change such conditions as mentioned above, therefore environmental studies should be fully and carefully carried out for conservation of the future environmental conditions including necessary measures.

4. PROJECT FORMATION

4.1. Project Formation

The project aims at an integrated rural development of the North Sinai Coastal Region, covering about 500,000 feddans (210,000 ha), and targeting its full development in year of 2000 within the frame of the National Development Policy,

taking the contents of the next and the second next 5-year development plans into consideration.

The Project is consisting of 320,000 feddans of land area including El Malaha Lake and 180,000 feddans of El Bardawil Lake and is composed of various development components such as agriculture, fishery, agro-industry and marketing, new community and social infrastructures, tourism, and so forth.

During the master plan study period, guidelines for development of the area are to be established, taking into consideration natural and social resources presently available in the study area as well as their development potential. On the basis of the guidelines, the study area would be divided into several sub-areas, and various sub-projects would be identified. In order to promote the consistent development policy for the Project, it is necessary to integrate and to combine identified sub-projects as well as sub-areas into a packaged project for the purpose of expecting multiplication effects, keeping well coordinated harmonization among various sectors/components concerned.

4.2. Prioritization

While it is ideal to implement all the sub-projects identified in the master plan study at the same time, it is no doubt to require a huge amount of investment as well as a heavy mobilization of the limited resources available in the country. Therefore, it is necessary to give priority to each identified sub-projects for their proceeding next steps such as feasibility study, detailed design/ implementation, etc., taking various factors into consideration, which may include technical/engineering, economical/financial, managerial/ institutional, social/political aspects.

4.3. Priority Projects

El Salam Canal crossing Suez Canal to Sinai Peninsula, is prerequisite to promote the development of North Sinai area, because water to be conveyed through El Salam Canal will be only water resource available for the proposed integrated rural development of the area. And the extension of El Salam Canal has been already schemed as phase II within the entire scope of the El Salam Canal Project.

The El Salam Canal extension should be followed by an optimum planning for water utilization after the Canal's crossing the

Suez Canal. In this connection, it is suggested that an agricultural development in Tina Plain is promising which is going to be included in the next 5-year plan, because the plain extends eastwards from the Suez Canal along with an anticipated alignment of the El Salam Canal, and has big potential from land reclaimability point of view including topography and soil condition as well as from fishery resouces available in Malaha Lake.

At this moment, it can be, therefore, concluded that a package of the El Salam Canal Extension Sub-Project and the Tina Plain Agricultural Development Sub-Project is considered most presumable priority project within the frame of the Project.

5. IMPLEMENTATION PROGRAM

5.1. Study Period and Schedule

The Project is composed of the master plan study for the North Sinai area and the feasibility study for priority project(s) to be identified at the early stage of the master plan study, which are most probably the said package project. The master plan study should embrace various sectors/components as sub-project.

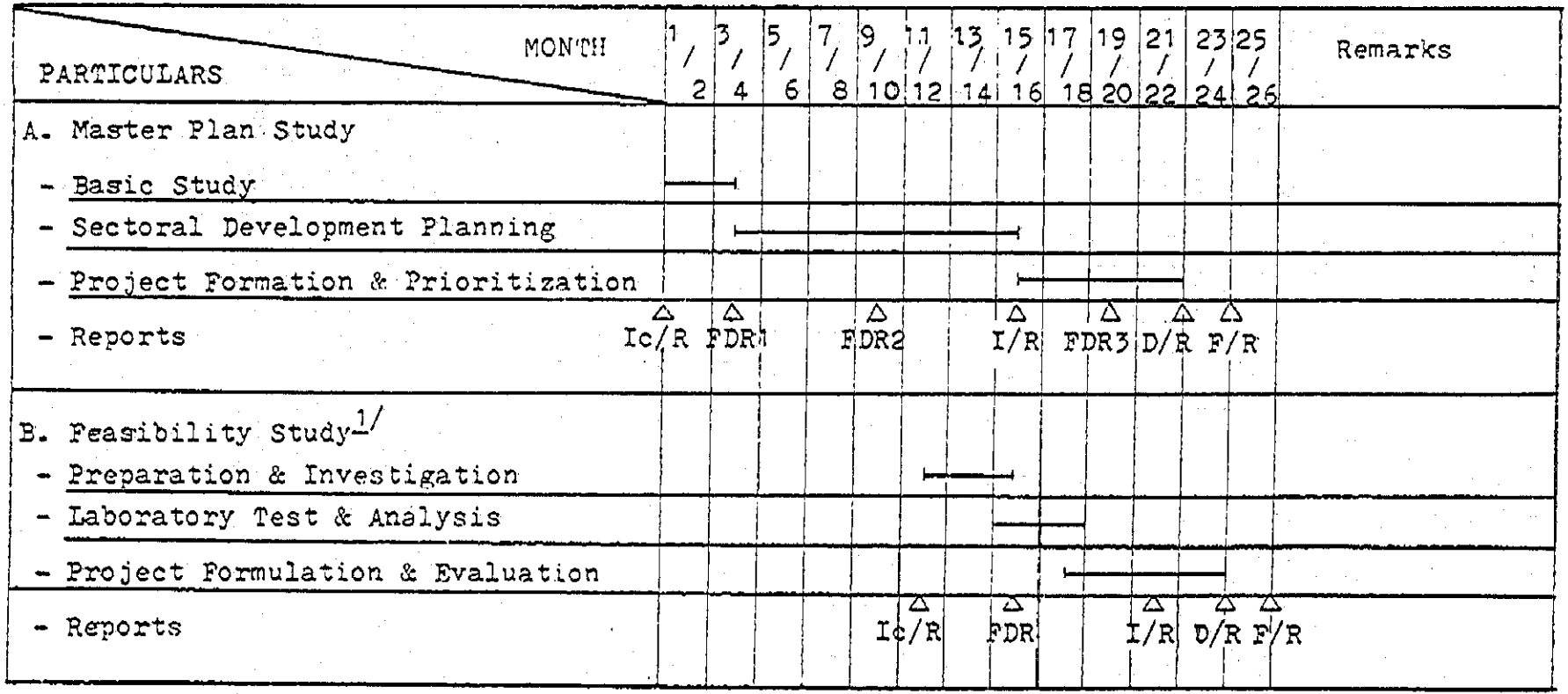
The study period shall require substantially two years, consisting of three stages of master plan study and feasibility study as indicated in Figure 5-1. Even within the study period, whenever high priority sub-projects be identified, they could proceed to the next stage, feasibilty study notwithstanding the master plan study has not yet been completed.

5.2. Feasibility Study of Priority Project(s)

As mentioned in the previous chapter, the El Salam Canal Extension Sub-Project inclusive of Suez Canal Syphon and the Tina Plain Agricultural Development Sub-Project are given higher priority as a package project. Thus the package project should be carefully studied from both technical and economical viewpoints through various alternative studies including phasing of the project in order to cope with basic requirements for the integrated rural development of the North Sinai area, without causing any discrepancy and delay in the development strategy and sequence, respectively.

Under such circumstances, it would be considered appropriate to commence a feasibility study for the priority projects, a package of the El Salam Canal Extension and the Tina Plain

Fig. 5-1 IMPLEMENTATION SCHEDULE



Note: 1/ A package of El Salaam Extension & Tina Plain Development

Ic/R: Inception Report, FDR: Field Report, I/R: Interim Report

D/R: Draft Final Report, F/R: Final Report

Agricultural Development within the frame of the master paln study for the Project as tentatively scheduled in Figure 5-1.

5.3. Coordination Committee

Since the Project covers various sectors/components as mentioned already, it is quite essential to establish inter-ministrial coordination function for the purpose of smooth and efficient execution of the Project. In this connection, the coordination committee shall be formed prior to commencement of the study, which is chaired by Minister of Development, New Communities and Land Reclamation, and composed of those representative from ministries and authorities concerned with the Project as shown in Figure 5-2.

5.4. Executing Agency

Although the Project cover various sectors/components, major items are agricultural development through land reclamation and new community development. In this context, the Ministry of Development, New Communities and Land Reclamation shall be responsible for the Project implementation as the chief executing agency. For those components such as fishery, tourism, etc., which are not covered by the said ministry, the coordination committee shall arrange necessary measures during the study period, and the respective ministry related to those component shall be responsible for implementing identified sub-project(s).

In the course of the study period, the Sinai Development Authority shall act as the substantial executing body with assistance of related authorities and agencies concerned with the Project, as indicated in Figure 5-3.

5.5. Consulting Services

For the smooth and efficient execution of the Project, consisting of the master plan study for the entire project area and the feasibility study for priority project(s), it is considered essential to employ consultants who are enough capable for and experienced with this kind of integrated rural development projects because the Project involves various sectors/components which require corresponding expertise and the study shall be performed within the limited period.

Fig. 5-2.

COORDINATION COMMITTEE

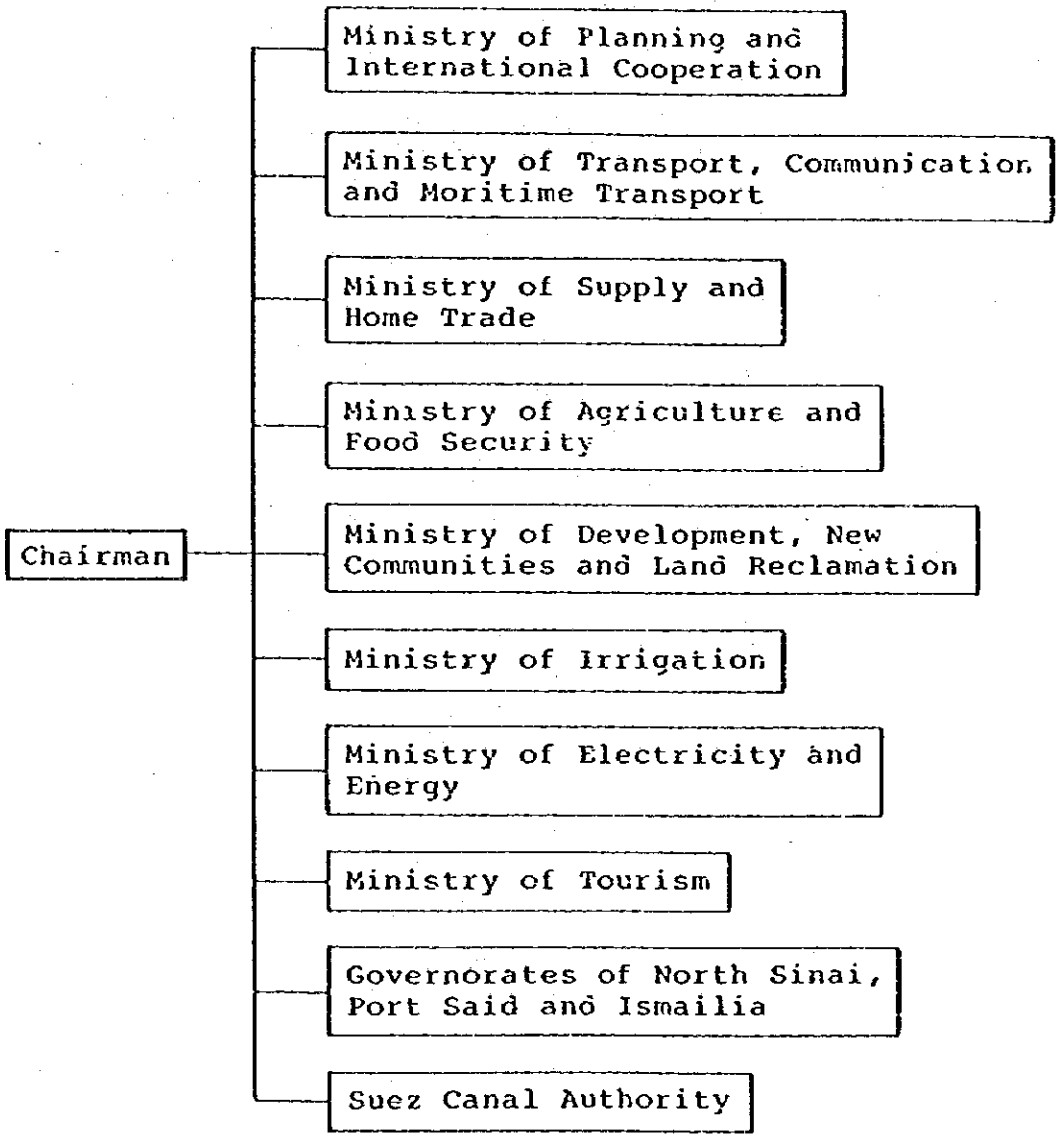


Fig. 5-3.

EXECUTING AGENCY