エジプト国農業開発計画
(南部ホサイニア・バレイ)事前調査報告

昭和55年5月

国際協力事業団

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はじめに

エジプト・アラブ共和国は，ナイルの水利用についての開発計画を策定する中で，さきに農業開発事業につきわが国に対し調査及び具体的な計画立案に関する技術協力の要請を行ったが，これを受けてわが国政府は，昭和５４年１１月に当事業団よりコンタクトミッションを派遣し，９案件につき調査・検討を行った。この調査結果から３案件が協力の可能性のあることが確認され，さらにこれらの３案件について国内で検討された結果，エルサラム用水路計画の一地域である南部ホサイニア・バレイ地区の農業開発に関する協力が最も有効であろうとの結論が得られた。

以上のような経過を経て，さらに昭和５５年１月２６日から１２日間，農林水産省関東農政局土地改良技術事務所所長　石坂仁兵氏を団長とする６名からなる事前調査団を派遣し，同農業開発計画のエジプト・アラブ共和国における位置づけを明確にすると共に現地踏査をふまえて，今後の協力方向等について調査検討を行った。本報告書は上記の調査結果をとりまとめたものである。

本報告書が今後の同国における農業開発計画の推進に役立ちまた，日本・エジプト両国間の友好・親善に一層の寄与をすることを願うものである。

終わりに，本調査の実施に際し，積極的なご支援とご協力を賜ったエジプト・アラブ共和国政府，在エジプト日本国大使館，外務省及び農林水産省関係各位に対して深甚の謝意を表する次第である。

昭和５５年５月

国際協力事業団

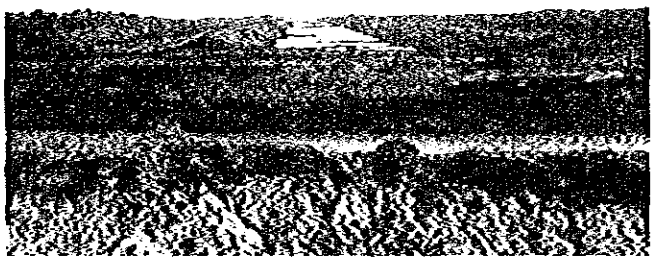
理事　有松　晃

(写真-1)　エル・サラム運河計画取水予定地
(ダミエッタ支流)

(ダミエッタ支流側)

(地中海側)

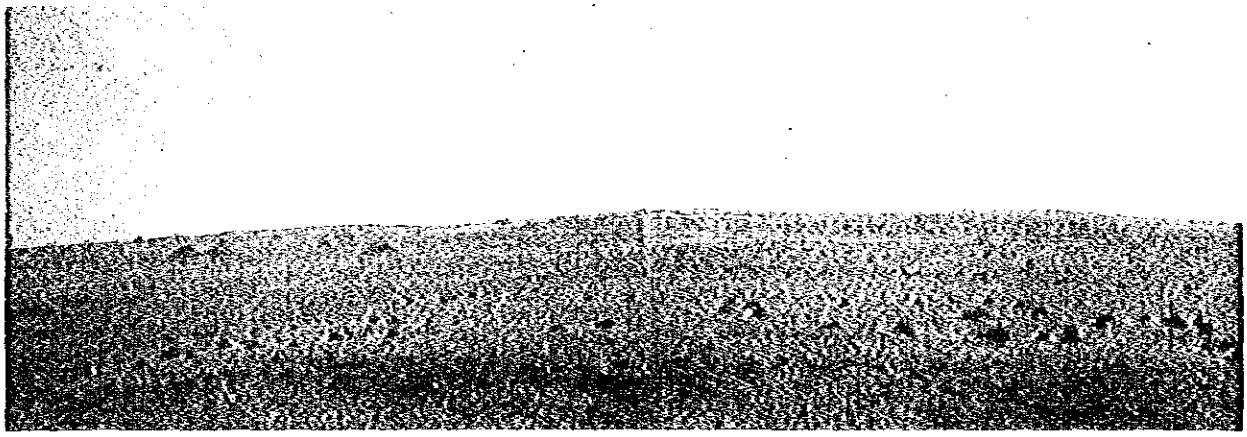
(写真-2)　ダミエッタ支流河口堰堤
(アースダム，L ≒350m，H ≒10m)



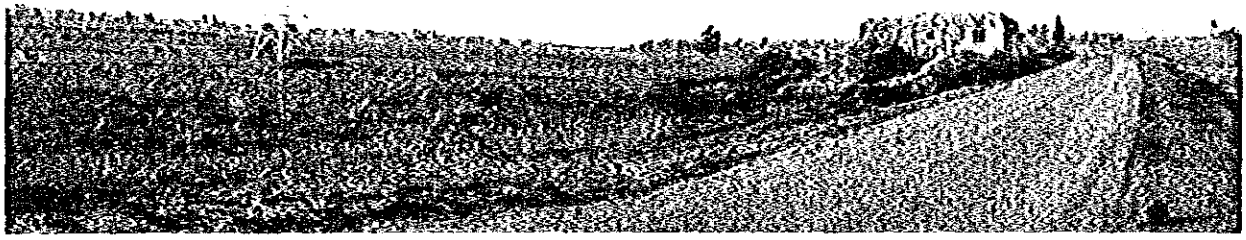
←エル・サラム運河

←地区内排水路

(写真-3)　エル・サラム運河浚渫状況
(エル・マタレーニア地点)



(写真-4)　南部ホサイニア地区（既干陸地域）

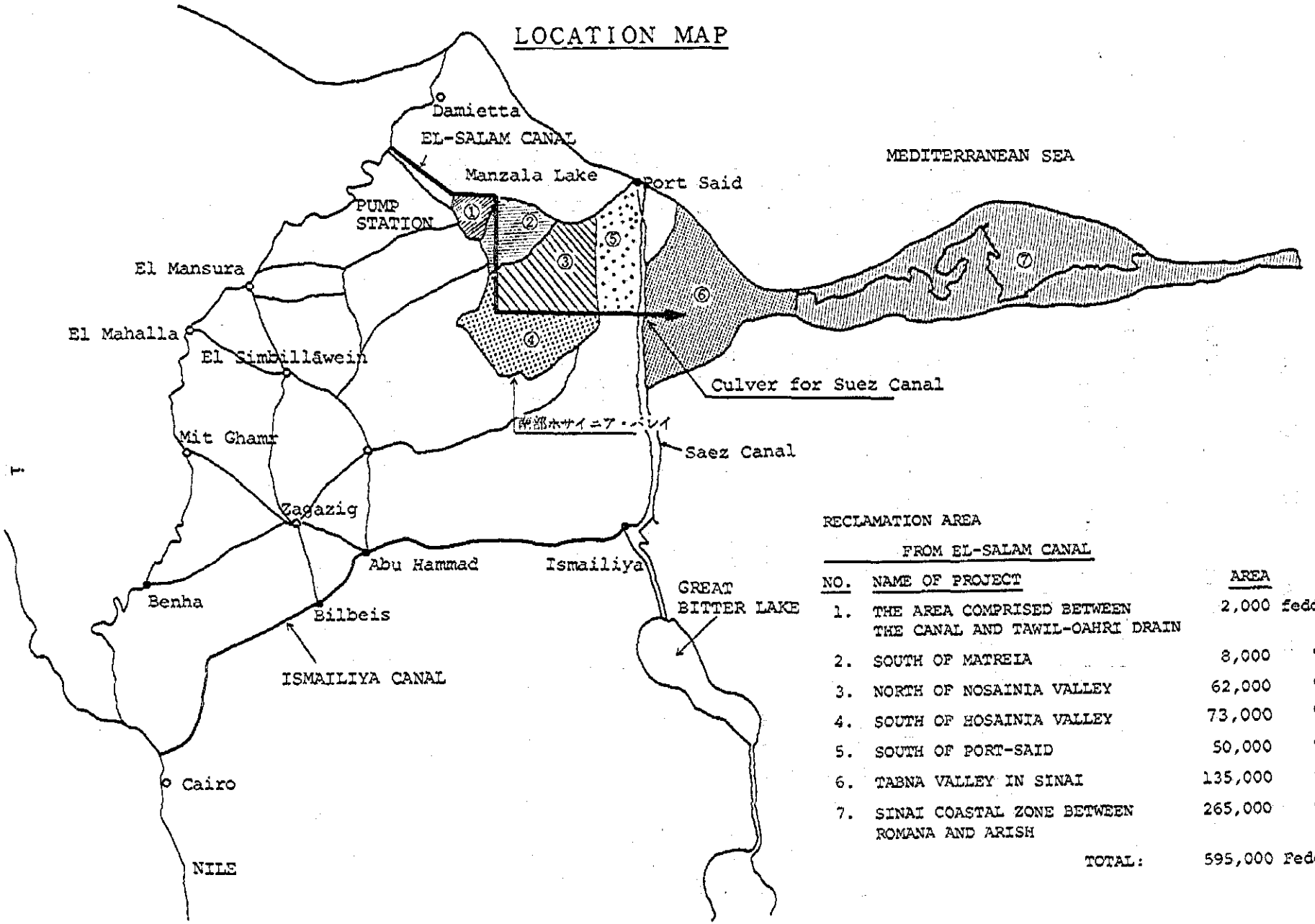


(写真-5)　南部ホサイニア地区周辺既耕地

(写真-6)　地区内排水路
(Bahr el Bagar)

(写真-7)　揚水施設(サキヤ)

LOCATION MAP



RECLAMATION AREA

FROM EL-SALAM CANAL

NO.	NAME OF PROJECT	AREA
1.	THE AREA COMPRISED BETWEEN THE CANAL AND TAWIL-OAHRI DRAIN	2,000 feddans
2.	SOUTH OF MATREIA	8,000 "
3.	NORTH OF NOSAINIA VALLEY	62,000 "
4.	SOUTH OF HOSAINIA VALLEY	73,000 "
5.	SOUTH OF PORT-SAID	50,000 "
6.	TABNA VALLEY IN SINAI	135,000 "
7.	SINAI COASTAL ZONE BETWEEN ROMANA AND ARISH	265,000 "
	TOTAL:	595,000 Feddans

ローカル　度・量・衡

面　　積　1 feddan(フェダン)　＝0.42ha

通　　貨　1 L・E (エジプトポンド)＝1.46 U・Sドル

1 L・E＝100P(ピアストル)

Egyptian Units of Field Crops

Commodity	Egyptian unit	Weight in kg	To convert Egyptian units/feddan to tons/ha, multiply by
Cotton (unginned)	Metric kantar	157.5	0.3749
Cotton (lint or ginned)	" "	50.0	0.1190
Sugar, onion, flax straw	Kantar	45.0	0.1071
Rice (rough or unmilled)	Dariba	945.0	2.2496
Lentils	Ardeb	160.0	0.3809
Clover	"	157.0	0.3737
Broadbeans, fenugreek	"	155.0	0.3690
Wheat, chickpeas, lupine	"	150.0	0.3571
Maize, sorghum	"	140.0	0.3333
Linseed	"	122.0	0.2904
Barley, cottonseed, sesame	"	120.0	0.2857
Groundnuts (in shells)	"	75.0	0.1785

Other Conversions

1 ardeb = 198 liters = 5.62 bushels (US)

1 ardeb/feddan = 5.41 bushels/acre

1 kg/feddan = 2.12 lb/acre

エジプト国の主要経済指標

項目	主要経済指標	出所

面積

	国土総面積	耕地面積	森林面積	その他面積
面積	千ha 100,145	千ha 2,826	千ha 2	千ha 97,317
割合	% 100	% 3	–	% 97

出所：1977 FAO production yearbook

人口

	1970	1975	1976	1977(推定)
人口(千人)	33,329	37,233	38,228	39,860
増加率	2.06%	2.55%	2.58%	2.58%

出所：世界銀行資料

人口密度　国土全体　36人／km²　　出所：同上

居住可能地域　1,030人／km²

人種構成　アラブ系エジプト人　98%

国内総生産

年度		1970	1975	1976	伸び率 70/69	伸び率 75/74	伸び率 76/75
GNP(百万ポンド)		3,058	4,861	5,828	79	158	199
産業別構成	農業	% 29.3	% 29.4	% 28.5	133	99	104
	鉱業	20.4	21.2	23.9	76	203	285
	電気	1.6	1.5	1.4	171	498	56
	建設	4.6	4.8	4.6	121	709	80
	運輸通信	4.9	4.7	6.5	126	339	585
	商業金融	9.0	11.3	12.5	107	154	263
	住宅	4.4	2.7	2.5	23	22	48
	公務	0.4	0.4	0.4	83	23	219
	サービスその他	25.7	24.0	19.8	260	115	△59

出所：同上

国民総生産　1976年GNP　5,674百万ポンド

1人当りGNP　148ポンド

出所：在エジプト日本大使館資料

項　　目	主　要　経　済　指　標				出　　所
国際収支	年度	1974	1975	1976	1977(推定)	世界銀行資料
	貿易収支	△1,817	△2,929	△2,602	△3,215	1977年度は
	輸出(f·o·b)	1,674	1,568	1,612	2,160	在エジプト日
	(農品)	857	525	543	(ワタのみ 500)	本大使館資料
	(綿糸・綿製品)	366	477	301	310	
	(石油)	104	164	269	590	
	(その他)	347	402	499	760	
	輸入(c·i·f)	△3,491	△4,497	△4,214	△5,375	
	(食料)	△ 991	△ 914	△1,036	△1,200	
	(中間産品)	△1,301	△1,750	△1,209	△1,900	
	(機械器具)	△ 480	△ 728	△ 840	△1,100	
	(その他)	△ 719	△1,105	△1,129	△1,175	
	貿易外収支	110	145	591	535	
	海外送金	75	301	493	1,120	
	収支	△1,632	△2,480	△1,518	△1,560	

主要輸出入　輸出農産品

農産品　　ワタ、米、柑橘、バレイショ、玉ネギ

輸入農産及び加工品

小麦、小麦粉、豆類、肉類、油脂類、砂糖、タバコ

通貨　通貨単位

1エジプトポンド＝100ピアストル

レート

パラレル・マーケットレート（1979年11月時点）

1エジプトポンド＝U・S　1.46ドル

（1ドル＝0.687エジプトポンド）

南部ホサイニアバレイ農業開発
事前調査報告書

目　　次

添 付 資 料

1. 総　　論

1－1　調査の経緯

エジプト国の農業開発計画に対する技術協力に関して、兼ねてから協力要請がなされており、この要請に応えて、エジプト国における農業開発計画に対する技術協力実施の可能性を調査するために、昭和５４年１１月２０日から同年１２月１４日まで２５日間、関東農政局土地改良技術事務所長石坂仁兵団長他５名からなる事前調査団が国際協力事業団（ＪＩＣＡ）からエジプト国に派遣された。

この事前調査の目的は、エジプト国の農業開発に係る協力要請が多岐に亘っているため現地の事情を調査して協力対象プロジェクトを選定するための資料を収集することに主眼がおかれた。

この調査の結果に基づいて、南部ホサイニア・バレイ・農業開発計画の実施計画調査（Ｆ／Ｓ調査）が協力の対象として選定され、今回このプロジェクトの実施計画調査を行うに先だって事前調査団がＪＩＣＡから派遣されることになった。

1－2　調査の目的

この調査は、Ｆ／Ｓ調査に先だって、フィージビリティ調査の実施方針を検討するために必要な資料、情報の収集及び現地踏査を行い、調査の範囲、規模、実施方針等についてエジプト政府側とあらかじめ協議を行うもので、主な調査事項は下記の通りである。

(1)　エジプト国側の要請内容の確認

(2)　開発地域の設定（Ｆ／Ｓ調査の範囲、面積）

(3)　Ｆ／Ｓ調査に必要な地形図作成のための調査

(4)　土壌調査方針決定のための調査

(5)　かんがい、排水計画のための現地概況調査、並びに資料収集

イ．上位計画であるエルサラム運河計画に関する計画資料及びその計画地域の現地概況

ロ．南部ホサイニア・バレイ地区の現地の概況

(6)　Ｆ／Ｓのスコープ・オブ・ワークス案（Scope of Works；S/W）の取りまとめ

(7)　Ｓ／Ｗに関する覚書の交換

(8)　Ｆ／Ｓ調査実施に対する調査団の意見の取まとめ

(9)　その他必要な事項

1－3　調査の内容

前述の調査経緯及び目的を踏まえ、対象地域である南部ホサイニア・バレイ地区のF/Sを行うに当っての事前調査内容は次のとおりである。

(1) 当地区のF／Sの基本方針について意見交換をし確認すること。又、エジプト政府当局の当プロジェクト計画、協力内容に対する意向を確認すること。更には当地区の計画作成に当っての前提条件を確認すること。

(2) 南部ホサイニアバレイ地区の上位計画で、すでに着工しているエルサラム運河計画の計画内容及び基本資料の確認を行うとともに、水源であるダミエッタ支流の状況、エルサラム水路の工事進捗状況等現地の状況を確認し、南部ホサイニア・バレイ地区との関連性を把握し、必要な資料については入手すること。

(3) 南部ホサイニア・バレイ地区のF／Sを行うに当っての基礎資料（地形図、土壌、水質、水文調査データー等）の有無、内容を確認し、主要なものを入手する。

(4) 出来る限り南部ホサイニア・バレイ地区内及び周辺の現状を把握すること。

(5) 現地での調査、試験等実施機関、所要経費を確認すること。

(6) 南部ホサイニア・バレイ地区の計画作成に当って関連する関係省の業務分担及び出先機関を調査すること。

以上の通り、現地の把握、資料の確認、入手等を行い、今後F／Sを実施するに当っての実施計画、補足調査等の骨子を決めるために必要な調査内容とした。

1－4　調査団の構成

石　坂　仁　兵	団長・総括	農林水産省関東農政局土地改良技術事務所所長
内　山　泰　孝	栽　培	農林水産省熱帯農業研究センター研究第一部主任研究官
一　川　保　夫	地域開発	農林水産省北陸農政局建設部水利課課長補佐
坂　本　皓　一	農業経済	農林水産省構造改善局計画部事業計画課経済第2係長
宮　本　泰　行	かんがい排水	農林水産省構造改善局建設部設計課海外技術基準係長
中　川　和　夫	業務調整	国際協力事業団内原国際農業研修センター研修室

1－5　調査行程

調査団は、１９８０年２月２６日(火)に東京を出発し、２月２７日にカイロ到着、１２日間にわたって現地調査、資料収集及びエジプト政府との協議を行ない、３月８日(土)に帰国した。

日程の詳細は下記の通りである。

また、３月１９日(水)外務省において、関係各省に対して総括帰国報告を行なった。

日順	月　日	調　査　内　容
1	２月２６日(火)	内山団長代理以下５名ＪＬ４６３にて１０：００AM成田出発
2	２月２７日(水)	１：００カイロ着　空港にてＪＩＣＡカイロ事務所所長代理藤田氏及び職員ユセフ氏の出迎えを受ける。 午後：ＪＩＣＡカイロ事務所にて調査日程等打合せ。 在エジプト日本大使館表敬訪問。
3	２月２８日(木)	午前：かんがい省表敬訪問 午後：かんがい省マクルーフ第一次官等と現地調査日程及び収集資料についての打合せ。
4	２月２９日(金)	資料整理及び調査内容確認作業。
5	３月　１日(土)	午前：カイロ → ザガジグ かんがい省ザガジグ事務所にて、エルサラム計画の概要聴取及び資料収集。 午後：南部ホサイニア地区を東端より現地視察。 ザガジグ → イスマイリア 石坂団長東京出発
6	３月　２日(日)	午前：ホサイニア南部地区を西端より現地視察。 午後：マタレイア地点にてエル・サラム運河浚渫状況視察。 イスマイリア → マンスーラ 石坂団長カイロ到着
7	３月　３日(月)	午前：かんがい省マンスーラ事務所にて資料収集。 エル・マンザラ湖、ダミエッタ支流及びエルサラム計画取水予定地点の現地視察。 午後：ダミエッタ → マンスーラ → カイロ 石坂団長南部ホサイニア地区視察のため、ザガジグへ向う。
8	３月　４日(火)	午前：かんがい省ショブラ事務所、かんがい省Soil Institute 及び農業省土壌局にて資料収集。 午後：石坂団長、ザガジグよりカイロへ戻る。 調査団合流。 調査結果の取りまとめ及びField Note の作成作業。

日順	月　日	調　査　内　容
9	3月　5日(木)	午前：かんがい省マクルーフ第一次官との打合せ。 （調査結果の報告及びField Noteの検討） 午後：Minutes of Diseussionsの作成作業。
10	3月　6日(木)	午前：かんがい省マクルーフ第一次官との打合せ。 Minutes of Diseussionsへの署名 午後：在エジプト日本大使館にて調査報告。
11	3月　7日(金)	午前：ＪＩＣＡカイロ事務所にて調査報告。 カイロ発（２２：００）ＪＬ４７４
12	3月　8日(土)	東京着（２２：００）

1－6　面会者及び関係機関

・Ministry of Irrigation

Mr.Mahmoud Said	Deputy Minister
Eng.Amin Makhlouf	First Undersecretary
Eng.Sadak	Engineer

・Department of Projects at Zagazig (Ministry of Irrigation)

Eng.Kairy Mahmoud Mostafa	Chief Manager
Eng.Zaki Mina Mikhail	Manager
Eng.Mahmoud Nassar	Assistant Manager

・Mansura office(Mintstry of Irrigation)

Eng.Mostafa Diraz	Head Office Chief Manager
Eng.Abd.Elaziz Elfiky	Chief Manager
Eng.Atif Ghaly Said	Engineer

・SHUBRA office

・Soil Institute and Foundations(Ministry of Irrigation)

D.E.Adel Abd Emged …… Director

・University of Alexandria Department of Soil Science

Professor Mohamed Noguib Hassan

…… Advisor to His Excellency Ministor of Agriculture

・在エジプト日本大使館

黒田瑞夫	大使
木原力	一等書記官

・ＪＩＣＡカイロ事務所

広谷泰	所長
藤田広巳	所長代理

2. 南部ホサイニア・バレイ地区の概要

2－1　エルサラム運河計画

エルサラム運河計画は、ナイル東部デルタの北辺マンザラ湖の南縁に沿って運河を建設して、デルタ北辺のスワンプ地帯及びスエズ運河以東のシナイの海岸平野地帯の開発を行うために必要な農業用水や附帯の生活用水を、ナイル河からの取水並びに東部ナイルデルタ末端の排水の再利用を図って、エルサラム運河を通じて供給しようとする計画である。計画書によれば、この計画地域と面積は次の通りである。

地　　区	面　　積
ポートサイド南部	21,000 ha（50,000 fad）
北部ホサイニアバレイ	26,000 （62,000 〃）
南部ホサイニアバレイ	30,000 （73,000 〃）
マタリア南部	3,000 （ 8,000 〃）
エルサラム運河とLong sea drainの間	1,000 （ 2,000 〃）
シ　ナ　イ	168,000 （400,000 〃）
計	249,000 （595,000 〃）

従って南部ホサイニアバレイ地区のかんがい用水は、このエルサラム運河から供給されることになっており、この運河は１９８３年末までにスエズ運河以西が通水出来るように現在建設工事が進められている。

2－2　南部ホサイニア・バレイ地区の概要

(1) 計画概要

南部ホサイニアバレイ地区は、ナイルデルタの北東部、スエズ運河西側に位置し、北側はエルサラム運河、西側はBahr Hadous排水路、東側はBahr El Bager排水路に接する低湿地帯である。

計画面積は約７３,０００フェダン（約３０,０００ha）で、エルサラム運河計画５９５,０００フェダンの一部となっている。エルサラム運河計画によれば、当地区の水源はエルサラム運河となっており、エルサラム運河の水源はナイル河ダミエッタ支流からの新規取入と、デルタ東部地域の排水の再利用で計画されている。

当地区内の具体的な施設計画は未定であるが、エジプト側の基本構想によれば、北側に計画されているエルサラム運河より、かんがい用水を取水し、幹線用水路により地区全体をかんがいし、併せて用水路と並行に幹線排水路を堀削し、地区南東部の

Bahr El Bagar 排水路を通じ、エルマンザラ湖へと排水する構想がある。

これら用、排水施設の完備により、この地域の一部既耕地を含め約３０,０００haの低湿地帯の新規開発を行う計画である。

3. 事前調査結果

3－1　事前調査結果

(1)　エルサラム水路

エルサラム水路の実施設計は、エジプト政府により作成され、スエズ運河西側の１９５,０００Feddanをかんがいする First Stage の工事は、１９７９年末に着手された。

着工された地点は、El Matariya の北側でマンザラ湖に面し、エルサラム水路の屈折点であり、現在その地点から上流側及び下流側に向って工事が進められている。

工事中の断面は、図３－１のとおりである。なお、本水路のライニングは計画されていない。

又、本水路の取水施設、ポンプ場、サイホン等の主要構造物の設計も終了している。

エルサラム水路の工程計画によれば、１９８３年までにFirst Stageの工事を完了させる予定となっているが、年次別の施工予定区間は図３－２の通りである。現在（１９８０年３月）のところは工事は予定通り進んでいる。

ダミック支流に近づくと、計画路線は既耕地内を走り、道路、鉄道等を横断することになる。

(2)　ダミエッタ支流

エルサラム水路の水源は、ナイル河下流ダミエッタ支流と排水の再利用で計画されている。

ダミエッタ支流からの取水地点は、Fariskurの南西部に計画されているが、当初、取水地点については現計画地点よりも下流Damiettaの市附近と比較検討し、その結果現計画地点に決定したと云われている。

取水地点へは、直接車で乗り込む道路がなく、現地状況の把握は不可能であったが、下流約３Kmm地点のダミエック支流の状況では、河川形状、周辺の地形等から見て特に問題はないと思われる。なお、取水工の実施計画は終了している。

ダミエッタ支流下流部を模式的に表示する図３－３のとおりであり、河口部は土堰堤により完全に海水と遮断されている。従って、海水のそ上現象は全くない。ダミエッタ支流への分水量は、デルタBarrageによりコントロールされており、エルサラム水路取入地点の河川流量は、Zifta Barrage においてコントロールしている。

従って、Zifta Barrage と河口堰堤間のダミエッタ支流はプール状態となっ

図３－１

エルサラム水路の工事中の断面

（First Stage）

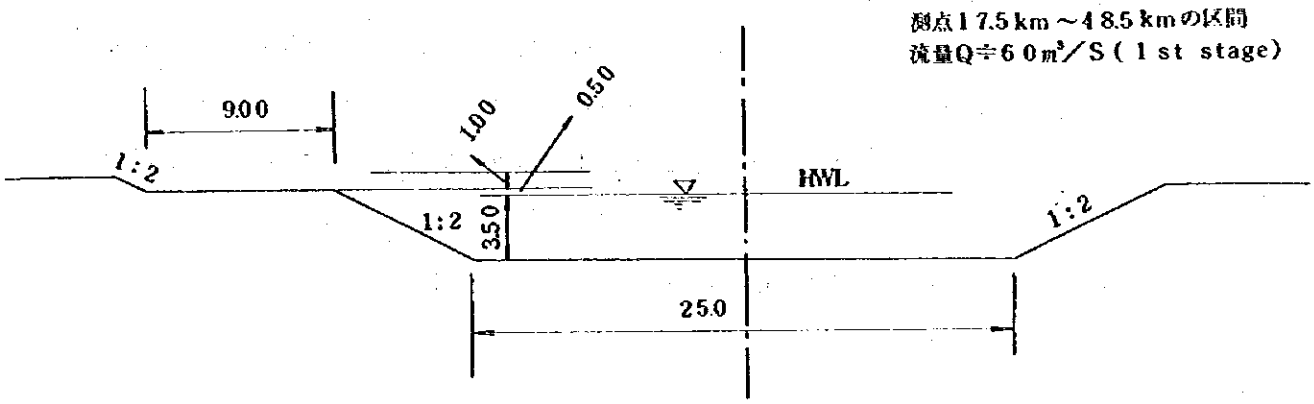
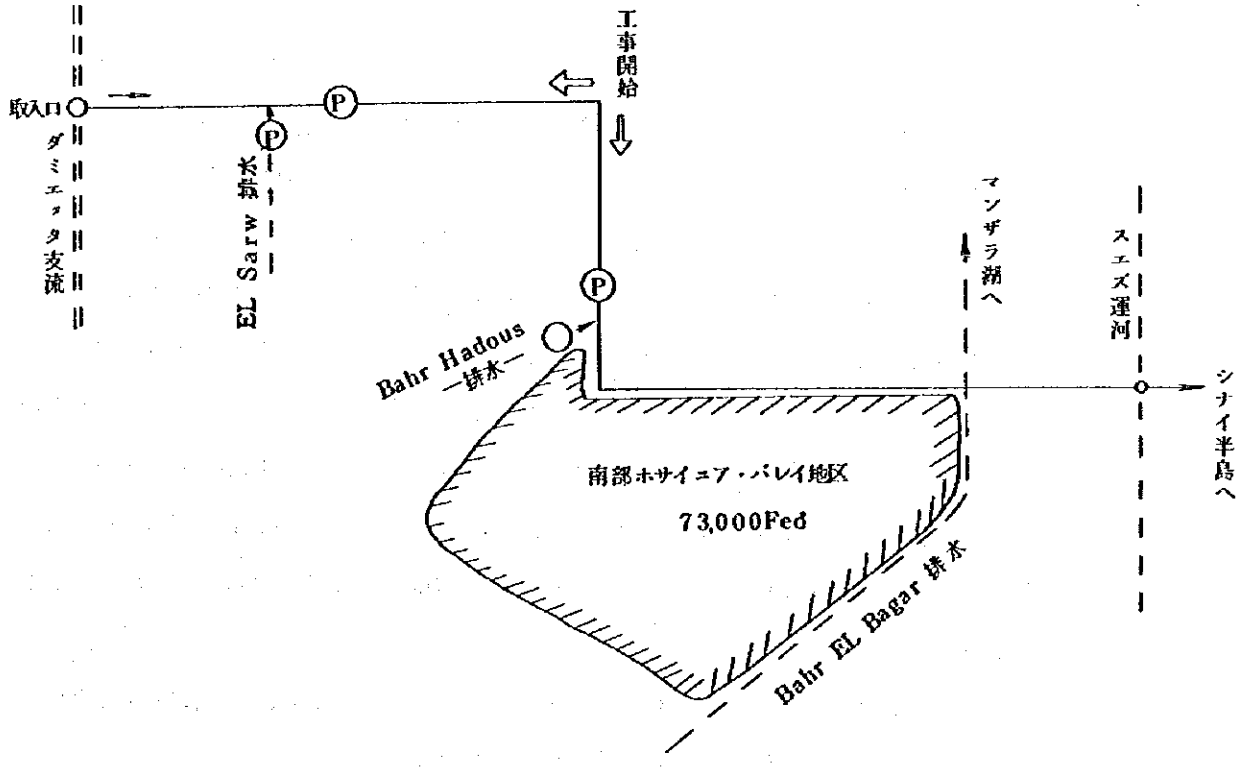


図３－２

エルサラム水路の工程計画



ており、Zifta Barrage で下流への放流量のデーターはあるが、他の主要地点では水位データしかない。

なお、余剰水は一部河口堰堤の仮排水路により下流へ流下している（4,000千㎥/dayの能力あり）が、残りはEnania Canal 等を通じ、エルマンザラ湖に注いでいる。

また、河口堰堤は、アスワンハイダムと並行して建設されたものだが、近年中にはゲート操作可能な構造に改造する計画がある。

ダミエッタ取水工の工事は計画によれば、１９８２年に着手し、１９８３年に完了することとなっているが、エルサラムプロジェクトの第一期開発計画（南部ホサイニアを含むスエズ西側地域１９５,０００Fed）の進展と相互に関連するだろう。

(3) 南部ホサイニア・バレイ地区

(イ) 地区の現況

当地区は北緯31°、東経32°の交点を中心として展開し、気候的にはエジプトのデルタ中部にあり相対的に雨量は多く、比較的に温暖な気候条件にあると云われている。南部ホサイニアバレイ地区は、SHRKIYA県の北、最下流部で、エル・サラム運河計画路線の南部に位置する。

地区の北部はマンザラ湖、東部は湖の干陸化の工事が急速に進められ、一部には入植してまもない農家も見られる新規造成地で、南部及び西部は既耕地である。

地区内の約1／3 程度は凹地に水がたまっているが、その他は干陸化している。

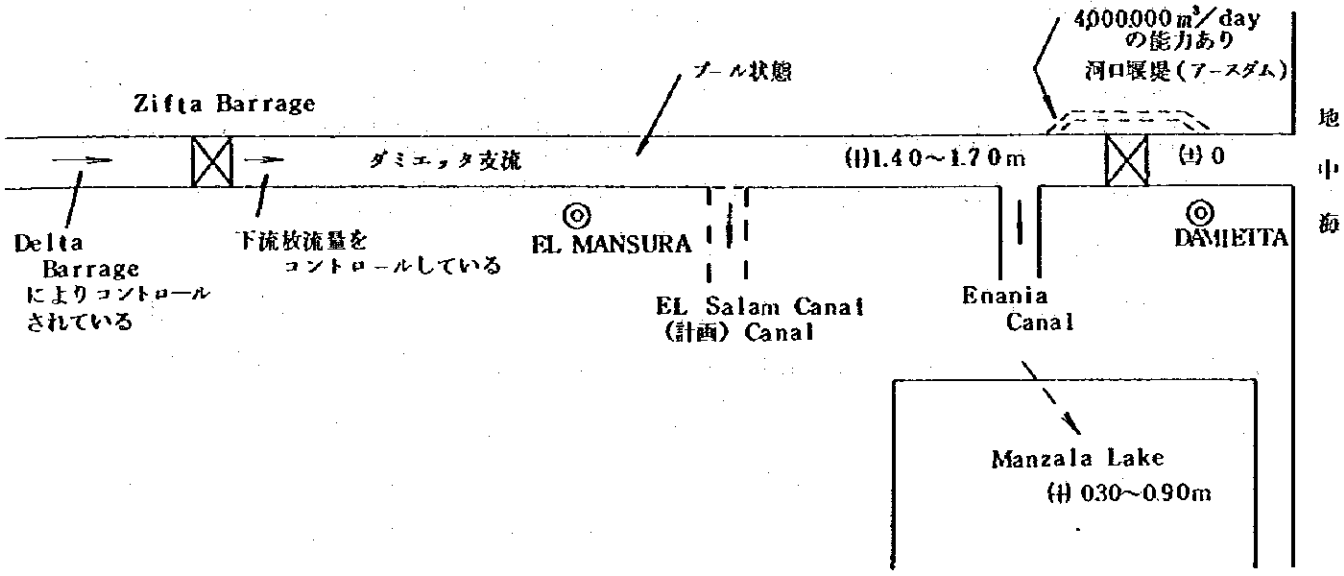
地区の北部湖側を除けば地区外周には道路があるが未整備で一部にはジープでなければ歩行困難な部分もある。又、地区内にはいる道路はない。地形的には、標高5.0ｍ以下の平坦な地域で、地区内の大部分は低湿地帯を呈し、部分的にはナイルデルタからの排水流出水、エルマンザラ湖水の浸入により湛水状態を呈している。

しかし、湛水の水深は深いところで１ｍ前後と推定され、夏期と冬期によりその湛水面積、範囲は大幅に変化するものと考えられる。地区の西部San el Hagarの附近には標高２０ｍ前後の砂漠状態の丘があり、全体的には南西部から北東部に向けてゆるやかに傾斜している。従って、湛水域は地区中央部からマンザラ湖にかけて分布している。

計画地区の中で、Bahr Hadous, Bahr el Bagar排水路の周辺及び地区南部では耕作が行われ、農家が点在している。

図－３－３

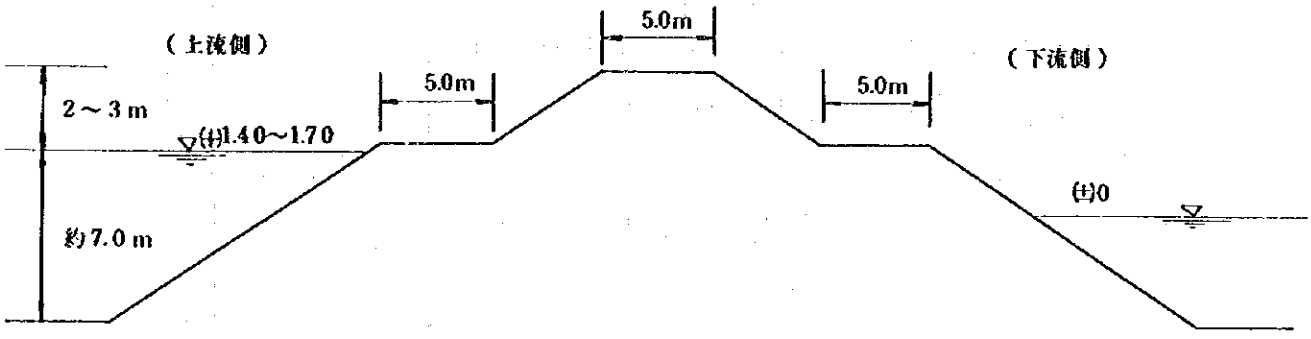
ダミエッタ支流下流部の模式図



図－３－４

河口堰堤の概要

○型　式　：　アースダム
○堤　高　：　約１０ｍ
○堤　長　：　約３５０ｍ



土壌の概要

この地区の土地は、潟性の浅い湖であるManzala湖に堆積を生じてできたもので、標高低く、地質は海成沖積で、土壌は粘土に富み、また塩分を含んだ地下水の水位が高い。このため一般に強塩性及び強アルカリ性の粘土質土壌であるが、計画地区内の西部は風積砂の影響を受け、低い丘状を成したところがあり、ここの土壌は粗砂の含量が多い。

今回の調査に際しては、降雨と道路の悪条件のため地区内に殆んど立ち入れず、計画地域の東北端及び西端（San El Hagar）で土壌をサンプリング調査しただけで、中央部の土壌については明らかでない。

東北端の土壌（稲作跡地）は、重粘な沖積土で養分もかなり含まれているものと推察される。残存した稲の根の断片も赤褐色で健全な状態を示しており、水田に好適した土壌と考えられる。なお、既にリーチングをした後であるから、※EC_5＝4m mhos程度である。

西端の土壌は数mの高台の麓で採取したもので、風に運ばれた粗砂が沖積土に混合してできたものと考えられる。したがって、粘土、腐植とも十分にあり、かつ排水もよく、野菜作等に好適していると考えられる。ただし表層約10cmは粗砂の含量が比較的多く、排水が良過ぎる恐れがある。したがって、水田にすることは不可能ではないが、畑作がより適していると考えられる。EC_5の値は、表土で約60m mhos，地下10～15cmで約25m mhos を示し、リーチングの必要がある。

風積砂の影響を受けた土地の面積はどの程度あるか不明であるが、何れにしても、塩分洗脱（リーチング）と排水を十分に行うならば、十分な作物生産が可能と考えられる。ただし、風積砂の影響の小さい土壌では、塩分洗脱に長時間かかるであろう。

入手資料（アラビア語）

Soil Survey Division of ministry of Agricultuve,
Egypt 1979 Soil survey for the district
of Hosainia, Sharkia Governarate

※EC_5とは、土1：水5の状態における電気伝導度である。

Bahr Hadous Drainの水質

１９７８年におけるこの排水路の、Manzala湖への排水量は２８４１百万㎥で、月別には７～９月が月当り３００百万㎥以上、他はおおむね２００～２４０百万㎥で、２月だけは約７０百万㎥と著しく少ない。

排水中の塩分濃度（Total Soluble Salt, TSS）は、水量の少い２月に２７０４ｐｐｍに上るが、他の月はおおむね１０００～１５００ｐｐｍで、またソーダ吸着率※（Sodium adsorption ratio, SAR）は、２月に２２.５になる以外はおおむね１２～１７である。これらの月別の値は、表３－１のとおりである。

かんがい水質の標準としては、次のようにいわれている。

表３－１　Baha Hadous Drainの月別排水量と水質　（１９７８）

月	排水量	ＴＳＳ	ＳＡＲ
	百万トン	ppm	
１月	２０１	１５４０	１５.４
２	７２	２７０４	２２.５
３	２３８	１０７１	１２.９
４	２１３	１１９２	１４.６
５	２０１	１０２１	１３.３
６	２２０	１２３４	１３.５
７	３０７	１２５４	１５.７
８	３２３	１３３０	１４.０
９	３０３	１４８９	１７.４
１０	２８５	１２８９	１１.８
１１	２３８	１４０４	１４.３
１２	２３０	１１９４	１２.６
計	２８４１	－	－
平均	２３７	１３８５	１４.８

水質		作物生育への影響
TSS	SAR	
＜480 PPm	＜8	全く問題なし
480～1920	8～16	問題が増大しつつある
＞1920	＞16	大きな問題がある

この標準によると、2月の水質は問題が大きいが、他の月は若干問題のある程度で、これをTSS250～500ppm のナイル川からの水と1：1に混合するならば、かんがい水として殆んど問題なく利用できる。

※ $SAR=Na/\sqrt{\frac{Ca+Mg}{2}}$

入手資料（英文）

M. Saki, M. Amek and I. Elassiout: 1979, A simulation model for assessing the potentiality of reusing drainage water of Hadous Main Drain in irrigation.

(ロ) 地区周辺の状況

南部ホサイニア・バレイ地区の西側に展開している東部デルタ下流地域は、デルタ地域の排水が集中し、ポンプによりBahr Hadous 及び Bahr el Bagar 排水を行っている。

地区周辺の作物作付状況を見ると、デルタの上流域であるか下流域に位置するかによって作付体系が異っている。表３－２に見るとおり、夏作は稲、綿、トウモロコシ、野菜等が主体であるが、デルタ下流地域の県ほど稲の作付割合が多い傾向にあり、現地調査の結果においても下流地域に位置する南ホサイニアバレイ地区周辺では稲作が主体であるように見受けられた。冬作は麦類、クローバ、そら豆、野菜であるが、デルタ下流域に向うほど麦作が減少し、クローバが主体に作付られている。地区周辺でもクローバの作付が多く見受けられた。

地区周辺地域における農業は比較的近代化が進んでおり、サキヤ（畜力揚水機）にかわってデイゼル揚水機が取り付けられているのも多く、又農作業では畜力にかわり大型トラクターによる耕起が行われていた。

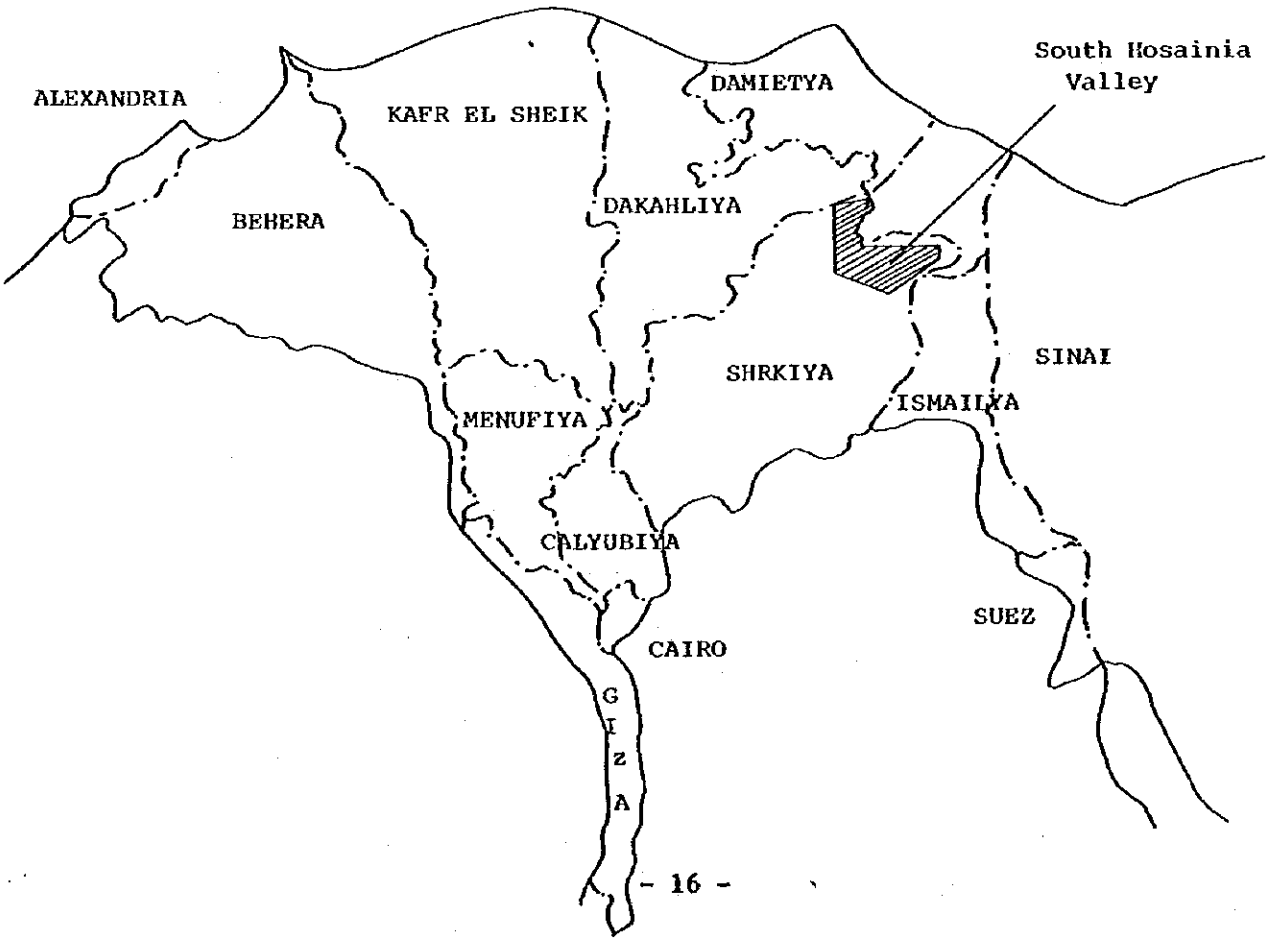
表３－２

地区周辺作物作付状況（１９７８年）

季別	県名 / 作物名	SHRKIYA 面積	SHRKIYA 割合	DAKAHLIYA 面積	DAKAHLIYA 割合	DAMIETTA 面積	DAMIETTA 割合
夏	稲	155	26%	284	46	51	52
	綿	143	24	186	30	14	14
	トウモロコシ	235	39	101	16	13	13
	野菜その他	68	11	45	8	21	21
	計	601	100	616	100	99	100
冬	麦	177	30	149	26	14	16
	クローバ	371	62	415	72	71	79
	そら豆	17	3	3		1	1
	野菜その他	33	5	9	2	4	4
	計	598	100	576	100	90	100

出所・農業省統計資料

県別区分及び南ホサイニアバレー地区位置図



3－2　確認事項

1)　全体計画について

イ)　F／S 対象地域について

南部ホサイニアバレイ地区の３０,０００ha とする。

ロ)　エルサラム運河の計画及び計画図書について

Canal の計画縦断図（縦1／１００，横1／１００,０００）
〃　　横断図（ 1／１００）
〃　　平面図（ 1／2,５００）
周辺の現況用排水系統図

} を入手した。

ハ)　エルマンザラ湖について

1)　当湖は海と連結しているが、潮位の影響はない。

2)　当湖の水位観測は、多くの個所で測定されているが、データーを整理したものがないようである。

3)　湖面の水位は、海面高より０.３０～０.９０ｍの高さの範囲で上下している様子である。

4)　なお、この水位変動は、潮位の影響ではなく、背後地からの排水等の流出により変動しており、夏期は低く、冬期は高い状態にある。

5)　当湖と海とは、現在、底幅２０ｍ、水深1.５～２.０ｍ程度の水路で結ばれているが、１９８２年を完成目標としてガミール水門（幅６６ｍ，１１門，高さ4.０ｍ）を工事中である。

ニ)　ダミエッタ支流の観測データについて

各 Barrage での分水量、河川水位、主要地点の取水量等の観測データーは、時期別に整理されている。（MANSURA出先機関）

ホ)　Bench Mark について

主要運河、道路沿線の不動構造物（橋梁、ポンプ場、建築物等）に設けてある。南部ホサイニアバレイ地区周辺にも運河沿いに設けてある。

ヘ)　関係先の業務分担関係について

1)　かんがい省（Ministry of Irrigation）

甲排水路、水源施設、排水施設

2)　農地開発省（Ministry of Land Reclamation）

道路、住宅、電気、公共施設、圃場整備

3) 農業省（Ministry of Agriculture）

営農、普及

(2) 南部ホサイニアバレイ地区について

イ) 地形図について

ア．既存の最大縮尺の地形図は1／25,000で、コンター間かくは50cmである。

イ．地区周辺を含む1／25,000の地形図を入手した。

ウ．F／Sでは現地補足測量により1／10,000程度の地形図作成は可能である。

ロ) 水文気象データ及び観測の必要性について

1) 特に周辺排水路の観測データがある（カイロ大学の英文レポード入手済）ので、F／S段階での定期観測の必要性はないが、チエックする必要がある。

2) その他の水文気象データは、既存のエルサラムプロジェクトの基礎資料、及びサルファイアプロジェクトの基礎資料を活用する。

ハ) ボンプ場の基礎ボーリングの必要性について

周辺にボンプ場等の構造物があるので、それらの調査結果を参考にすれば良いであろう。

ニ) 路線測量について

地区内は平坦な地形であり、地形図作成の段階で補足現地測量を行ない、路線測量を現地で実施する必要はないであろう。（路線計画は図上で可能である）

ホ) 地区内計画について（かんがい排水計画、営農計画、土地利用計画）

エルサラム運河計画の基本を変更しないという条件で、地区内計画を樹立する。現在エジプト側には具体的な地区内計画はない。但し、日本がF／Sを行う場合の検討事項として、2～3点の要請がある。（3－2－(3)）

ヘ) 軍用地について

地区内には軍用地はない。

ト) 土壌、水質調査実績について

(3) エジプト側の意向

日本が南部ホサイニアバレイ地区のF／Sを行うに当っては、次の事項についてエジプト側当局と意見交換を行ない配慮してほしい旨の要望があった。

イ) エルサラム運河計画の基本については固定して、南部ホサイニアバレイ地区の地

区内計画を立ててほしい。

ロ　エジプト政府としては、新しく開発する地域の農村計画について別紙－1のような基本的な構想をもっているので、十分検討してほしい。

ハ　畜産の導入、農村への工業導入についても配慮されたい。

別紙－1

農村計画に関するエジプト側の意向

エジプト政府としては、今後新らたに開発する農業地帯について農村計画を立てる場合には、次のような基本的構想で計画する意向を持っている。

従って、南部ホサイニアバレイ地区の実施設計を行うに当っても、この点を十分配慮してほしい旨の要望があった。（かんがい省で打合せ結果）

1. 集落の構成

Small Village

面積は1,500～2,000Fedで、農家戸数300～400戸（5Fed/戸当り）程度の規模とする。ここにはいくつかの商店と農業会館を設置する。

② Service Village

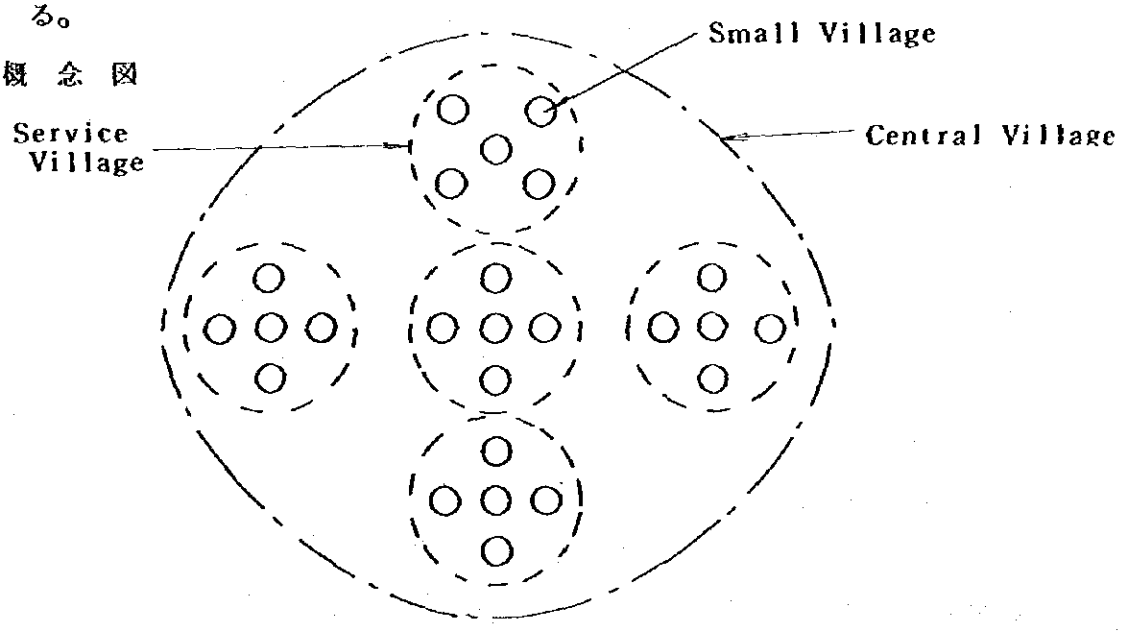
Service Villageは5つのSmall Villageにより構成される。従って7,500～10.000Fed. 1,500～2,000戸でService Villageが成立する。1つのService Villageには、学校、モスク、市場、農業センター、集会場、保健所、作物倉庫等を配置する。

③ Central Village

更に、Central Village は、5つのService Villageによって構成され、面積も約50,000Fed（10,000戸）の規模となる。

Central Villageには、警察、郵便局、学校、病院、工場等の施設を配置する。

2. 概念図



3－3　入手資料及び確認資料リスト

(ア)　入手資料

(1)　地形図（1／50,000）……　1mコンター入り。コピー。

(2)　地形図（1／25,000）……　0.5mコンター入り。印刷物。

(3)　土壌調査図及びデータ（アラビア語版及び邦文版）

……南部ホサイニアバレイ地区の約半分をカバーしている。

(4)　エル・サラム運河計画書……英文版

……地区概要、主要工事計画等が記載されている。

(5)　エル・サラム運河計画図面……平面図、縦横断図

(6)　バールハドウス排水路の流出量、水質の調査解析資料（英文）

(7)　ダミエッタ支流の水位流量観測資料

……1978～1979年、日データ

(イ)　確認資料

(1)　南部ホサイニア・バレイ地区の地下水位、水質調査結果

内容……地下水コンター図等

場所……ザガジグ事務所（かんがい省）

4. 今後の調査に対する調査団の意見

4－1 F／Sの実施方針

本地区は、エル・サラム運河計画（82,000ha 195,000fed.但しスエズ運河以西）に包含されており、F／S調査実施に際して次の事項が考慮されるべきである。

(1) エル・サラム運河計画の内容を把握し、本地区の計画に関連する事項について、必要に応じてレコメンドする。

(2) 調査規模

南部ホサイニアバレイ地区の開発可能面積は、約30,000ha（73,000fed）である。先にも述べられているように、本地区はエル・サラム運河計画に包含されている一地区でエル・サラム運河計画の基本計画について資料は存在するが、その中で南部ホサイニアバレイ地区の具体的計画については、検討されていないので、今後の調査で明確にされなければならない。その場合、既存の資料は出来る限り利用し、不足する調査を補足する方法とすることが望ましい。

(3) 南部ホサイニアバレイ地区（約30,000ha、73,000fed）の実施計画作成上特に考慮さるべき事項は次の通りである。

イ) 用排水計画の策定に当って、エル・サラム運河計画で既に決定されている主要工事計画については影響を与えないようにすること。

ロ) 排水計画の策定に当っては、耕地の塩分の集積の排除、リーチング（Leaching）機能の発揮を考慮すること。

ハ) 土質・土壌条件に適した水経済的な用水路の設計並びにほ場におけるかんがい方式の選択。

ニ) 末端計画の策定は、土壌条件、土地利用、営農類型等により分類される代表的モデルブロックを選定してほ場造成計画、集落配置計画、生活用水供給計画等を決定する。モデルブロックの大きさは、エ側の基準に従って決定し、この中に公共施設用地を確保する。

ホ) 営農計画の策定に関連して、農業企業、畜産の導入の検討を行う。

ヘ) 用排水計画と同時に、地区内道路計画、送電線計画を検討する。

ト) 上記の他、計画策定に当り、エル・サラム運河計画との整合性、事業効果の早期発揚を考慮すること。更に計画策定に当っては、県知事の意見も充分聴取すること。

4－2　今後の調査方法

(1)　地形図の作成

F／S調査で1／10,000　地形図の作成が必要である。

今回調査で入手した1／25,000地形図（0.5mコンター挿入されているが、地区の約1／3の湛水区域のコンター欠落、又この地図の作成時点が１９５６年と古いことから、現状に合った地形の修正が必要である）を基図として1／10,000の図面を複製し、これを現地調査で修正、更新する方法が望ましいと考える。

(2)　土壌調査

地区の約½の面積については、既にエ側によって調査されており、これらの結果について今回資料を入手している。従って今後、欠落部分の調査（面積約１５,０００ha)と、既済部分のチエックのために調査が必要である。今回の調査の結果によれば、この地区の土壌は砂質土と粘質土に別かれて分布しているようであり、特にリーチングテストを考慮する必要がある。なお、土壌分析、リーチングテスト等については、カイロ大学、農業省の試験研究機関等への委託も可能である。

(3)　気象及び水文調査については、既在資料の利用が可能であると判断されるが、観測の精度等についてチエックを行う必要がある。

(4)　土地利用及び作付計画

土地利用及び作付計画の決定は、周辺既耕地の現況調査結果がベースになると考えられるが、耕地の規模、機械化の導入等によっても変るので、営農計画とも関連して総合的な調査が必要である。

(5)　営農計画

地域の社会経済条件、農民の技術水準等を考慮して、モデル営農類型を策定する他、特に農業企業の振興、畜産の導入の可能性について、とくに調査検討する必要がある。

(6)　単位用水量調査

作物別単位用水量決定と併せて、リーチング用水量も決定されなければならない。

(7)　地区内用水路の送水ロスを少くするための水路工法選択のため土質試験、現場透水試験が必要である。

(8)　ほ場におけるかんがい方式の選択、ほ場要水量の決定、更に排水計画策定のためにほ場におけるインテークレイトの測定が必要である。

(9)　排水計画策定に必要な地下水調査に関する資料は、既存資料がエ側に保存されてこ

れの利用が可能であるが、前記の土壌調査と併行してこのチェックのための補足調査が必要である。

(10) 地区内主要工事計画調査

主な工事計画は、用排水計画、ほ場造成計画、集落配置計画、地区内道路、送電線、防風林等の配置計画、生活用水供給計画等である。

ほ場造成、集落配置、防風林、生活用水供給計画等はモデル計画として取りまとめる。この場合、集落配置の規模はエ側の基準に従って、一モデルの規模は７００ha を標準として、このなかに学校、病院、モスク等の公共施設用地を確保する。

(11) 建設工事の資材価格に関する調査

(12) プロジェクトの費用、便益に関する調査

4－3 今後の取組み方

F／S調査に関しては次のようなスケジュールで速やかに実施されることが望ましい。

調査は全体で１０ケ月を要すると考える。この内、現地調査には6ケ月が必要である。５６年3月までに調査を完了するには、５５年6月に現地調査に着手しなければならない。従ってスコープ・オブ・ワークについては遅くとも5月中旬に先方に送付する必要がある。

現地の地形条件が低湿地であること、又、気象条件が5月～１１月が乾燥期、１２月～3月は時々降雨があり、この期間のジープでの地区内立入りは不可能である。１２月3月の間は気温も低く寒いし、又地面も過湿状態になるため、現地調査は避けた方がベターであると考える。

調査団との討議を通じてエ側は、F／S調査に対して便宜を供与する意向を表面した。その便宜には下記のものが含まれることが暫定的に同意された。

(1) F／S調査団によって費用負担される次の事項

イ) 現地調査期間中調査団が使用する事務所の用意

ロ) 現地調査に必要な労務者の用意

ハ) 運転手付ジープの用意

(2) 調査に必要な資料・情報の提供

(3) エ側カンターパートの協力・現地で必要な試験施設の提供

(4) 機械の無税通関・及び調査団に対する一切の課税の免除

エ側は、下記事項について調査団に強く要請した。

(1) 現地調査に必要なジープとエンジン付ボートの日本からの供与

(2) かんがい省高級幹部の日本の土地改良事業視察への招聘

上記について、現地はジープによる他は地区内立入りは不可能であり、少くとも4台は必要であり、又、低湿沼地の調査のためボートも少くも2艘は必要である。

エ側幹部の招聘は、かんがい省第一次官がよいと考える。

4－4 実施調査概要（案）

以上の見解を含め、調査団として適当と考えるF／S調査の調査概要は次の通りである。

(1) 現地調査

イ) 計画地域と関連周辺地域の踏査及び現況の把握

飛行機による上空からの概査、ジープによる踏査、ボートによる沼地及びエル・マンザラ湖周辺の調査

ロ) 資料及び情報等の補足収集

1）気象、水文

2）地質、土質

3）土壌、現況土地利用

4）現況栽培体系、営農技術

5）かんがい排水計画の基準、地域の実態

6）国家経済、地域経済、社会構造

7）農業経済、農村計画

8）地域農政、研究普及活動

9）関連インフラ、農業関連工業の現況

10）電力事情

11）諸物価、建設物価、建設資材の調達

12）計画地区内または周辺地域での開発プロジェクト報告書

ハ) 計画地区、及び主要構造物サイトの概定

1 開発対象区域の概定

2 基本用排水路線計画の概定

ニ) 地形図の補足調査

地形図の補足調査は、今回入手した1／25,000図を基図にして国内で1／10,000図を複製し、これを現地におけるグランドコントロール測量で補足修正する方法が望ましい。

ホ) 水文調査

既存資料のチエックと解析

ヘ) 土壌調査

1) 現地土壌サンプリング調査（試坑及び試穿……土壌調査未済区域 200ha につき1点の割合）

2) 土壌分析（土層、土性、塩分濃度、化学性、物理性、肥沃度等の調査）

3) リーチングテスト（塩分洗脱に関する試験）

4) 土壌図、土地分級図の作成

ト) 土地利用及び作付計画調書

1) 現況作付体系、収量等についての実態調査

2) 作物の市場性、需要動向の調査

3) 作付体系の立案に関する調査

4) 畜産の導入に関する調査

5) 農業企業振興に関する調査

チ) 営農計画調査

1) 土地所有に関する調査

2) 農家の経営状況、耕作技術水準等に対する現況調査

3) 農業機械の普及実態調査

4) 農産物及び資材価格に関する調査

5) 投入資材投下労働力、資本装備等の農業経営計画及び費用に関する調査

6) モデル営農類型の策定に関する調査

リ) 流通、営農サービスに関する調査

1) 農業資材の需要及び供給の実情と供給体制に関する調査

2) 集出荷、貯蔵、加工、輸送、販売等流通に関する調査

3) 営農指導、農民組織等に関する調査

ヌ) 単位用水量調査

土壌別、作物別の単位用水量決定に関する調査

ル) かんがい排水計画調査

1) 土壌調査の結果にもとづいてかんがいタイプ区分を行う。

2) ほ場におけるインテークレイトの測定。

3) 現場透水試験

4) エル・サラム運河計画の見通し調査

5) 地下水チエックの調査

ヲ) 土質試験

盛土材料の土質試験、透水試験等

ワ) 農村計画調査

1) 周辺地域の農村現況調査

2) 先行開発地の事例調査

カ) 農業金融

金融組織と利用状況及び資金返済に関する等についての実態調査

ヨ) 施設維持管理計画

1) 周辺土地改良施設の維持管理実態調査

2) 維持管理方式及び費用に関する調査

タ) 経済性評価

プロジェクトの経済性評価に関する調査

レ) 環境調査

計画地域の生態、保健医療、教育関係調査

(2) 国内作業

イ) 農業開発基本構想の策定

水文、土壌、人口等の調査結果解析による地域の水資源、土地資源等の評価

ロ) 基本計画の概定

1) かんがい対象面積

2) 作付体系、かんがい用水量

3) 営農計画、関連インフラの基本計画

4) エル・サラム運河計画に含まれる関連事業費の算定

ハ) 予備設計、評価

1) 開発計画の確定

計画地域、作付体系、営農計画、かんがい排水計画、関連インフラ計画

諸施設の概略設計

2) 事業費及び便益の算定

3) 経済評価及び財務分析

4) プロジェクトの達成に必要な関連事業の検討

（添付資料１）

FIELD NOTE ON PRELIMINARY SURVEY

FOR

SOUTH HOSAINIA VALLEY AGRICULTURAL DEVELOPMENT PROJECT

THE ARAB REPUBLIC OF EGYPT

CAIRO ++++++ MARCH ++++++ 1980

Japanese Survey Team

JAPAN INTERNATIONAL COOPERATION AGENCY

Minutes of Discussions

on

The South Hosainia Valley Agricultural Development Project, the Arab Republic of Egypt

Eng. Amin Makhlouf, First Undersecretary, Minisry of Irrigation, the Arab Republic of Egypt and Eng. Jimpei Ishizaka, Leader of Japanese Preliminary Survey Team for the South Hosainia Valley Agricultural Development Project, Japan International Cooperation Agency, have principally agreed to the contents of the Field Note and the Attached Paper I through a series of discussions.

Furthermore, the Egyptian Government requested the Japanese Government to accept the Attached Paper II.

Cairo, March 6, 1980

Eng. Amin Makhlouf,
First Undersecretary,
Ministry of Irrigation,
Arab Republic of Egypt,

Jimpei Ishizaka
Leader of Japanese Preliminary
Survery Team for South Hosainia
Valley Agricultural Development
Project

I. OBJECTIVES AND BACKGROUND

In response to the request of the Government of Egypt, the Government of Japan sent, through Japan International Cooperation Agency (JICA), a preliminary survey team to Egypt for agricultural developments projects in the country from November 20 to December 14, 1979.

Based upon the results of the above survey, the Government of Japan decided to send a second preliminary survey team, through JICA, to Egypt for seeking possible technical cooperation programme to the South Hosainia Valley Agricultural Development Project (30,000 ha, 73,000 fed) in the El Salam Canal Project (82,000 ha, 196,000 fed). During the period between February 27 and March 7, 1980, the team conducted a study with the following objectives:

1) To discuss with the authorities concerned of the Egyptian Government the feasibility study on the project to be carried out by the Japanese Government.

2) To discuss with the authorities concerned of the Egyptian Government the possible framework of technical cooperation between the two Governments for the aforementioned project.

II. UNDERSTANDING AND SUGGESTIONS

1. Introduction

The Government of the Arab Republic of Egypt has given high priority to the implementation of the El Salam Canal Project with a view to solving major problems that Egypt is presently facing, that is, 1) food security and international balance of payments, 2) distribution of urban population to rural areas and 3) increase of employment opportunity.
Under the circumstances, the Egyptian Government requested the Japanese Government to cooperate in working out the planning and designing of agricultural development projects in the country.

In reply to that request, the Japanese Government sent a preliminary survey team to Egypt in 1979.
Based upon the results of the above survey, the Japanese Government

sent a second preliminary survey team to Egypt for the South Hosainia Valley Agricultural Development Project in 1980.

Since arrival in Egypt February 27, 1980, the team has been conducting a field survey and data collection as well as holding a series of discussions with officials involved of the Egyptian Government over the project.

Through these activities, the team's understanding about the project is summarized as below:

South Hosainia area is a swampy one locating on the northeast of Nile Delta and facing the Manzala Lake on the nothern part. The planning acreage for the project is 30,000 ha (73,000 fed). This plan is part of the El Salam Canal Project which is under way and its water demand will be supplied from El Salam Canal. The water resources of the El Salam Canal Project comes from the Nile River and the drainage water in the east of the Nile Delta. According to the plan, the low level area will be developed by improving the drainage.

2. Understanding and Suggestions

Based upon the field survey, the team has ascertained the following items:

1) Necessity of making topographic maps with contour lines (1:10000 scale).

2) Supplementary work of existing soil surveying and water-quality test.

In working out the project, the following have to be taken into consideration:

1) To consolidate an intensive drainage scheme, containing salinity-leaching scheme.

2) To draw up an economical water utilization plan suited to the existing soil conditions.

3) To pay attention to the consistency with the El Salam Canal Project.

4) To attain the earliest possible realization of the effect of the project.

3. Scope of Work for the Feasibility Study

In conducting the feasibility study on the South Hosainia Valley Agricultural Development Project, the following scope of work is proposed:

1) Time schedule

The time schedule for the study is as attached Annex I.

2) Project area

Acreage of the study is 30,000 ha (73,000 fed) which is located at the South Hosainia Valley in the area of the El Salam Canal Project.

3) Preparation of feasible layout and design on secondary canal, tertiary canal and on-farm irrigation system, etc., where appropriate modern techniques are to be applied to save conveyance loss and field application loss. The contents of the work can be described as follows:

(a) Review of the El Salam Canal Project. (82,000 ha, 196,000 fed, west of the Suez Canal)

(b) Preliminary design for the project, i.e.

i. Location and structural design of secondary and tertiary canal

ii. Location and structural design of main facilities and social infrastructure

iii. Selection of a few small model blocks (about 700 ha each), depending on topographical and soil conditions in the project area, and making the general model plan of these blocks. (land use plan, cropping pattern, on-farm irrigation systems, etc.)

(c) Preparation of the implementation schedule for the project.

(d) Estimation of the project cost and benefit.

(e) Economic evaluation of the project.

4. Undertaking by the Egyptian Government

To facilitate the performance of the field survey, the Government will undertake the following:

1) To arrange the following, the cost of which will be borne by the Japanese Feasibility Study Team (hereinafter referred to as the Team):

   (a) Office accommodation for field and desk works.

   (b) Laborers for the field survey.

   (c) Jeeps with drivers.

2) To provide the Team with data and materials including reports, papers, maps and aerial photographs which are necessary for the study, and permit the Team to retain copies thereof.

3) To provide the Team with Egyptian counterparts and laboratories to fully cooperate with the Team.

4) To give necessary permissions to the Team for the study at the project area.

5) To help the Team in contacting the Governmental organizations concerned for collecting data and information and for any other works in connection with the study.

6) To assure the Team of the security in carrying out the study.

7) To exempt the Team from any tax and duty which may be imposed on in Egypt when bring into equipment and materials for the study provided they are reexported from the country after completion of the works.

5. Undertaking by the Japanese Government

The following are to be undertaken by the Japanese Government:

1) To send a Japanese team to Egypt to conduct the fasibility study for the project.

2) To provide equipment necessary for the study of the project.

3) To bear direct cost incurred for the study such as hotel accommodations, transportation, etc.

4) Presentation to the Egyptian Government copies of the feasibility study report on the project.

III. MEMBERS OF THE TEAM

PRELIMINARY SURVEY TEAM FOR SOUTH HOSAINIA VALLEY AGRICULTURAL DEVELOPMENT PROJECT IN THE ARAB REPUBLIC OF EGYPT

Assinment	Name	Position
Leader	Jinpei ISHIZAKA	Director, Land Improvement Engineering Service Center, KANTO Resional Agricultural Administration Office, Ministry of Agriculture, Forestry and Fisheries
Agronomy	Yasutaka UCHIYAMA	Chief Researcher, 1st. Laboratory, Tropical Agriculture Research Center, Ministry of Agriculture, Forestry and Fisheries
Land Development	Yasuo ICHIKAWA	Deputy Director, Water Utilization Division, Construction Department, HOKURIKU Resional Agricultural Administration Office, Ministry of Agriculture, Forestry and Fisheries
Agro-Economy	Koichi SAKAMOTO	Section Chief, Economic Section, Project Planning Division, Planning Department, Agriculture Structure Improvement Bureau, Ministry of Agriculture, Forestry and Fisheries
Irrigation & Drainage	Yasuyuki MIYAMOTO	Section Chief, International Standard of Technique Section, Design Division, Construction Department, Agriculture Structure Improvement Bureau, Ministry of Agriculture, Forestry and Fisheries
Coordination	Kazuo NAKAGAWA	Insturctor, UCHIHARA International Agriculture Training Center, Japan International Cooperation Agency

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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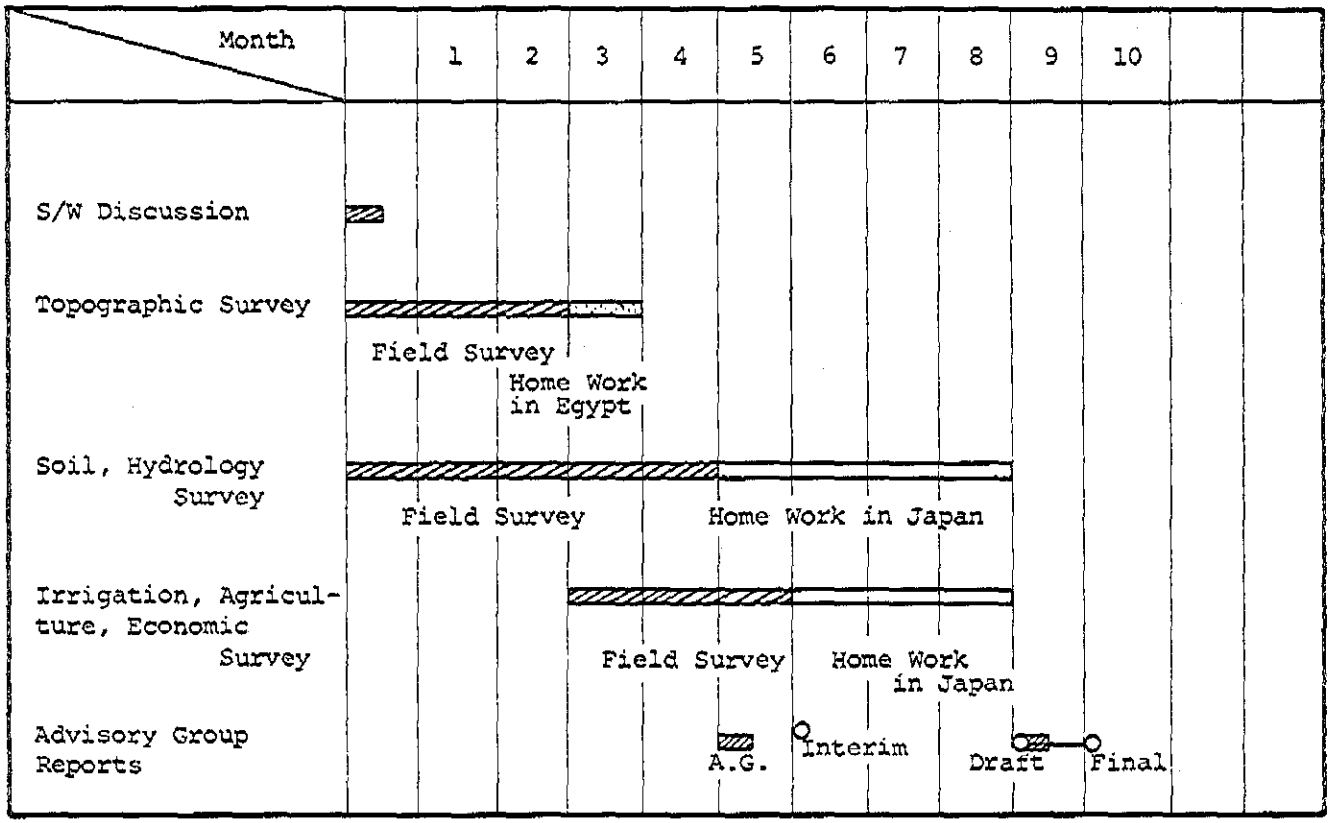
160 JAPAN

IV. PROGRAMME CARRIED OUT BY THE TEAM

Feb.	26 (Tue.)	Lv. Tokyo (09:50) by JL463	
	27 (Wed.)	Ar. Cairo (00:35) Arrangement of survey	(Cairo)
	28 (Thu.)	Courtesy call at Ministry of Irrigation and programme metting	(Cairo)
	29 (Fri.)	Preparation for survey	(Cairo)
Mar.	1 (Sat.)	Move to Zagazig General survey in South Hosainia area	(Ismailia)
	2 (Sun.)	Detailed survey in South Hosainia Valley Project area	(Mansura)
	3 (Mon.)	Field trip to Manzala Lake and Dumyat River-mouth area Return to Cairo	(Cairo)
	4 (Tue.)	Visit Shoubra Office, Ministry of Irrigation for data collection Preparation of spot report	(Cairo)
	5 (Wed.)	Visit Ministry of Irrigation for discussions	(Cairo)
	6 (Thu.)	Visit Ministry of Irrigation Submission of field survey report	(Cairo)
	7 (Fri.)	Lv. Cairo (17:50) by JL474	
	8 (Sat.)	Ar. Tokyo (17:20)	

Annex I.

TENTATIVE SCHEDULE



ATTACHED PAPER I

UNDERSTANDING BY THE EGYPTIAN GOVERNMENT
AND THE JAPANESE GOVERNMENT

(1) In making the implementation program of the South Hosainia Valley Agricultural Development Project, the basical points of the El Salam Canal Project should not be affected.

(2) In designing the model block, the following should be taken into consideration.

a) To secure the land for farmers' residences and public facilities on planning the land utilization program.

b) To study the possibility of development of agro-industry and livestock in this area.

ATTACHED PAPER II

THE EGYPTIAN GOVERNMENT REQUESTED THE JAPANESE GOVERNMENT TO CONSIDER

(1) To receive Egyptian engineers in Japan for study in connection with the feasibility study on the project.

(2) To donate Jeeps and boats with engines for the field survey.

（添付資料２）

ARAB REPUBLIC OF EGYPT

Ministry of Irrigation

A Study of The Planned Peace Channel Project

September 1979

Summary of the

"Peace Channel" Project

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

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

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

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

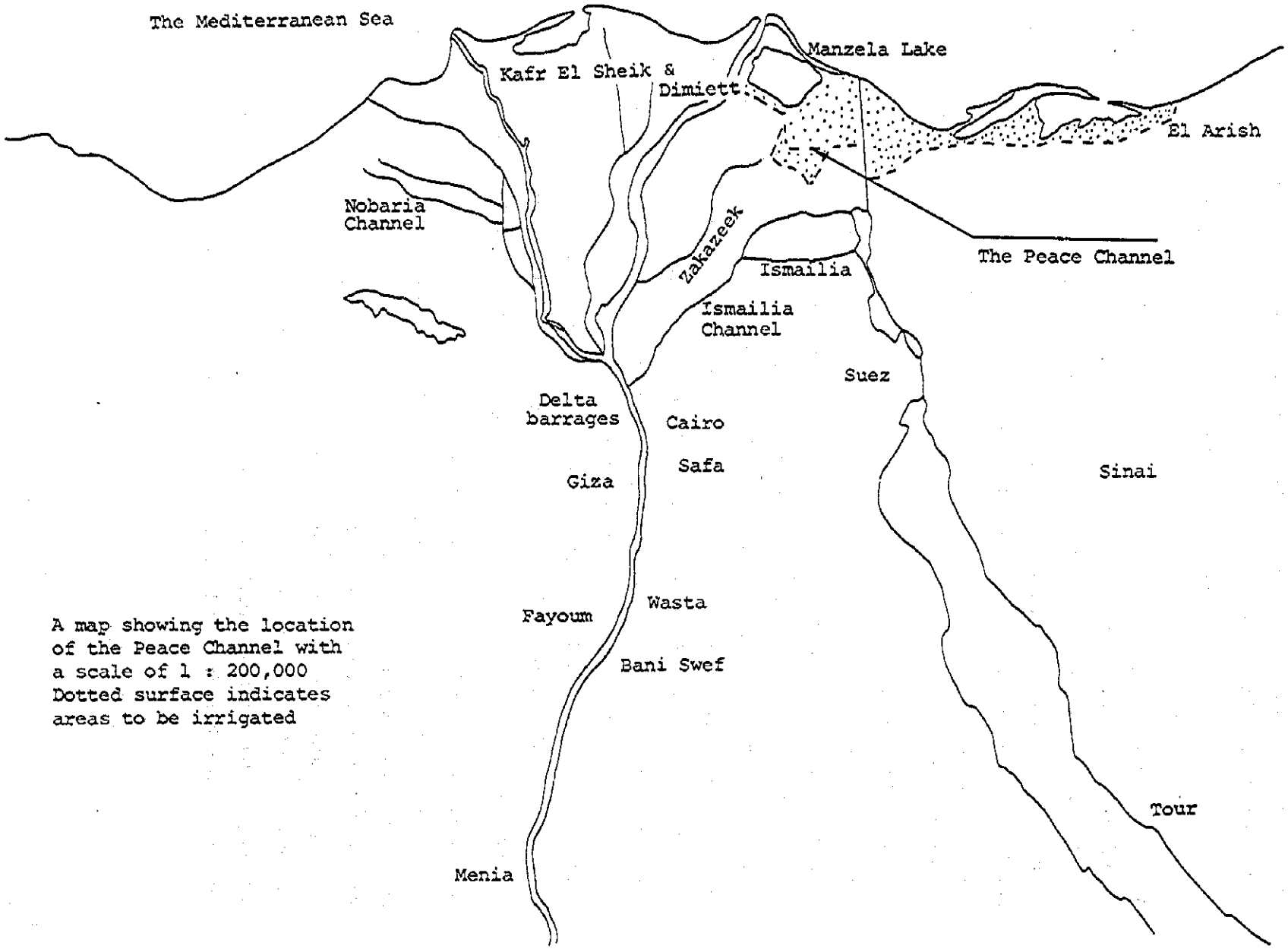
If water resources occupy nowadays a prominent place in the world's interests, as the foundation for agricultural development, it was natural for Egypt to start to exploit this national wealth outside the valley and the Dalta by drawing a new agricultural map for Egypt to ensure the nourishment and feeding of its people and offer new opportunities for work.

With the return of peace in Sinai, an entirely new place was opened in May 1971 following the Rectification Revolution for liberation, constitution

and rehabilitation, reformation of the human-being, begining with the eastern part of the Dalta which extends from the eastern and western sides of the Suez Canal to the Sinai region where water resources are so abundant as to effect a successful and settled agricultural development; it was thus necessary to lay down an integrated and consistent plan to utilize every drop of water from the various sources such as the fresh water from the Nile branch at Domietta, the drained water suitable for irrigation as such or mixed with fresh water, rain water on the north-east coast which can be used as it is or stored in the valleys, the under-ground water in the Sinai which can safely be drawn for irrigation and drinking and other development purposes.

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

The Minister concluded by saying that the peace channel project is one of the important executive projects which the Ministry of Irrigation is undertaking to translate the water and horizontal expansion policies to ther year 2,000 into an actual and effective plan beginning with one of the most important region for future. Horizontal expansion as it represents the eastern door of Egypt and the wide horizon, to effect a comprehensive development by absorbing without any limitations, efforts, funds and labour with immediate benefits and support to the national economy.



A map showing the location of the Peace Channel with a scale of 1 : 200,000
Dotted surface indicates areas to be irrigated

1. "The Peace Channel" Project, Between the Notion and the Decision.

Attention was drawn to Sinai and East of the Suez Canal tracing a picture of the future of this great expanse of land when rehabilitated and constructed laying the foundation for a new society and exploding a new source of permanent wealth for the country.

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

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

This channel is not an alternative or a substitute to the expansion and deepening of the "Ismailia Channel", work which began a few years ago by the Ministry of Irrigation in accordance with pre-determined phases of execution, but they are two integrated projects designed to provide irrigation water to west areas east and west of the Suez Canal; it represents the greatest horizontal expansion decided within the frame-work of the horizontal expansion plan in Egypt until the year 2,000 so that the proposed expansion in this region would reach approximately 1.50 million feddans (Egyptian acres).

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

In 29/11/1978, the Minister of Irrigation decided to establish a technical committee to study the projects relating to the horizontal expansion of the region lying east of the Delta, to lay down an integrated plan of the sources of irrigation waters and to plan the

public water courses for irrigation and draining, the site of the necessary pumps to raise and mix the waters to determine the water disposals and the priorities for the execution of the projects.

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

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

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

(3) The level of the Nile water in front of the Fareskour Viaduct to be drawn (1,70).

(4) The water levels behind "The Peace Channel" source to be (1,50) at the maximum requirements.

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

(6) The hydraulic sloping of the water in the longitudinal sector of "The Peace Channel" to be 6 cm/kilometer.

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

(8) The reutilization of some of the drained water of "BAHR HADOUS", the lower "SARU" in irrigation by mixing it with fresh water in "The Channel".

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

(10) "The Peace Channel" project is to be executed in two phases: the first in a hydrological sector to absorb the necessary mixture (of drain and fresh water) to irrigate 200 thousand feddans west of the Suez Canal and the second to expand the sector to the degree necessary to irrigate 400 thousand additional feddans in Sinai. Thus the maximum final limit to be irrigated would be 600 thousand feddans by "The Peace Channel".

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

2. The Geography of the Project.

The project is situated in the area following between latitude 30° 40', 31° 25' and longitude 31° 45', 35° 45'.

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

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

Domietta, Sharkia, Port-Said

and

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

3. Description of the Project.

3-1 "The Peace Channel" draws its waters from the Nile branch at Domietta at kilometers 204 in front of Fareskour Viaduct to be built at the present site of the earthy Dam. The water level behind the source of "The Peace Channel" is established at (1,50).

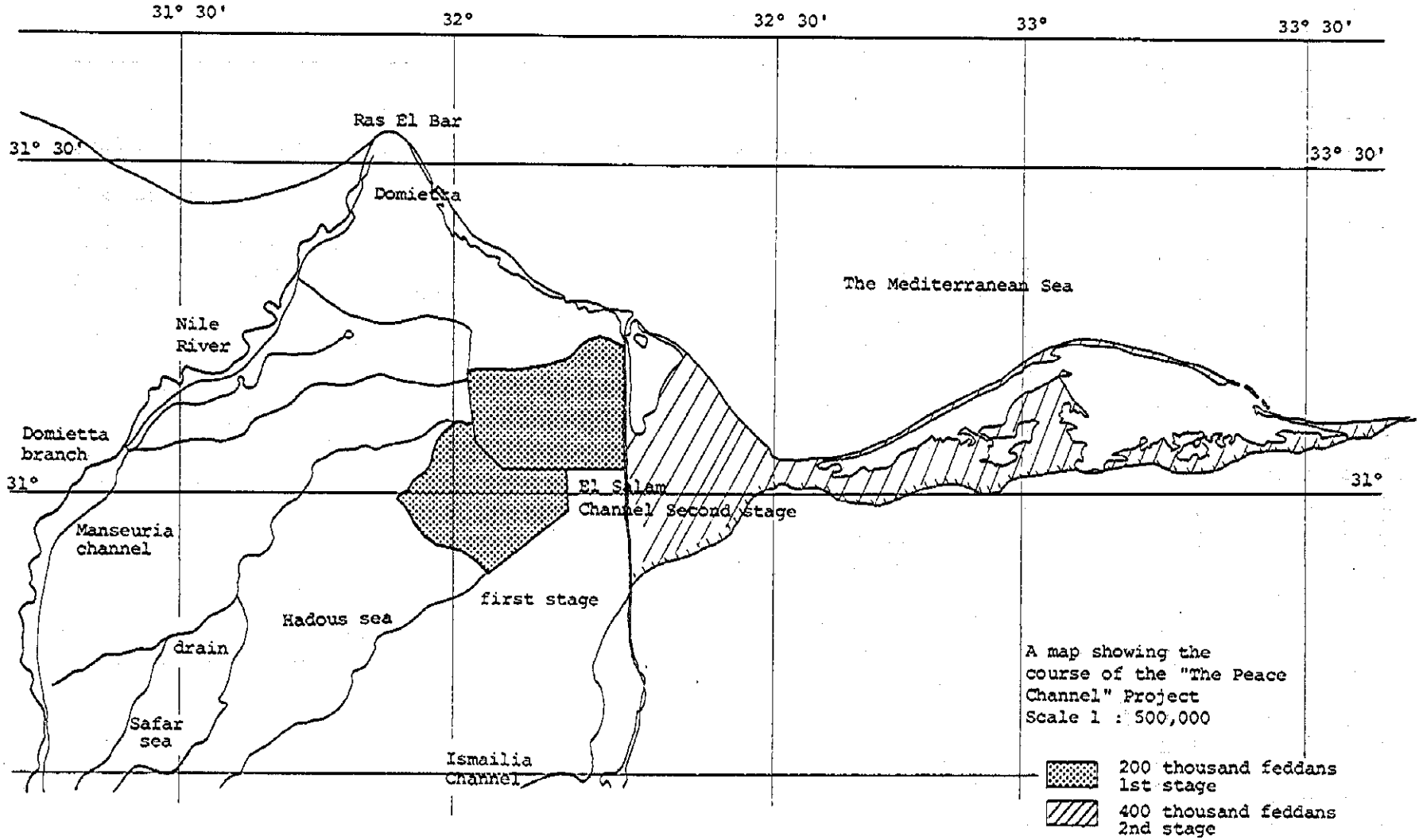
3-2 The source of "The Channel" was chosen at this site to avoid inhabited areas and to conduct "The Channel" along the course of some existing water courses, which would facilitate the executuion of the work and prevent, as far as possible, the fragmentation of agricultural lands, as well as to exploit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

3-3 "The Peace Channel" runs in the south-east direction along EL HERNA drain until the embankment site of the pumping station of the lower "SARU" in order to utilize around two million cubic meters daily of the water of the lower "SARU" drain to be mixed with the water of "The Peace Channel". This feeding will be accomplished through the free flow from the drain to "The Channel" at km 13.50 on "The Cahnnel".

3-4 According to the hydraulic sloping agreed to by the committee i.e. 6 cm/km. The water level at km 17.50 on "The Channel" will reach + (0.50) where a pumping station to raise the water from level + (0.50) to level + (2.25) in conformity with the topography of the region and the technical requirements to design the sector of "The Channel".

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

3-6 "The Channel" crosses at km 34,650 the "long sea drain" and proceeds in a southern direction and continues until it crosses BAHR HADOUS drain at km 48,000 where a lifting and mixing-station will be constructed from level + (0.50) to level + (3.00) on "The Channel".


31° 30'
32°
32° 30'
33°
33° 30'
Ras El Bar
31° 30'
33° 30'
Domietta
The Mediterraneam Sea
Nile
River
Domietta
branch
31°
31°
El Salam
Channel Second stage
Manseuria
channel
first stage
Hadous sea
drain
Safar
sea
Ismailia
Channel
A map showing the
course of the "The Peace
Channel" Project
Scale 1 : 500,000
200 thousand feddans
1st stage
400 thousand feddans
2nd stage

3-7 "The Channel" runs behind the lifting and mixing station, proceeding in a southern direction and curves towards the east until it meets the Suez Canal at km 27,800 (numbered Suez Canal) whereby the length of "The Channel" from its source until this spot approximately 82 kms.

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

4. Natural Characteristics of the Region of the Project.

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

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

Under these meteorological conditions, it can be said that the region is fit for cultivation of most crops, winter and summer crops alike.

1 - Climate observations of the meteorological station at Mansura

Latitute 31° 3' Longitude 31° 23'

Data	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Max. daily temperature centig.	19.1	20.6	23.2	27.2	33.3	33.7	32.7	33.5	32.6	28.8	25.9	21.3
Max. monthly temperature centig.	28.5	34.2	38.5	42.5	45.5	46.8	41.3	40.6	42.0	40.5	36.9	31.5
Min. daily temperature centig.	7.1	7.5	9.4	12.0	15.6	18.7	20.5	20.6	19.1	17.2	14.0	93
Min. monthly temperature centig.	0.4	-	2.0	4.2	6.2	13.0	16.0	10.2	12.3	10.4	5.2	2.7
Av. daily temperature centig.	11.9	12.3	15.2	17.7	21.4	25.2	25.8	25.8	24.0	21.9	18.2	13.7
Av. relative humidyt %	70	68	66	58	52	57	69	71	78	77	71	71
Rate of evaporation mm	2.5	3.8	4.6	7.1	9.2	9.8	6.4	5.2	5.7	5.6	4.1	3.3
Rate of rainfall mm	10.2	8.5	5.6	2.5	4.3	0.5	-	-	0.1	4.5	6.2	10.5
Max. daily rainfall mm	20.0	20.5	27.0	24.3	35.3	25.0	-	-	4.0	48.0	45.0	22.0
Av. wind speed km/h	10.7	12.0	11.8	11.5	10.5	9.4	7.4	5.7	6.3	6.8	8.7	10.9
Hourly rate of sun-shine	10.4	11.1	12.0	12.9	13.7	14.1	13.9	13.2	12.4	11.4	10.6	10.2

Table 2) Climate Observations of the meteorological station at Ismailia

Latitude 30° 35' Longitude 32° 26'

Data	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Maximum daily temp. centigrade	19.9	21.1	23.9	28.7	31.2	35.1	35.1	30.1	37.8	30.8	25.7	21.6
Maximum month temp. centigrade	26.9	28.5	32.9	40.0	43.9	46.0	40.8	39.9	38.5	37.2	26.5	28.4
Minimum daily temp. centigrade	7.1	7.7	9.9	13.0	12.1	19.5	20.9	12.2	19.2	16.4	12.8	8.9
Minimum monthly temp. centigrade	0.2	4.2	4.6	6.8	11.0	16.0	18.2	18.1	10.2	9.7	5.2	4.8
Average daily temperature	12.7	13.6	16.4	20.3	23.2	26.9	27.4	28.5	25.4	22.5	18.5	14.4
Average relative humidity %	61	63	40	38	41	43	53	55	52	58	61	61
Rate of evaporation mm	4.2	5.0	7.5	10.6	10.1	11.9	10.3	9.3	7.8	7.1	4.5	4.1
Rate of rainfall mm	8.4	2.1	7.3	0.5	4.6	-	-	-	-	2.9	9.6	3.1
Maximum daily rainfall mm	8.0	3.6	6.0	1.8	6.0	-	-	-	-	11.1	23.0	3.0
Average wind speed Km/hr	-	-	-	-	-	-	-	-	-	-	-	-
Rate of hourly sunshine	10.5	11.2	12.0	12.9	13.6	13.9	13.8	13.2	12.4	12.4	10.7	10.3

Table 3. Climate observations of the meteorological station at Port-Said

Data	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aig.	Sep.	Oct.	Nov.	Dec.
Max. Daily temperature centg.	18.1	18.6	20.2	22.5	25.6	28.5	30.4	30.8	29.7	27.3	24.1	19.8
Max. monthly temperature centig.	25.0	32.5	35.0	38.3	44.9	41.2	38.0	36.9	35.9	37.0	35.3	28.5
Min. daily temperature centig.	11.4	12.0	13.6	16.8	19.6	22.4	24.1	24.9	23.8	21.8	18.5	13.6
Min. monthly temperature centig.	0.1	2.2	0.9	8.2	11.7	18.6	20.3	22.0	18.8	14.4	9.6	7.5
Av. daily temperatute centig.	14.3	14.8	16.4	18.8	22.0	25.0	26.7	27.3	26.1	24.1	20.9	16.3
Av. relative humidity %	73	70	68	71	71	73	73	73	70	69	72	74
Rate of evaporation mm	4.7	5.4	6.5	6.4	6.8	7.4	7.5	7.3	7.8	7.9	5.9	4.5
Rate of rainfall mm	12.4	11.3	8.5	2.7	2.6	-	-	-	0.2	7.3	9.1	17.6
Max. daily fainfall mm	11.6	15.3	10.9	22.8	19.5	-	-	-	5.4	39.6	18.0	47.7
Av. wind speed km/h	17.2	19.1	20.5	17.9	15.2	13.7	12.6	10.2	11.7	13.9	16.1	17.4
Hourly rate of sun-shine	10.4	11.1	12.0	12.9	13.7	14.1	14.0	13.3	12.4	11.4	10.7	10.2

4-2 The topography:

The area west of the Suez Canal represents a part of the Nile Delta. The Manzala Lake (BOUHAIRAT EL MANZALA) covers the greater part of the northern side of this area and the surface of the lands west of the Suez Canal slopes from the south to the north where the land in the south is a few meters above sea-level and it slopes gradually till it falls a few meters below sea level at the extremeh north.

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

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

4-3 Classification of the soil:

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

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

4-3-1 EL HOSAINIA Plain, south of part said and south of Matereia:

The lands of the region are considered to be a part of Manzala lake. The lands of southern and eastern parts were dried due to water recession from them in the past.

The northern part is inundated with water with outcrops of islands which have alluvion river a sea soils. For that the soils are considered to be recently formed alluvium, formed by both Nile silt and mediterranean sea waters. So the soils are characterized by presence of broken sea shells and appearance of recognizable percentage of sand, fine silt in soil profile and increase of magnesium salts. The

southern banks of manzala lake have many undulations and flow to them much of the water of the major drains like "BAHAR HADOUS" and "BAHAR EL BAKAR" drain.

The soils of the region are characterized by the following sectors,

- Clay sector to a depth of 150 cm. The soil is sticky blakish in colour and spread over it pieces of shell which are usually found between 50 ∿ 150 cm from the soil surface.
- Light clay sector to a depth of 150 cm and its soil is dark brown, or to a depth of 50 ∿ 80 cm from soil surface and that is followed by silty soil or heavy clay.
- Silty clay sector or silty to a depth of 20∿100 cm from soil surface followed by heavy clay.
- Silty sand sector at the soil surface layer to a depth of 50 cm followed lay heavy clay which is sticky and black in colour.

From the results of the chemical and mechanical analysis of various type of soil in the region, it is clear the soils are considered alkaline and saline with rich in magnesium and sodium salts.
The percentage of the total dissolved salts ranges between (1.02 ∿ 24.8%)

The electric conductivity of the soil filtrate the from the soil paste ranges between 13.00 ∿ 180.88 milimoles/cm at 25°C less. The soils of the region are rich in calcium salts particularly the soil surface layer.

Cation exchange capacity for the soil range between 10 ∿ 49.5 milligram/100 grams of soil.

The percentage of exchangeable sodium for the soil types ranges between 18.7 ∿ 78.1%.

P.H. values range between 6.2 ∿ 8.3

Water holding capacity of soils ranges between 29 ∿ 116%.

The surface soil of the dried southern part of the region have high water percolation ability. The hydraulic conductivity ranges 0.12 ∿ 5.7 cm per hour. This is atributed to higher percentage of salts. But it is probable that after salt leaching the soil layer will become to be of low permeability to water.

As for the soil layers below the surface they are less permeable to water and that is due to being saturated by magnesium salts and the presence of ground water which is rich in those salts as well as the presence of some soil layers of heavy sticky clay in structure.

As for the resort areas and the lands which are inundated by water for some seasons in the year, their permeability to water is low and the hydraulic conductivity is less than 0.01 cm/hour, except soil types of light structure.

From the mechanical analysis;

- Soils of heavy clay consist of the following constituents:-

Clay	Less than 2 microns	45.99 ∿ 3.36%
Fine silt	2 ∿ 20 microns	20.76 ∿ 36.44%
Coarse silt	20 ∿ 50 microns	0.9 ∿ 10.3 %
Fine sand	50 ∿ 100 microns	0.48 ∿ 6.52%
Medium sand	100 ∿ 200 microns	Zero ∿ 1.65%
Coarse sand	More than 200 microns	Zero ∿ 1.75%
Calcium carbonates		24 ∿ 4.47%
Total dissolved salts		4.4 ∿ 18.88%

- Soils of light structure consists of the following constituents:-

Clay	Less than 2 microns	45 ∿ 69 ∿ 3.36%
Fine silt	2 ∿ 20 microns	20.76 ∿ 36.44%
Coarse silt	20 ∿ 50 microns	4.45 ∿ 17.28%
Fine sand	50 ∿ 100 microns	0.44 ∿ 8.30%
Medium sand	100 ∿ 200 microns	Zero ∿ 1.75%
Coarse sand	More than 200 microns	Zero ∿ 1.94%
Calcium carbonates		0.08 ∿ 3.45%
Total dissolved salts		3.24 ∿ 24.80%

Results of the chemical analysis of underground waters and resorts:-

It was clear from the results of some specimens of underground waters and surface waters that the amount of total dissolved salts range 4,298 ∿ 19,366 part per million. The depth of water varies from zero ∿ 250 cm below the soil surface.

One to that there soils are considered to be of high salinity in ground water and this necessitaty deepening of the drains as possible in order to get rid of the high saline under ground water.

The Suitability of The Lands for Agriculture:-

From the outcome of the field studies and results of the chemical analysis for the soil types which represents the soil of the reigion it is plain that the soils are heavy, sticky and alkaline with predominancy of calcium and magnesium salts which are less permeable to water. So a long time is required to get rid of the salts, and the following recommendations should be excuted:-

- It is recommended to dig a network of field drains in the dried lands south of the region at distances of 12.5 is meters between each two field drains and after the end of the first years of reclamation the middle drain can be omitted so the distance between every two drains becames 25 meters.

- It is also recommended to dry the inundated lands with consideration of constructing drainage networks on the previous distances on condition that the digging should be started after drying immediately since prolonging the drying time will enhance the inflorescence of the salts at the upper layers. There salts are leached to lower serfaces by the flooded water now.

- In soil leaching or washing process it should be started by getting rid of the salts at the upper layers, then afterwards the underground washing should be done.

- It is recommended to deepen the drains to more than 100 cm so as to validate the underground leaching and hence getting rid of excess salts.

- It is advisable to cultivate soils which endure salinity specially in the first year of cultivation.

- Since these lands are alkaline there is no need to apply agricultural gypsum since it is available but it is advisable to plow the earth deeply for several times.

- It is advisable to apply organic fertilizers to enhance the betterness of chemical, texturol and biological characteristics of the soil.

4-3-2 Northen Coastal Plains of Sainai

Area of this plaine amounts to 7,500 km^2. On most of it's parts it is covered by sand deposits which take the shape of dunes. These sand dunes are mainly concentrated at the north western side & slope to the north till they reach the sea level. These sand dunes enclose some depressiond between them where soils seem to be a mixture of clay, sand and calcarious. Mixing of the soils of the depression is brought out by the rain wash.

It is preferrable for the irrigation in this region to be sprinkler or dripping irrigation due to steepness of the land. Also soil levelling is not required in order not to demolish the soil sector which previously developed as shown by the existing state.

4-3-3 Sainai Regional Ports:-

The coastal plain region is limitted from the north west and western parts by huge areas of saline clay lands which are partly flooded by seawaters, and the other part of it the surface increase in height for several meters and is covered by sand dunes and fine sands.

The increase in salinity in upper reigions and the presence of thick clay layers with ancient deposits on lower layers, all there lead to increase in underground water. The area of this lands amount to 3,000 km^2. majority of it spread over the north west and south of BARDAWAIL lake, east of "BUHIARAT EL MURA" and "TOMSAH" lake. The surface of it seems to be covered by sand dunes predominated by saline clay deposits. The previous studies show that clay deposits of one of the nile estuaries concentrate in this area. This region encompasses also "SAHL EL TINA" region.

In addition to these divisions and description of the soil layers of the scheme it is important for the land reformation systems to do more studies to sort out and classify the soils of the areas decided for expansion, so as to restrict the area which could be

added to peace channel project at east of the Suez Canal and Sinai in particular. This will certify and limit the works for the second phase for the expansion of peace channel in accordance to the actual area which will be shown by soil sorting and classification studies.

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

50 thousand feddens south of Port Said
62 thousand feddans north of Heisseneiah Plain
73 thousand feddan south of Heisseniah Plain
8 thousand feddans south of Materia
2 thousand feddans in the area confined between the "Peace Channel" and the "Long Sea Drain".
135 thousand feddans in SAHL/ELTINA in Sinai
265 thousand feddans in the coastal region of Sinai between RAMANA and AREISH up to contour _ (5.00).

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

6. Suggested agricultural rotations"

These areas shall be used for the cultivation of crops that help to build the soil, raise its fertility in the early years and later will be cultivated by crops of high economic returns permenantly.

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

The suggested rotation will be changed after the first years of land reclamation and getting rid of salinity in soil. Then crops like vegetables, sugar beat and non traditional crops will be grown with allotment of a part of land for rice cultivation as a guarantee for salt balance.

Table (1)

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

6-2 Rotation in muddy sand and limey sand lands in the early yeara

Table (2)

Season	Percentage	Crop
Winter	22%	Vegetables
	22%	rough alfalfa
continuous	34%	citrus
	22%	lucerne
Summer	22%	vegetable
	22%	peanut and sunflower

Also crop rotation after the first years of land reclamation should be changed by introducing the processable vegetable crops which grow successfully in the area for the sake of high economic return.

Generally it is required by the land reform systems to establish experimental fields to test the suitability of the selected crops for the area, also to determine the required amounts of water for soil leaching or washing to get rid of salts and after all to introduce the alternations required in conformity with the nature of the soil and the results of the field experiments.

7. Water requirements:

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

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

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

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

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

The results of these equations vary.

All these equations consider the factors effecting consumptive use of water by plants, hence the results vary accordingly. For example Blaney-Criddle equation estimates the consumptive use of water by a crop in due to consideration of temperature, length of the day and states as follows:-

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

where

U = Estimated Consumptive use in millimeter/month

K = Factor

$$P = \frac{\text{Shining hours of the month}}{\text{total hours of the day in a year}}\ \%$$

t = Average monthly temperature in °C.

If all the above factors could be measured but the consumptive use is only estimated amount and differe from one crop to another according to the following factors:-

1. Seasons of crop cultivation.
2. Depth and the way of root spread.
3. The density of the vegetative cover and the shape of the leaves.
4. Distance between trees and shrubs as well as their hights.

All there factors change the factor (K) from one crop to another.

Also the estimated consumptive use for one crop differs within the season according to thickness of vegetative cover, depth of roots at the beginning and the end of the growth period.
This study provides examples. It gives in a table the average value of the consumption factor (K) in Bleny Credle's equation for some crops as follows:

Crop	Value
Cotton	0.60 - 0.70
Lucerne	0.80 - 0.90
Maize	0.85 - 0.95
Summer Vegatables	0.65 - 0.75
Rice	1.00 - 1.10
Sugar beet	0.65 - 0.75
Sugar Cane	0.80 - 0.90

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

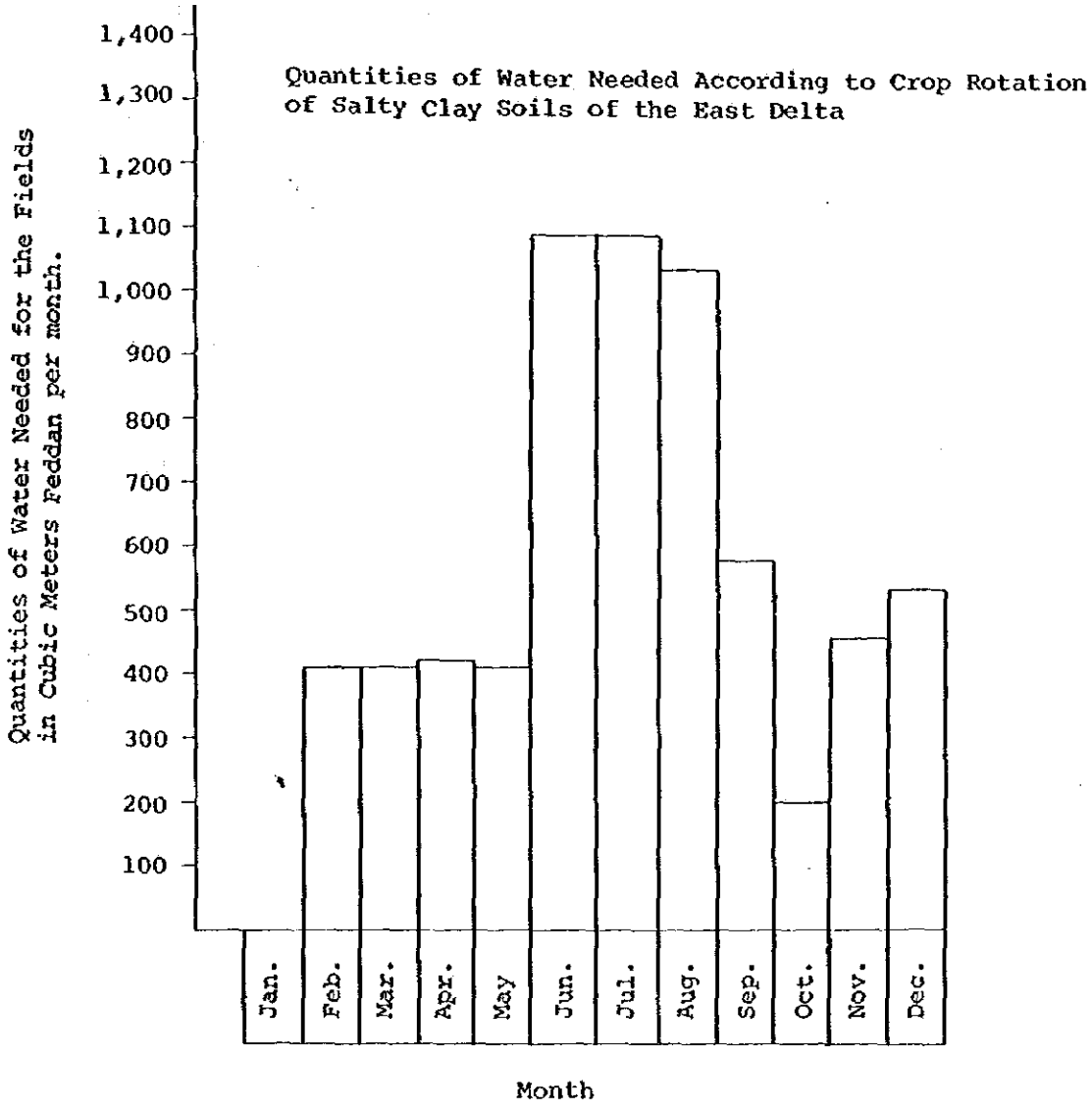
In accordance with the traditional and prevailing system of surface irrigation, the total water requirement in the field by Feddan, as for suggested rotation, is 7,000 cubic meter per year. The Ministry of

Irrigation, however, now pursues through the evaluation of irrigation in Egypt a policy of reducing the rationing of water to the various crops to meet the need of the plants and vegetation to achieve the most appropriate and economic use of the irrigation water according to the actual conditions of the soil, the quality of water and climate, with due regard to the introduction of modern and developed methods such as irrigation by sprinkling and by dropping which can be widely applied in the new expanded lands.

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

Water requirements of the main crops in the region east of the Delta and field requirements for water/cm/per Fed/month

Season	Percentage	Crops	Field requirements for water in cubic meter per feddan/month												Water requirements of crops throughout growth season in cubic meter/ Feddan
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
Winter	33	Wheat & Barley	-	350	365	330	-	-	-	-	-	-	160	400	1,605
	34	Alfalfa	-	-	-	-	-	-	-	-	-	325	690	690	1,705
	33	Lucerne	-	670	690	765	220	-	-	-	-	335	690	695	4,065
Summer	34	Cotton	-	350	325	305	420	420	655	750	375	-	-	-	3,180
	32	Rice	-	-	-	-	-	180	2,260	1,780	2,630	1,950	-	-	8,800
	33	Maize	-	-	-	-	-	545	750	935	470	-	-	-	2,700
Field Water requirements for crops for agricultural season in cubic meter/feddan, throughout the year in case of using traditional surface irrigation				-	455	460	470	455	1,220	1,169	650	215	515	600	7,420


Quantities of Water Needed According to Crop Rotation
of Salty Clay Soils of the East Delta
Quantities of Water Needed for the Fields
in Cubic Meters Feddan per month.
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sep.
Oct.
Nov.
Dec.
Month

8. Water resources:

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

(a) Water available from the "High Dam".

(b) Drain water, as it is or after mixing with channel's waters.

(c) Under ground water that can be safely drawn especially in the Sinai.

8-2 The use of drain water for irrigation need to be determined according to the conditions under which it is used. The elements that affect the suitability of the waters for irrigation are:

(a) Total concentration of salts

(b) Soluable salts (examples given)

(c) Harmful salts with excess concentration

(d) Availability of irrigation water, periods of irrigation n availability of other water resources with reduced salinity which assist washing.

(e) Physical and chemical characteristics of the soil.

(f) Adequacy of the drainage methods

(g) Agricultural services and the use of fertilizers.

(h) Climatic conditions.

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

8-3 BAHR HADOUS Drain:

During 1978 the studies showed:

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

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

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

The salinity increases from 1,385 parts to the million as a general rate per year to 2,704 in February.

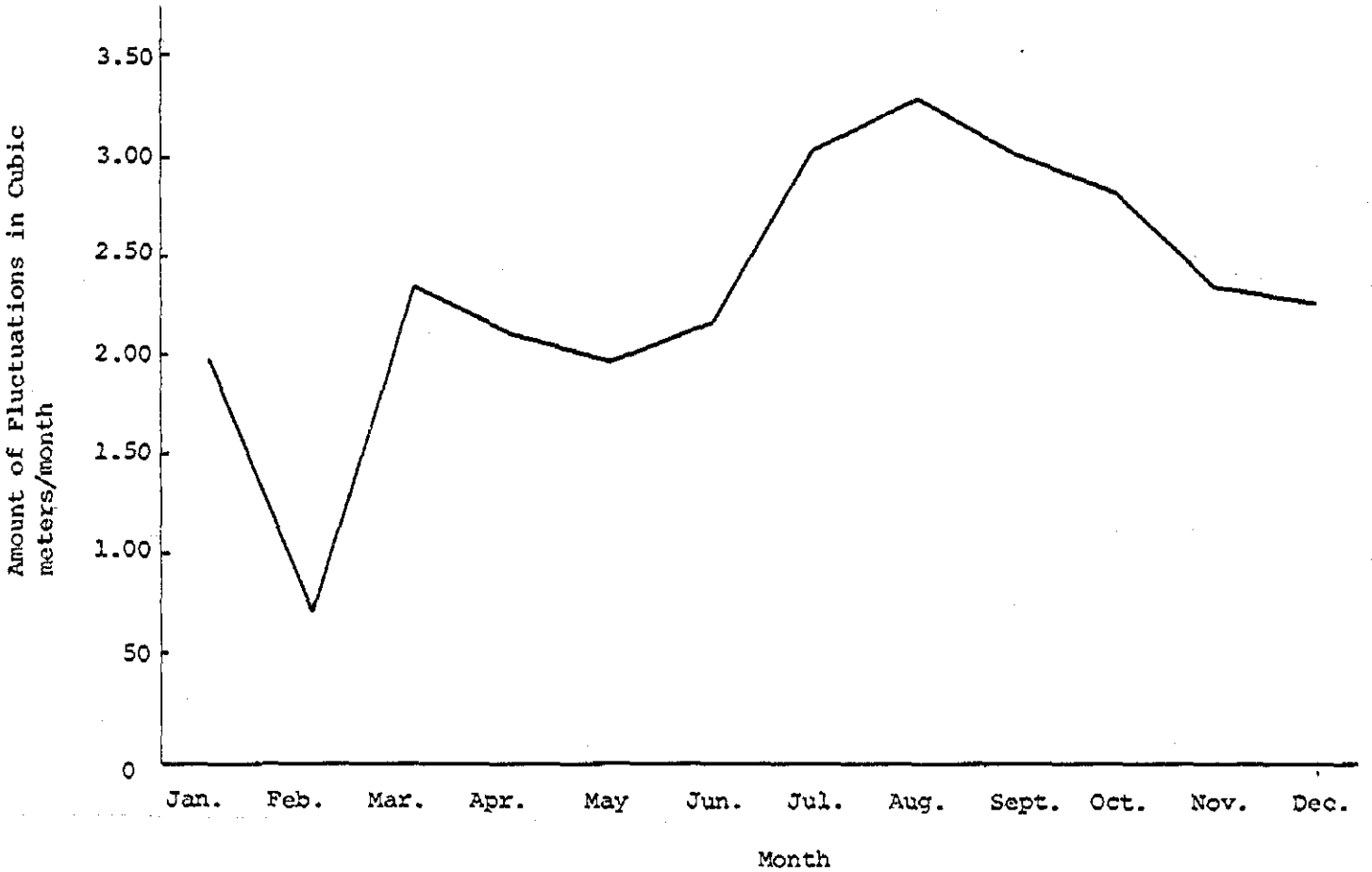
The proportion of sodium increases in February to 22.5.

1 table and 3 graphs showing changes in drain water outflows and characteristics of the waters of BAHAR HADOUS at the mouth of the river

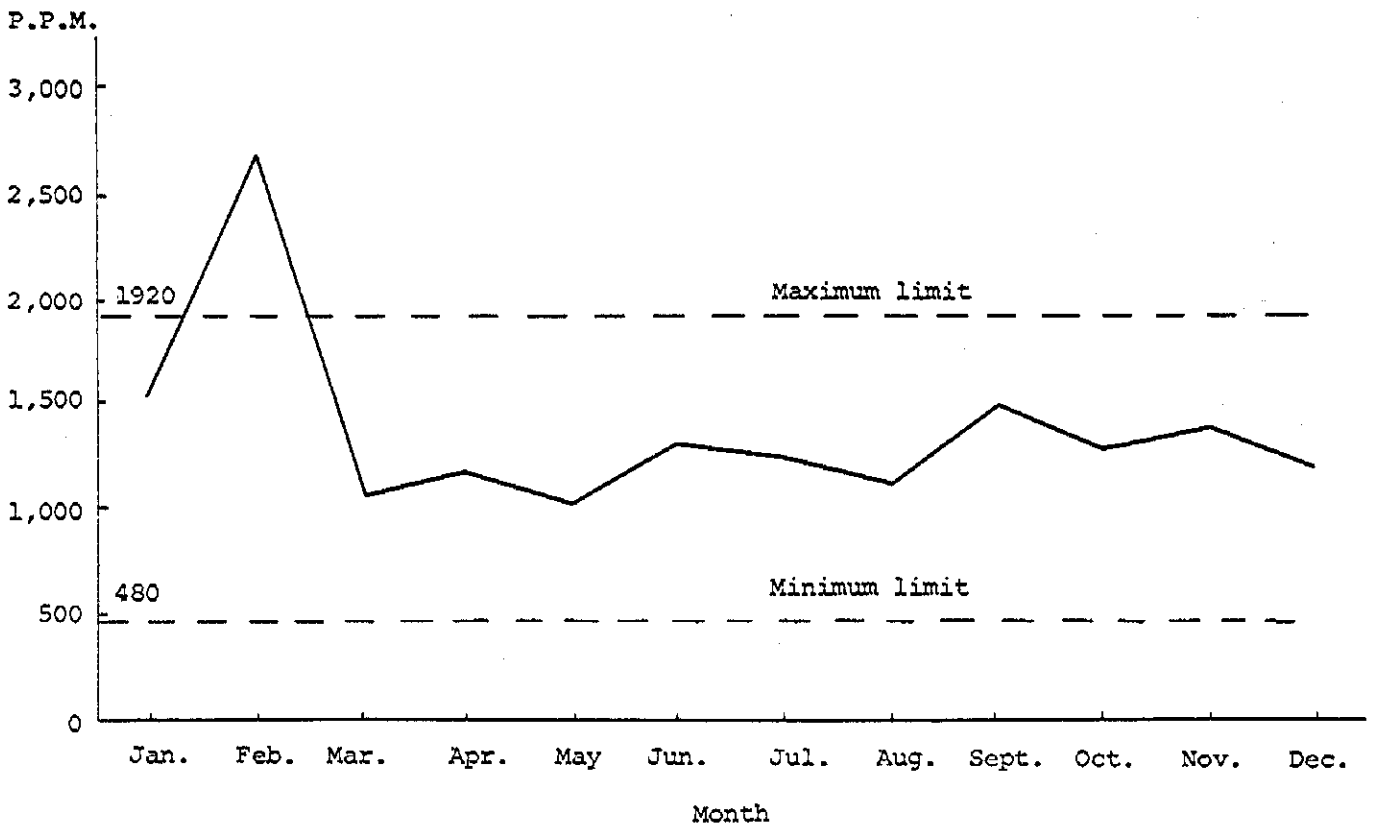
during 1978

Month	Drain per Million cubic meters per month	Rates of salinity part of a million	Ratio of Sodium
January	201	1,540	15.4
February	72	2,704	22.5
March	238	1,071	12.9
April	213	1,192	14.6
May	201	1,021	13.3
June	220	1,234	13.5
July	307	1,254	15.7
August	323	1,330	14.0
September	303	1,489	17.4
October	285	1,289	11.8
November	238	1,404	14.3
December	230	1,194	12.6
Total	2,841	16,622	
Average	237	1,385	

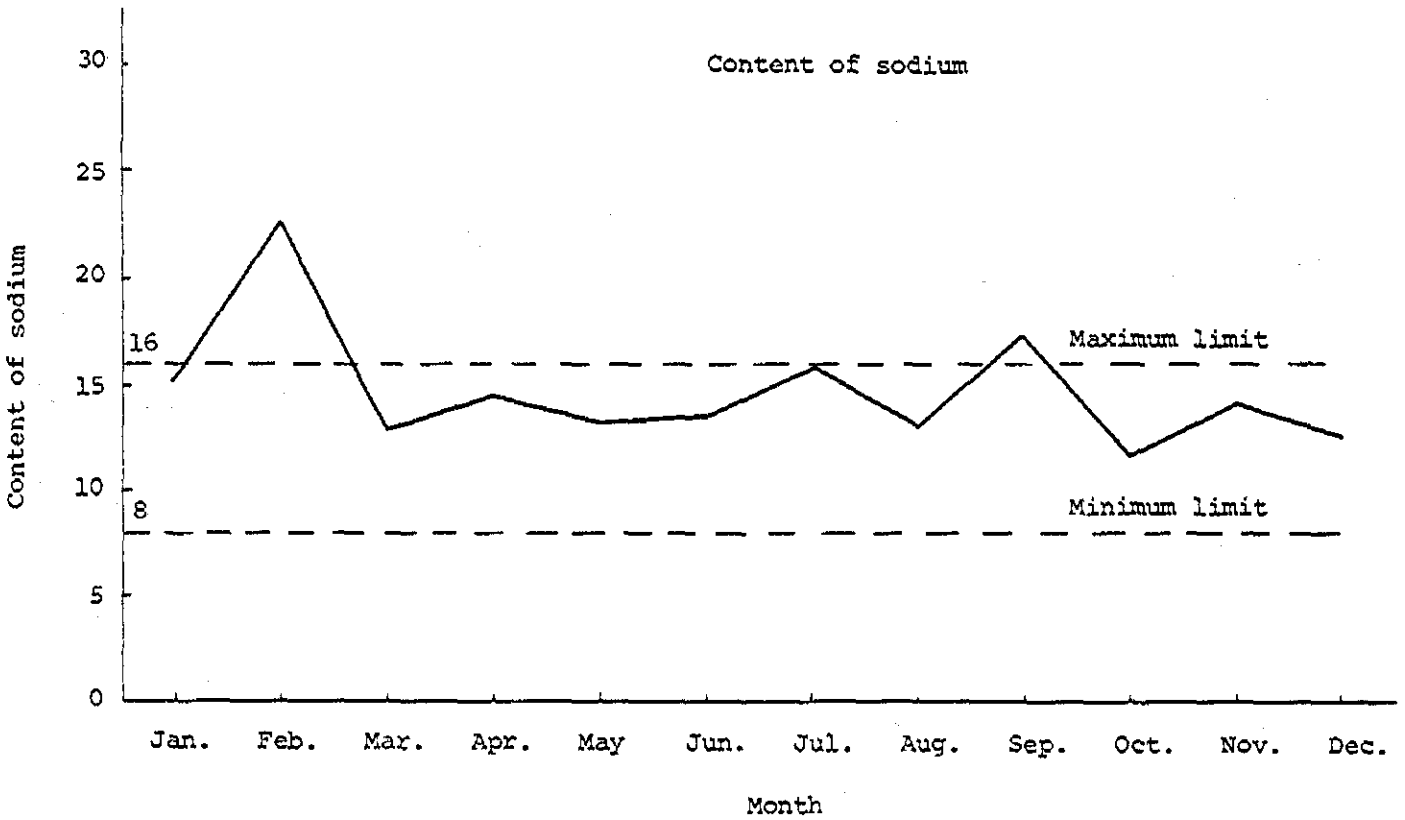
Functuations in drain water outflows of BAHAR HADOUS at the estuary



Characteristics of the waters of BAHAR HADOUS at the estuary salinity in part/million



Characteristics of the waters of BAHAR HADOUS
at the estuary



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

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

If we consider the proportion of mixed water to be considered as 1380 parts of a million from the Drain and 250 parts of a million from the waters of the Nile, then from the salt balance equation:-

Ratio of salinity in mixture = $1385\alpha + 250\ (1 - \alpha)$ suppose the percentage of mixture from Hadous Drain is 50% then the salinity ratio will be 817 part per million which necessitates deep drain, choice of crops that endure saline conditions, together with organic fertilizer application .

8-4 "EL SARU" Drain:

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

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

- The monthly amount of drain water is reduced from 44 million (yearly average) to 23 million cubic meters in February.
- Salinity increases from 926 parts per million to 1499 parts per million during March.
- The highest ratio of sodium occurs during March.

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

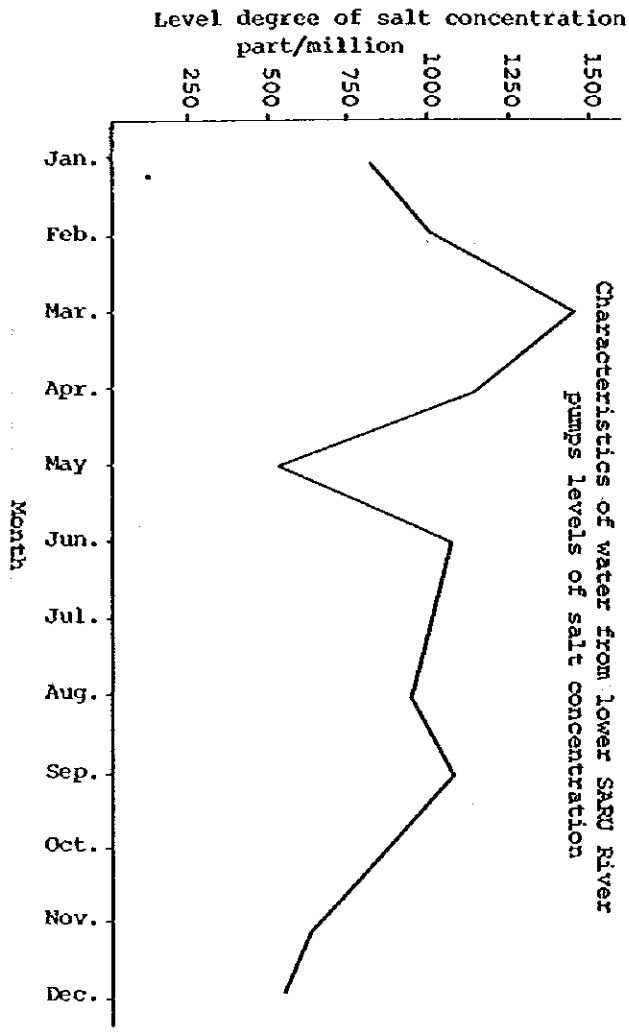
Ministry of Irrigation
Centre of hydrological Research
Institute of drainage research
Laboratory Section

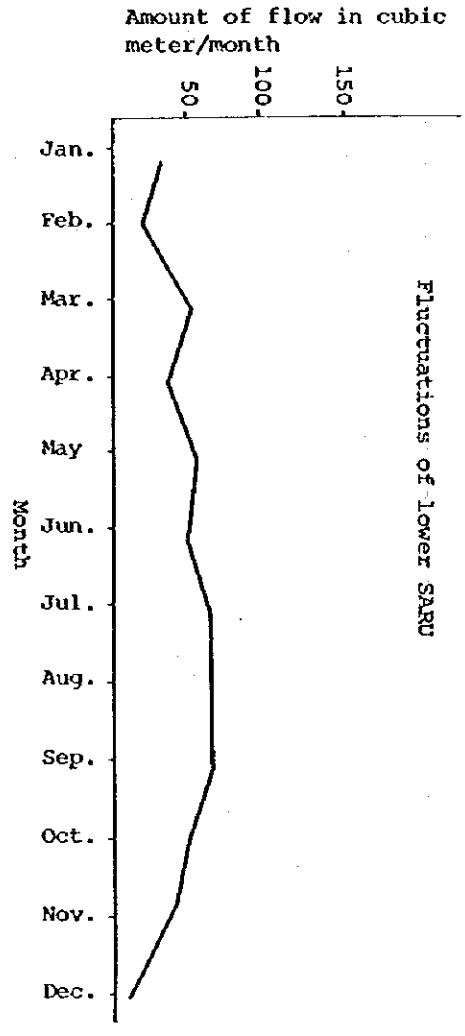
Chemical analysis for Lower SARU water

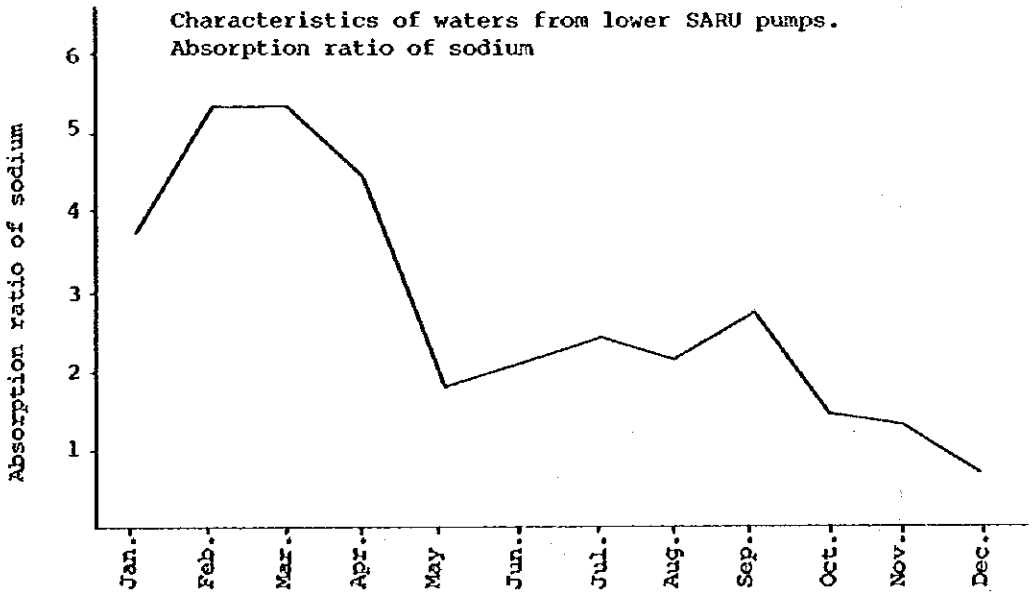
	Electric conductivity degree Ml/ Santemeter at 25°C	Degree of concentration of salt Part/Mil P.P.M.	Salts/Mm per Lt.								Sodium absorbtion SAR
			Cations				Anion				
			Sodium	Potassium	Mg.	Calsium	Cloride	Sulphur	Bicarbonates	Carbonates	
15/1/77	1.1	796.77			1.35	2.85	2.85	4.95	3.4		3.72
6/2/77	1.56	1,006.85	6		1.28	3.16	10.91	1.17	2.9		5.38
27/2/77	1.0	1,270.8	.9		6.8	4.3	6.3	13.45	.25		5.36
3/3/77	2.27	1,449.35	1.2		5.8	4.2	6.85	11.45	3.75		5.36
15/3/77	1.0	640.0	.8		4.4	3.7	4.6	2.0	3.3		.9
3/4/77	1.7	1,151.5	.9		3.7	4.3	8.8	5.7	3.4		4.45
15/5/77	.78	501.7	1.8		2.2	2.3	2.4	1.4	3.5		2.8
19/9/77	1.8	1,186.1	1.8		8.5	3.4	7.4	7.1	4.2		2.8
3/10/77	1.35	858.55	3.3		.3	2.9	5.4	3.75	4.35		1.5
20/10/77	1.0	636.6	2.5		1.8	3.1	1.1	1.8	5.4		1.4

Changes of water characteristics at the mouth
of "The Lower SARU"
throughout 1977

Month	Salinity Million C M per month	Salts ratio part/per Mil.	Sodium Ratio
January	36.00	796	3.72
February	23.00	1,006	5.38
March	45.00	1,449	5.36
April	39.00	1,151	4.45
May	59.00	503	1.9
June	49.00	1,065	2.17
July	55.00	1,001	2.52
August	58.00	920	2.25
September	67.00	1,189	2.8
October	50.00	858	1.5
November	39.00	636	1.4
December	14.00	540	1.23
Total :	534	11,114	
Average:	44	926	


Level degree of salt concentration
part/million
250
500
750
1000
1250
1500
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sep.
Oct.
Nov.
Dec.
Month
Characteristics of water from lower SARU River
pumps levels of salt concentration


Amount of flow in cubic
meter/month
50
100
150
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sep.
Oct.
Nov.
Dec.
Month
Fluctuations of lower SARU


Characteristics of waters from lower SARU pumps.
Absorption ratio of sodium
Absorption ratio of sodium
6
5
4
3
2
1
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sep.
Oct.
Nov.
Dec.

From the tables a figures it can be said that the drain waters of the lower SARU, at the month, is considered suitable for irrigation during most of the year.

The Research Institute advises that irrigation waters should be mixed at the ratio of 1 to 1 with fresh water, with due consideration to deep drainage, choice of saline enduring crops and organic fertilizer. Abscration ratio of sodium - as shown-ranges between 1,23 ∿ 0,38, the range that does not create permeability problems.

8-5 Ratio of the mixture:

To determine the mixture ratio between Nile waters and drain water the following basic facts were taken into account:-

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

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

(c) The waters of the "Lower SARU" were used to the maximum extent as they were less saline relatively, than that of HADOUS DRAIN". The water from EL SARU will be drawn from 0.5 million cubic meters per day at the beginning to reach 2 million m^3 per day, as appropriate, at the mouth in lake Manzala.

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

Table showing calculation of the amounts of water to be drawn (a) from the Nile (b) from "the lower SARU" and (c) HADOUS Drain to irrigate the limit of "the Peace Channel" considering that salinity does not exceed 800 parts in a million

Month	Water requirements		Total Sanity	The NILE			EL SARU			HADOUS			MIXED WATER		
	Monthly	Daily		Total	Salt ratio	Total salt	Total	Salt ratio	Total salt	Total	Salt ratio	Total salt	Total	Salt ratio	Total salt
Jan.	240	8	6,400	4	250	1,000	1	800	800	3	1,540	4,620	8	6,420	802
Feb.	300	11	8,800	8.5	250	2,125	.5	1,000	500	2	2,704	5,408	11	8.033	730
Mar.	305	10	8,000	4	250	1,000	1	1,449	1,449	5	1,071	5,355	10	7,804	780
Apr.	310	10	8,000	5	250	1,250	1	1,151	1,151	4	1,200	4,800	10	7,201	720
May	305	10	8,000	2.5	250	625	1.5	503	754	6	1,021	6,126	10	7,254	725
Jun.	570	19	1,520	9.5	250	2,375	1.5	1,065	1,598	8.-	1,330	10,640	19	14,613	769
Jul.	570	19	15,200	9.5	250	2,375	1.5	1,000	1,500	8.-	1,255	10,040	19	13,915	732
Aug.	540	18	14,400	8.5	250	2,125	1.5	920	1,380	8.-	1,130	9.040	18	12,545	697
Sep.	520	14	11,200	7.50	250	1,875	2.-	1,190	2,380	4.50	1,490	6,750	14	10,955	782
Oct.	160	5	4,000	1.5	250	375	1.-	860	860	2.-	1,290	2,580	5.5	3,715	743
Nov.	340	11	8,800	5	250	1,250	1	635	635	5	1,400	7,000	11	8,885	807
Dec.	390	13	10,400	5	250	1,250	.5	540	270	7.5	1,190	8,925	13	10,715	824

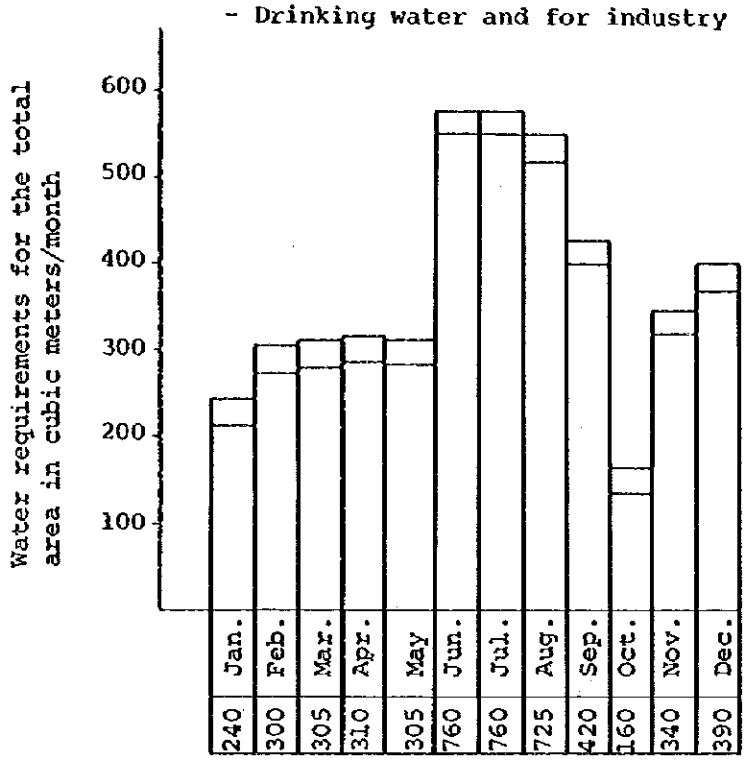
Table showing monthly outflow
required from feeding source

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

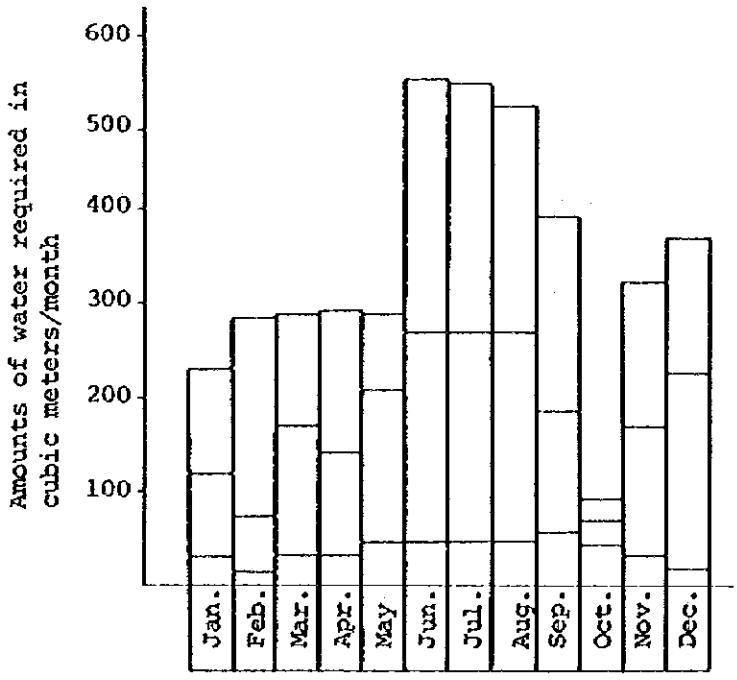
Outflow in millions of m3 per month
Ratio of mixture 1/1 : 1

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

A graph showing the total water
requirements throught the year.
- Drinking water and for industry



A graph showing the water requirements
from the feeding source throught the year
"The lower SARW"
"BAHR HADOUS DRAIN"
"THE NILE"



A graph showing the
drain water required
"Million m3/per month"

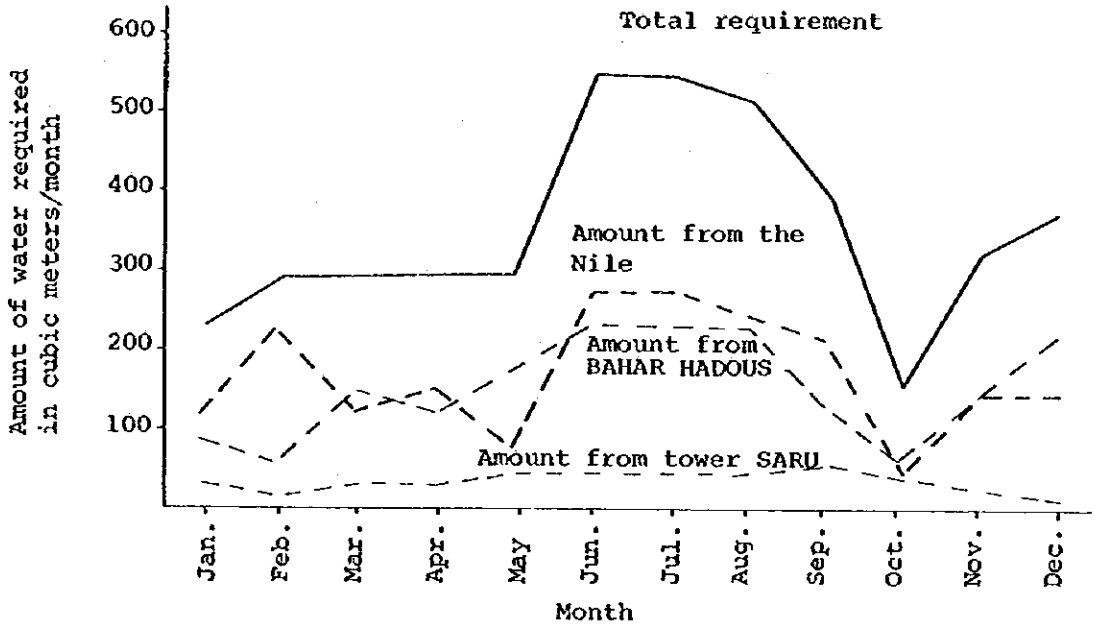


Table showing the degree of resistance various crops to salinity at 25 degree centigrade

Source: Report of the Land Reclamation Bureau at Denver, U.S.A.

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

8-6 Natural water resources in Sinai Penensula:-

Irrigation water in Sinai has two sources:
Rami water and tonents. Ramis are cnetered in the northern coast and ususally bessen in the south and East so that the annual rate are suits to 50 millimeters, on the coast in the north the rates reach 100 mm West of Areish increase gradually as we proceed east to 200 mm at RAFH, resulting in toments sloping to the Gulfs of AKABA and SUEZ feading the sand dunes and penetiating the underground water reservoir. The Sinai Peninsula can be devided into four hydrological regions:

- The North western region

- Wadi El Areish basin

- The torrential pooling region in the Gulf of Suez.

- The pooling region in the Gulf of Akaba.

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

The North Western Region:-

This region extends parallel to the mediterraneun coast with a width of 5 kilometers. The width increase gradually towards "Suez Canal" till it reaches 130 kilometers. Also a part of this region extends as a strip parallel to "The Suez Canal" till the village of "Shut" east of "Suez" City. The southern part of this area is limited by "Halal", "Magara" and "Lubna" mountains. The eastern part of the region is limited by "Arish" valley.

This region is effered the first scheme of land reclamation which amounted 20 thousands feddane as Phase one. It will be extended to reach 30 thousand feddans in total. Water to this region will be brought from the Nile via "Sahara" kilometers 92,800" on the Suez Canal. This scheme is out of the region which will be irrigated from peace channel.

Basin of Arish Valley

The area of the basin of "Arish" valley will be around 20 thousands square kilometers which is almost equal to 1/3 of "Sinai" penensula. It will consequently be a heart of "Sinai". A reconaisance survey for water resources to a part of this basin was done which included the coastal area from "Arish" village to "Rabaa" village, regions of "HOSAINIA" and "Buruk". The surveyed area was 8,600 kilometers square.

Studies of underground waters showed that the quantities of yearly supplied waters to the upper layers of the underground basins of "Arish" valley amount to 103 million cubic meters. As for the layers away from the the ground surface which are the layers of the "Hubian" sandstones of 700 900 meters in depth, no studies have been yet done so far.

8-7 The sources of the transported waters:

The Sinal Peninsula is organically linked with the expansion west of

the "Canal" local sources in sinai are not sufficient to expand cultivation.

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

9. Hydraulic Design of "The Peace Channel" sector:-

9-1 Channel water take-in is from the Nile, branch of DAMIETTA - at kilometers 204 right bank is front of "Faskour", viaducts it is decided to be constructed at that site.

9-2 It was decided that the levels of construction water at the main channel sectors not to be less than + (0.50) and on secondary channels not less than +(0.50). This is to evade the water not to be affected by salinity of the region. That implied construction of two water lifting stations on the peace channel, one at kilometers 17,500 and the other at kilometers 48,500 along the channel.

9-3 The derection of the peace channel in most cases neighbours direction of some natural flow tracks, so to make use of the present bridges for paved roads it was decided to cover the line of filtration between the channel and the neighbowing natural flow tracks.

9-4 For the irrigated water of the irrigable area from the channel it was decided to be 30 cubic meters/feddan/day.

9-5 Nile level - DAMETTA branch - at kilometers 204 considered to be +(1.70).

9-6 Water slope in the channel behind the month viaduct to the lifting station at kilometers 17,500 is 6 cm/kilometer with due consideration of constructing bridges to cover the line of filtration 15:1. This hydraulogical slope was chosen for the reason of exploiting the discharge of lower SARU pumps drain to flow into the channel by gravity flow at kilometers 13,500 at a level of +(.69) and also to add 2 millions cubic meter/day of the waters from the drains.

9-7 Level of absorption in front of the first lifting station is +(0.50) a the level behind the station discharge +(2.25) and the hydraulogical slope of waters between the first lifting station at kilometers 17,500 and the and lifting station at kilometers 48,500 is 5 cm/kilometer and consequently the level of absorption infront of the second lifting station +(0.57).

9-8 It was decided to establish a station for mixing of waters from "BAHAR HADOUS" and the peace channel at kilometer 47,750 along the channel, so as the discharge from the mixing station and the discharge from the second lifting station will join at the peace channel at kilometers 48,500 at water level of +(3.00).

9-9 The flow of the peace channel behind the mixing & second lifting station will continue at slope of 4 cm/kilometer till the end of the flow at kilometers 82,00 at the junction with the Suez Canal where the suggested tunnel is positioned. The level of water at the end of channel will be +(1.50).

9-10 It was considered for the design of the canal cross section in a way to alleviate soil friction rate, corosion and deposit factors. The side slopes were chosen for the secter to be 2:1 and the roughness ratio 1/n = 45.

9-11 The idea of lining the canal was disregarded - particularly for phase 1 because it was assured from the clayey conditions of the soil that it reduces if not impeding water filtration from the channel and according to observations of operation and following up of the channel sector after stage one the lining of the channel can be considered if to be made or disregarded totally and choice of the suitable solution for that.

9-12 Following are some specifications for the cross-sectional design for the channel at different places.

Weir	Distance between (Km) From	To	Width of Bed (Meters)	Depth of Water (Meters)	Water Sloping (Cm/Km)	Observations
First	Source	13,500	32	3,60	6	
Second	13,500	17,500	36	4,05	6	Mixture from pumping of the "Lower SARU"
Third	17,500	48,500	44	3,75	5	
	48,500	49,000	60	4,50	3,5	
	49,000	53,750	56	4,45	3,5	
	53,750	63,125	54	4,35	3,5	
	63,125	67,415	52	4,00	3,5	
	67,415	72,325	50	3,90	3,5	
	72,325	77,000	48	3,70	3,5	
	77,000	81,725	46	3,50	3,5	

A table showing specifications of the latitudinal sector of "The Channel" design at it's various Weirs.

A graph of longitudinal sector
of "The Peace Channel"
spread over five papers in the "Study"

A statement of Industrial Works
undertaken is spread
over three papers

Hydraulic data of the major
Industrial works and the
lifting of water stations

PEACE CHANNEL

Longitudinal Sector

Scale:-

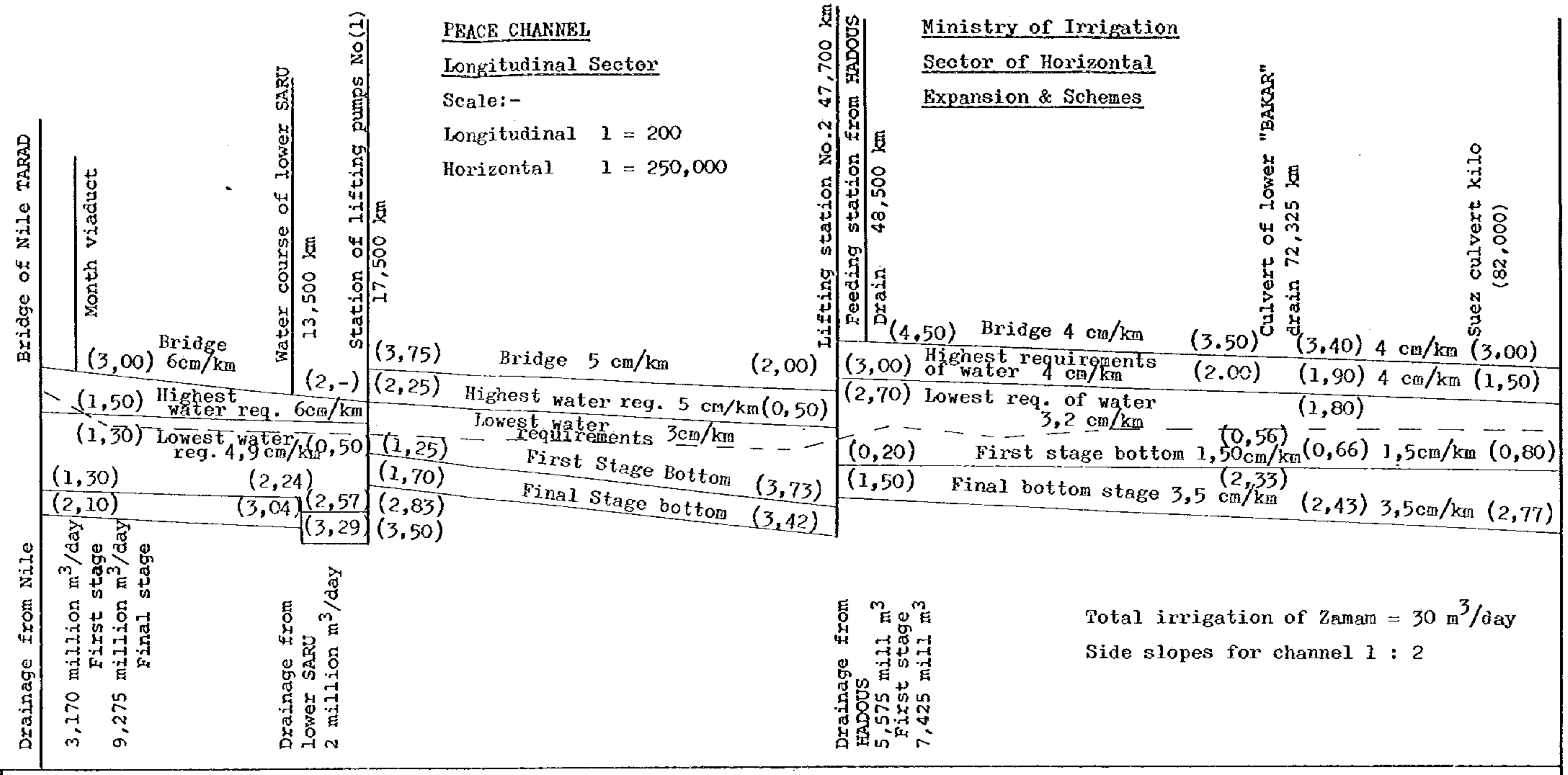
Longitudinal 1 = 200

Horizontal 1 = 250,000

Ministry of Irrigation

Sector of Horizontal

Expansion & Schemes



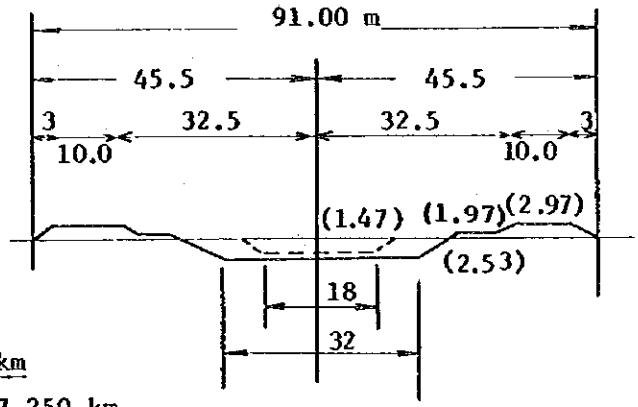
Total irrigation of Zamam = 30 m^3/day

Side slopes for channel 1 : 2

Distances in km	0	0	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	
Levels for agriculture	2.03	0.89	0.07	0	0.35	0.46	0.50	0.40	0.20	0.40	0.50	0.10	0.70	0.70	0.70	0.30	0.40	
Levels at bridges & their width	3.00	Width 12,00m slope 6 cm/km			2.00 3.70	Slope 5 cm/km		m 2.00		2.00 4.50						3.50 3.40		3.00
Water levels	1.65 1.50			0.69	0.50 2.35					0.50 3.00						2.00 1.90		1.50
Phase (1) 195,000 — Agricultural land in thousand feds.	195										185 120.5	150.5 132.5	132.5 121	121 94.5	94.5 75.5	75.5 50	50 25	2,5
Phase (1) 195,000 — Levels, width & slope of bottom	1.30	6 cm/km	18,00m	2.24 2.57	2.83 0.25	Slope 5 cm/km		m 25,00		2.73 0.40	34					0.56 0.66	15,00 10,00	0.80
Phase (2) 595,000 — "Zamam" in thousand feds.											585 550.5	550.5 532.5	532.5 521	521 494.5	494.5 475.5	475.5 450	450 425	4.25
Phase (2) 595,000 — Levels of the base & its width and slope	2.30	6 cm/km	32,00m	3.04 3.29	3.55 1.70	Slope 5 cm/km		44.00m		3.23m 1.50	60 56.00	3.5 cm/km	54,00m	52.00	50.00	2.33 2.43 48.00	46.00	2.77
Width of		93.00	113.00	96.00	100.00			119m		154	170 166.00		145.00	133.00		121.00		

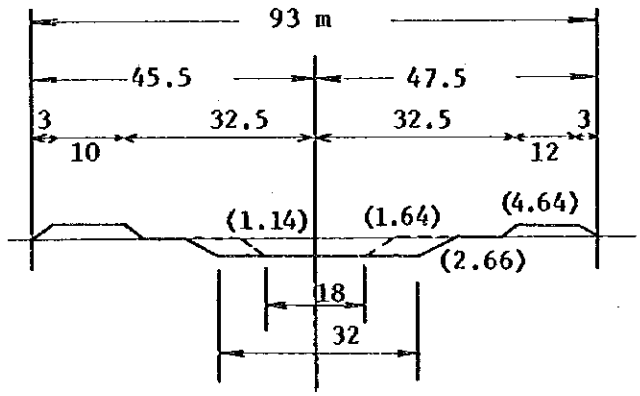
1 - Sector 0.500 km

From Source ∿ 2,250 km



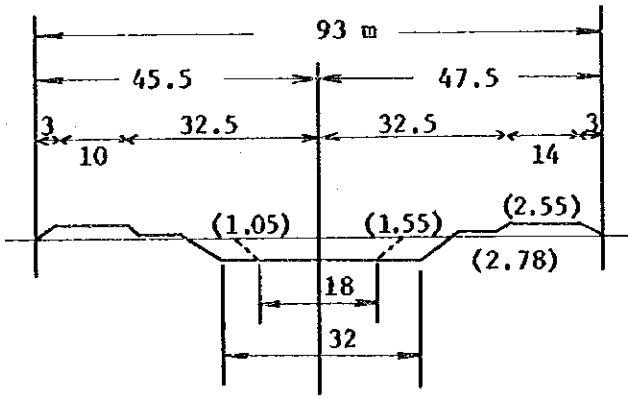
2 - Sector 6,000 km

From 2,250 ∿ 7,250 km



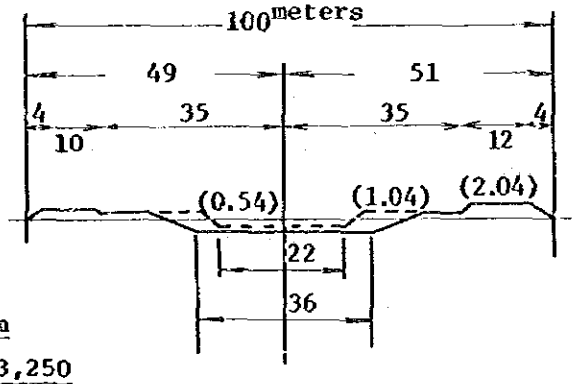
3 - Sector 8,000 km

From 7,250 ∿ 9,000 km



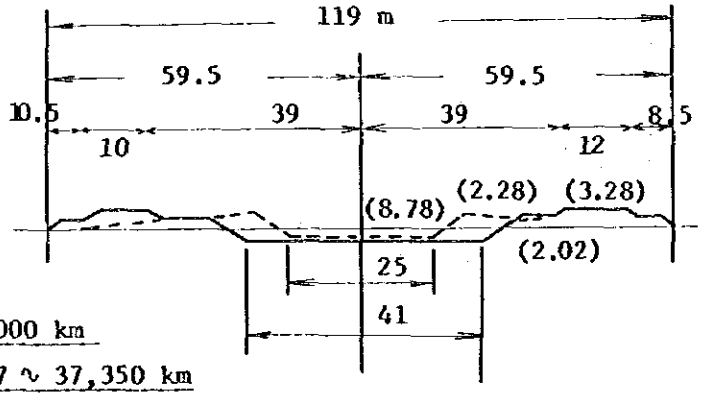
4 - Sector 16,000 km

From 15,500 ∿ 17,500.km



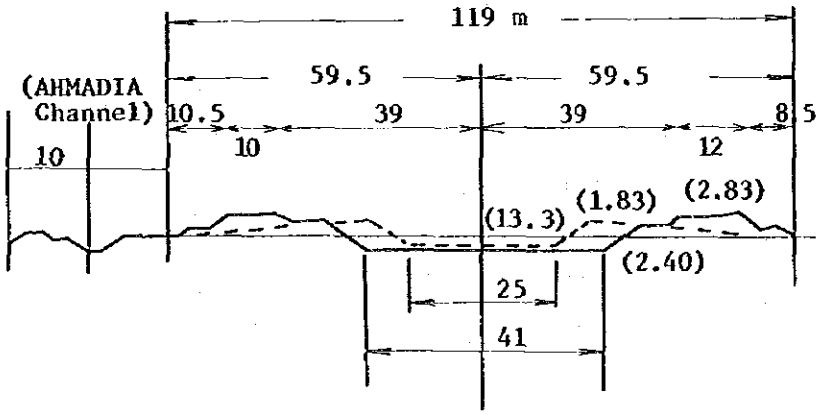
5 - Sector 24,000 km

From 17,500 ∿ 33,250



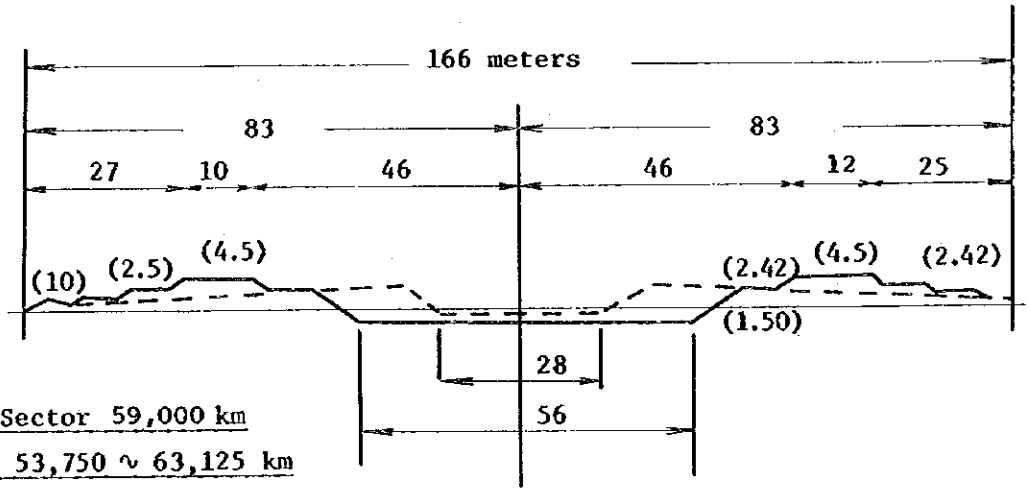
6 - Sector 35,000 km

From 33,257 ∿ 37,350 km



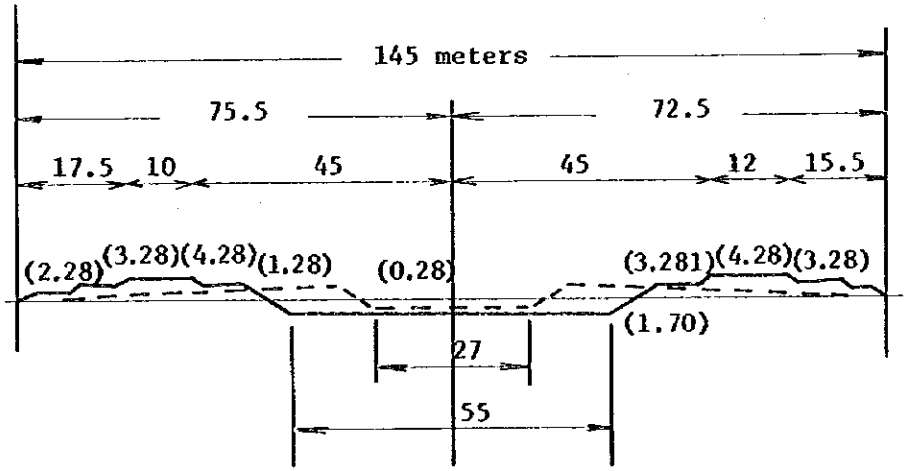
7 - Sector 52,500 km

From 49,000 ∿ 53,750 km



8 - Sector 59,000 km

From 53,750 ∿ 63,125 km



1-10 INDUSTRIAL WORKS

No.	Kind of Work	Site in Km	Peace Channel			Industrial Works Monitors						Observations
			Level of flood water	Bottom		Road		Pavements		Basic level	Net in Meter	
				Level	Width in meters	Level	Width in meters	Level	Width in meters			
1.	Wile "TARAD" Bridge		(1.65) / (1.60)	(2.20)	32	(3.10)	12	(3.25)	1.50	-	.85	Bridge on "Post"
2.	Delta Railway Bridge	1,050	(1.54)	(2.26)	32	-	-	-	-	-	.85	Relevent to Railway water level
3.	Culvert of "SHRGAWIA" Channel	1.070	(1.54)	(2.26)	32	(3.04)	12	-	-	(2.76)	-	Level of at the top of culvert
4.	Month barrage at MASURA DAMIETTA	1,100	(1.53) / (1.50)	(2.30)	32	(3.00)	12	(3.15)	2.00	(2.80)		
5.	Concrete bridge	5,350	(1.23)	(2.55)	32	(2.73)	12	(2.88)	1.5	-	.85	Bridge on posts
6.	Culvert of "Gunaimia" drain	7,200	(1.13)	(2.67)	32	(2.63)	12	-	-	(3.17)	-	Level at top of culvert
7.	Concrete bridge	8,00	(1.09)	(2.71)	32	(2.59)	12	(2.74)	1.50	-	.85	Bridge on Posts
8.	Culvert of WARAM channel	8,00	(1.09)	(2.71)	32	(2.59)	12	-	-	(3.21)	-	Level at top of culvert
9.	Culvert of "GASH Drain"	9,100	(1.02)	(2.78)	32	(2.52)	12	-	-	(3.28)	-	Level at top of culvert
10.	Culvert of HAJAHA Channel	9,200	(1.01)	(2.79)	32	(2.51)	12	-	-	(3.29)	-	Level at top of culvert
11.	Concrete bridge	13,350	(.77)	(3.03)	32	(2.27)	12	(2.42)	1.50	-	.85	Bridge on posts

No.	Kind of Work	Site in Km	Peace Channel			Industrial Works Monitors						Observations
			Level of flood water	Bottom		Road		Pavements		Basic level	Net in Meter	
				Level	Width in meters	Level	Width in meters	Level	Width in meters			
12.	Feeder of lower SARU channel & Culvert below the channel	13,500	(0.76)	(3.04) / (3.29)	32 / 36	(2.26)	12	-	-	(3.79)	-	Level at top of culvert
13.	Lift pump station No. 1	17,500	(0.50) / 2.25	(3.95) / (1.70)	36 / 44	2. / (3.75)	12	-	-	-	-	
14.	Bridge of Pump (1)	17,550	(2.23)	(1.72)	44	(4.58)	12	(4.73)	1.50	-	.85	Bridge on posts
15.	Concrete bridge	22,150	(2.02)	(1.93)	44	(4.37)	12	(4.52)	1.50	-	0.85	Bridge on posts
16.	From first water channel source right shore	30,000	(1.62)	(2.33)	44	(4.97)	12	(4.52)	1.50	-	.85	Bridge on posts
17.	TAWIL culvert drain under peace channel	34,850	(1.38)	(2.57)	44	(2.88)	12	-	-	(3.07)	-	Water level on top of culvert
18.	From 2nd water channel source left shore	35,250	(1.38)	(2.57)	44	(2.88)	12	-	-	-	-	
19.	Concrete bridge on MATARIA GAMALIA road	40,150	(1.12)	(2.83)	44	(3.47)	12	(3.62)	1.50	-	0.85	Bridge on posts
20.	Bridge of MATARIA-GAMALIA Railway	40,180	(1.11)	(2.84)	44	(3.46)	4	(3.61)	0.50	-	0.85	Bridge on posts

No.	Kind of Work	Site in Km	Peace Channel			Industrial Works Monitors						Observations
			Level of flood water	Bottom		Road		Pavements		Basic level	Net in Meter	
				Level	Width in meters	Level	Width in meters	Level	Width in meters			
21.	Bar Saed - MANZALA railway	40,950	(1.18)	(2.87)	44							
22.	Culvert of TAMIL drain under peace channel	41,250	(1.06)	(2.89)	44	(2.56)	12	-	-	(3.39)		Water level on top of culvert
23.	Culvert of peace channel under GADOMS drain	47,125	(.70) / (.57)	(3.10) / (3.23)	44	(2.20) / (2.07)	12	-	-	-	-	
24.	Lifting station(1)	47,000	(0.50) / (3.03)	(3.30) / (1.47)	44	(2.00) / (4.53)	12	-	-	-	-	
25.	Lifting station(2)	47,750	(3.03)	(1.47)	44	(4.53)	12	(4.68)	1.5	-	0.85	Bridge on posts
26.	Channel feeder from drain water of GADOUS via mixture station	48,500	(3.0)	(1.50)	35/60	(4.50)	12	-	-	-	-	
27.	Water course from "RAMSIS" channel - right - left	49,000	(2.98)	(1.52)	60/56	(4.48)	12	-	-	-	-	
28.	Water course from "ELMUHSIN" Island Channel	53,750	(2.79)	(1.68)	56/54	(4.29)	12	-	-	-	-	
29.	Concrete bridge	53,780	(2.79)	(1.68)	54	(4.29)	12	(4.44)	1.50	-	0.85	Bridge on posts

No.	Kind of Work	Site in Km	Peace Channel			Industrial Works Monitors						Observations
			Level of flood water	Bottom		Road		Pavements		Basic level	Net in Meter	
				Level	Width in meters	Level	Width in meters	Level	Width in meters			
30.	Water course from shargid shore channel	58,625	(2.57)	(1.85)	54	(4.07)	12	-	-	-	-	
31.	Water course from um BATIKH channel	63,125	(2.42)	(2.01)	54/52	(3.92)	12	-	-	-	-	
32.	Watercourse "RAS HYIA" Island channel	63,125	(2.42)	(2.01)	52	(3.92)	12	-	-	-	-	
33.	Concrete bridge	63,150	(2.41)	(2.02)	52	(3.91)	12	(4.06)	1.50	-	.85	Bridge on posts
34.	Watercourse "BAHAQ ZAZA" channel	67,415	(2.34)	(2.16)	52/50	(3.84)	12	-	-	-	-	
35.	Watercourse "ELGUZ LAN" Island chennel	72,125	(2.06)	(2,33)	50/48	(3.56)	12	-	-	-	-	
36.	Concrete bridge	72,150	(2.06)	(2.33)	48	(3.56)	12	(3.71)	1.50	-	.85	Bridge on posts
37.	Channel watercourse	77,000	(1.71)	(2.62)	48/46	(3.21)	12	-	-	-	-	
38.	Concrete bridge	77,050	(1.70)	(2.62)	46	(3.20)	12	(3.35)	1.50	-	.85	Bridge on posts
39.	Channel water-course	81,725	(1.50)	(2.77)	46	(3.00)	12	-	-	-	-	

10-2 Hydraulical Manifest for the major Industrial Works:-

Month barrage:-

* Kilometric Position 1,100
* Maximum limit for the front level 1,53
* Maximum limit for the rear level 1,50
* Lowest level for the rear 1,30
* Maximum balance difference 4,00
* Number of openers 5
* Capacity of the opener 5,00 meters
* Maximum charge permissable through the barrage/day 12 million m^3

Liftins Stations:-

No.	Station	Site	Charge		Absorbed levels		Charged levels		No. of unit	
			Milliard/ day	m^3/	Maxi-mum	Mini-mum	Maxi-mum	Mani mum	Basal	Re-served
1.	Station number 1	17,500	11	127	-	.50	2.25	1.80	4	1
2.	Station number 2	48,500	11	127	-	,50	3,00	2,70	4	1
3.	Mixture Station	48,500	8	93	-	,68	3,00	2,70	3	1

11. Estimated costs

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

Cultivation L.E 1,500,000

11-2 Industrial works Sum of Money in thousands pounds

Serial No.	Kind of Work	Unit	Q'ty	Unit Cost	Value
1.	Viaduct at source under asphalt road.	in numbers	1	3,000	3,000
2.	Concrete bridges 70 tons load	in numbers	2	200	2,400
3.	Bridge over "Bahr Elbakar" drain	in numbers	1	2,300	2,300
4.	Bridges for Delta Railways	in numbers	2	150	300
5.	Bridge for port-said ELMAN SURA Railways	in numbers	1	2,000	2,000
6.	Source of lower El "SARU" pumps and its Culvert and Drain	in numbers	1	1,500	1,500
7.	Culvert of channel under "Bahr Hadous Drain".	in numbers	1	2,000	2,000
8.	Culverts for secondary Channels	in numbers	3	200	600
9.	Culverts for secondary Drain	in numbers	4	100	400
10.	Sources for secondary Drains	in numbers	12	75	900
11.	Coverings	m^3	2,000	1,030	600
Total Estimated costs of industrial work					1,600

11-3 Soil works

Serial No.	Kind of Work	Unit	Q'ty	Unit Cost	Value
1.	Digging and scraping the course to km 82	m^3	8,000,000	0.002	16,000
2.	Soil works & transport	m^3	1,500,000	0.005	7,500
Total Estimated costs of soil works					23,500

11-4 Lifting & mixing stations

Table 11-4 Lifting and Mixing Stations

in thousand pounds

Item	Station (1)		Station (2)		Mixing Station		Total	
	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local
The mechanical and electrical tasks matters	6,500	-	6,500	-	4,500	-	17,500	-
Matters of the converting station	500	-	500	-	500	-	1,500	-
Electric line	-	600	-	600	-	600	-	1,800
Observation for establishment construction	200	50	200	50	200	50	600	150
Custom duties	-	2,100	-	2,100	-	1,500	-	5,700
Release, transportation, storage, establishment and steel works	-	250	-	250	-	220	-	120
Buildings of pumps and converting stations	500	3,000	500	3,000	200	2,500	1,200	7,500
Living community	-	500	-	700	-	-	-	1,200
Reserve	-	800	-	600	-	730	-	2,130
Total of the items costs	7,700	7,300	7,700	7,300	5,400	5,600	20,800	20,200
Gross totaloof estimated costs	15,000		15,000		11,000		41,000	

11-5 Culvert for the Channel under the Suez Canal

Estimated cost 38,000,000

Total Estimated costs of the project Sum of money in thousand Pounds estimated cost

Kind of Work	Estimated Cost
1. Expropriation & Compensations	1,500
2. Industrial work on the course of the water	16,000
3. Soil Work on the water course	23,500
4. Lifting & pumping stations	41,000
5. Culvert for "The Channel" under Suez Canal	38,000
Total Estimated costs of the Project	120,000

12. Monetary flow for the Project

In millions of E. Pounds

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

The distribution of the needed allocations over the years of the execution of the project was established in accordance with the timetable.

First stage: Consists of the following works

No.	Kinds of works	Kilo-metric site	Execution					
			Time		To		From	
			Year	Month	Year	Month	Year	Month
1.	Channel feader from lower SARU	13.500	2	-	2nd	3	1st	4
2.	Concrete bridges							
	1. Bridge of discharge stage No. 1	17,500						
	2. Bridge of kilo 22,150	22,150						
	3. Bridge of MATARIA-JAMALIA Road	40,150	1	6	2nd	12	1st	5
	4. Bridge of discharge station number 2	47,750						
	5. Concrete bridge	53,780						
	6. Concrete bridge	63,150						
3.	Bridge of railway of delta, material Jamalia	40,180	1	-	3rd		2nd	1
4.	Drainage culverts coastal							
	1. Coastal drain of TAWIL	34,850	1	-	3rd	6	2nd	5
	2. Southern drain of TAWIL	41,250						
5.	Months of secondary channels							
	1. Outflow from suction pit-right bank	30,000						
	2. Outflow from suction pit-left bank	35,250						
	3. Outflow from RAMSIS channel right bank	49,000						
	4. Outflow from RAMSIS channel left bank	49,000	1	-	3rd	4	2nd	10
	5. Outflow from "EL-MAHAMASA" Island	53,150						
	6. Outflow from BAR EL SHARGIA channel	58,625						
	7. Outflow from "UM-EL BATAH" channel	63.125						

2nd stafe:-, Consists of the following works

No.	Kinds of works	Kilo-metric site	Execution					
			Time		To		From	
			Year	Month	Year	Month	Year	Month
1.	Month riaduct	1,100	2	-	4th	12	3rd	1
2.	Concrete bridges							
	1. Bridge of Nile dis-charge							
	2. Concrete bridge	5,350						
	3. Concrete bridge	8,000	1	6	4th	12	3rd	1
	4. Concrete bridge	13,350						
	5. Concrete bridge	72,150						
	6. Concrete bridge	77,050						
3.	Channel culvert							
	1. Culvert below BAHAR HADOUS drain	47,125	1	-	4th	12	3rd	1
	2. Culvert below BAHAR ELBAKAR & navigable bridge	72,325	2	-	5th	6	3rd	7
4.	Bridges of railway							
	1. Bridge of delta railway	1,050	1	-	4th	12	4th	1
	2. Bridge of Port Said Manzala railways	40,950	2	-	4th	12	3rd	1
5.	Culverts for secondary channels							
	1. SHRGAWIA chennel	1,070						
	2. KARAM channel	8	1	-	4th	6	3rd	7
	3. HAJAJA chennel	9,200						
6.	Culverts for secondary drains							
	1. EL GUNAIMIA drain	7,200	1	-	4th	6	3rd	7
	2. EL FASHIN drain	9,100						

(Continued)

No.	Kinds of works	Kilo-metric site	Execution					
			Time		To		From	
			Year	Month	Year	Month	Year	Month
7.	Water course of secondary channels							
	1. Water course of RASHAYIA Island channel	63,150						
	2. Water course of BAHAR ZAZAA channel	67,415						
	3. Water course of EL GUZLAN Island channel	72,125	-	9	4th	9	4th	1
	4. - do -	77,						
	5. - do -	81,725						

13. The timely program for excuting the Works

The time for the excution of the project is five years from 1980 ∿ 1985.

13-1 Survey works and compensations:-

Lifting starts from the first year and ends at the first half of the 2nd years. As for the compensation works will continue till the end of the forth year.

13-2 Soil works

Divided into two

Stage	Kilometeric		Length in Kilometers	Time in Years
	From	To		
First	17.50	72	54,500	
Total of the first stage			54,500	2-1/2
2nd	The Nile 72.00	17,500 82,000	17,500 10,000	
Total of the 2nd stage			27,500	1-1/2
Gross Total of soil works			82,000	4

At the time of when the excution programme was suggested it was considered to dig the channel and excute industrial works simultaneously i.e. in parallel line, and accordingly the first stage of the soil works will begin at the distance from kilometers 17,500 kilometers 72.00 on condition that the work will be finished during 2.1/2 years.

As this stage the excution of industrial works on the channel would be carried which are in water course of lower SARU, and the discharge culvert as they are excuted in virgin land.

Other industrial works in this stage are the mouths of the channels on the right bank of peace channel from kilometers 48,00∿kilometers 72,000 so as to be able to feed south HOSAINIA plain which amount 70,000 feadan and hence to start the reform of this area from BAHAR HADOUS drain waters.

The second phase of the soil works will start on the 2nd half of the third year on condition that the works will be finished during 1.1/2 years.

At this stage the industrial works will be their completion from the mouth to kilometer 13,500 and control from kilometer 72.00 to kilometer 82.00 and also the two culverts under both BAHAR BADOUS & BAHAR ELBAKAR drains.

13-3 Industrial works along the channel

The works are divided into two stages.
1 - First stage - shown by tables below.

13-4 Stone coverings begins with the second year.

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

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

The first years will be spert in studies preparation of contracts and finalization of contract procedures.

Execution of the work will start from the beginning of the third year & will last three years.

These follows one table detailing the timetable for the execution of the project over the five year period.

Peace Channel Project Establishment Time Schedule for Excution of the Project

Ministry of Irrigation
Sector of Horizontal Exparsion

No.	Kind of work	Year	1st year 1980	2nd year 1981	3rd year 1982	4th year 1983	5th year 1984
		Month	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
1.	Survey works and expropria-tion						
2.	Month viaduct	1					
3.	Concrete bridge of 70 ton bear-ing capacity	12					
4.	Culvert under BAHAR ELBAKAR drain and navigable bridge	1					
5.	Bridges of DELTA railway	2					
6.	Bridge on port saed-Mansura railway	1					
7.	Feeder channel of lower SARU and culvert be-low the channel	1					
8.	Channel culvert below BAHAR MADOUS drain	1					
9.	Culvert for secondary channels	3					
10.	Drainage cul-vents	4					
11.	Mouths of se-condary channel	12					
12.	Lining works						
13.	Soil works for the water course						
14.	Pumping stations						
15.	Culvert of Suez Canal						

14. Economic Feasibility of the Project

The study of the economic feasibility of the project was confined to the work of the first phase which includes areas located west of the Suez Canal & totalling 195 thousands feddans, as follows:-

50 thousands feddan	South of Port Said
62 " "	North of HOSAINAI Plain
73 " "	South " " "
08 " "	South of Mataria
02 " "	Area confined between "The Peace Channel" and "The long sea Drain"
195 thousands feddans	

14-1 Water course and the industrial works along it:-

On the assumption that the wear and tear of the mechanical and electrical works is 25 years and of the civil works 50 years and that the rate of interest in the case of over a 50 year period is 12% and over a 10-year period is 8%, the price of a kilowat/hour is 2 millimes (0.002).

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

14-1-1 Amortization of capital

The estimated costs of the project:

In thousands of L.E.

Description of Works	Estimated Costs		
	Local	Foreign	Total
1. Expropriations & Compensations	1,500	-	1,500
2. Industrial Works	13,000	500	13,500
3. Soil Works	23,500	-	23,500
4. Pumping Stations	8,370	19,600	27,970
Mechanical & Electrical Works			
Civil Works	11,830	1,200	13,030
Total	58,200	21,300	29,500

Annual amortization instalment:-

Mechanical & Electrical	0.1275 × 27,970 = 3,566 thousands pounds
Civil works	0.1204 × 51,530 = 6,204
Total annual instalment	6,204 = L.E. 9,770 thousand

14-1-2 Operation and maintenance costs

- Discharge lifting station No. 1: 2,545 million m^3/per annum with statical lift of 1.25 meter.
- Discharge of lifting station No. 2: 2,545 million m^3/per annum with statical lift of 2.5 meters.
- Discharge of lifting and rivising station No. 3: 1,905 million m^3/per annum with statical lift of 2.32 meters.

Electric consumption of station No. (1)	15.8×10^6 Kw/hr.
" " " No. (2)	22.5×10^6 "
" " of mixing station	15.7×10^6 "
Total consumption of Electricity	54×10^6 "

*Electrical consumption cost	= 378 thousand E. Pounds
*Cost of maintenance (2% of pump cost)	= 35
*Labour cost for stations (estimated)	= 7
*Cost of canal cleaning (estimated)	= 250
Total cost of operation and maintenance	= 670

*Total annual costs = 9,710 + 760 = 10,440

Costs of the first stage 50% × 10,440 = 5,220

Cost concerning one feddan/year = 26.75

14-2 Irrigation and Drainage Network:-

* Time for excution of scheme is 5 years from 1980 ∿ 1984.
* It should be taken into consideration that the layout of the irrigation & drainage networks and roads at the beginning of the project, and the excution during the project excution time but work should be finished before the end of the fifth year.
* The minor civil works - field works - should be done during the last years of the plan and should be finished before the fifth year so as to make early use of the project.

14-2-1 Estimated costs of irrigation and diginage networks:-

* Considering 33 m^3 for one feddan in major irrigation courses.
* And 15 m^3 for one feddan in major drainage courses.

Then cost of major irrigation & drainage network /feddan = 60 L.E.

Cost of field irrigation & drainage system/feddan = 40

Total cost/feddan = 100

Cost will be paid at the benefit of 8%/year for ten years.

The annual instalment = 0.1490 × 100 = 14.90 L.E.

14-3 Irrigation:-

Estimated cost of one feddan is 16 E.P. including cost of lifting equipment, operation and maintenance.

14-4 Land reclamation and cultivation:-

14-4-1 After establishment of irrigation and drainage networks during the decided time - five years then the reclamation stage follows which comprises levelling, application of soil amendment mainly organic fertilizer - deep plangning operation, below surface soil breaking operation then washing and draining. The time for this stage is one and a half year, and the cost/feddan is 60 L.E.

14-4-2 The reclamative cultivation stage:-

After decreasing salinity and alkalinity in the land of the project to on extend that cultivation in possible then the reclamative cultivation stage starts. For the selection of crops for the stage the following are considered:-

A. Crop endurance to the relatively high solinity.
B. Crop endurance to the relatively high alkalinity.
C. Consumplive use of crops for water should be high.
D. The depth of roots should be more or less equal to the depth of layers from which salinity and alkalinity were reduced.
E. The crop should cover the soil to an extend that direct water evaporation is lessened.

All the above mentioned characteristics are shown by the following crops.

a. Lucerne

b. Rice

c. Barley

The stage begins after inundation and washing for a year and a half then the land is cultivated by rice on the 2nd half of the 2nd year.

Crops	Percentage	Season	Year
Rice	100	Summer	2nd
Lucerne Rice	100 100	Winter Summer	3rd
Lucerne Rice	100 100	Winter Summer	4th

14-4-3 Normal cultivation stage:-

After 3 years of the reclamative cultivation and by the increase of the reform period it is possible to shift to normal cultivation as follows:-

Crop	Percentage	Season	Year
Lucerne	100	Winter	5th
Rice Vegetable	50 50	Summer	
Rangh alfalfa Clover	33 67	Winter	6th
Cotton Rice	33 67	Summer	

14-4-4 Cost of reclamation and cultivation of lands

Stage	Year	Season	Type of cultivation	Cost/ feddan	Per-centage	Cost of survey	Annual casts
Reform	1st + 2nd	Year and half	Levelling immersion washing	60	100	60	60
Reclamative cultivation	2nd	Summer	Rice	100	100	100	100
	3rd	Winter	Lucerne	64	100	64	
		Summer	Rice	100	100	100	164
	4th	Winter	Lucerne	64	100	64	
		Summer	Rice	100	100	100	164
Normal cultivation	5th	Winter	Lucerne	64	100	64	
		Summer	Rice	100	50	50	
			Vegetable	150	50	75	189
	6th	Winter	Alfalfa	64	33	21	
			Clover	64	67	43	
		Summer	Cotton	100	33	33	
			Rice	100	67	67	164
Cost of reform and cultivation of are feddan for six years							841

14-4-5 Production amounts during the reform and cultivation of the land

Stage	Year	Season	Type of cultivation	Production/feddan				Percentage	Production	Annual production/feedan
				Unit	Amount	Total unit	Total amount			
Reclamation	1st + 1/2 2nd	Year and half	Levelling immersion washing	-	-	-	-	100	-	
Reclamative cultivation	2nd	Summer	Rice	ton	0.5	65	32	100	32	32
	3rd	Winter	Lucerne	ton	4	16	64	100	64	
		Summer	Rice	ton	1.25	65	81	100	81	145
	4th	Winter	Lucerne	ton	8	16	128	100	128	
		Summer	Rice	ton	1.75	65	113	100	113	241
Normal cultivation	5th	Winter	Lucerne	ton	10	16	160	100	160	
		Summer	Rice	ton	2.5	65	162	50	81	
			Vegetable	ton	8	50	400	50	200	451
	6th	Winter	Alfalfa	ton	8	16	128	33	43	
			Clover	ton	16	16	256	67	171	
		Summer	Cotton	-	5	45	225	33	74	
			Rice	ton	2.5	65	162	67	109	397
Total production of one feddan for six years										1,266

14-5 Calculation of the revenue till the end of the sixth year

Reclamation and cultivation stage

14-5-1 Expenses per feddan in L.E.

1. Annual amount for the major water course for six years = 26.75 × 6 = 161 E.L.
2. Annual amount for irrigation & drainage network for six years = 14.9 × 6 = 90 E.L.
3. Irrigation cost for six years = 6 × 16 = 96
4. Reclamation & cultivation cost for six years = 841

Total expenses = 1 = 1,188

14-5-2 Cost of production/feddan

Cost of production for six years = 1,266 E.L.

14-5-3 Revenue:-

* Revenue/feddan for the first six years = 78 E.L.
  Revenue for the total area = 15,210,000 E.L.
* The reformed land starts to give return from the 4th year.
* At the end of 6th year it will be possible to cover all the total cost except the cost of the construction of the major water course and irrigation and drainage networks. The exceptional costs will be divided into annual installments. After deduction of the costs the revenue will be around is millions E.Ls at the end of the 6th year.

14-6 Annual revenue (Normal cuttivation)

* Revenue of feddan/year = 397,000 E.L.
* Cost of production of one feddan/year.
  - Cost of major water course = 26.75
  - Cost of irrigation drainage networks = 14.90
  - Irrigation cost = 16.00
  - Agricultural costs = 164.00
  * Total cost/feddan/year = 221.65
  * Profit from one feddan/year = 175.35

i.e. the net profit from one feddan amounts 175 E.L. in case of traditional crops and the net profit will increase if other crops are introduced.

The total net income for the 1st stage area which is 195 feddan will be 34 millions E.L.

14-7. Covering project expenses

* First stage of the area 195 thousands feddan west of Suez Canal

14-7-1 Cost of construction and operation.

* Total cost of the project till Suez Canal culvert = 79,500 million E.L.
* Cost of operation & maintenance for nine years = 6,030 m. E.L.
* Total construction & operation cost for the major water course = 85,530
* For first stage (50%) = 42,675
* Cost of irrigation & drainage network (100/fedder) = 19,500
* 8% benefits (Major water course and drainge irrigation net work) = 62.265 × 0.999 = 62,203
* Cost of irrigation (16 E.L./feddan/year) for 9 years = 28.80

Total costs of operation and benefits for 9 years = 152,548

14-7-2 Costs of reformation and cultivation

* Costs for the first six years (841 E.L./feddan) = 163.995 millions E.L.
* Costs of cultivation for the first 3 years (164 E.L./feddan) = 95,940 " "
* Total cost of reclamation a cultivation for nine years = 259,935 " "

Therefore Gross total costs = 412,483 million E.L.

14-7-3 Agricultural revenue:-

* Agricultural return for the first six years = (1,266 E.L./feddan) = 246.870 million E.L.

* Agricultural return for the following three years (397 E.L./feddan/year) = 232,245 million E.L.

* Gross total of agricultural return for 9 years = 479,115 " "

Total costs	= 412,483	"	"
Net revenue	66,632	"	"

* From above the economic feasibility of project is quite abvious to us.

- The project will cover it's costs in nine years time starting from the end of the first stage onwards including the time required for reclamation and reclamative cultivation.
- Return from one feddan will not be less than 175 E.L. in case of cultivating traditional crops and it will increase by selection & introduction of other crops.
- The suggested crop complex will include fodder crops like colver, lucerne & alfalfa which is utilized for fattening of cattle a evenually will give more importance to the economic feasibility of the project.

15. Evaluation of the Project

15-1 Horizontal expansion:

"The Peace channel" Project will greatly add to the economic potentialities of the Egyptian national income, since the area that will be added to the arable land will amount to 595 thousands feddans, that is, 10% of the present cultivated area.

15-2 Exploitation of the drain waters

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

15-3 The new communities:

Adoption of scientific development in the reclamation of lands & their exploitation will result in establishing new industrial and

agricultural communities in addition to the distribution of the population density outside the Nile Valley.

15-4 Food security:

The land exploitation system encompasses the following bases:

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

(b) Provision of necessary vegetable foodstuffs.

(c) Provision of vegetables in raw form to some factories now present or in the future, engaged in food preservation.

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

(e) The crop composition proposed for the project includes the production of animal feed such as alfalfa and ensure the integration between vegetable and animal production which encompass the following:-

(1) Breeding cattle for milk production

(2) Breeding sheep for the residence

(3) Fattering calves for meat production

(4) Breeding poultry for eggs

In other words to provide the necessary needs of animal foodstuffs especially milk, meat, eggs & the installation of milk products factories.

To make use also of the animal's residue in fertilizing the soil and hence improving and increasing the productivity of the land.

Finally, having completed the study of "The peace channel" which included its economic usefulness, from one side only which is the agriculture, and having shown the importance of the project, it is possible to study the economic benefit of the other projects which rely on this project whether industrial or animal husbandry etc. which increase the value of the project economically. And generally, this project will bring much return to the economics of the country & ensure the food safety and security, relieves the population density, provides new opportunities for work, in addition to developing the national wealth.

End of summary