エジプト・アラブ共和国
エリトリア国
モーリタニア・イスラム共和国

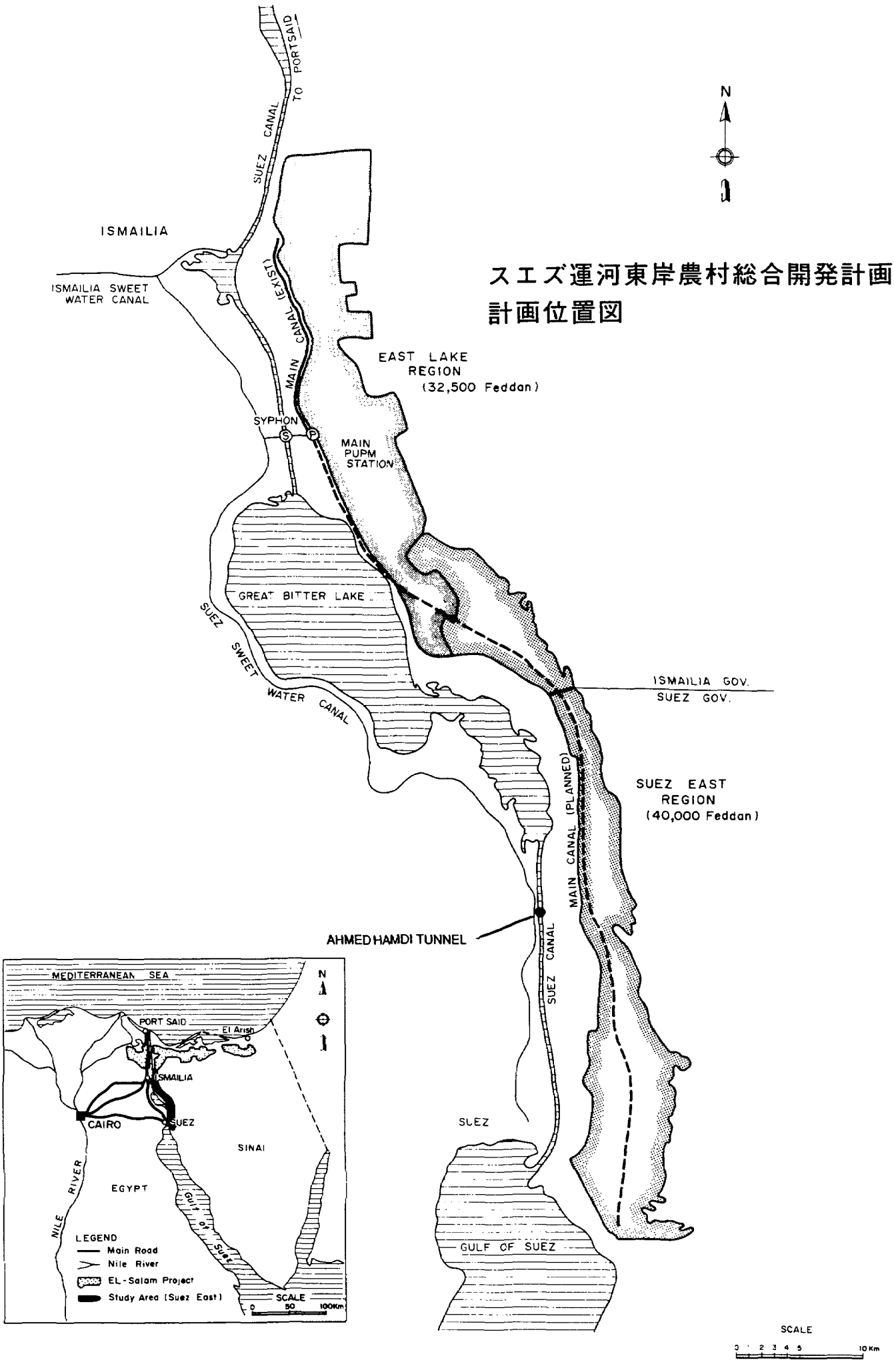
アフリカ３ケ国農業開発計画

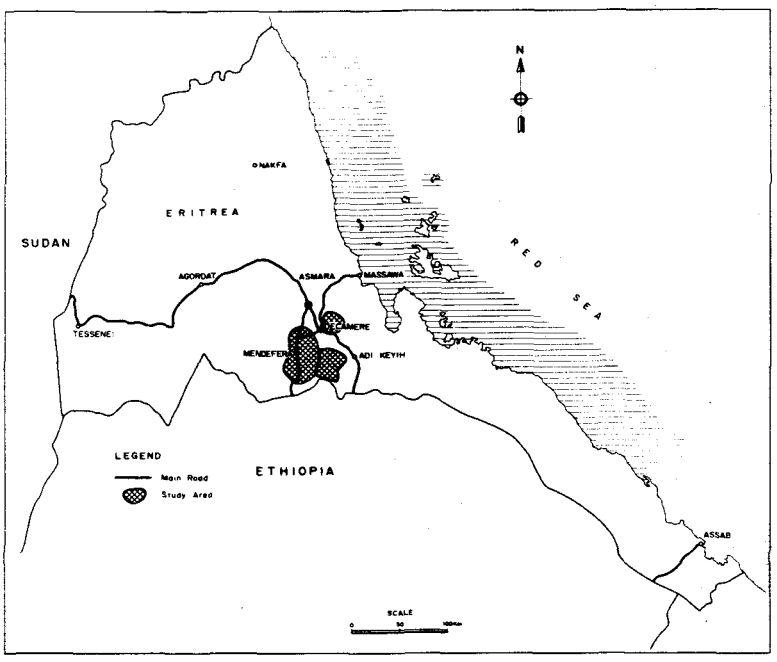
エジプト・アラブ共和国	スエズ運河東岸農村総合開発計画
エリトリア国	アスマラ南部地区農業生産基盤復旧改善計画
モーリタニア・イスラム共和国	ディウプ・ディアデール地区農業環境開発計画
	ガラック・コンディ地区農業灌漑開発計画

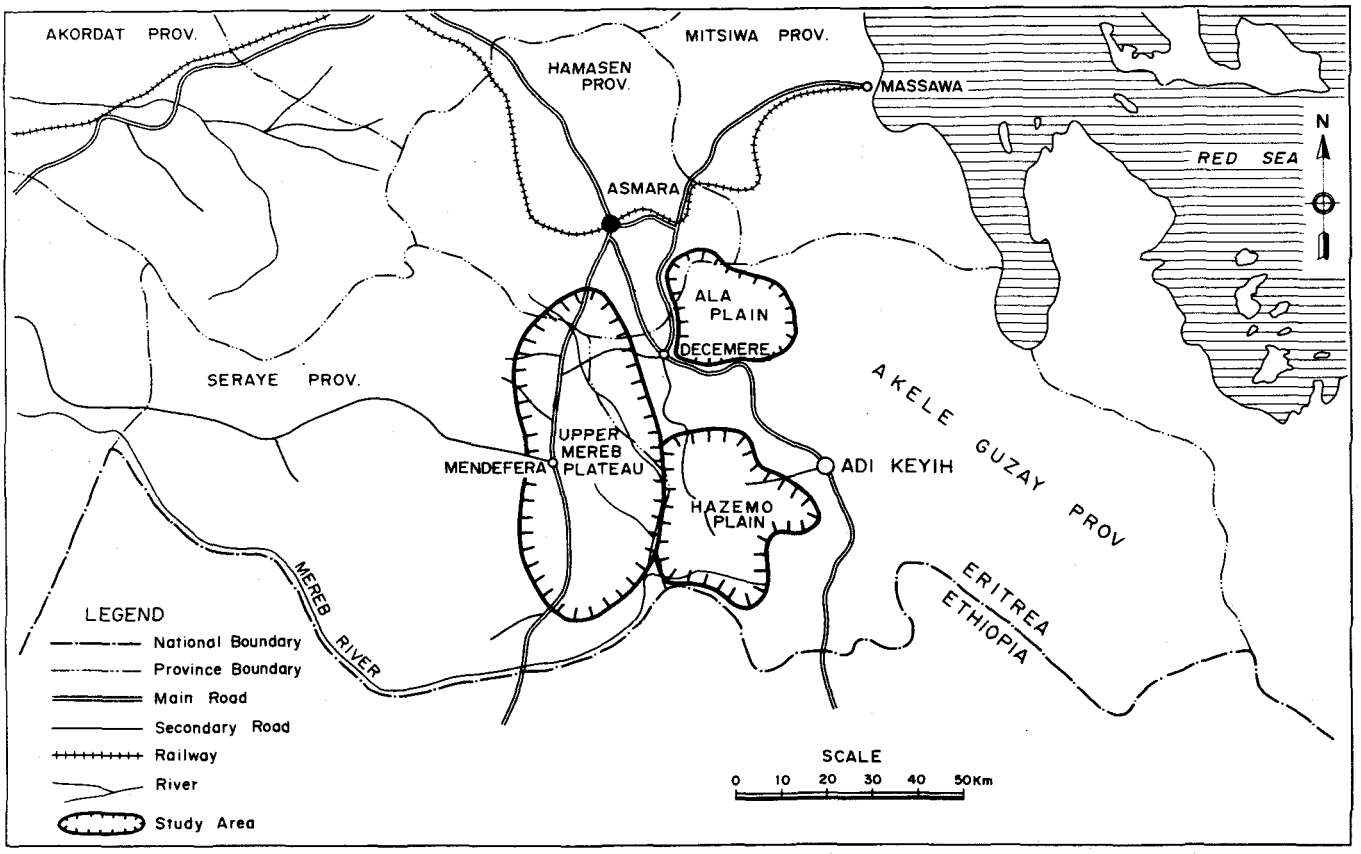
プロジェクト・ファインディング調査報告書

平成６年３月

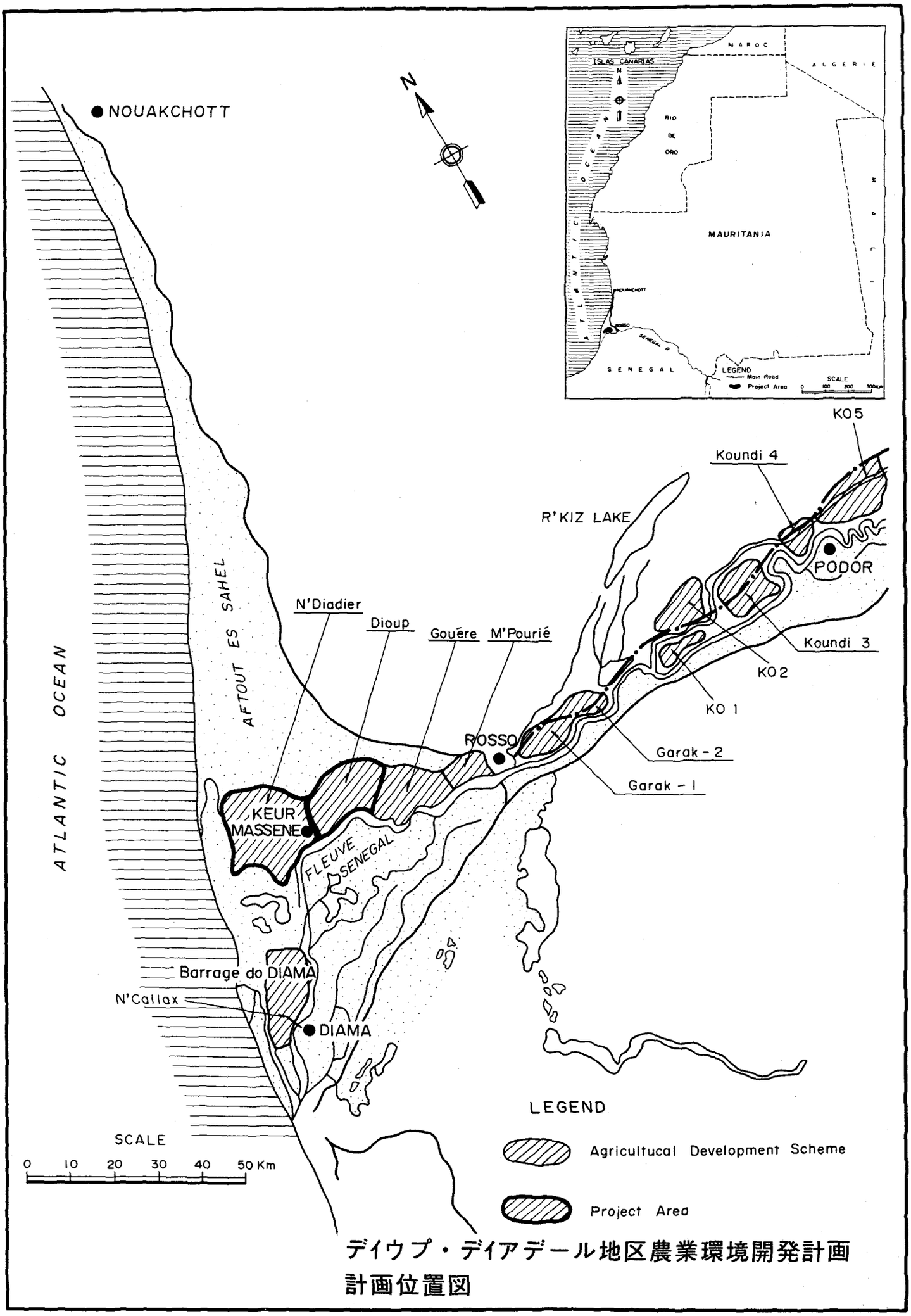
社団法人　海外農業開発コンサルタンツ協会


スエズ運河東岸農村総合開発計画
計画位置図
N
TO PORTSAID
SUEZ CANAL
ISMAILIA
ISMAILIA SWEET WATER CANAL
MAIN CANAL (EXIST)
EAST LAKE REGION (32,500 Feddan)
SYPHON
MAIN PUPM STATION
GREAT BITTER LAKE
SUEZ SWEET WATER CANAL
ISMAILIA GOV.
SUEZ GOV.
SUEZ EAST REGION (40,000 Feddan)
MAIN CANAL (PLANNED)
AHMED HAMDI TUNNEL
SUEZ CANAL
SUEZ
GULF OF SUEZ
SCALE
0 1 2 3 4 5 10Km
MEDITERRANEAN SEA
PORT SAID
El Arish
ISMAILIA
CAIRO
SUEZ
SINAI
EGYPT
NILE RIVER
Gulf of Suez
LEGEND
Main Road
Nile River
EL-Salam Project
Study Area (Suez East)
SCALE
0 50 100Km

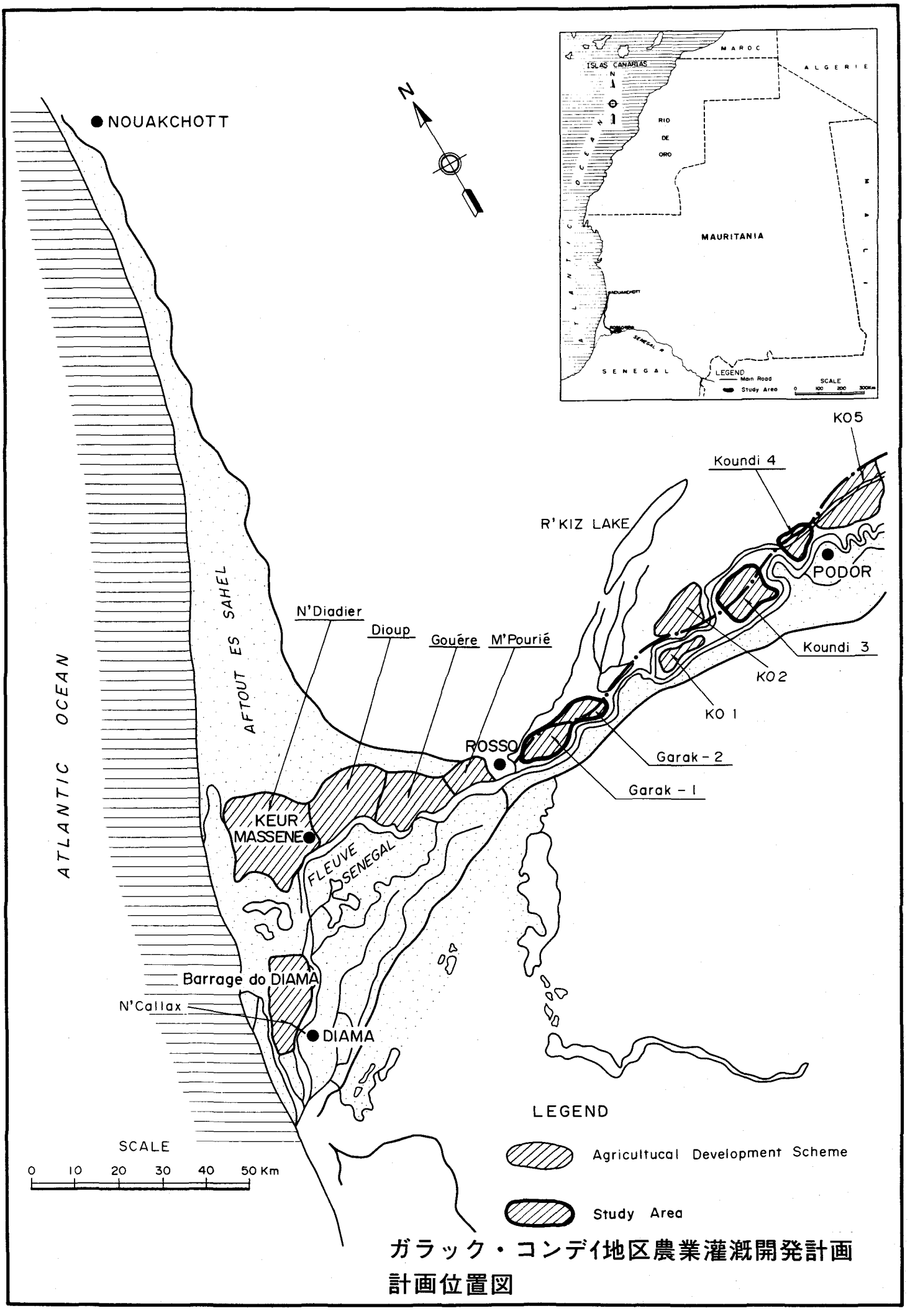




アスマラ南部地区農業生産基盤復旧改善計画
計画位置図



デイウプ・デイアデール地区農業環境開発計画
計画位置図



ガラック・コンデイ地区農業灌漑開発計画
計画位置図

要約

1. スエズ運河東岸農村総合開発計画 （エジプト　アラブ共和国）

事業の背景

エジプト農業の「水平拡大」政策の根底にあるのは毎年3%にも昇る人口増大に起因した農地に対する人口圧の軽減、新たな食糧生産基地の建設、農村住民への就労機会の提供等である。エジプト政府はシナイ半島へ向けた東進政策を水平拡大政策の優先事業として位置づけ、スエズ運河東岸に沿った地域で約7万3千フェダンの灌漑農業事業を推進している。スエズ運河東岸地区は既存開発事業地区の湖東地区（East Lake Region : 32,500フェダン）と新規開発のスエズ東部地区（Suez East Region : 40,000フェダン）からなり、スエズ東部地区の開発は第3次5ヶ年計画で実施するとしている。

湖東地区の灌漑施設は　ほぼ完成し、農村建設も進捗しているが実際に灌漑が行われているのは32,500フェダン中、7,000フェダンに過ぎない。これは用水管理のまずさによる排水問題と農村基盤整備、営農技術普及体制、農業支援組織体制等の立ち遅れに起因している。エジプト政府は湖東地区事業の改善と、これを教訓にしたスエズ東部地区の適正な開発事業を推進することを目指している。

計画概要

本計画は既存農業開発地の増産・生活基盤の改修・改善と新規開発地の農産物生産と農産工業の振興を図り、計画地区の農民の生活水準と地域経済の向上を目指す農村総合開発事業である。開発計画の構想は以下の通りである。

1) 湖東地区における既存灌漑・排水施設の改修と改善、とくに緊急を要する排水不良問題の解決を図ること、及び　開発地区の可能な限りの面積拡大を図る。
2) 湖東地区の開発事業の教訓をもとにスエズ東部地区の適正な灌漑排水計画を樹立する。
3) 農業普及、金融、協同組合、市場サービス、訓練計画等の農業支援制度の樹立、及び収穫後処理施設、農産加工施設などの農村工業体制の樹立し、地域経済の高揚を図る。
4) 交通体系、生活給水、農村電化、生活協同、娯楽、保険衛生、教育など農民の生活環境の改善と社会生活基盤の整備を図り、農民の入植地定着と生産意欲を高める。

協力への展望

1) フィージビリティ調査
2) 機関　：　約15ヶ月

2. アスマラ南部地区農業生産基盤復旧改善計画　（エリトリア国）

事業の背景

農業は30年に及ぶ独立戦争で最も打撃を受けた産業・経済部門の一つで、戦争中農民は農地を放棄せざるを得ず、独立後には荒廃した農地が放置されたままであった。現在エリトリア政府に課せられた農業部門における緊急な開発目標は(i) 農業生産を増大し、(ii) 国民に安価な食糧調達を可能ならしめることにある。農民は元の農地に戻りだしたが、農地の荒廃と生産基盤施設の崩壊で思うように生産を上げることができず、灌漑施設、農村道路等の農業生産基盤の復旧と改善はエリトリア政府の緊急課題である。とりわけアスマラ南部地区のAkeke-GuzayとSereyeの両州はエリトリア人民解放戦線による解放が最後まで遅れ、新エリトリア政府の開発の手が一番遅れている地域である。この地区はかってはエリトリア国民の主食であるテフやトウモロコシの大生産地であり、余剰農産物を産み出した数少ない地域であった。また首都アスマラに隣接し、紅海に面するエリトリアの主要貿易港であるマサワ(Massawa)へも短時間でアクセスできる等、経済上有利な地理的位置にある。このような歴史的背景と経済的好条件を有す当地域の農業開発、特に既存農業生産基盤施設の復旧と改善及び新規生産基盤施設の導入による農業生産の増大で住民の生活水準の向上を図ることは勿論、食糧確保、雇用増大、国内産業への原材料の供給などを目標にし、エリトリア政府は当地域の農業開発に最も高い優先順位を与えている。

計画概要

計画地区は首都アスマラの南からエチオピア国境付近に至るまでの直線距離で約70 km、幅 約50 kmの地域で、地域内にはアラ(10,000 ha)、ハゼモ(30,000 ha)の2つの盆地とメレブ上流平原 (30,000 ha)がある。本地域の農業開発は下記に示す４ヶ所の既存灌漑地区を中心に地域内の農業生産可能地区の開発を推進する。

	地区名（暫定）	灌漑面積(ha)	州
(1)	Tedrer Plain Irrigation	2,000	Akele-Guzay
(2)	Upper Mereb Tributary Distribution	4,000	Seraye
(3)	Hazemo Groundwate Irrigation	1,000	Akele-Guzay
(4)	Tserona Groundwater Irrigation	- to be identified -	Akele-Guzay

開発は表流水および地下水による灌漑水源の確保、既存水路と付帯施設の復旧、改修、改善と新規施設の建設、既存農村道路の改修と拡充、飲料雑用水供給施設、収穫後処理施設、共同組合施設等の生産・社会基盤の整備を通じて食糧増産と地域農民の生活水準向上を目指す。

協力への展望

1) マスタープラン調査

2) 機関　：　約18ヶ月

3. デイウブ・デイアデール地区農業環境開発計画　（モーリタニア　イスラム共和国）

事業の背景

国土の大部分を砂漠に覆われたモーリタニアの国土に耕地が占める割合は僅か0.2%に過ぎず、農業はセネガル河沿いの河岸地帯と河口近くのデルタで行なわれているだけである。その生産量は穀類で約15万トンで自給自足に必要な約25万トンをはるかに下回っており、不足量は輸入に頼り総輸入額の30%に達している。食糧増産による食糧安全保障の強化と外貨節約が緊急の政策課題である。従って国内で唯一、河川から地表灌漑による農業が可能なセネガル河沿岸は同国の食糧生産地帯としての重責を担っておりモーリタニア政府の経済開発で最も高い位置づけがなされている農業開発事業である。セネガル河開発機構のもとモーリタニア政府はセネガル河沿岸に6地区約155,000 haの灌漑農業を中心とした農業開発を策定し開発事業を推進している。モーリタニア政府は村落単位での小規模農業経営により各農家の収入と生活水準の向上を図る半面、農民の農業事業に対する運営能力を高め彼らに運営責任を持たせることにより、より食糧作物の流通性を高め、政府の関与を減少を目指す。

計画概要

デイウブ及びデイアデールの両地区はセネガル(Senegal)河の右岸氾濫原に位置しロッソ市の西約30 Km地点から西方、大西洋沿岸までに延びる低湿地農業地帯である。セネガル河の河口に建設したデイアマ堰の関連施設として堰からロッソ市まで約80 Kmに及ぶ高さ2.3 mの河川堤防が築造されたが、堤防は河と農地を繋ぐ既存の用排水網を絶ち切ってしまい、また排水不良で生活・自然環境に悪影響を及ぼしている。対策として現在進めている閘門建設の他、計画地区内の既設用水路の改修と新規水路の建設で灌漑用水を安定して地区内に導水し、水稲栽培（デイウブ地区：2,630 ha, デイアデール地区：2,030 ha）を復旧・改善する。また主要排水路の改修で排水改良を施し、牧草生産（デイウブ地区：2,490 ha, デイアデール地区：4,700 ha）と牧畜業の改善を図ることは勿論、自然環境と住民生活環境の回復と改善を目指す。改修及び新規建設する水路・排水路の総延長は約56 kmである。

協力への展望

1) 無償資金協力援助

2) 所要資金額　：　約25億円

4. ガラック・コンデイ地区農業灌漑開発計画　（モーリタニア　イスラム共和国）

事業の背景

国土の大部分を砂漠に覆われたモーリタニアの国土に耕地が占める割合は僅か0.2%に過ぎず、農業はセネガル河沿いの河岸地帯と河口近くのデルタで行なわれているだけである。その生産量は穀類で約15万トンで自給自足に必要な約25万トンをはるかに下回っており、不足量は輸入に頼り総輸入額の30%に達している。食糧増産による食糧安全保障の強化と外貨節約が緊急の政策課題である。従って国内で唯一、河川から地表灌漑による農業が可能なセネガル河沿岸は同国の食糧生産地帯としての重責を担っておりモーリタニア政府の経済開発で最も高い位置づけがなされている農業開発事業である。セネガル河開発機構のもとモーリタニア政府はセネガル河沿岸に6地区約155,000 haの灌漑農業を中心とした農業開発を策定し開発事業を推進している。モーリタニア政府は村落単位での小規模農業経営により各農家の収入と生活水準の向上を図る半面、農民の農業事業に対する運営能力を高め彼らに運営責任を持たせることにより、より食糧作物の流通性を高め、政府の関与を減少を目指す。

計画概要

ガラック及びコンデイの両地区はロッソの東側、東トラルザに位置するセネガル河沿岸農業地区でガラックー1・2、コンデイー3及びコンデイー４の3地区からなり、灌漑面積の合計は約25,000haである。ガラク地区はロッソ市の東側に隣接し、東トラルザの西端に位置する。一方、コンデイー3及び4地区は東トラルザの東端に位置し、ロッソ市の60 kmから90kmまでの範囲にある。当地区の灌漑農業開発は1990年のPost-Dams開発計画（マスタープラン）で策定された優先計画の一つで、セネガル河から安定した灌漑用水を取水し、かつ沿岸地区の農地を湛水と堆砂被害から防御するものである。更に計画地区の灌漑農業を円滑に実施資、生産向上による地域経済を高揚させ、計画地区農民の生活水準向上のために既存村道の改修・拡充、村落給水、収穫後処理施設、農村電化などの社会・農村基盤施設を整備する。

協力への展望

1)　フィージビリテイ調査

2)　機関　：　約18ヶ月

まえがき

海外農業開発コンサルタンツ協会は、エジプト・アラブ共和国、エリトリア国及びモーリタニア・イスラム共和国における農業開発に関する現地調査及び資料収集のために、1993年11月26日より12月19日までの期間、プロジェクト・ファインディング調査団を派遣した。派遣調査団は下記の２名により構成されている。

団長／灌漑排水計画	村井　浩	日本工営株式会社
農村開発計画	伴　正一郎	日本工営株式会社

調査団はエジプト・アラブ共和国、エリトリア国及びモーリタニア・イスラム共和国各政府の依頼により、下記4ヶ所の計画地区を踏査した。

エジプト・アラブ共和国

1) スエズ運河東岸農村総合開発計画

エリトリア国

2) アスマラ南部地区農業生産基盤復旧改善計画

モーリタニア・イスラム共和国

3) デイウブ・デイアデール地区農業環境開発計画

4) ガラック・コンデイ地区農業灌漑開発計画

調査団は上記開発地区の現地調査を行い、各国政府関係機関との協議を重ね、計画に係る各種資料の収集を実施した。本調査を実施するに当たり各国政府関係機関のご協力を頂き円滑に調査業務を遂行することができた。調査団の受け入れ窓口としてご協力頂いたのは、エジプト・アラブ共和国の農業・食糧保障・土地開拓省、公共事業・水資源省及びイスマイリア県庁、エリトリア国の農業省、モーリタニア・イスラム共和国の地方開発・環境省と農業開発公社(SONADER)及び計画省であった。また、在エジプト国日本大使館とJICA事務所、在エチオピア国日本大使館とJICA事務所及び在セネガル国日本大使館の方々に多大なる助言とご協力を頂いた。これらの方々に対し深甚なる謝意を表する次第である。

平成6年3月

アフリカ３ケ国農業開発計画

プロジェクト・ファインディング調査団長

村井　浩

アフリカ３ヶ国農業開発計画

プロジェクト・ファインディング調査報告書

目次

II.　エリトリア国編

付属資料

III.　モーリタニア・イスラム共和国編

エジプト・アラブ共和国編

スエズ運河東岸農村総合開発計画

I.　エジプト・アラブ共和国編

1.　背景

1.1　国土と人口

(1)　国土

エジプト．アラブ共和国（以下、エジプト国）はアフリカ大陸の北東の角部、北緯22度00分－31度36分、西経24度45分－36度23分の範囲に位置している。西側はリビアに、南側はスーダンに、東側はシナイ半島とともに紅海に面し、北側は地中海に面している。国土面積は1,002,000km^2（日本の約2.6倍）であるが、国土の大部分が砂漠で耕地面積は国土面積の僅か3%に過ぎない。

気象条件は地中海に沿った北部海岸地帯から内陸部に進むに連れて変化する。海岸地帯に位置するアレキサンドリアは地中海性気候で全般に気候温和で年間の最高・最低気温は30 ℃から10 ℃程度の変化で年間200 mm前後の降雨がある。海岸から180 km内陸に入ったデルタ南端のカイロでは35 ℃から8 ℃程度の変化となり年間降雨量は25 mmに減少し、更に海岸から900 kmのアスワンでは40 ℃ －10 ℃で降雨は年間を通じて殆ど見られない。

(2)　人口

1986年の人口センサスによると総人口は約48.3百万人であったが1992年現在で約58.3百万人に増加していると推定されており、内30%弱にのぼる16百万人がカイロ首都圏に住んでいるといわれている。国土の大部分が砂漠であるため人口の約97%が全国土面積の僅か4%のナイル狭谷とデルタに住み、その人口集中度は約1,400人/km^2（全国平均は58人/km^2）と極めて高い。

1.2　社会経済

1989年末でエジプトは約500億米ドルもの対外債務を抱え、その返済に加え輸出競争力のある産業の欠如などとも併せ依然厳しい経済情勢下にある。1992年の国内総生産（ＧＤＰ）は実勢で約2千83億エジプトポンド(LE),　国民一人当たり概ねUS$1,000と推定される。農業部門のGDPに占める割合は約15%で産業部門に次いで国の経済を担っている。

モーリタニアの輸出入額は1992年の実績で輸出総額104億LEに対し輸入277億LEであり、貿易収支は例年赤字である。エジプトの主な外貨収入源は原油の輸出、スエズ運河の通行料、海外出稼ぎ労働者からの送金及び観光収入であるが、近年の国際原油価格の低迷、湾岸危機と湾岸不況等の影響もあって総じて減少している。

1.3 農業の現状

古来、エジプトはナイル河の恵みで一時は農産物の輸出国ですらあったのが、年3%にも達する急激な人口増加や消費の拡大等により、今では基礎的な穀物に関し膨大な輸入国になってしまい、エジプトにとって食糧の安定供給を図ることが緊急かつ重要な課題になっている。

農業部門のGDPに占める割合は約15%で労働人口の約32%が農業部門に属している。エジプトは国土の大部分が砂漠で、耕地は国土面積の僅か3%に過ぎない。従来からの耕地面積は650万フェダン（1 Feddan = 0.42 ha）で、1952年以降特に1960年代を中心に約90万フェダンの耕地が開発された。しかし、これらの耕地のうち改良を加え栽培利用しているのは3分の2程度とみられている。他方、1960 - 80年間に都市化により宅地、工業用地としてつぶれた耕地は50万フェダンに及ぶとみられている。農民の土地保有面積は極めて小さく農家一戸当たりの耕作面積も約2.5フェダン（約1 ha）程度である。

エジプトの作物栽培は大別して冬作、夏作、ナイル作からなる。冬作は10 - 12月に植えつけて4 - 6月に収穫し、ベルシーム(Egyptian Clover)、小麦、大麦、ソラマメ、レンズマメ、アマ、冬野菜等が作られる。夏作は3 - 6月に植えつけて8 - 11月に収穫するもので、綿花、トウモロコシ、米、ソルガム、大豆、ゴマ、落花生、夏玉葱、夏野菜等が栽培される。ナイル作はナイル河の氾濫期に因んで命名された夏晩作というべきもので、7 -8月に植えつけて10 - 11月に収穫し、トウモロコシ、ソルガム、野菜等が栽培されている。以上の作期に加え、永年作あるいは周期作として果樹類と砂糖きびがある。最近5年間（1988 - 1992）の主要農産物の栽培面積と生産高は別表に示す通りである。

エジプトの水資源はその大部分をナイル河に依存しており、現在、全水資源利用可能量の内、ナイル河は91.4%を占めている。ナイル河の年間流量は840億トンであるが上流国のスーダンとの協定により、エジプトは555億トンを利用することができる。これに加え、地下水29億トン、排水再利用23億トン、合計607億トンの水資源が利用できると推定される。内、農業用水に497億トン（約82%），生活用水に33億トン、工業用水に25億トン、発電・航運・河川維持に40億トンの使用配分となっている。しかし2000年までに生活・工業用水の水需要は現況の2倍に達すると見込まれており、また栽培の多様化、品種の多様化に加え、今後の土地開拓による農地の拡大（水平拡大）に伴い新たな農業用水の確保が求められている。エジプト政府は水資源開発に対する長期的対応としてナイル河の堰の改修、水管理の改善および灌漑施設の改修、海への無効放流の制限、ナイル河の新たな水資源開発、水道供給システムのロスの減少等を中心に考えている。

1.4 国家開発計画

第2次5ヶ年社会経済開発計画（1987/88 - 1991/92）を引き継ぐ第3次5ヶ年計画が1992年から実施されて

いる。第2次計画では(1) 生産の拡大、(2) 経済構造転換促進のための投資の増大、(3) 経済協力と貿易の拡大、(4) 民間部門の投資増大と協同組合の充実及び(5) 人口の適正配置の目標を掲げて経済政策を推進してきた。第3次5ヶ年計画も引き続き同様な政策目標を掲げている。

エジプトの農業の基本政策は「水平拡大」と「垂直拡大」による農業生産力の強化・増大である。水平拡大は農地開拓を行うことにより農業生産力を拡大する他、雇用機会の増大と人口分散を狙いとして展開されている。第2次5ヶ年計画では5年間で75万フェダンの農地開拓を行うとし、現在約86万フェダンの開拓を進めていると言われ、第3次5ヶ年計画では更に約25万フェダンを新たに開拓するとしている。他方垂直拡大は単位収量の増大を目指すものであり、新しい営農技術の導入、種子改良、土壌改良などにより達成するとしている。

2. スエズ運河東岸農村総合開発計画

2.1 事業の背景

エジプト農業の「水平拡大」政策の根底にあるのは毎年3%にも昇る人口増大に起因した農地に対する人口圧の軽減、新たな食糧生産基地の建設、農村住民への就労機会の提供等である。また既存耕地が住宅・工業用地として転用されている状況で新規に農地を開墾する必要性にも迫られている。しかしながら農業に適する自然条件（気象・水・土壌）を備えたナイル河両岸とデルタ地帯は殆ど開発しつくされ、水平拡大は砂質（砂漠）土壌の東西方向に限られる。このような背景でエジプト政府はシナイ半島へ向けた東進政策を水平拡大政策の優先事業として推進している。これは国際政治戦略上の理由（領土保全）であることは勿論であるが、スエズ運河や首都カイロからの整備された交通網による流通面での有利性、ナイル河の水資源を容易に利用できること等が理由である。これによりナイル河デルタの余剰農民と若年知識層を吸収し個人農家による中・小規模農業と企業ベースの大規模投資農業開発を目指すものである。このシナイ半島農業開発政策に従って公共事業・水資源省を事業主体として40万フェダンのエルサラム水路灌漑事業を北シナイで実施し、さらにスエズ運河東岸に沿った地域で約7万3千フェダンの灌漑農業事業を推進している。前記のエルサラム水路灌漑事業40万フェダン中、26万5千フェダンの開発は現行の第3次5ヶ年計画内で完成させるとしている。スエズ運河東岸地区は既存開発事業地区の湖東地区（East Lake Region : 32,500フェダン）と新規開発のスエズ東部地区（Suez East Region : 40,000フェダン）からなり、スエズ東部地区の開発も同様に第3次5ヶ年計画で実施するとしている。

湖東地区の灌漑施設はほぼ完成し、農村建設も進捗しているが実際に灌漑が行われているのは32,500フェダン中、7,000フェダンに過ぎない。これは用水管理のまずさによる排水問題と農村基盤整備、営

農技術普及体制、農業支援組織体制等の立ち遅れに起因している。エジプト政府は湖東地区事業の改善と、これを教訓にしたスエズ東部地区の適正な開発事業を推進することを目指している。スエズ運河東岸地区の大半を占め、事業建設後の農業生産・農村運営に行政面で責任を負うイスマイリア県(Ismailia Governorate)の強い要望を受けエジプト政府はスエズ運河東岸地区の開発に係る日本政府の技術・資金援助を求めている。

2.2 計画地区の概要

(1) 位置及び地形

スエズ運河東岸地区（以下、計画地区）はスエズ運河の東岸、シナイ半島側に位置し、北のEL Quantara（スエズ運河地中海側入口ポートサイードから約50 km地点）からスエズ運河紅海側入口のスエズ市対岸までの約90 km、幅3 - 6 kmの規模を有している。首都カイロから計画地区までの距離は約100 kmで運河に設けられた多くの船着場からフェリーボート及び運河唯一で現在日本政府の無償資金協力援助で改修中のスエズ横断トンネル（Ahmed Hamdi Tunnel）で計画地区に入る。調査地区の標高は概ね25 m前後であり、行政的にはイスマイリア県とスエズ県に属している。

(2) 自然条件

計画地区の気候は熱帯乾燥に属しイスマイリアの気象記録では年間の降雨量は10月から3月の約30 mm程度と極めて少ない。一方、日蒸発量は最大で10 mmにも達している。月平均気温は8月の30℃から1月の14℃の間にある。本計画地区を含めシナイ半島には永久河川はなく、降雨時に流出があるワジ（涸沢）だけである。

計画地区への水資源は古くは紀元前に端を発し19世紀に整備されたイスマイリア水路（Ismailia Canal）を通して給水されるナイル河川水と計画地区内外での地下水であり、更に排水の再利用も行われている。イスマイリア水路はイスマイリアで北上するポートサイード淡水水路 (Port Said Sweet Water Canal)と南下するスエズ淡水水路 (Suez Sweet Water Canal)とに分流されスエズ運河沿いの都市、農業及び工業用水として利用されている。本計画地区へはスエズ運河のポートサイードから92 km地点をサイフォンでスエズ淡水水路から分水・横断して給水している。

計画地区の土壌は一般に砂質土壌である。

(3) 農業現況

計画地区は湖東地区における農地開拓後に農業を開始したものであるが、実質的な農業生産はあがっておらず、またその生産統計も定かではない。参考までに計画地区を含むイスマイリア県の農業事情を示す。イスマイリア県内での農業は主にスエズ運河西岸が中心で、比較的肥沃な土壌条件に恵まれ

ている。県内の可耕地の総面積は約1.5百万フェダンであるが実際に耕作されているのは10%程度に過ぎない。当地域での農業生産上の主たる制約要因は排水施設の不備と過剰灌漑による地下水位の上昇と塩分土壌の存在である。当地域での耕作体系は大きく分けて、夏作、冬作、果樹作及び野菜栽培の4種類である。主要作物は米、トウモロコシ、落花生、大麦、小麦、マメ類、トマト、マンゴ、オレンジ等である。1990年の作物別栽培面積と収量を下表に示す。

作物	栽培面積	収量
	(Feddan)	(Ardab(*)/Ton)
Summer Field Crops		(Ardab)
Rice	3,142	7,695
Corn	50,821	504,873
Peanuts	61,055	588,521
Total	61,055	588,521
Winter Field Crops		(Ardab)
Beans	4,105	21,233
Wheat	13,826	160,845
Alfalfa	25,512	1,333,173
Barely	12,004	95,783
Others	2,032	8,295
Total	57,489	1,619,329
Vegetable Crops		(Ton)
Watermelon	3,436	28,729
Tomatoes	28,700	271,834
Cucumber	3,352	20,928
Sqaush	8,445	20,006
Pepper	4,827	26,580
Others	7,537	34,417
Total	56,297	402,494
Horticulture Crops		(Ton)
Mango	7,387	29,548
Orange	2,569	27,488
Others	1,187	13,956
Total	11,143	70,992

(*) Ardab = 5.6 Bushels (1 Bushel = 36 litre)

2.2 開発計画の概要

(1) 計画の概要

本計画は前章で述べた「水平拡大」政策に基づく新規農地の開拓に伴う農村総合開発事業である。計画地区は下記の既存・新規の2地区からなっている。

地区名	開発面積（フェダン）	開発段階
湖東地区（East Lake Region）	32,500	既存開発地区
スエズ東部地区（Suez East Region）	40,000	新規開発地区
合計	72,500	

湖東地区とスエズ東部地区の北部10,000フェダンはイスマイリア県に属し、スエズ東部地区中南部の30,000フェダンはスエズ県に属している。計画地区への用水源はナイル河で、イスマイリア水路からスエズ淡水水路に分流されスエズ運河92 km地点をサイフォン横断し、計画地区に導水したものである。現在、サイフォンは6本のパイプからなっており湖東地区を灌漑しているが、今後更に4本のパイプを敷設し、計10本のパイプで計画地区全体の給水を行うこととしている。東岸側に導水された水はポンプで揚水された後計画地区の幹線水路で地区内へと供給される。

(2) 湖東地区の概要と問題点

湖東地区の開発は1960年代に開始された。1961年に最初の水路サイフォン（2本パイプ）が建設され、1965年に１つ目の入植農村が建設された。土地開拓局（GARPAD：現在、農業・食糧保障・土地開拓省に属す）が事業主体となって灌漑幹線水路は1986年に一部完成、1991年に全部完成した。幹線水路には4ヶ所の揚水機場(Booster Pump)があり、これら揚水機を含め幹線水路の運営・維持は公共事業・水資源省に移管された。幹線水路以下の灌漑網の建設(Terminal Works)と農村建設は引き続きGARPADが実施している。開拓された農地は一般入植農民、知識若年入植者(Graduate)及び農業投資企業家に分配される。すでに６つの農村が建設され、更に７村目を建設中である。諸施設の建設が完成し、初期の運営指導を終えた後、施設は入植者に引き渡され県庁と協力を得ながら運営することになる。

32,500フェダンの内、現在耕作されているのは約7,000フェダンに過ぎない。エジプト政府は耕作面積が拡大されない主たる要因として下記3点を挙げている。

(1) 適切な運営・維持に必要な予算の不足

(2) 灌漑用水の不適切な使用法（過剰灌漑）による地下水位の上昇

(3) 入植農民への生活基盤施設と社会サービスの不備

上記の要因で最も深刻な問題は農地の地下水位の上昇で、既に8,000フェダンの農地で被害が認められ、更に7,000 - 8,000フェダンに拡がる恐れがある。元来、本事業は乾燥地・砂質土壌に対応する散水、点滴等による灌漑方法を採用することで計画されているにも拘わらず、灌漑面積が限られて用水がまだ潤沢であり、農民の意識・訓練度合いが低いことによる過剰な地表灌漑と排水施設の不備により、このような排水不良問題が発生したものと判断される。事実、問題地区の地下水位は地表から1.5 mか

ら1 m迄に上昇し、低地部には湛水被害が見られる。このまま適切な対応を取らずに放置すると早晩開拓農地の劣悪化、更には塩類集積の問題が発生する恐れがある。又、計画地区には29基のピボット灌漑施設（1基当たり150フェダン、10農家）が導入されているが農民間の生産計画の統一がとれない等多くの問題を抱え、29基全て放置されたままで各自小型ポンプで地表灌漑を行っており、これも排水問題を更に加速させている。政府は問題解決に乗り出したが技術及び資金の不足で本格的な対策を講じるに至っていない。

このような問題に加え、収穫後処理施設、道路を含む流通施設の不備、不十分な農業普及、金融、農民組合、訓練等の農業支援制度、等まだ改善、再検討すべき点が多い。また当地区の生産活動を鈍らせている大きな要因の一つとして、農民の住宅、上下水道、電気、医療、教育、娯楽等の基本的な社会・農村施設が貧弱で、これが農民の生産意欲を削いでいるようである。

(3) スエズ東部地区の概要と問題点

エジプト政府はスエズ東部地区についても湖東地区と同様の開発構想に基づいて事業を着手しようとしている。当地区の基本計画は樹立されたばかりで、40,000フェダンの農地を灌漑する幹線用水路約（延長72 km）及び水路上の揚水機場、及びスエズ運河を横断する追加サイフォン（4連パイプ）の建設を1994年から開始する予定でいる。幹線水路建設の事業主体は公共・水資源省で建設資金はアラブ首長国連邦(UAE)の無償資金協力30百万米ドルである。幹線水路以下の灌漑網の建設(Terminal Works)と農村建設はGARPADが担当し、現在、GARPADが調査を開始したが地形測量と土壌調査に限られている。エジプト政府は当地区の建設事業を現行の第3次5ヶ年計画中(1997年迄)に完成させるとしているが、スエズ東部地区での教訓を充分に生かしたいとして慎重に事業計画を検討している。

(4) 開発計画の構想

上記に述べた計画地区の現況と問題点を踏まえた上で、下記の構想でスエズ運河東岸地区の農村総合開発計画を樹立する。

- 湖東地区における既存灌漑・排水施設の改修と改善、とくに緊急を要する排水不良問題の解決を図ること、及び開発地区の可能な限りの面積拡大を図る。
- 湖東地区の開発事業教訓をもとにスエズ東部地区の適正な灌漑排水計画を樹立する。
- 農業普及、金融、協同組合、市場サービス、訓練計画等の農業支援制度の樹立、及び収穫後処理施設、農産加工施設などの農村工業体制の樹立し、地域経済の高揚を図る。
- 交通体系、生活給水、農村電化、生活協同、娯楽、保険衛生、教育など農民の生活環境の改善と社会生活基盤の整備を図り、農民の入植地定着と生産意欲を高める。

2.3 協力への展望

エジプト政府がアスワン・ハイダムに次ぐ国家重要事業として位置づけ、日本政府の開発調査結果を基に建設を進めているエルサラム水路・北シナイ地区灌漑計画をから鑑みてもシナイ半島の農業開発には極めて高い優先性を与えられている。この政策の枠組みの中でスエズ運河東岸地区の農業開発は現行の第3次5ヶ年計画で完成を目指す重要な国家事業である。一方、スエズ運河東岸の事業運営と地域経済の振興に係る行政責任を負っている県庁、特に深刻な問題に直面している湖東地区を抱えるイスマイリア県庁はその改善策と両計画地区の今後の事業建設・運営及び地域経済振興について総合的な調査を中央政府に求めている。イスマイリア県知事及び県庁担当者と中央政府関係者との協議を通じて、本計画事業について日本政府が技術・資金援助することに強い要請があった。

日本政府の援助の取り組み方としては、地区全体の開発調査で緊急・優先事業の具体的な計画と予備設計を行うのは勿論として、これらハード面のみならず入植農民が計画地区に定着し、意欲を持って農業生産に携われるという観点からソフト面でも幅広い検討を行う必要がある。

エジプト最近5年間の主要農作物の栽培面積・生産高

Cultivated Area of Main Crops　　Unit : 1.000 Feddan

Crop	Year				
	1988	1989	1990	1991	1992
Winter Crop					
Barely	89	118	127	154	248
Beets	42	40	34	49	38
Beans	363	368	345	326	425
Chickpeas	17	17	13	12	14
Clover	2,569	2,648	2,620	2,519	2,542
Fenugreek	21	26	16	8	11
Garlic	17	11	15	17	14
Lentil	19	17	14	16	15
Linen	41	41	31	44	29
Lupine	8	8	8	7	7
Onion	38	24	25	29	32
Vegetables	352	358	344	327	350
Wheat	1,422	1,533	1,955	2,215	2,092
Others	52	61	46	36	35
Total	5,050	5,270	5,593	5,759	5,852
Summer Crop					
Cotton	1,014	1,006	993	851	840
Maize	1,480	1,534	1,547	1,676	1,649
Millet	308	298	312	315	335
Peanut	30	32	29	29	31
Potatoes	94	66	70	80	87
Rice	837	982	1,036	1,100	1,215
Sesame	29	25	42	57	54
Soybeans	117	92	99	101	52
Sugarcane	268	275	274	263	267
Vegetables	506	472	437	439	400
Others	236	202	216	228	241
Total	4,919	4,984	5,055	5,139	5,171
Nile Crop					
Rice	1	1	1	1	1
Millet	7	8	8	9	20
Maize	480	470	428	392	318
Potatoes	113	110	119	130	N.A.
Vegetables	183	185	164	157	154
Others	98	90	71	83	104
Total	882	864	791	772	597

Production of Main Crops　　Unit : 1,000 m.ton

Crop	Year				
	1988	1989	1990	1991	1992
Barley	120	138	142	121	234
Beans	362	640	451	466	382
Beets	726	685	575	1,106	744
Chickpeas	12	13	11	12	11
Clover seed	43	43	45	46	48
Cotton seed	532	498	504	483	N.A.
Cotton, ginned	322	296	303	299	372
Cotton, raw	882	820	838	814	971
Fenugreek	17	26	16	7	10
Garlic	142	130	185	220	186
Lentil	15	14	12	12	11
Linen seed	29	28	21	28	20
Linen	116	113	86	119	81
Lupine	7	7	7	6	6
Maize	4,088	4,529	4,798	5,122	5,069
Millet	586	585	628	675	764
Onion	662	445	577	555	606
Peanuts	26	28	26	27	30
Potatoes	1,862	1,657	1,638	1,786	N.A.
Rice	2,132	2,679	3,168	3,448	3,910
Sesame	13	12	21	29	28
Soybeans	129	91	107	120	59
Sugarcane	10,795	11,213	11,144	11,095	11,624
Strawberry	24	26	43	30	25
Vegetables	9,074	8,444	8,717	8,378	
Wheat	2,838	3,182	4,266	4,483	4,619

付属資料

1. スエズ運河東岸農村総合開発計画援助要請状及びTOR（案）
2. 調査団長略歴
3. 調査工程表
4. 面会者リスト
5. 収集資料リスト
6. 現地写真集

TECHNICAL AID PROPOSAL FOR FEASIBILITY STUDY ON INTEGRATED AGRICULTURE AND RURAL DEVELOPMENT PROJECT IN THE EAST BANK OF THE SUEZ CANAL

1. Project Title	:	**Integrated Agriculture and Rural Development Project in the East Bank of the Suez Canal**
2. Location	:	**Governorate of Ismailia and Governorate of Suez along the east bank of the Suez Canal, Arab Republic of Egypt**
3. Executing Agency	:	**Governorate of Ismailia and Governorate of Suez in cooperation with the Ministry of Agriculture, Food Security and Land Reclamation, and the Ministry of Public Works and Water Resources**
4. Proposed Source of assistance	:	**The Government of Japan through a technical assistance program by Japan International Cooperation Agency (JICA)**
5. Objective of the Study	:	**The objectives of the study are to formulate an optimum plan for integrated agriculture and rural development projects for the East Lake Region (32,500 Feddan) and Suez bank of the Suez Canal**

6. Background

The agricultural sector plays a major role in the structure of the national economy. Agricultural production is closely connected with the livelihood of the people and it represents the source of income for the majority of the population. In addition, export of agricultural products represents a part of the foreign trade of Egypt. Accordingly, the Government initiated programs for a horizontal expansion which increases the area under cultivation, and perpendicular expansion which increases the yield of the cultivated areas.

For the horizontal expansion, drastic measures have been taken in reclamation of the arid lands to increase productive cultivated areas. The area reclaimed during the period from 1952 to 1992 was about 2.5 million Feddan. As a result, the surplus labourers in the rural sector have been absorbed and are involved in the activities of land reclamation.

For the perpendicular expansion, due care has been given towards the increase in yield per Feddan. A comprehensive plan was developed for the improvement of irrigation and drainage systems. Likewise, there has been a development in the agricultural equipment and tools in use, combating harmful plant worms, diseases, insects, and developing a new and superior varieties of seeds. Consequently, the cultivation of certain crops, such as sugar cane, flax, rice, and maize expanded greatly. Meantime, there has been an increase in the average yield of the main agricultural output per Feddan.

Considerable efforts have been directed to the promotion of animal wealth. Specialized institutions have developed programs to improve the breeding and fattening of

livestocks. The Government has put a premium on the cooperatives specializing in cattle breeding through subsidies and other substantial support.

In the light of the above sectoral policy, the Government is promoting the land reclamation projects in Sinai, being situated at the geographic centre of the Middle East and having been expected to have enormous potential for the economic development of the country. There are two (2) major on-going land reclamation projects in this area, one is El-Salam Canal Project and the other Agricultural and Rural Development Project in the east bank of Suez Canal. The El-Salam Canal Project is considered to be the largest national project after the Aswan High Dam Project, reclaiming 600,000 Feddan of which 400,000 Feddan is extending in the northern Sinai along the Mediterranean Sea. The Rural Development Project in the east bank of Suez Canal with a reclaiming land of 72,500 Feddan has been implemented since 1960's as the regional development, absorbing individual farmers from Nile Valley and Delta and graduate youths.

The project area is located along the east bank of the Suez Canal from El Quantara in the north down to Suez with a length of about 90 km and a width of 3 to 6 km. The project is primarily the land reclamation for irrigated agricultural development. The project area consists of the following two (2) regions from the north down to south for the integrated agriculture and rural developments, one is the existing development region and the other under planning:

- East Lake Region : existing with a development area of 32,500 Feddan; and
- Suez East Region : under planning with a development area of 40,000 Feddan.

The total development area is 72,500 Feddan, out of which the East Lake Region (32,500 Feddan) and a part of Suez East Region (10,000 Feddan) belong to the Ismailia Governorate and the rest (30,000 Feddan) to the Suez Governorate administratively. The source of irrigation water for the project area is the Nile River, being fed from the Suez Sweet water Canal diverted from the Ismailia Canal. The water is diverted to the left bank at 92 km Point of the Suez Canal by inverted syphon with six (6) pipes at present and four (4) pipes to be added in future. The water is lifted at the main pump station for feeding the East Lake Region and also for the Suez East Region in future.

(1) East Lake Region

The project implementation of the East Lake Region was started about 30 years ago. The inverted syphon of two (2) pipes was constructed in 1961 and the first village was established in 1965 in the East Lake Region. The main irrigation canal was constructed by the Department of Land Reclamation (GARPAD), being completed partly in 1986 and fully in 1991. The main canal including booster pump stations on it was handed to the Ministry of Public Works and Water Resources for operation and maintenance. The internal works such as construction of feeder canals, terminal irrigation and drainage systems, and social infrastructure are implemented by GARPAD.

The reclaimed land is to be distributed to small farmers, graduates and investors. Six (6) villages have been established and the construction of seventh one is on-going. After providing initial operation and maintenance (O&M) by GARPAD, all the production and social facilities are gradually handed to and managed by beneficiaries in cooperation with the Governorate.

Out of 32,500 Feddan, the cultivated area is limited to about 7,000 Feddan only at present. There are many adverse factors that restrict agricultural production in this newly reclaimed land, and mainly these are: (i) shortage of fund for proper O&M; (ii) drainage problem by mis-use of irrigation system; and (iii) lack of social services for beneficiaries.

The most serious factor is the drainage problem which take place in the area of about 8,000 Feddan and potentially another 7,000 to 8,000 Feddan. Such poor drainage has been caused by excessive surface irrigation which has not been intended in the project design. This resulted in forming high ground water table and marshy spots at topographically depressed lands. Unless adequate steps will be taken at an earlier time, the reclaimed land would be deteriorated extensively by high level of ground water and possible salt concentration in cultivated soils. The Government has set up a remedial program recently, however further deep study from both technical and economic points of view and arrangement of a considerable large fund are still needed.

To boost in both quantity and quality the agricultural and agro-industrial productions in this region, it is still needed to improve and expand the agro-processing facilities and transporting networks. To support these production activities, it is necessary to strengthen the institutional setting such as extension services, credits, cooperatives and farmers association, marketing services. In addition, farmers training programs will have to be established, so that for instance such drainage problem can be minimized or eliminated. The social aspect is another important factor in view of the project sustainability. This is to encourage the farmers and investors for settlement in the newly reclaimed land and stable and beneficial productions in their respective fields. This factor would include the improvement and up-grading of social infrastructure like housing, potable water and electric supply facilities, education and health services, facilities for amenity, etc.

Although the development in this region is placed in a matured stage historically, it is facing to many difficulties which restrict benefited agricultural and agro-industrial productions as mentioned above, and also needs further expansion of development area towards the north-east. To remedy the present situation and realize intended project benefit and social welfare, it is necessary to conduct a development study for this region at the earliest date, and on this basis to implement the improvement /additional works according to those priority order.

(2) Suez East Region

The agricultural development in the Suez East Region has been set up with the same development concept as that of the East Lake Region. The Government is now to start the construction of additional syphons under the Suez Canal and a main canal of about 72 km in length with booster pump stations on it, covering the land of 40,000 Feddan. These works are funded from United Arab Emirates (UAE) with an amount of about US$ 30 million on a grant aid basis. This is to be implemented by the Ministry of Public Works and Water Resources. While, GARPAD under the Ministry of Agriculture, Food Security and Land Reclamation has started the development study of internal works as its jurisdiction. The present study is, however, still limited to topographic and pedological investigation.

The Government has an intention to expedite the implementation of the development project in this region under the current 3rd five year national plan (1992 - 1997). Having been lessoned by the development process of the East Lake Region, it is required to carry out an overall development study of the Suez East Region in respect of all the same factors as mentioned in the East Lake Region above. Based the on study results, the project works should be implemented in a right order and in a harmonized manner among the social and national requirements, fund arrangement and progress.

3. Terms of Reference

The Terms of Reference for the Feasibility Study on the Integrated Agriculture and Rural Development Project in the East Bank of the Suez Canal are given in Attachment Paper hereto.

4. Experts Assigned

The following foreign experts will be required for executing the Study:

- Team Leader
- Irrigation Engineer
- Drainage Engineer
- Agronomist
- Agro-institutional Expert
- Project Economist
- Pedologist
- Soil Mechanical Engineer
- Rural Development Expert
- Environment Expert
- Design Engineer
- Cost Estimate Expert
- Mechanical /Pump Engineer
- Building Engineer
- Geodetic Engineer
- Topographic Survey Engineer

5. Schedule of the Study

The Study will be carried out in the following two stages:

Stage - 1 : Data collection, review of previous studies, supplemental field survey and investigation, and formulation of basic development and improvement plans; and

Stage - 2 : Analysis of the results of field survey and investigation, study and preliminary design of definite development plan and improvement plans and preparation of a feasibility study report.

The period required for the Study is estimated to be 15 months in total.

(Attached Paper)

TENTATIVE TERMS OF REFERENCE FOR THE FEASIBILITY STUDY ON INTEGRATED AGRICULTURE AND RURAL DEVELOPMENT PROJECT IN THE EAST BANK OF THE SUEZ CANAL

Project Title	:	Integrated Agriculture and Rural Development Project in the East Bank of the Suez Canal
Executing Agency	:	Governorate of Ismailia and Governorate of Suez in cooperation with the Ministry of Agriculture, Food Security and Land Reclamation, and the Ministry of Public Works and Water Resources
Proposed Source of Assistance	:	The Government of Japan

1. Introduction

The agricultural sector plays a major role in the structure of the national economy. Agricultural production is closely connected with the livelihood of the people and it represents the source of income for the majority of the population. In addition, export of agricultural products represents a part of the foreign trade of Egypt. Accordingly, the Government initiated programs for a horizontal expansion which increases the area under cultivation, and perpendicular expansion which increases the yield of the cultivated areas.

For the horizontal expansion, drastic measures have been taken in reclamation of the arid lands to increase productive cultivated areas. The area reclaimed during the period from 1952 to 1992 was about 2.5 million Feddan. As a result, the surplus labourers in the rural sector have been absorbed and are involved in the activities of land reclamation.

For the perpendicular expansion, due care has been given towards the increase in yield per Feddan. A comprehensive plan was developed for the improvement of irrigation and drainage systems. Likewise, there has been a development in the agricultural equipment and tools in use, combating harmful plant worms, diseases, insects, and developing a new and superior varieties of seeds. Consequently, the cultivation of certain crops, such as sugar cane, flax, rice, and maize expanded greatly. Meantime, there has been an increase in the average yield of the main agricultural output per Feddan.

Considerable efforts have been directed to the promotion of animal wealth. Specialized institutions have developed programs to improve the breeding and fattening of livestocks. The Government has put a premium on the cooperatives specializing in cattle breeding through subsidies and other substantial support.

In the light of the above sectoral policy, the Government is promoting the land reclamation projects in Sinai, being situated at the geographic centre of the Middle East and having been expected to have enormous potential for the economic development of the country. There are two (2) major on-going land reclamation projects in this area, one is El-Salam Canal Project and the other Agricultural and Rural Development Project in the east bank of Suez Canal. The El-Salam Canal Project is considered to be the largest

national project after the Aswan High Dam Project, reclaiming 600,000 Feddan of which 400,000 Feddan is extending in the northern Sinai along the Mediterranean Sea. The Rural Development Project in the east bank of Suez Canal with a reclaiming land of 72,500 Feddan has been implemented since 1960's as the regional development, absorbing individual farmers from Nile Valley and Delta and graduate youths.

2. Project Background

2.1 General

The project area is located along the east bank of the Suez Canal from El Quantara in the north down to Suez with a length of about 90 km and a width of 3 to 6 km. The project area is on the arid region with warm temperature year round ranging from 14°C in January to 30°C in August on monthly average. The rainfall is very limited with 30 mm on an annual average recorded in Ismailia. The majority of agricultural land is on the sandy soil. The project area is considered to be on the marginal zone for benefitted agriculture in view of such adverse natural conditions, however adequate land reclamation and social development promise an economic enhancement on the basis of agriculture and agro-based industry by full utilization of water drawn from the Nile River through Ismailia Canal.

The project is primarily the land reclamation for irrigated agricultural development. The project area consists of the following two (2) regions from the north down to south for the integrated agriculture and rural developments, one is the existing development region and the other under planning:

- East Lake Region : existing with a development area of 32,500 Feddan; and
- Suez East Region : under planning with a development area of 40,000 Feddan.

The total development area is 72,500 Feddan, out of which the East Lake Region (32,500 Feddan) and a part of Suez East Region (10,000 Feddan) belong to the Ismailia Governorate and the rest (30,000 Feddan) to the Suez Governorate administratively. The source of irrigation water for the project area is the Nile River, being fed from the Suez Sweet water Canal diverted from the Ismailia Canal. The water is diverted to the left bank at 92 km Point of the Suez Canal by inverted syphon with six (6) pipes at present and four (4) pipes to be added in future. The water is lifted at the main pump station for feeding the East Lake Region and also for the Suez East Region in future.

2.2 East Lake Region

The project implementation of the East Lake Region was started about 30 years ago. The inverted syphon of two (2) pipes was constructed in 1961 and the first village was established in 1965 in the East Lake Region. The main irrigation canal was constructed by the Department of Land Reclamation (GARPAD), being completed partly in 1986 and fully in 1991. The main canal including booster pump stations on it was handed to the Ministry of Public Works and Water Resources for operation and maintenance. The internal works such as construction of feeder canals, terminal irrigation and drainage systems, and social infrastructure are implemented by GARPAD.

The reclaimed land is to be distributed to small farmers, graduates and investors. Six (6) villages have been established and the construction of seventh one is on-going. After providing initial operation and maintenance (O&M) by GARPAD, all the production and social facilities are gradually handed to and managed by beneficiaries in cooperation with the Governorate.

Out of 32,500 Feddan, the cultivated area is limited to about 7,000 Feddan only at present. There are many adverse factors that restrict agricultural production in this newly reclaimed land, and mainly these are: (i) shortage of fund for proper O&M; (ii) drainage problem by mis-use of irrigation system; and (iii) lack of social services for beneficiaries. The most serious factor is the drainage problem which take place in the area of about 8,000 Feddan and potentially another 7,000 to 8,000 Feddan. Such poor drainage has been caused by excessive surface irrigation which has not been intended in the project design. This resulted in forming high ground water table and marshy spots at topographically depressed lands. Unless adequate steps will be taken at an earlier time, the reclaimed land would be deteriorated extensively by high level of ground water and possible salt concentration in cultivated soils. The Government has set up a remedial program recently, however further deep study from both technical and economic points of view and arrangement of a considerable large fund are still needed.

To boost in both quantity and quality the agricultural and agro-industrial productions in this region, it is still needed to improve and expand the agro-processing facilities and transporting networks. To support these production activities, it is necessary to strengthen the institutional setting such as extension services, credits, cooperatives and farmers association, marketing services. In addition, farmers training programs will have to be established, so that for instance such drainage problem can be minimized or eliminated. The social aspect is another important factor in view of the project sustainability. This is to encourage the farmers and investors for settlement in the newly reclaimed land and stable and beneficial productions in their respective fields. This factor would include the improvement and up-grading of social infrastructure like housing, potable water and electric supply facilities, education and health services, facilities for amenity, etc.

Although the development in this region is placed in a matured stage historically, it is facing to many difficulties which restrict benefited agricultural and agro-industrial productions as mentioned above, and also needs further expansion of development area towards the north-east. To remedy the present situation and realize intended project benefit and social welfare, it is necessary to conduct a development study for this region at the earliest date, and on this basis to implement the improvement /additional works according to those priority order.

2.3 Suez East Region

The agricultural development in the Suez East Region has been set up with the same development concept as that of the East Lake Region. The Government is now to start the construction of additional syphons under the Suez Canal and a main canal of about 72 km in length with booster pump stations on it, covering the land of 40,000 Feddan. These works are funded from United Arab Emirates (UAE) with an amount of about US$ 30 million on a grant aid basis. This is to be implemented by the Ministry of Public Works and Water Resources. While, GARPAD under the Ministry of Agriculture, Food Security and Land Reclamation has started the development study of internal works as its jurisdiction. The present study is, however, still limited to topographic and pedological investigation.

The Government has an intention to expedite the implementation of the development project in this region under the current 3rd five year national plan (1992 - 1997). Having been lessoned by the development process of the East Lake Region, it is required to carry out an overall development study of the Suez East Region in respect of all the same factors as mentioned in the East Lake Region above. Based the on study results, the project works should be implemented in a right order and in a harmonized manner among the social and national requirements, fund arrangement and progress.

3. Objective of the Study

The objectives of the study are to formulate an optimum plan for integrated agriculture and rural development projects for the East Lake Region (32,500 Feddan) and Suez East Region (40,000 Feddan) along the east bank of the Suez Canal

4. Scope of the Study

4.1 Extent and Schedule of the Study

The Feasibility Study (the Study) on the Integrated Agriculture and Rural Development Project in the East Bank of the Suez Canal (the Project) will be made in respect of the following development aspects and confirm the technical soundness and economic and financial viability of the Project:

(1) Rehabilitation and improvement of the existing irrigation and drainage facilities in the East Lake Region and possible extension of these facilities;

(2) Development of irrigation and drainage system from the main facilities down to terminal ones in the Suez East Region;

(3) Agricultural and agro-industrial development in both the regions including agricultural extension services, credits, cooperatives and farmers' association, marketing services, training programs, post harvest and agro-processing facilities, etc.; and

(4) Development and improvement of social infrastructure including transportation network, potable water and electric supply facilities, community and amenity facilities, health and education services, etc.

The Study will be divided into the following two (2) stages:

Stage - 1 : Data collection, review of previous studies, supplemental field survey and investigation, and formulation of basic development and improvement plans; and

Stage - 2 : Analysis of the results of field survey and investigation, study and preliminary design of definite development and improvement plans and preparation of a feasibility study report.

4.2 Stage - 1

4.2.1 Supplemental Topographic Survey

Carry out supplemental topographic survey to verify the existing aero-photo maps of the project area on a scale of 1:10,000.

4.2.2 Data Collection and Review

Collect, review and analyze following data and information as well as the previous studies related to the project:

- Meteorology and hydrology;
- Soil and land use;
- Demographic condition;
- Agriculture and livestock;

- Land holding and tenure;
- Market and prices of agricultural input and output;
- Infrastructure;
- Agro-industries;
- Agro-economy; and
- O&M conditions of existing irrigation facilities;

4.2.3 Supplemental Survey and Analysis

Carry out field investigation and survey on the following items, and analyze the results:

- Soil and land use;
- Groundwater and salinity;
- Irrigation water supply and quality;
- Inventory of existing irrigation and drainage facilities;
- Geology at major project facilities;
- Post harvest facilities;
- Social infrastructure;
- Agriculture and agro-economy;
- Agricultural supporting system;
- Marketing;
- Socio-economy;
- Environment; and
- Construction materials and equipment.

4.2.4 Identification and Evaluation of Present Constraints

a) Identify and evaluate the present conditions for and constraints to the agricultural and rural development of the East Lake Region including drainage problems due to high groundwater level, irrigation and farming methods, water distribution, social welfares for settlers, O&M and agro-supporting systems, etc.; and

b) Identify and evaluate the present conditions before the development in the Suez East Region, and constraints to its future development including water balance of Ismailia Canal.

4.2.5 Formulation of Preliminary Agricultural and Rural Development Plan

a) Study and formulate agricultural development plan including proposed land use, cropping patterns, farming practices, input and labour requirement for both individual farmers and investors;

b) Study preliminary plan of organization and procedure for project O&M and agricultural supporting systems;

c) Study preliminary plan of post harvesting and agro-processing facilities including those management frameworks and marketing; and

d) Study preliminary plan of village and community development.

4.2.6 Formulation of Preliminary Development and Improvement Plan for Physical Works

a) Delineate the project area including phasing for development and improvement; and

b) Prepare preliminary plan for irrigation and drainage system including rehabilitation and improvement of existing irrigation and drainage facilities.

4.2.7 Preliminary Implementation Schedule and Economic Evaluation of the Project

a) Study project implementation schedule for alternative development sequence including preliminary project costs; and

b) Evaluate economic viability and technical soundness of the project for alternative development sequence of the project.

4.2.8 Environmental Aspects and Women Involvement Studies

a) Clarify the present constraints to the integrated agriculture and rural development from the view point of environment in the project area;

b) Clarify the present environmental problems and assess impacts of the rural development on social and natural environment in the project area, including losses of social and farming practices, effect on water pollution, etc;

c) Clarify women involvement in the present irrigated agriculture and rural activities and assess that under the project.

4.3 Stage - 2

4.3.1 Formulation of Definitive Development Plan

On the basis of the investigation and study made in Stage - 1 above, formulate the definitive development plan of the project in respect of:

- the project area to be developed and improved including preparation of layouts of the project facilities;
- the best sequence of the project implementation and select the priority schemes to be implemented;
- the agriculture including land use, cropping pattern, farming practices, input levels, labour management, etc.for both individual farmers and investors and agro-supporting system;
- the organization and procedure best suited for effective operation and maintenance of the project
- the post harvesting networks coupled with agro-industry and marketing development; and
- the social infrastructure for rural development;

4.3.2 Preliminary Design of Project Facilities and Implementation Schedule

a) Design the rehabilitation works of existing irrigation and drainage facilities;

b) Design irrigation and drainage canals and related facilities;

c) Design infrastructure for agriculture and rural development including up-grading works of existing infrastructure; and

d) Prepare implementation schedule for the entire development and priority scheme.

4.3.3 Cost Estimate and Evaluation

a) Estimate investment cost for implementation and annual cost for project O&M;

b) Estimate economic cost and benefit; and

c) Evaluate economic and financial feasibility for the overall project development and implementation of priority scheme;

5. Transfer of Technology

In the course of the Study, transfer of technology and training will be provided to Egyptian experts participating the Study directly and indirectly by foreign experts in the following fields:

a) Field survey and investigation for every lines of foreign experts assigned; and

b) Plan and design of facilities for irrigation, drainage and agro-infrastructure.

The above transfer of technology will be carried out in the form of on-the-job training and seminar. Overseas training will also be programmed.

6. Schedule of the Study and Reporting

The period required for the Study is estimated to be 15 months in total. A tentative study schedule is shown in Attachment-2.

The following reports will be prepared in the course of the Study:

a) Inception report	:	Within one (1) months from the commencement of the Study;
b) Interim Report	:	Within six (6) months from the commencement of the Study;
c) Draft feasibility Study report	:	Within 13 months from the commencement of the Study; and
e) Feasibility report	:	Within 15 months from the commencement of the Study.

7. Experts Assigned

The following foreign experts will be required for executing the Study:

Team Leader
Irrigation Engineer
Drainage Engineer
Agronomist
Agro-institutional Expert
Project Economist
Pedologist
Soil Mechanical Engineer
Rural Development Expert
Environment Expert
Design Engineer
Cost Estimate Expert
Mechanical /Pump Engineer
Building Engineer
Geodetic Engineer
Topographic Survey Engineer

8. Undertakings of the Government of the Arab Republic of Egypt

In order to facilitate a smooth and effective conduct of the Study, the Government of the Arab Republic of Egypt shall take the necessary measures;

(a) to secure the safety of the Study Team

(b) to permit the members of the Study Team to enter, leave and sojourn in the Arab Republic of Egypt in connection with their assignment therein, and exempt them from alien registration requirement and consular fees.

(c) to exempt the Study Team from taxes, duties and other charges on equipment, machinery and other materials brought into and out of the Arab Republic of Egypt for conduct of the Study.

(d) to exempt the Study Team from income tax and charges of any kind imposed on or connection with any emoluments or allowances paid to the members of the Study Team for their services in connection with the implementation of the Study.

(e) to provide necessary facilities to the Study Team for remittance as well as utilization of the funds introduced in the Arab Republic of Egypt from Japan in connection with the implementation of the Study.

(f) to secure permission or entry into private properties or restricted areas for the conduct of the Study.

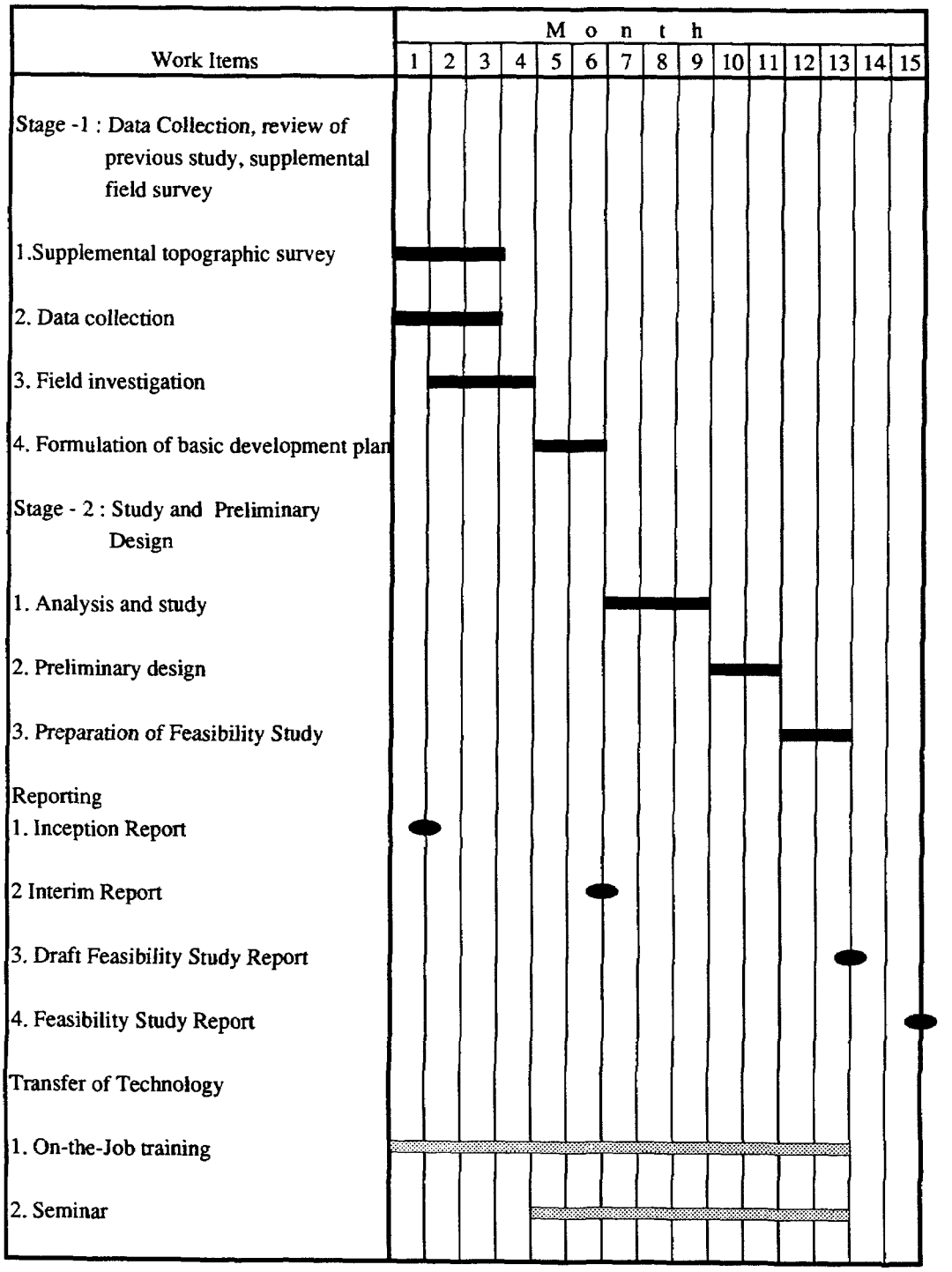
(g) to secure permission for the Study to take all data, documents and necessary materials related to the Study out of the Arab Republic of Egypt to Japan.

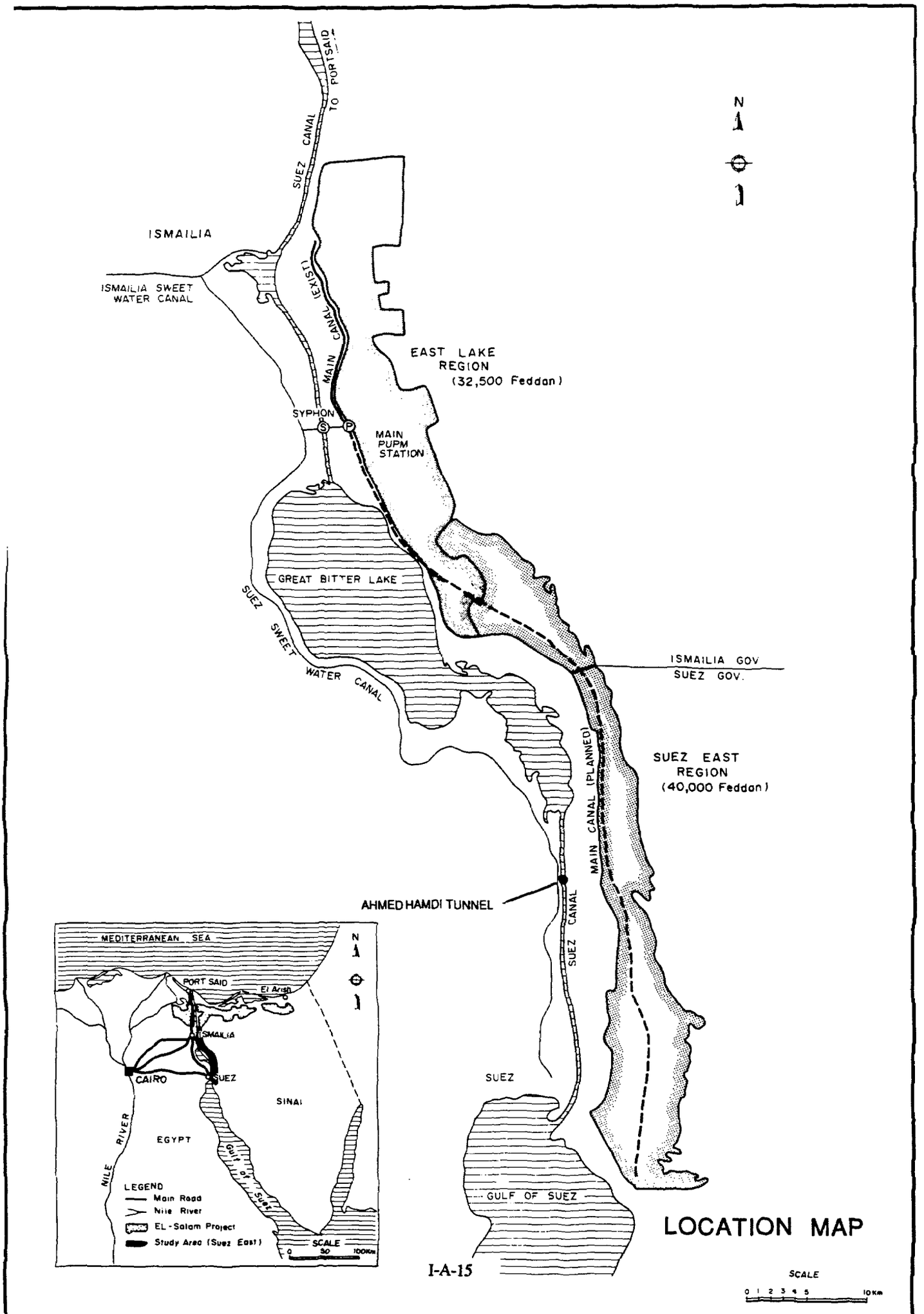
(h) to provide medical services as needed. Its' expenses will be chargeable to members of the Study Team.

The Government of the Arab Republic of Egypt will bear claims, if any arises against members of the Japanese Study Team resulting from, occurring in the course of

or otherwise connected with the discharge of the their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Study Team. The Government of the Arab Republic of Egypt shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non governmental organizations concerned for the smooth implementation of the Study.

Study Schedule for Feasibility Study on
Integrated Agricultural and Rural Development Project in the East Bank of the Suez Canal




SUEZ CANAL
TO PORTSAID
ISMAILIA
ISMAILIA SWEET WATER CANAL
MAIN CANAL (EXIST)
EAST LAKE REGION (32,500 Feddan)
SYPHON
S
P
MAIN PUPM STATION
GREAT BITTER LAKE
SUEZ SWEET WATER CANAL
ISMAILIA GOV
SUEZ GOV.
SUEZ EAST REGION (40,000 Feddan)
MAIN CANAL (PLANNED)
AHMED HAMDI TUNNEL
SUEZ CANAL
SUEZ
GULF OF SUEZ
N
MEDITERRANEAN SEA
PORT SAID
El Arish
ISMAILIA
CAIRO
SUEZ
SINAI
EGYPT
NILE RIVER
GULF OF SUEZ
LEGEND
Main Road
Nile River
EL-Salam Project
Study Area (Suez East)
SCALE
0 50 100Km
LOCATION MAP
SCALE
0 1 2 3 4 5 10Km

調査団長略歴

調査員名	略歴
村井　浩	
1947.11.19生	
1971.3	九州大学農学部農業工学科卒業
1971.4	日本工営株式会社入社
1971.4	日本工営（株）農業部
1971.7	日本工営（株）設計第1部
1975.9	日本工営（株）メスケネ開発事務所（シリア）
1977.4	日本工営（株）農業水利部
1979.11	日本工営（株）カンカイ開発事務所（ネパール）所長
1985.6	日本工営（株）第1農業水利部副参事
1987.1	日本工営（株）ナラヤニ開発事務所（ネパール）所長
1990.1	日本工営（株）農業開発部　課長
1992.2	日本工営（株）メスケネ開発事務所（シリア）所長

主な海外業務実績

案件名	対象国	従事期間	担当業務
ビンディン灌漑開発計画	ヴェトナム	1973.7- 1975.4	灌漑排水計画・設計
メスケネ灌漑計画	シリア	1975.9 - 1977.4	灌漑排水計画・設計
リアムカナン灌漑計画	インドネシア	1977.7 - 1979.3	灌漑排水計画
カンカイ灌漑計画	ネパール	1979.11 - 1985.6	総括／灌漑排水計画・設計 施工監理・水監理
スンサリモラン灌漑計画	ネパール	1986.7 - 1986.12	灌漑排水計画
ナラヤニ灌漑計画	ネパール	1987.1 - 1991.1	総括／灌漑排水計画・設計 施工監理・水監理
メスケネ灌漑計画	シリア	1992.2 - 現在	総括／灌漑排水計画 施工監理・水監理

調査行程表

日順	月日	起点・経由地	目的地・滞在地	活動
1	11月26日（金）	東京		出発
2	11月27日（土）			移動
3	11月28日（日）			移動
4	11月29日（月）	ダマスカス	カイロ	移動
5	11月30日（火）		スエズ	大使館、公共事業・水資源省表敬訪問、現地踏査
6	12月1日（水）		カイロ	イスマイリア県庁表敬訪問、現地踏査、資料収集
7	12月2日（木）		カイロ	土地開拓局表敬・資料収集、JICA表敬訪問・報告
8	12月3日（金）		カイロ	資料整理
9	12月4日（土）		カイロ	土地開拓局協議・資料収集・整理
10	12月5日（日）	カイロ		JICA・大使館報告、出国

面会者リスト

Ministry of Public Works and Water Resources

1.	Mr. Ahmed Mazen	Assistant Minister and Chairman of Sinai Authority
2.	Dr. Abdel Abd El Majeed	Advisor to Chairman of Sinai Authority
3.	Mr. Soliman M. Abou-Zeid	Project Director, Main System Management Project
4.	Mr. Issa Mohamed	Under Secretary, Project Manager of Canal Region
5.	江上　博司	派遣専門家

Ministry of Agrculture, Food Security and Land Reclamation

6.	Mr. Hassan Abu El Nasr	Assistant Minister
7.	Mr.Abd Dl Moneem	General Director of Land
8.	Mr. Mohamed El Tomy	General Manager of Projects

Ismailia Governorate

9.	Dr. Ahmed Gaily	Governor of Ismailia
10.	Dr. Ali Abdelrahman	Researcher of Agricultural Economics,

在エジプト国日本大使館

11.	皆川　猛	書記官
12.	東　俊夫	書記官

在エジプト国JICA事務所

13.	篠浦　烈	所長
14.	長沢　一秀	次席

収集資料リスト

- Statistical Year Book 1952 - 1992, June 1993
- Sinai Development Study, Phase I Final Report, March 1985
- The Environmental Profile of Ismailia Egypt, July 1993
- Ismailia Governorate, Agricultural Economic Research Unit, Agricultural Projects at the East Side of the Lakes
- El Salam Canal Project for Reforming and Cultivating 600,000 Acres, Ministry of Public Works and Water Resources
- Project Layout Maps for East Lake Region
- Project Layout for Suez East Region

現地写真集（エジプト・アラブ共和国編）

湖東地区・スエズ東部地区主揚水機場

湖東地区幹線水路

現地写真集（エジプト・アラブ共和国編）

湖東地区内灌漑支線水路

湖東地区・放置されたピボット散水機と湛水状況

エリトリア国編

アスマラ南部地区農業生産基盤復旧改善計画

II. エリトリア国編

1. 背景

1.1 国土と人口

エリトリア国は紅海に面し、北緯12度22分－17度58分、西経36度28分－43度7分の範囲に位置している。東側は紅海に面し、南側はエチオピアに、西北はスーダンに隣接している。国土面積は124,432 km2（日本の約1/3）である。気候的にエリトリア国は寒冷高地、東部低地及び西部低地の大きく３つの地域に分けることができる。寒冷高地の年間降雨量は500 - 650 mm、東西の低地では200 - 400 mm程度であり、寒冷高地と西部低地は6月－9月が雨期、一方西部低地は10月－2月が雨期となっている。

過去30年にわたるエチオピアからの独立闘争によるかなりの人的資源の損失があり、また正確な人口統計もないが、1993年の推定でエリトリア国の人口は約350万人と推定されている。また首都アスマラ(Asmara)の人口は約28万人と推定されている。

1.2 社会経済

エリトリア国は1890年にイタリアの植民地となり、第2次大戦後に一時イギリスが統治、1952年、国連提案によりエチオピアと連邦を形成する自治州となったが、1962年にエチオピアが併合した。しかし、併合直後から分離独立を目指す意思が強く、これを制圧しようとするエチオピア政府軍との紛争が続いた。エリトリア人民解放戦線(EPLF)を主体に独立闘争を展開し一時かなりの消耗を強いられたが、1982年以降次第に勢力を回復し、1990年に入ってエリトリア州の85%を支配下におさめた。1989年には米国の仲介が始まりエチオピア中央政府も次第に和平に積極的になった。1991年5月、エチオピア人民革命民主戦線(EPRDF)の武力攻撃によってメンギスツ政権は打倒された。1993年4月、国連監視下での住民投票（投票率98%）の結果、独立賛成票が99%の高率を占め、解放2周年目の1993年5月24日独立宣言を行ない、アフリカで53番目の独立国となった。

30年近く続いた独立闘争はエリトリア国の経済基盤を殆ど壊滅させ、特に農地の荒廃で国民の80%が従事する農業の生産基盤の破壊が著しい。一人当たりの国民総生産は1993でUS$120程度と推定されている。今後の経済発展には諸外国、国際機関の技術・資金援助が不可欠である。また、自然・社会統計等の基礎的資料も殆ど散逸している模様で今後の経済再建と共に整備されねばならない。

1.3 農業の現状

エリトリア国の経済は全く農業に依存していると言って差し支えない。人口の80%が農業部門に属し、

国内総生産（GDP）の50%を農業部門が占めている。過去30年間にわたる独立戦争と80年代からの打ち続く干魃で農業生産量は1960年代の半分から3分の1に減少したと言われているが、この30年間農業行政は見捨てられたままで、従って農業に関する有効な統計・情報は殆ど無い。

エリトリア国の主な農作物は大麦、テフ（稗の一種でエリトリア国民の主食）、トウモロコシ、ソルガム、小麦、豆類等で、その殆どは天水による栽培で収量も極めて低く、どの作物についてもha当たり1tonにも満たりない。1960年代にはかなりの農作物を生産し、1963年には豆類、綿実、果実、落花生、ミレット、トウガラシ等93,000 tonもの農産物を輸（移）出したという記録がある。

農地あるいは農業が可能な土地は国土面積の26%に相当する320万 haあるといわれているが、その内耕作されているのは高々10%に過ぎない。農地の所有形態は一部の私有を除いて村落レベルの共同保有で各個人農家に配分され定期的に農地の交換（ローテーション）を行なっている。

1.4 国家開発計画

1993年5月に独立したエリトリア国はその復興に着手したばかりであり、すべての経済活動基盤と社会生活基盤を再建しなければならないと言っても過言ではない。エリトリア政府は「エリトリア復興・改修事業」(Recovery and Rehabilitation Project for Eritrea)政策を掲げ1993年3月時点での事業予算は約147百万米ドルで、内85%を外国からの援助に期待している。各分野の配分は下記の通りである。

分野	事業費(US$ Million)	（率）
農業	18	(12.2)
産業	47	(32.0)
社会インフラ	6	(42.2)
福祉関連	10	(6.8)
行政等、他	10	(6.8)
合計	147	(100)

農業分野の復興はエリトリア政府の優先政策であり、農業開発を策定・実施に当たっては特に下記の5点に重点を置いて復興事業を推進することとしている。

(1) 食糧安全保証

(2) 雇用増大

(3) 国内産業への原材料の供給

(4) 農産物の輸出による外貨獲得

(5) 環境復興・保全

2. アスマラ南部地区農業生産基盤復旧改善計画

2.1 事業の背景

農業は30年に及ぶ独立戦争で最も打撃を受けた産業・経済部門の一つである。被害は人的資源の減少は勿論、灌漑施設や道路等の流通施設等の生産基盤の崩壊、更には戦争作戦中の森林破壊とこれに起因する土壌侵食に及んでいる。戦争のため農民は農地を放棄せざるを得ず、独立後には荒廃した農地が放置されたままであった。このような状況でエリトリア政府に課せられた農業部門における緊急な開発目標は(i)農業生産を増大し、(ii)国民に安価な食糧調達を可能ならしめることにある。この実現に向けてエリトリア政府は近代的な農業資材と農業技術の導入、高い生産性をもつ農地の拡大、牧畜業の改善、持続的な農業開発を可能ならしめるバランスのとれた生態系の保持、及び灌漑施設の整備を行なうこととしている。

一方、水資源についてはエリトリア国内にはMereb/Gash, Barka,及びAnseba の3つの主要河川があり、またエリトリアとエチオピアの国境を流れるTekeze/Setit河がある。後者を除く前記の3河川は雨期にのみ流出がある季節河川であるが、Gash河の年間総流出量は6億m^3, Setit河は10億m^3を越す流出量を有している。しかしどの河川についてもまだ開発の手はつけられていない。この他多数の小河川が縦横に流れている。また浅層・深層地下水資源の存在も確認されており、一部で果樹栽培などに開発されている。従い、主要河川での貯水池建設、小河川での雨期流出の溜池貯留や地下水涵養、井戸の建設等, 適切な水資源開発により灌漑面積の拡大を図ることが可能で、60万ha程度の農地の灌漑が可能と推定されている。

独立闘争の終了につれて農民が元の農地に戻りだしたが、農地の荒廃と生産基盤施設の崩壊で思うように生産を上げることができないのが実情である。この状況は全国的なものであり、灌漑施設、農村道路等の農業生産基盤の復旧と改善はエリトリア政府の緊急の課題である。とりわけアスマラ南部地区のAkeke-GuzayとSereyeの両州はエリトリア人民解放戦線による解放が最後まで遅れ、新エリトリア政府の開発の手が一番遅れている地域である。更にこの地域は他に比べて人口密度も高く小農が農業の担い手である。この地区はかってはエリトリア国民の主食であるテフやトウモロコシの大生産地であり、余剰農産物を産み出した数少ない地域であった。また首都アスマラに隣接し、紅海に面するエリトリアの主要貿易港であるマサワ(Massawa)へも短時間でアクセスできる等、経済上有利な地理的位置にある。このような歴史的背景と経済的好条件を有す当地域の農業開発、特に既存農業生産基盤施設の復旧と改善及び新規導入による農業生産の増大で住民の生活水準の向上を図ることは勿論、食糧確保、雇用増大、国内産業への原材料の供給等の農業開発目標に資するとして、エリトリア政府は当地域の農業開発に最も高い優先順位を

与えている。

2.2 計画地区の概要

調査地区は首都アスマラの南からエチオピア国境付近に至るまでの直線距離で約70 km、幅約50 kmの地域に点在する。当地域は行政的にはAkele-GuzayとSerayeの2州に属している。調査地区の標高は概ね海抜1,500 mから2,000 mまでの間にあり、折り重なるような山・丘陵の中に比較的平坦な盆地や平原から成っているが、戦争中に作戦上の必要性と駐屯軍の燃料にするためエチオピアによって森林、灌木は切り払われ植生は貧弱である。調査地域の年雨量は400 mm － 600 mmで7月と8月の2ヶ月に集中しており、したがって地域内の河川の流出はこの雨期に限られている。地域内には下記に示す2つの盆地と1つの平原がある。

- アラ盆地 (Ala Plain) ： 10,000 ha
- ハゼモ盆地 (Hazemo Plain) ： 30,000 ha
- メレブ上流平原 (Upper Mereb Plateau) ： 30,000 ha

前章で述べた通り、上記の地域はかっては大農業生産地であり、主要作物はテフ、ソルガム、大麦、トウモロコシ、ミレット等の穀類と柑橘類、パパイヤ等の果樹類である。農民も元の農地に戻り生産を開始しだし、盆地では小河川を簡単に締め切った原始的な表流灌漑施設、一部小型ポンプを導入した小規模灌漑、井戸による灌漑などが認められ、また平原では溜池による灌漑施設が多く認められる。しかしながら農地自体は勿論、灌漑施設や農村道路等の農業生産基盤の荒廃は著しく、今後農業生産を向上させ、その維持を図るにはこれら生産基盤の復旧と改修を緊急に実施せねばならない。

2.3 開発計画の概要

本開発計画の目的は調査地区内に点在する既存の農業生産地区の灌漑施設を含む農業生産基盤施設の復旧と改善を実施することにより、農業生産の向上と安定した生産体勢を樹立し、地域農民の生活水準の向上を図り、更に逼迫する国内食糧事情を緩和させることにある。本地域の農業開発は下記に示す４ヶ所の既存灌漑地区を中心に地域内の農業生産可能地区の開発を推進することにあるが、これまでに基礎的な調査もなされておらず、地域の開発可能性を検証するためにまず総合的なマスタープラン調査を実施が不可欠である。

	地区名（暫定）	灌漑面積(ha)	州
(1)	Tedrer Plain Irrigation	2,000	Akele-Guzay
(2)	Upper Mereb Tributary Distribution	4,000	Seraye
(3)	Hazemo Groundwate Irrigation	1,000	Akele-Guzay
(4)	Tserona Groundwater Irrigation	- to be identified -	Akele-Guzay

地区内には通年で表流水がある川は殆どないので、雨期の流出を貯留し、地下水涵養の目的も含めた小規模貯水池の建設、地下水の開発等により灌漑水源の確保を図る。また水源から各農地への水路と付帯施設の復旧、改修、改善と新規施設の建設を実施することとなる。また、計画地区の灌漑・農業生産活動を円滑に実施すると共に、農民の生活水準の向上のために既存農村道路の改修と拡充、飲料雑用水供給施設、収穫後処理施設、共同組合施設等の生産・社会基盤の整備も必要となる。

2.4 協力への展望

30年に及ぶ独立戦争で殆どの生産基盤・社会施設は壊滅的な打撃を受けてこれから国家の再建に取り掛かろうとしている現在、どの経済部門も夫々に優先開発の必要性を訴えている。とりわけ逼迫した食糧需給という観点から農業部門への開発投資は緊急の政治目標として位置づけられている。エリトリア政府及び農業省は経済・地理的要因から特アスマラ南部地域の農業復興計画を優先事業とし、この復興事業を日本政府の無償資金協力援助で実施することに強い要請があった。しかしながら本地域の農業開発・復興事業を実施するには基礎的な情報が全く不足していることから、計画の具体化に向けて総合的な開発調査を行ない、どの事業で日本政府の援助協力が可能であるか詳細な検討が必要である。本地区の開発調査では調査地区全体のマスタープラン調査により開発地区の選定と各事業計画を策定し、優先開発地区についてより詳細なフィージビリティー調査を実施するものとする。

更にエリトリア政府農業省の意向として、日本政府の資金協力が実現するまでに本地域で緊急に復旧が必要な農業生産施設については自助努力で復旧・改修工事を実施するとしているが、そのための建設機械を含む資機材を日本政府に無償援助協力で供与することに強い要請があった。要請のあった資機材のリストは別紙に示す通りであるが、現地ではこれら資機材の欠如で多くの人力と時間をかけて井戸の掘削や農業施設の復旧を行なっているのが実情である。

Ministry of Agriculture
List of Machinery
for Rehabilitation of Agricultural Infrastructure
in Asmara Southern Region

No.	Description	Nos.
1.	Crane (60 ton)	2
2.	Wood work machine	1
3.	Lathe machine	1
4.	Bulldozer (D-8/D-9)	To be decided
5.	Truck with trailer	To be decided
6.	Scraper	To be decided
7.	Loader	To be decided
8.	Grader	To be decided
9.	Vibrating compactor	To be decided
10.	Concrete vibrator	To be decided
11.	Concrete mixer	2
12.	Forklift	2
13.	Drugline	1
14.	Stone crusher	3
15.	Dump truck	To be decided
16.	Drilling unit with compressor	2
17.	Generator (10 - 15HP)	10
18.	Drilling rig	1
19.	Steel materials	
	- Angle	1 lot
	- Round bar	1 lot
	- Steel sheet	1 lot
	- Gate shaft	1 lot
20.	Pipes	
	- GI pipe	1 lot
	- Plastic pipe	1 lot
21.	Pipe fittings	1 lot

付属資料

1. アスマラ南部地区農業生産基盤復旧改善計画援助要請状及びTOR（案）
2. 調査団長略歴
3. 調査工程表
4. 面会者リスト
5. 収集資料リスト
6. 現地写真集

TECHNICAL AID PROPOSAL FOR MASTER PLAN STUDY ON REHABILITATION AND IMPROVEMENT OF AGRICULTURAL INFRASTRUCTURE IN ASMARA SOUTHERN REGION

1. Project Title	:	**Rehabilitation and Improvement of Agricultural Infrastructure in Asmara Southern Region**
2. Location	:	**Akele Guzay and Seraye Province in the Southern Part of Asmara, Capital of Eritrea**
3. Executing Agency	:	**The Ministry of Agriculture, The Government of Eritrea**
4. Proposed Source of assistance	:	**The Government of Japan through a technical assistance program of Japan International Cooperation Agency (JICA)**
5. Objective of the Study	:	**The objective of the Study is to formulate a Master Plan on urgent rehabilitation in the southern region of Asmara and improvement of agricultural infrastructure and to conduct a feasibility study of priority schemes selected in the Master Plan Study.**

6. Background

Agriculture is the mainstay of the Eritrean economy, holding about 80% of the population and contributes to about 50% of GDP and to the bulk of export earning. Agriculture is the one of the sectors seriously affected by the prolonged war over the past three decades. War damages include destruction and replacement of human beings, the destruction of infrastructure such as irrigation systems, transportation networks and deforestation which accelerated the soil erosion vastly. A great number of farmers had to leave villages during the war, and the agricultural lands were left uncultivated for a long period. This resulted in the seriously degraded environment for rural living and agricultural production. Now, farmers are returning to their home lands and have started farming, however agricultural production cannot be boosted easily due to these constraints.

Notwithstanding its present poor condition, the Eritrean agriculture has a good potential or growth. There is ample land and water resource potential to sustain reasonably efficient and rapid development of the sector. Out of the total land area of 12.5 million ha, about 3.2 million (26%) is suitable for agricultural use, of which only about 10% is currently under cultivation. Eritrea has also, if developed, a considerable water resource potential (surface and groundwater) to irrigate around 0.6 million ha. This can be tapped through dams across major rivers, small-catchment dams to conserve run-off water during

the rainy season, and boring wells to exploit underground water. While, Eritrea has diversified agro-climatic zones suitable for a wide-range of crops and livestock production, a strategic location for accessing the markets of Europe and Middle East, and a hard working and industrious people.

The urgent need of the Government of Eritrea is to mitigate the food problem and to improve the living standard of Eritrean people. Therefore, the Government places an emphasis strongly on the rapid agricultural development as the top priority policy. The Department of Agriculture is the prime agency to execute this policy with the objectives to achieve:

i. food security;
ii. employment generation;
iii. raw material supply to domestic industries;
iv. foreign exchange earning through direct and indirect exports; and
v. environmental protection and restoration.

The study area is located in the southern part of Asmara, national capital of Eritrea, within a length of about 70 km from Asmara down to the border of Eritrea and Ethiopia and with a width of about 50 km. The area belong administratively to the Akele-Guzay Province and Seraye Province. The area is composed of manifold hills, relatively flat plateaus and lowland plains. There are following two (2) plains and a plateau where the agriculture has been developed, but that require the urgent rehabilitation and improvement of agricultural infrastructure:

- Ala Plain (10,000 ha);
- Hazemo Plain (30,000 ha); and
- Upper Mereb Plateau (30,000 ha).

This area is well known for taff, a kind of finger millet and staple food of Eritrea, and maize production traditionally, and it was one of the few surplus producer regions in Eritrea. However, the area was severely affected by war and drought. It is reported that it was the lastly liberated rural area and could therefore not be reached by all the development efforts off EPLF.

At present, almost all the regions and sectors require the restoration and developments since the prolonged war eradicated the basis of national economy and social welfare. It is not over-stating that the respective sectors appeal their top-priority for development. Among others, the restoration and development of agriculture are considered to be the most important policy of Eritrea, particularly the rehabilitation and improvement of existing but devastate agricultural infrastructure. The objective area is densely populated and has been cultivated by peasants with a small scale holder traditionally. For such peasants who are returning to their home lands, it is seriously necessary to rehabilitate and improve the basic infrastructure for stable agricultural production and their settlement in the southern region of Asmara. Taking an advantage that this region is located at the immediate south of Asmara and has good access to the port of Massawa facing the Red Sea, the development of this region is expected to give strong impact to the national economy and to fulfil the objectives and strategy of the Ministry of Agriculture mentioned above.

The study is to be carried out for formulating a master plan on urgent rehabilitation and improvement of agricultural infrastructure in this region, focussing on the following four (4) schemes being currently identified:

	Project Name (Provisional)	Potential Irrigable Area (ha)	Province
1)	Tedrer plain irrigation	2,000	Akele-Guzay
2)	Upper Mereb tributary discharge	4,000	Seraye
3)	Hazemo groundwater irrigation	1,000	Akele-Guzay
4)	Tserona groundwater irrigation	to be identified	Akele-Guzay

Subsequently after the master plan study, a feasibility study is to be carried out for the priority schemes programmed in the master plan study for the implementation.

7. Scope of the Study

The Study will be made in respect of the following development aspects and confirm the technical soundness and economic and financial viability of the Project:

(1) Rehabilitation, improvement and development of agricultural infrastructure in the Southern Region of Asmara, capital of Eritrea, including feeder village/farm road system, village water and electricity supply and community facilities;

(2) Rehabilitation, improvement and development of irrigation and drainage development including small scale ponds, water supply system and drains;

(3) Agricultural development in the region including agricultural extension services, credits, cooperatives and farmers' association, marketing services, training programs, post harvest and agro-processing facilities, etc.,; and

(4) watershed management and restoration and conservation of rural environment.

8. Experts Assigned

The following foreign experts will be required for executing the Study:

- Team Leader;
- Irrigation Engineer;
- Dam Engineer;
- Structural Engineer;
- Hydrologist;
- Soil Mechanical Engineer;
- Mechanical Engineer;
- Electrical Engineer;
- Agro-infrastructure Expert;
- Pedologist;
- Agronomist;
- Agro-economist;
- Institutional Expert;
- Environmentalist;
- Geodetic Engineer;
- Topographic Survey Engineer; and
- Drilling Engineer.

9. Schedule of the Study and Reporting

The Study will be divided into the following two (2) stages:

Stage - 1 : Mater plan study on overall development of the project area and aerial photo mapping; and

Stage - 2 : Feasibility study on the priority schemes.

The period required for the Study is estimated to be 18 months in total.

10. Equipment for Urgent Rehabilitation of Agricultural Infrastructure

In the light of food problems in Eritrea, the Government of Eritrea intends to start the rehabilitation of important agricultural infrastructure which need urgent restoration works in the southern Asmara Region even before the proposed aid by the Government of Japan would be realized. However, the Government of Eritrea faces the absolute shortage of necessary construction equipment and materials, therefore, requests the Government of Japan to provide them as listed hereof on a grant aid basis.

Ministry of Agriculture
List of Machinery
for Rehabilitation of Agricultural Infrastructure
in Asmara Southern Region

No.	Description	Nos.
1.	Crane (60 ton)	2
2.	Wood work machine	1
3.	Lathe machine	1
4.	Bulldozer (D-8/D-9)	To be decided
5.	Truck with trailer	To be decided
6.	Scraper	To be decided
7.	Loader	To be decided
8.	Grader	To be decided
9.	Vibrating compactor	To be decided
10.	Concrete vibrator	To be decided
11.	Concrete mixer	2
12.	Forklift	2
13.	Drugline	1
14.	Stone crusher	3
15.	Dump truck	To be decided
16.	Drilling unit with compressor	2
17.	Generator (10 - 15HP)	10
18.	Drilling rig	1
19.	Steel materials	
	- Angle	1 lot
	- Round bar	1 lot
	- Steel sheet	1 lot
	- Gate shaft	1 lot
20.	Pipes	
	- GI pipe	1 lot
	- Plastic pipe	1 lot
21.	Pipe fittings	1 lot

(Attached Paper)

TENTATIVE TERMS OF REFERENCE FOR MASTER PLAN STUDY ON REHABILITATION AND IMPROVEMENT OF AGRICULTURAL *INFRASTRUCTURE* IN ASMARA SOUTHERN REGION

Project Title	:	**Rehabilitation and Improvement of Agricultural Infrastructure in Asmara Southern Region**
Location	:	**Akele Guzay Province and Seraye Province in the Southern Part of Asmara, Capital of Eritrea**
Executing Agency	:	**The Ministry of Agriculture, The Government of Eritrea**
Proposed Source of Assistance	:	**The Government of Japan**

1. Introduction

Agriculture is the mainstay of the Eritrean economy, holding about 80% of the population and contributes to about 50% of GDP and to the bulk of export earning. Agriculture is the one of the sectors seriously affected by the prolonged war over the past three decades. War damages include destruction and replacement of human beings, the destruction of infrastructure such as irrigation systems, transportation networks and deforestation which accelerated the soil erosion vastly. A great number of farmers had to leave villages during the war, and the agricultural lands were left uncultivated for a long period. This resulted in the seriously degraded environment for rural living and agricultural production. Now, farmers are returning to their home lands and have started farming, however agricultural production cannot be boosted easily due to these constraints.

Notwithstanding its present poor condition, the Eritrean agriculture has a good potential or growth. There is ample land and water resource potential to sustain reasonably efficient and rapid development of the sector. Out of the total land area of 12.5 million ha, about 3.2 million (26%) is suitable for agricultural use, of which only about 10% is currently under cultivation. Eritrea has also, if developed, a considerable water resource potential (surface and groundwater) to irrigate around 0.6 million ha. This can be tapped through dams across major rivers, small-catchment dams to conserve run-off water during the rainy season, and boring wells to exploit underground water. While, Eritrea has diversified agro-climatic zones suitable for a wide-range of crops and livestock production, a strategic location for accessing the markets of Europe and Middle East, and a hard working and industrious people.

The urgent need of the Government of Eritrea is to mitigate the food problem and to improve the living standard of Eritrean people. Therefore, the Government places an emphasis strongly on the rapid agricultural development as the top priority policy. The

Department of Agriculture is the prime agency to execute this policy with the objectives to achieve:

i. food security;
ii. employment generation;
iii. raw material supply to domestic industries;
iv. foreign exchange earning through direct and indirect exports; and
v. environmental protection and restoration.

2. Project Background

The study area is located in the southern part of Asmara, national capital of Eritrea, within a length of about 70 km from Asmara down to the border of Eritrea and Ethiopia and with a width of about 50 km. The area belong administratively to the Akele-Guzay Province and Seraye Province. The area is composed of manifold hills, relatively flat plateaus and lowland plains. The study area is supplied with water from many streams running in the plain for a period of two months in the rainy season, mostly during July and August with an annual rainfall of 400 to 600 mm.

There are following two (2) plains and a plateau where the agriculture has been developed, but that require the urgent rehabilitation and improvement of agricultural infrastructure:

- Ala Plain (10,000 ha);
- Hazemo Plain (30,000 ha); and
- Upper Mereb Plateau (30,000 ha).

This area is well known for taff, a kind of finger millet and staple food of Eritrea, and maize production traditionally, and it was one of the few surplus producer regions in Eritrea. However, the area was severely affected by war and drought. It is reported that it was the lastly liberated rural area and could therefore not be reached by all the development efforts off EPLF.

At present, almost all the regions and sectors require the restoration and developments since the prolonged war eradicated the basis of national economy and social welfare. It is not over-stating that the respective sectors appeal their top-priority for development. Among others, the restoration and development of agriculture are considered to be the most important policy of Eritrea, particularly the rehabilitation and improvement of existing but devastate agricultural infrastructure. The objective area is densely populated and has been cultivated by peasants with a small scale holder traditionally. For such peasants who are returning to their home lands, it is seriously necessary to rehabilitate and improve the basic infrastructure for stable agricultural production and their settlement in the southern region of Asmara. Taking an advantage that this region is located at the immediate south of Asmara and has good access to the port of Massawa facing the Red Sea, the development of this region is expected to give strong impact to the national economy and to fulfil the objectives and strategy of the Ministry of Agriculture mentioned above.

The study is to be carried out for formulating a master plan on urgent rehabilitation and improvement of agricultural infrastructure in this region, focussing on the following four (4) schemes being currently identified:

	Project Name (Provisional)	Potential Irrigable Area (ha)	Province
1)	Tedrer plain irrigation	2,000	Akele-Guzay
2)	Upper Mereb tributary discharge	4,000	Seraye
3)	Hazemo groundwater irrigation	1,000	Akele-Guzay

4) Tserona groundwater irrigation to be identified Akele-Guzay

Subsequently after the master plan study, a feasibility study is to be carried out for the priority schemes programmed in the master plan study for the implementation.

3. Objectives of the Study

The objective of the Study is to formulate a Master Plan on urgent rehabilitation and improvement of agricultural infrastructure in the southern region of Asmara and to conduct a feasibility study of priority schemes selected in the Master Plan Study.

4. Scope of the Study

4.1 Concept of the Study

The Study will be made in respect of the following development aspects and confirm the technical soundness and economic and financial viability of the Project:

(1) Rehabilitation, improvement and development of agricultural infrastructure in the Southern Region of Asmara, capital of Eritrea, including feeder village/farm road system, village water and electricity supply and community facilities;

(2) Rehabilitation, improvement and development of irrigation and drainage development including small scale ponds, water supply system and drains;

(3) Agricultural development in the region including agricultural extension services, credits, cooperatives and farmers' association, marketing services, training programs, post harvest and agro-processing facilities, etc.,; and

(4) watershed management and restoration and conservation of rural environment.

The Study will be divided into the following two (2) stages:

Stage - 1 : Mater plan study on overall development of the project area and aerial photo mapping; and

Stage - 2 : Feasibility study on the priority schemes.

4.2 Stage -1 : Master Plan Study and Aerial Photo Mapping

4.2.1 Preparation of Aerial Photo Maps

Carry out aero-photo shooting and field topographic survey for mapping of the proposed project area and prepare the topographic maps on a scale of 1 : 10,000.

4.2.2 Data Collection and Review

Review and analyze data and information on the human, land and water resources, socio-economy, agriculture, agro-infrastructure and environment in connection with the project as well as the previous studies on the agriculture/rural development.

4.2.3 Field Survey

a) Carry out agricultural and agro-economic survey on land use, farming practice, crops and cropping patterns, yields, agricultural production and inputs, prices of crops, etc.;

b) Carry out soil survey and test soil samples;

c) Carry out geohydrological survey for groundwater potential;

d) Carry out geotechnical survey for proposed major project infrastructure including proposed dam sites;

e) Carry out inventory survey for the existing irrigation and agricultural infrastructure;

f) Carry out hydrological surveys including measurement of river flows, inventory of the existing meteo-hydrological stations, water sampling for sedimentation and water quality analysis, etc.;

g) Conduct construction material survey;

h) Carry out socio-economic survey; and

i) Identify and observe the environmental components in connection with the agricultural developments of the project area.

4.2.4 Evaluation of Water and Land Resources

a) Identify and evaluate the present conditions for and constraints to the agricultural development of the proposed project area, including rainfall, run-off and flood, sedimentation, water quality, soil condition, etc;

b) Carry out the meteo-hydrological studies to evaluate the water resources available for the irrigated agricultural development of the project area; and

c) Carry out studies on land use, soils and land capability, geology, topography to evaluate the development potentials of the project area.

4.2.5 Irrigation and Drainage Development Studies

a) Identify the irrigation development area on the basis of soils, land capability, topography, flood condition, water availability, etc;

b) Prepare preliminary layout and design of irrigation and drainage facilities to be rehabilitated and constructed including headworks at water sources (dams, weirs, groundwater wells, etc.), irrigation and drainage canals, roads, flood protection, etc.

4.2.6 Agricultural and Agro-economic Studies

a) Evaluate all the available data related to present land use, soil classification, cropping pattern, crop yields, input levels and farming practices in the project area;

b) Recommend practical and suitable cropping patterns, farming practices, input levels and labour requirement for the project area;

c) Assess the adequacy of existing agricultural support services and recommend appropriate measures to strengthen such services under the project;

d) Clarify the prices and marketing system of agricultural products and farm input on the project and regional levels; and

4.2.7 Agro-infrastructure Studies

a) Examine the adequacy of existing agro-infrastructure such as farm road networks, storage facilities and other post harvest system in the project area;

b) Prepare plans for improvement of agro-infrastructures for irrigation development under the project, and

c) Prepare the preliminary design of the agro-infrastructures to be provided under the project.

4.2.8 Environmental Aspects and Women Involvement Studies

a) Clarify the present constraints to the agricultural development from the view point of environment in the project area;

b) Clarify the present environmental problems and assess impacts of the agricultural development on social and natural environment in the project area including effect on wild life, water pollution, etc;

c) Assess measure for controlling local diseases; and

d) Clarify women involvement in the present agricultural activities and assess that under the project.

4.2.9 Formulation of Development Plan and Preparation of Master Plan

a) Formulate the agricultural development plans including rehabilitation and improvement of existing agricultural irrigation and agro-infrastructure for the proposed priority schemes based on the results of field survey and development studies;

b) Estimate preliminary costs and benefits of the respective schemes;

c) Evaluate preliminarily economic viability of the proposed schemes;

e) Recommend organization and procedures best suited for effective operation and maintenance of the project and the respective schemes;

f) Recommend the priority order of the project implementation including overall project viability; and

g) Prepare the preliminary implementation schedule for the irrigated agricultural development project.

4.3 Stage - 2 : Feasibility Study on the Priority Schemes

a) Prepare layouts of irrigation and drainage facilities and agro-infrastructure;

b) Carry out topographic survey of major irrigation and drainage canals including related facilities and agro-infrastructure;

c) Prepare preliminary design of project facilities;

d) Calculate the work quantities and estimate the costs for investment and operation and maintenance;

e) Prepare implementation schedule;

f) Recommend the organization and procedure for project implementation and project O&M;

g) Estimate the direct project benefit, and also indirect benefits;

h) Evaluate farm budgets for typical farm households under the project.

i) Evaluate economic and financial feasibility for implementation of the priority schemes

5. Transfer of Technology

In the course of the Study, transfer of technology and training will be provided by foreign experts to Eritrean experts participating the Study directly and indirectly in the following fields:

a) Field survey and investigation for every lines of foreign experts assigned; and

b) Plan and design of facilities for irrigation, drainage and agro-infrastructure.

The above transfer of technology will be carried out in the form of on-the-job training and seminar. Overseas training will also be programmed.

6. Schedule of the Study and Reporting

The period required for the Study is estimated to be 18 months in total. A tentative study schedule is shown in Attachment-2.

The following reports will be prepared in the course of the Study:

a) Inception report - 1 : Report on aerial photo mapping within one (1) months from the commencement of the Study;

b) Inception report - 2 : Report on the field survey and investigation and the studies within four (4) months from the commencement of the Study;

c) Mapping report with aero-photo maps : Within nine (9) months from the commencement of the Study;

d) Mater Plan Study

Report	:	Within 12 months from the commencement of the Study; and
e) Draft Feasibility report	:	Within 16 months from the commencement of the Study.
e) Feasibility report	:	Within 18 months from the commencement of the Study.

7. Experts Assigned

The following foreign experts will be required for executing the Study:

- Team Leader;
- Irrigation Engineer;
- Dam Engineer;
- Structural Engineer;
- Hydrologist;
- Soil Mechanical Engineer;
- Mechanical Engineer;
- Electrical Engineer;
- Agro-infrastructure Expert;
- Pedologist;
- Agronomist;
- Agro-economist;
- Institutional Expert;
- Environmentalist;
- Geodetic Engineer;
- Topographic Survey Engineer; and
- Drilling Engineer.

8. Undertaking of the Eritrean Government

In order to facilitate a smooth and effective conduct of the Study, the Government of Eritrea shall take the necessary measures;

(a) to secure the safety of the Study Team

(b) to permit the members of the Study Team to enter, leave and sojourn in Eritrea in connection with their assignment therein, and exempt them from alien registration requirement and consular fees.

(c) to exempt the Study Team from taxes, duties and other charges on equipment, machinery and other materials brought into and out of Eritrea for conduct of the Study.

(d) to exempt the Study Team from income tax and charges of any kind imposed on or connection with any emoluments or allowances paid to the members of the Study Team for their services in connection with the implementation of the Study.

(e) to provide necessary facilities to the Study Team for remittance as well as utilization of the funds introduced in Eritrea from Japan in connection with the implementation of the Study.

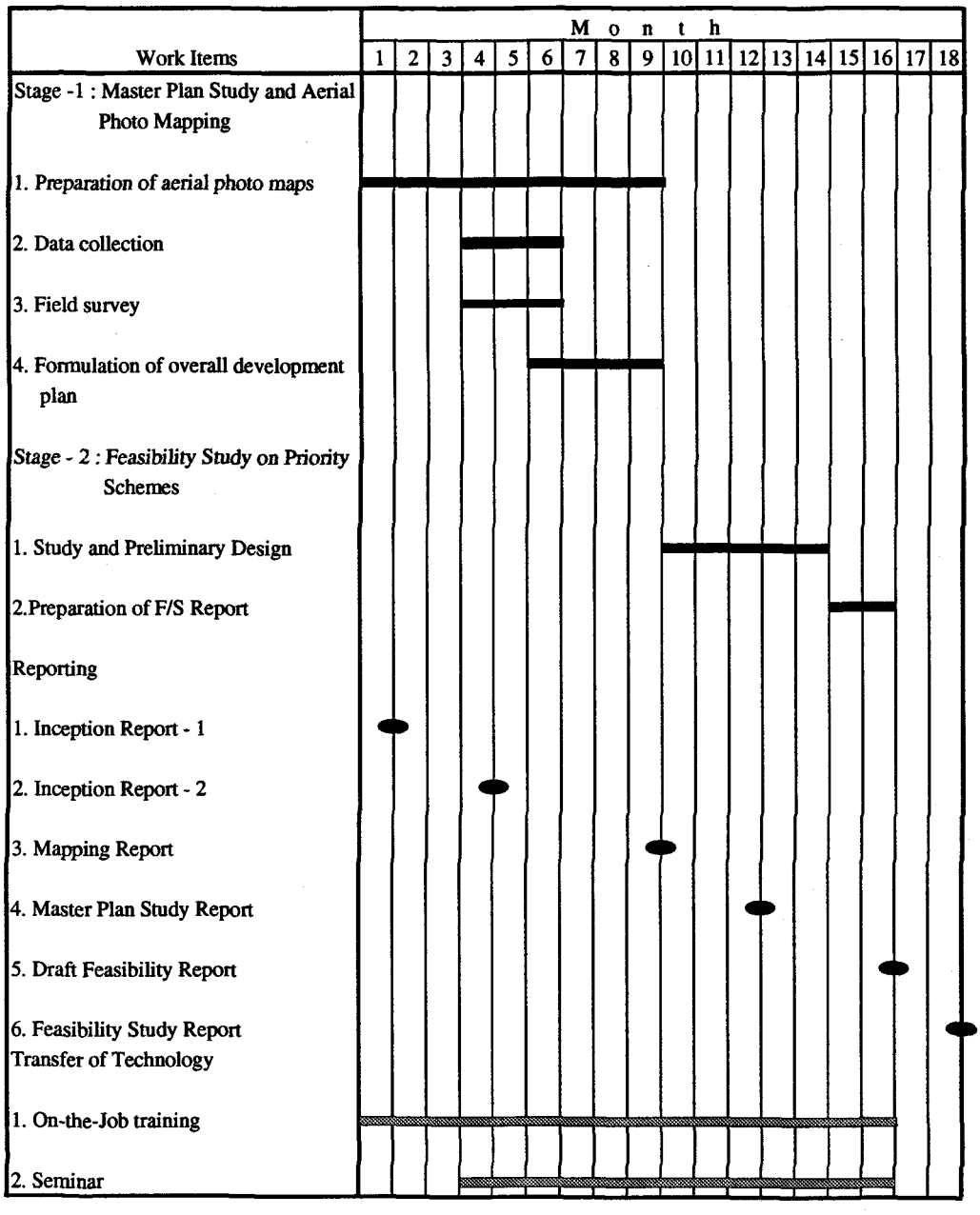
(f) to secure permission or entry into private properties or restricted areas for the conduct of the Study.

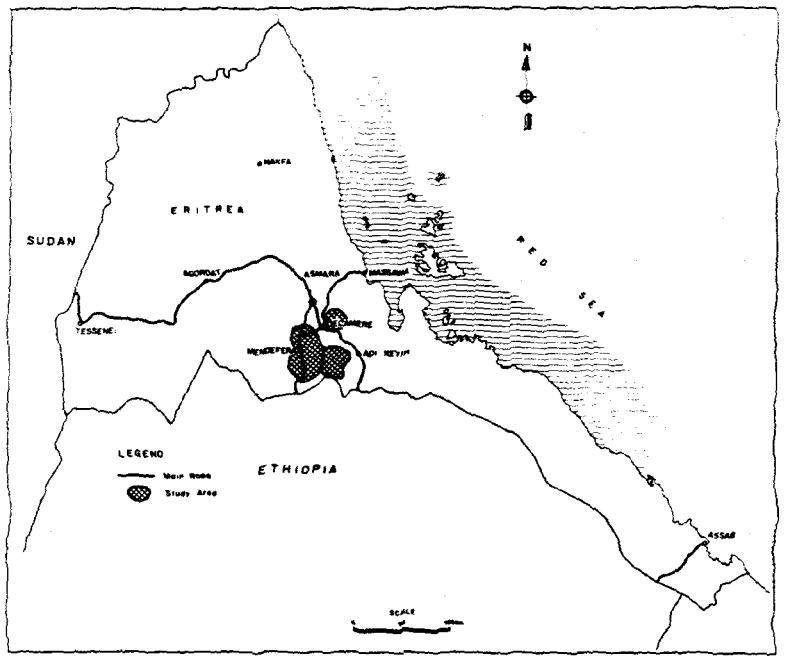
(g) to secure permission for the Study to take all data, documents and necessary materials related to the Study out of the Eritrea to Japan.

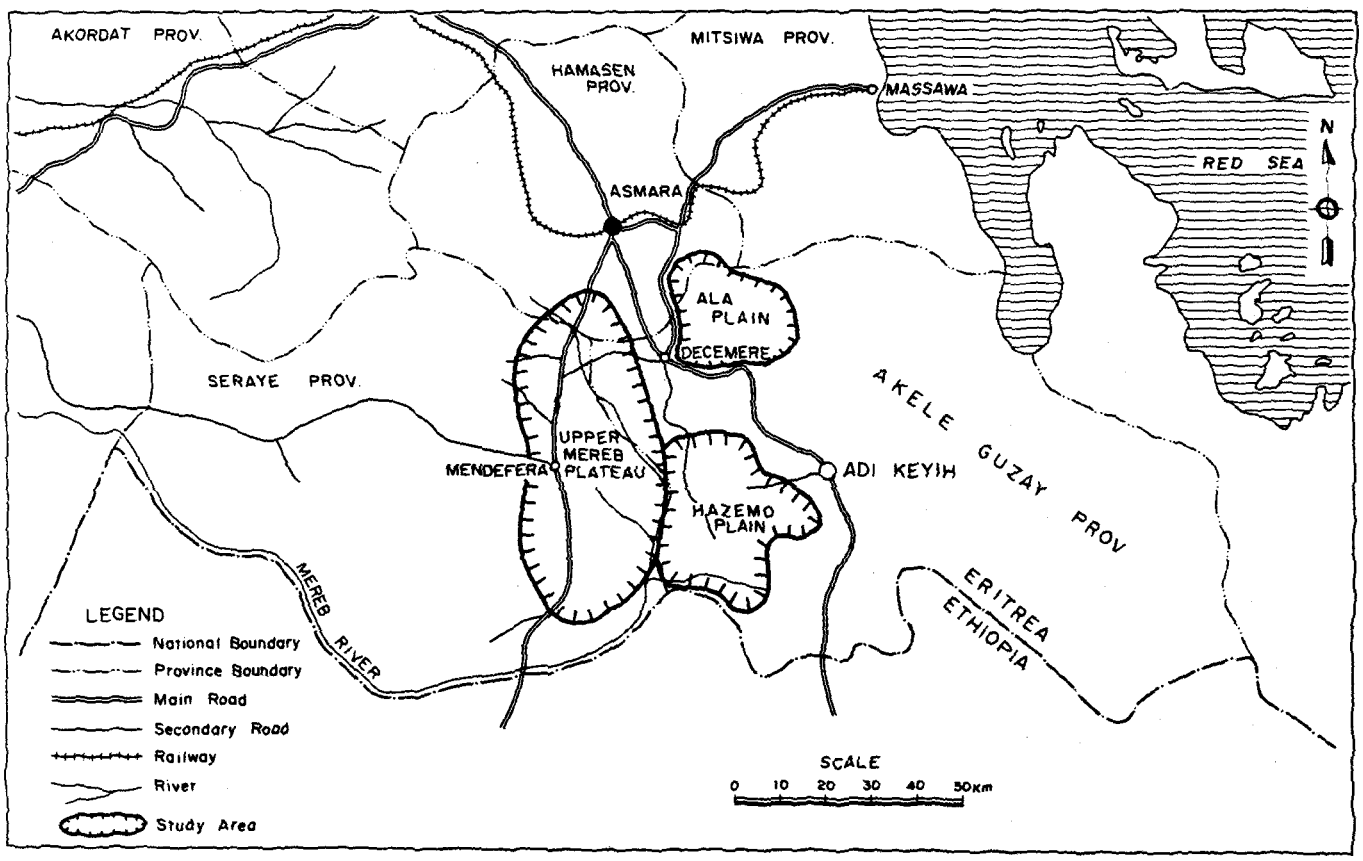
(h) to provide medical services as needed. Its' expenses will be chargeable to members of the Study Team.

The Government of Eritrea will bear claims, if any arises against members of the Japanese Study Team resulting from, occurring in the course of or otherwise connected with the discharge of the their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Study Team. The Government of Eritrea shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non governmental organizations concerned for the smooth implementation of the Study.

Study Schedule for Master Plan Study on
Rehabilitation and Improvement of Agricultural Infrastructure in Asmara Southern Region







LOCATION MAP

調査団長略歴

調査員名	略歴
村井　浩	
1947.11.19生	
1971.3	九州大学農学部農業工学科卒業
1971.4	日本工営株式会社入社
1971.4	日本工営（株）農業部
1971.7	日本工営（株）設計第１部
1975.9	日本工営（株）メスケネ開発事務所（シリア）
1977.4	日本工営（株）農業水利部
1979.11	日本工営（株）カンカイ開発事務所（ネパール）所長
1985.6	日本工営（株）第１農業水利部副参事
1987.1	日本工営（株）ナラヤニ開発事務所（ネパール）所長
1990.1	日本工営（株）農業開発部　課長
1992.2	日本工営（株）メスケネ開発事務所（シリア）所長

主な海外業務実績

案件名	対象国	従事期間	担当業務
ビンデイン灌漑開発計画	ヴェトナム	1973.7- 1975.4	灌漑排水計画・設計
メスケネ灌漑計画	シリア	1975.9 - 1977.4	灌漑排水計画・設計
リアムカナン灌漑計画	インドネシア	1977.7 - 1979.3	灌漑排水計画
カンカイ灌漑計画	ネパール	1979.11 - 1985.6	総括／灌漑排水計画・設計 施工監理・水監理
スンサリモラン灌漑計画	ネパール	1986.7 - 1986.12	灌漑排水計画
ナラヤニ灌漑計画	ネパール	1987.1 - 1991.1	総括／灌漑排水計画・設計 施工監理・水監理
メスケネ灌漑計画	シリア	1992.2 - 現在	総括／灌漑排水計画 施工監理・水監理

調査行程表

日順	月日	起点・経由地	目的地・滞在地	活動
1	12月5日（日）	カイロ	アスマラ	移動
2	12月6日（月）		アスマラ	農業省表敬訪問・資料収集、現地調査
3	12月7日（水）		アスマラ	現地調査、資料収集、農業省協議
4	12月8日（木）	アスマラ	アジスアベバ	移動
5	12月9日（金）		アジスアベバ	大使館・JICA、公共事業・水資源省表敬訪問、現地踏査
6	12月10日（土）	アジスアベバ		出国

面会者リスト

Ministry of Agriculture	
1. H.E.Dr. Tesfay Girmazion	Minister of Agriculture
2. Mr. Mebrathu Iyassu	Deputy Minister of Agriculture
3. Mr. Amanuel Negassi	Head of Land Resources Department
在エチオピア国日本大使館	
4. 太田　富男	書記官
在エチオピア国JICA事務所	
5. 坂田　武穂	所長

収集資料リスト

- A brief Description of the Agricultural Sector (Background and Potential for Growth), Ministry of Agriculture, March 1993
- Workshop Documentation and Results of the Project Finding Mission, GTZ, September 1992
- National Map (1 : 1,000,000)
- Topographic Maps in the Study Area (1 : 100,000)
- Administration Maps (1 : 1,000,000)

現地写真集（エリトリア国編）

アラ盆地耕作現況

ハゼモ盆地

現地写真集（エリトリア国編）

メレブ平原

農業省建設機械基地

モーリタニア・イスラム共和国編

1. デイウプ・デイアデール地区農業環境開発計画
2. ガラック・コンデイ地区農業灌漑開発計画

III.　モーリタニア．イスラム共和国編

1．背景

1.1　国土と人口

(1)　国土

モーリタニア．イスラム共和国（以下、モーリタニア国）は大西洋に面するアフリカ大陸西端にあり、北緯13度45分－27度25分、西経4度10分－16度50分の範囲に位置している。東側はアルジェリアとマリに、南側はセネガル河を国境としてセネガルに面し、北側は西サハラに隣接している。西側は667kmの海岸線で大西洋に臨んでいる。国土面積は1,030,700km^2（日本の約2.7倍）であるが、サハラ砂漠進行化の最前線に位置しているといわれるモーリタニアの国土の3分の2はサハラ砂漠地帯に占められている。

国土の大半を砂漠に覆われているため典型的な砂漠気候を呈し、一般に降雨は少なく暑くて乾燥している。セネガル河沿いの南部地域のみに降雨による植生がある。気温は平均で25 ℃を越えるが季節及び昼夜の変動が大きい。気候的にモーリタニアは北部のサハラ気候と南部のサヘル気候の２つの地域に大別することができ、これは更に沿岸性と内陸性とに区分される。首都ヌアクショット（標高21m）の気象緒言は以下の通りである

月平均最高気温	：	35.7 ℃
月平均最低気温	：	13.7 ℃
年平均気温	：	26.0 ℃
年平均降水量	：	120 mm

(2)　人口

人口調査は1987年に開始されたがその後の干魃と砂漠化の進行による地方住民の都市への流出（毎年約6%程度といわれる）及び砂漠遊牧民の存在等で正確な人口を特定できないでいるが、1992年の総人口は約231.1万人、その内首都ヌアクショットは40万人以上、人口増加率2.93%、乳幼児死亡率13.2%、平均寿命は男性49才、女性52才と推定している。

1.2　社会経済

モーリタニアは1960年のフランスからの独立に続く10年余りは新しい輸出品の鉄鉱石に支えられて急

速に、また持続して成長したが70年代半ばに世界不況によって鉄鉱石の需要が減り経済が停滞した。経済的自立達成を国家政策の最優先目標として自助努力を行なってきたが未だ達成できず前途もかなり厳しい見通しのようである。モーリタニア国経済は北部の資本集約的な鉱業・漁業と南部のセネガル河沿いの農業から成り立っている。

1989年の国内総生産(GDP)は実勢で約830億ウーギャ(UM), 1983年固定で504億UM、 国民一人当たり実勢GDPはUS$500である。過去6年間の年成長率は平均2%であるが近年は鈍化し1988 - 1989は僅か0.5%であた。

モーリタニアの輸出入額は1990年の実績で輸出総額351億UMに対し輸入313億UMであり、貿易収支は例年黒字である。主な輸出品目は魚介類で輸出総額の47%（1990年）を占め、僅かに鉄鉱石があるに過ぎない。一方、主な輸入品目は自動車、内燃機関、鉄鋼板、消毒剤、殺虫剤等である。

1.3 農業の現状

モーリタニアの農産部門は北の漁業、南部セネガル河沿いの農業及び伝統的な遊牧方式による牧畜の3分野からなる。これら農業部門の国家経済に占める割合は全産業の50%であり、内、水産と牧畜がその大半を占めている。大西洋沖合はタコ、イカ、エビ等の有力な漁場で日本政府の経済援助を含め、近代的な漁業開発に取り組んでいるが、漁獲量は年間50万トン前後で伸び悩んでいる。

牧畜業はサハラ性気候と広大な牧草地帯とが相俟って昔からモーリタニア人の主な生活手段となっており、伝統的に牛、山羊、ラクダの遊牧が行なわれ労働人口の約80%が牧畜業に従事していると言われている。しかし1973年から始まった慢性的旱魃と砂漠化の進行は農業と牧畜業に大打撃を与えている。

国土の大部分が砂漠であるので国土に耕地が占める割合は僅か0.2%に過ぎず、農業はセネガル河沿いの河岸地帯と河口近くのデルタで行なわれているだけである。その生産量は穀類で約15万トンで自給自足に必要な約25万トンをはるかに下回っており、不足量は輸入に頼り総輸入額の30%に達している。

1976年から1991年までの土地利用状況と1979年から1992年までの主要農作物の推定生産量は下表の通りである。

土地利用 (1,000 ha)

	1976	1981	1986	1991
総面積	102,552	102,552	102,552	102,552
陸地面積	102,552	102,552	102,552	102,552
耕地面積	198	195F	201F	205F
永年作物	3	3F	3F	3F
永年牧草地	39,250	39,250	39,250F	39,250F
森林面積	4,570F	4,520F	4,470F	4,420F
その他	58,504	58,557	58,601	58,647

F : 推定値
出典：FAO Year Book, Production Vol.46, 1992

主要農作物の収穫面積(1,000ha)と生産量(1,000mt)

	1979 -81		19 90		19 91		19 92	
	面積	生産量	面積	生産量	面積	生産量	面積	生産量
ミレット・ソルガム	114	31	103	49	129	60	115F	53F
米（籾）	3	12	14	52	15	42	5F	18F
メイズ	8	5	4	3	4	2	3F	2F
野菜その他	7	-	8	1	12	-	11F	-

F：推定値
出典：FAO Year Book, Production Vol.46, 1992

1.3 国家開発計画

モーリタニア政府は経済・財政の不均衡解消と各経済部門での構造改革を実施するために経済・財政再建計画(PREF：1985 - 1988)の政策を踏襲した経済総合成長計画(PCR)を立案、実質GDP成長率を年平均33.5%に設定し1989年から実施してきた。この計画は1991年を目標としたものであったが達成出来ず引き続き実施中である。本計画の総投資額は455億1,800万UM(1990年 US$1.0 = 85.82UM)で、部門別配分は農村開発43.3%、地域開発25.2%、鉱業開発13.2%、人的資源（保健、教育、雇用、訓練、スポーツ等）10.2%、その他8.1%となっており、農業分野への開発に重点を置いている。しかしながら総投資額の93.6%を外国資金に期待している。

モーリタニア政府が農業分野でとりわけ重点を置いている開発計画は国内で唯一、河川から地表灌漑による農業が可能なセネガル河沿岸の農業開発で、セネガル河流域のセネガル、マリ及びモーリタニアの3国が1972年に結成したセネガル河開発機構(OMVS)の調整のもとで農業開発事業を推進している。

2. セネガル河流域開発事業計画

2.1 事業の背景

国土の大部分を砂漠に覆われ農業に資する水源も極端に限られたモーリタニアは食糧作物を生産する上では極めて不利な自然条件に置かれている。国土に耕地が占める割合は僅か0.2%に過ぎず、農業はセネガル河沿いの河岸地帯と河口近くのデルタで行なわれているだけである。その生産量は穀類で約15万トンで自給自足に必要な約25万トンをはるかに下回っており、不足量は輸入に頼り総輸入額の30%に達している。

このような状況を背景にモーリタニア政府の農業分野に対する基本的な政策目標は下記の6点である。

（1）食糧の自給率を最低55%達成・維持する。

（2）牧畜の近代化を図る。

（3）農村での給水施設を改善・拡大する。

（4）砂漠化進行を防御する。

（5）農業支援対制を改善する。

（6）農業生産体制の近代を図る。

上記の政策目標の下、特に食糧増産による食糧安全保障の強化と外貨節約が緊急の政策課題である。従って国内で唯一、河川から地表灌漑による農業が可能なセネガル河沿岸は同国の食糧生産地帯としての重責を担っておりモーリタニア政府の経済開発で最も高い位置づけがなされている農業開発事業である。

2.2 セネガル河開発機構

セネガル河はマリ国でBafing及びBakoyeの２河川が合流し、途中４本の主要河川を合流させながら大西洋に注ぐまで1,000 kmの延長を流れ、約30万km^2の流域面積を有する大河川である。セネガル河流域は上流域(Upper Basin)、セネガル渓谷(Senegal Valley)及びデルタ(Delta)と大きく3つの地域に分割され、流況は上流域地域の雨量に支配されている。セネガル河の流況を特徴づけるのは流量の年間変動と年間総流出量の変動が極めて大きいことであり、下記に示す通りである。

Bafing河・Bakoye河の合流地点下流のBakelに於ける流況

（1）年平均流量・総流出量：732 m^3/sec ・230 億m^3

（2）年間最大・最小流量　：3,215 m^3/sec(9月)・ 8m^3/sec (5月)

（3）1903 - 1984年の最大・最小年平均流量・総流出量：

- 1984年　219m^3/sec ・69億m^3
- 1967 年　1,317 m^3/sec・415億m^3

セネガル河開発機構(OMVS)はセネガル河流域のセネガル、モーリタニア及びマリが共同して流域開発を行うことを目的として1972年に結成した地域開発国際機構である。加盟3ヶ国はサハラ砂漠周辺地域に位置し慢性的な干魃被害に対処するためセネガル河の要所に多目的ダムを建設し、灌漑による農業の振興の他、発電、洪水調節、水産、河川航運、観光等に資することを機構の目的としている。この機構の実施する諸計画に対して国連開発計画(UNDP)、EC及びフランス等が全面的に支援してきた。現在、河口から約700 km上流に110億m^3の貯水容量を持つマナンタリ(Manantali)ダムと河口にデイアマ(Diama)ダム（河口堰）の2つの貯水池が夫々1988年と1991年に完成した。マナンタリダムの年間発電量は800GWh、またこの2つのダムにより375,000 haの灌漑が可能となった。流域3ヶ国の灌漑面積はセネガ

ル240,000 ha、モーリタニア126,000 ha、マリ9,000 haに配分されている。この内1989年時点で約64,000 haの農地が灌漑されている。

上記セネガル河開発機構の枠内でモーリタニア政府はセネガル河沿岸に6地区の灌漑農業を中心とした農業開発を策定し開発事業を推進している。6地区の農業開発面積の合計は下記に示す通り約155,000 haで、各地区は幾つかの事業地区から成っている。

地区名(*)	農業開発事業面積 (ha)
1. Delta	12,560
2. Trarza	42,700
3. Brakna	49,700
4. Gorgol	30,600
5. Gorgol Valley	11,304
6. Guidimaka	8,200
合計	155,064

(*) 順次、下流から

上記灌漑事業中、既存・新規を含め35,000 haについては灌漑が行われている。これら灌漑事業を推進しているのは地方開発・環境省の下部機関である農業開発公社(SONADER)で、約390名の職員を擁し、事業の計画、設計、工事を実施するとともに農民への営農指導も行っている。

2.3 事業地区の概要

後章で述べる今回の調査対象2地区を含むセネガル河下流地域デルタ(Delta)およびトラルザ(Trarza)の2地区に焦点を置いて事業地区の概要を述べる。

(1) 自然状況

事業地区は首都ヌアクショットから約150 km南に位置しセネガル河下流に面するロッソ(Rosso)市を中心として東西上下流夫々約90 kmに渡って延びる河岸農業地帯であり、下流地域はデルタ地区、上流をトラルザ地区と称している。行政的にはトラルザ州に属す。

事業地区は一般に平坦な地形で標高は概ね海抜20 m内外である。河道は上流では蛇行が著しく河幅は200mか500mで河口に向かうに従い広くなり、河岸の低平地は毎年湛水被害を被っている。河口デルタは大西洋からの塩水の侵入を受けていたがディアマダムの建設後解消した。

事業地区の気候は準乾燥気候で、年間の降雨量は30 mmから340 mmと大きく変動し、年間降雨日数は概ね10日から30日で7月から9月にかけて集中している。年間の平均最高・最低気温は夫々38℃と

20℃である。事業地区内の土壌は一般に粘質土でウアロ(Oualo)と称されており肥沃で作物の栽培に適している。また洪水時の湛水により河岸低平地には砂がかなりの厚さで堆積しており、灌漑開発を計画する上で充分注意する必要がある。

(2) 農業現況

両地区は下表に示す通り夫々5及び7の合計12事業地区から成っている。

(1) Delta 地区(12,560 ha：純灌漑面積)

- M'Pourie	4,000	
- Gouere	3,300	
- Dioup	2,630	
- N'Diader	2,030	
- N'Colax	600	
(2) Trarza 地区(42,700 ha)		
- Garak-1	8,150	
- Garak-2	4,860	
- Koundi-1	3,590	
- Koundi-2	5,680	
- Koundi-3	10,300	
- Koundi-4	2,120	
- Lac R'Kiz	7,000	（純灌漑面積）

事業地区内の主要作物は米、メイズ、ソルガム等で、一般に小規模経営農業で一部で導入されている農業機械による耕作を除けば人力による集約農業が当地区の農業形態である。詳細な作物生産統計は定かではないが稲の単位収量は2.5 ton/ha程度である。地区内には近代的・伝統的なものをふくめ既存の灌漑施設がある。ロッソ市の西隣のブーリエ地区には1960年代に中国の援助で機械化稲作農業が導入され、現在1,400 haを対象に揚水灌漑を行っている。その他の地区はセネガル河から導水し一旦自然貯水池に貯溜、あるいはデルタでの干満を利用した伝統的な灌漑方法を採用し水位が不足する農地では末端水路から小さなポンプで揚水している。

これら農業開発事業地区に対するモーリタニア政府の開発政策の基本方針は村落単位での小規模農業経営により各農家の収入と生活水準を向上させることにある。半面、農民の農業事業に対する運営能力を高め彼らに運営責任を持たせることにより、より食糧作物の流通性を高め、政府の関与を減少させることにある。

3. ディウプ・ディアデール地区農業環境開発計画

3.1 事業の背景と概要

ディウプ(Dioup)及びディアデール(N'Diader)の両地区（計画地区）はセネガル(Senegal)河の右岸氾濫原(Haut-Delta)に位置しロッソ(Rosso)市の西約30 Km地点から西方、大西洋沿岸までに延びる低湿地農業地

帯である。地区の規模は東西延長約30 Km、平均幅約10 Kmである。計画地区は元来セネガル河を介して大西洋の潮汐の影響を受けていた。モーリタニア政府がロッソ市の西隣プーリエ(M'Pourie)地区に中国の援助で機械化稲作を導入した1960年代から計画地区でもセネガル河の干満差を利用した小規模水稲栽培を行ってきた。地区内の住民は稲作以外にも漁業および畜産業に従事してきた。又、これら農業及び畜産業のための協同組合も組織され活動を続けている。

セネガル河の河口に建設したディアマ堰(Diama Dam)の関連施設として堰からロッソ市まで約80 Kmに及ぶ高さ2.3 mの河川堤防が築造された。堤防の建設は1989年に開始され1991年に完成した。セネガル河上流に建設されたマナンタリダム(Manantali Dam)、ディアマ堰及びこの堤防により計画地区を含む下流沿岸農業地帯は洪水と塩水遡上による被害から免れたが堤防は河と農地を繋ぐ既存の用排水網を絶ち切ってしまった。セネガル河開発機構(OMVS)は堤頂に簡単な用水取水溝を数多く造ったが殆ど機能しておらず、法面保護工もなくむしろ危険でもある。OMVSは現在計画地区に対し用水の取水閘門を3ヶ所建設中である。しかしながら堤防の建設はこれまでの自然との調和がとれた農業生産基盤はもとより生活環境と自然環境をおおいに損なう結果となった。具体的には次のような問題が発生してい

(1) 用水の不足による水稲生産の大幅な減少と水田農地の放棄

(2) 排水不良に起因する域内湛水による家畜死亡率の急激な増加、住民への健康障害及び植生の枯死に代表される自然破壊の進行（緑資源の減少）

実際、計画地区内の農業生産は堤防建設が開始された1989年頃から大きく阻害されている。

モーリタニア政府は計画地区を含むセネガル河沿岸農業地域の開発計画のためのマスタープランを1990年に策定し、更に1991年には計画地区を含む3地区(Gouere, Dioup及びN'Diader)の緊急農業復興計画を世銀と仏政府の援助で策定し復興事業の詳細設計を行った。復興計画における主な事業は堤防への閘門建設、計画地区内の既設用水路の改修（通水面積の拡大）と新規水路の建設及び主要排水路の改修である。これにより灌漑用水を安定して地区内に導水し、また排水改良を施すことにより水稲栽培と牧草生産を復旧・改善する。又、セネガル河から堤防までの導水路の改修も計画に含まれている。計画地区と主要事業の概要は以下の通りである。

	グエレ地区	ディウプ地区	ディアデール地区	合計	(***)
灌漑面積(ha)	3,300	2,630	2,030	7,960	(4,660)
牧草地面積(ha)	920	2,490	4,700	8,110	(7,190)
水路改修延長(km)	7	35	17	59	(52)
排水路改修延長(km)	2	0	3.5	5.5	(3.5)

（注）(1) グエレ地区は1994年から仏政府が無償協力援助で事業開始の予定

(2) (***)内数字はディウプ・ディアデール計画２地区の合計値

3.2 援助対象事業の概要と事業費

デイウプ・デイアデール計画２地区の開発事業の概要は下表に示す通りである。

地区名	工種	延長	構造物	土工量
		(km)	(Nos.)	(1,000 m3)
Dioup	Canal	35	4	1,260
	(Ibrahim)	(9)		
	(Dalagona)	(1.5)		
	(Dioup)	(17)		
	(Dialo)	(7.5)		
	Dike	1		10
N'Diader	Canal	17	1	1,350
	Drain	3.5	-	25
Total		55.5	5	2,645

Note : Canal width 8 - 50 m, Depth 1 - 2 m

上記の工事の他、付帯道路及び管理棟を建設する。この事業に要する建設資金は約25億円と見積られる。

3.3 協力への展望

有効な対策が緊急に講じられないと計画地区の農業生産基盤と自然・生活環境の劣悪化は更に急速に進行するであろう。これはサハラ砂漠に位置するモーリタニアでは経済的・環境的にも極めて限られた貴重な生産土地資源の一部喪失を意味する。従い本復興事業の実施は農地保全のみならず国家食糧保障と外貨節約という国家経済政策に大きく貢献するものである。

幹線水路の詳細設計はすでに完了しているので資金確保の目処がたてば水路の改修・新設工事は直ちに開始可能である。幹線水路によって導水された灌漑用水は既存の小水路を通して農地に配分される。又、域内湛水も排水路により相当緩和されることになり、これにより地区内の用水不足と排水不良は大幅に改善する。また自然・生活環境も急速に改善すると期待される。

しかしながら計画地区の経済状態を更に向上させるには幹線水路以下の小用水路網の改修と拡大、畜産施設の改善、収穫後処理施設や流通施設の改善、社会基盤の整備、農業支援制度の改善拡充等が必要である。唯、上記で述べた水路の改修・建設は現在進行している農業生産基盤と自然・生活環境の破壊を阻止し少なくとも従前の状態に復帰するための緊急事業であり、また水路建設は地形的観点から将来実施されるであろう地区内末端開発との整合性はとれるものと考えられる。従って計画地区の経済振興開発計画の策定は別途に検討することとする。

モーリタニア政府との協議を通じて、日本政府に対し下記の無償資金協力を供与することに強い要請

があった。

(1) 計画地区の第1次開発として幹線用排水路と付帯水利調整構造物の改修と新規建設

(2) 計画地区の第2次開発として幹線水路以下の小用排水路網の改修と拡大、畜産施設の改善、収穫後処理施設と流通施設の改善、社会・生活基盤の整備、農業支援制度の改善拡充等を含む農村総合開発

4. ガラック・コンディ地区農業灌漑開発計画

4.1 事業の背景と概要

ガラック及びコンディの両地区（計画地区）はロッソの東側、東トラルザ(Trarza-Est)に位置するセネガル河沿岸農業地区である。計画地区は大きく下表の通りガラック－1・2、コンディ－3 及び コンディ－4の3地区からなり、灌漑面積の合計は約25,000haである。

地区名	灌漑農業開発面積 (ha)
(1) Garak - 1 & 2	13,000
(2) Koundi - 3	10,000
(3) Koundi - 4	2,000
合計	25,000

ガラク地区はロッソ市の東側に隣接し、東トラルザの西端に位置する。一方、コンディ－3及び4地区は東トラルザの東端に位置し、ロッソ市の60 kmから90kmまでの範囲にある。計画地区の幅はセネガル河に沿って南北に10 kmから20 kmの間で変化している。地区内は水稲栽培のための既存水田とセネガル河から溜池に導水・貯溜した用水を供給する灌漑施設があるが絶対的な水不足に陥っている。一方、河に面する地帯は洪水期には湛水被害を受け砂がかなりの厚さで堆積している。

当地区の灌漑農業開発は1990年のPost-Dams開発計画（マスタープラン）で策定された優先計画の一つで、セネガル河から安定した灌漑用水を取水し、かつ沿岸地区の農地を湛水と堆砂被害から防御するものである。本計画事業の開発目的と構想は下記の通りである。

(1) マナンタリダムによる洪水調節と流量調節及びディアマダムによる塩水侵入阻止と貯水効果を最大限に利用して農業生産の増大を図り、逼迫した国家食糧事情の緩和に資する。

(2) 村落レベルで農民が自主的に運営が可能な小規模灌漑農業で、極力機械化された水稲栽培の普及を図り、かつ政府の事業運営への関与を極力減らす。

灌漑用水はセネガル河から直接揚水機により取水する計画である。また、沿岸低地部を洪水時の湛水被害から解放するにはセネガル河沿いに堤防を建設する必要があるが、モーリタニア政府/OMVSの資

金不足で現在堤防の建設の目処はたっていない。従い当地区の開発計画は当座堤防を考慮しないものとなるが堤防は恒久的な開発計画に含まれねばならない。

更に計画地区の灌漑農業を円滑に実施し、生産向上による地域経済を高揚させ、計画地区農民の生活水準向上のために、既存村道の改修・拡充、村落給水、収穫後処理施設、農村電化などの社会・農村基盤施設の整備が必要となる。

4.2 協力への展望

モーリタニア政府との面談を通じて、日本政府に対して上記3地区の事業実現に向けた技術・資金協力の強い要請があった。本計画地区にはかなり整備された水田が拡がっており、小用水路網も広範囲に存在して地区農民の水田農業にかける意気込みが感じらる。しかし用水の不足は決定的であり、この点を解消すれば相当の生産をあげモーリタニアの逼迫した食糧事情の緩和に大いに貢献するものと考えられる。また用水改善とともに農村道路などの生産基盤についても改善、拡充が必要である。

当地区の灌漑農業開発は1990年のPost-Dams開発計画（マスタープラン）で調査・策定が行われているが、事業の具体化には更に詳細な開発調査が不可欠である。開発調査では基盤施設計画等のハード面への充分な検討は勿論であるが、モーリタニア政府の農民への事業運営責任委譲を大きく掲げている点を充分考慮して、農業支援制度や農民の教育訓練計画等のソフト面について慎重な検討が必要である。

付属資料

1. デイウプ・デイアデール地区農業環境開発計画援助要請状
   及び無償資金協力援助申請書（案）
2. ガラック・コンデイ地区農業灌漑開発計画援助要請状
   及びTOR（案）
3. 調査団長略歴
4. 調査工程表
5. 面会者リスト
6. 収集資料リスト
7. 現地写真集

GRANT AID PROPOSAL FOR CONSTRUCTION WORKS FOR DIOUP AND N'DIADER AGRICULTURE AND RESTORATION OF ENVIRONMENT PROJECT

1. Project Title	:	**Dioup and N'Diader for Agriculture and Restoration of Environment Project**
2. Location	:	**Haut Delta, Trarza Region, Islamic Republic of Mauritania**
3. Executing Agency	:	**Sociate Nationale pour le Development Rural (SONADER), Ministry of Rural Development and Environment**
4. Proposed Source	:	**The Government of Japan through technical and financial assistance program on a Grant Aid basis by Japan International Cooperation Agency (JICA)**
5. Objectives of Project	:	**The objectives of the project is to increase the productivity of agriculture and livestock by rehabilitation and construction of major canals, and also to restore the environment in the areas of Dioup and N'Diader.**

6. Background and Needs

The two (2) areas named Dioup and N'Diader (the project area) are extended along the right bank of estuary of Senegal River with a length of about 30 km and a width of about 10 km, located about 30 km away from Rosso and towards the west. The project area has been tidal-affected lands and well developed for small scale rice cultivation by tidal irrigation since 1960's when China introduced with mechanized farming near Rosso, livestock and fishery. The cooperatives for agriculture and livestock have been also well functioning in the project area.

In connection with the construction of Diama Dam at the estuary of Senegal River, a levee with a length of about 80 km was constructed along the right bank of Senegal River from the Dam up to Rosso (Mauritanian side). The construction of levee was commenced in 1989 and completed in 1991. The levee relieved the tidal affected lands including the project area from flooding and salt water intrusion from the sea in combination with the function of the Diama Dam. OMVS is now undertaking the construction of control gates on the levee to intake the irrigation water into the project area. However, the levee also cut an well harmonized linkage between natural conditions and traditional production systems of inhabitants, resulting in giving the negative impacts to the nature, life and economy in these lands. Specifically in the project area, many traditional water channels between the river and agricultural lands were closed by the levee, and this caused the following problems in the project area:

- Lack of irrigation water particularly for rice cultivation, forcing partly farmers to leave the agricultural fields uncultivated; and

- Stagnation of drainage water, causing drastically increased death rate of livestock, descending health conditions of inhabitants, lost of natural conditions (grass and trees) and concentration partly of residual salt in the soil.

Several investigations were made in this area, namely:

(i) master plan; and
(ii) study of detailed design and scheme of works by finance of the World Bank and France.

The works proposed in these studies are to deepen the natural and artificial canals to lead the river water into the project area. The drainage canals are also to be constructed. The features of project area and required works are summarized below.

Description	Dioup	N'Diader
- Irrigable area (ha)	2,630	2,030
- Livestock area (ha)	2,490	4,700
- Rehabilitation and construction of Canal (km)	35	17

The construction cost is estimated to be Yen 2.5 billion.

Unless necessary steps will be taken urgently, the project area will be rapidly deteriorated for agricultural production and environmental situation for nature and inhabitants. This means the lost of valuable lands from the country of which the areas economically and environmentally available are limited. Therefore, this project will allow to save this lands and to contribute to the policy of national economy such as strengthening the food security and saving foreign exchange.

7. Sequence of the Development

Since the detailed design was completed for the rehabilitation and construction of main irrigation and drainage channels, the construction can be immediately commenced. By this, the problems in the major parts of the project area, i.e. lack of irrigation water and inundation in the topographically depressed spots, will be mitigated, and the environmental conditions are expected to be restored rapidly.

To boost up the economic situation in the project area, however, it is still needed to improve the existing minor canal networks including those expansion, facilities for livestock, post harvest and transportation, social infrastructure, agricultural supporting system, etc.For this, the further study would be necessary, and would be examined and discussed more deeply later on.

8. Request to the Government of Japan

The Government of Mauritania requests the technical and financial cooperation of the Government of Japan on a grant aid basis in:

(1) Urgent implementation of rehabilitation and construction of main irrigation and drainage canals with associated hydraulic control structures in the project area as the first step; and

(2) Integrated agricultural and rural development of the project area including improvement and upgrading of existing minor canal system, livestock, post harvest and transportation development, agricultural supporting systems, etc. as the second step.

The application form for Japan's Grant Aid for the first step implementation is enclosed herein (Attached Paper).

(Attached Paper)

The Application Form for Japan's Grant Aid

Applicant: Islamic Republic of Maulitania	*Project Title*: Dioup and N'Diader Agriculture and Restoration of Environment Project
Economic Sector: Agricultural Development and Environmental Conservation	*Project Type*: 1. Construction of irrigation, drainage and transport facilities 2. Building works 3. Equipment supply
Total Project Cost:	Yen 2,500,000,000 (Provisional estimate)
Responsible Ministry (Ministry requesting the aid): Ministry of Rural Development and Environment	*Implementing Agency (Agency in charge of execution of the project)*: Sociate Nationale pour le Development Rural (SONADER)

I. Project Description

1. *Background (Please describe in detail)*

(1) *Current Situation of the Sector*

The agricultural sector including livestock and fishery contributes to 30% of GDP. More than half of population (54%) are engaged in the agricultural sector. As almost all the land is occupied by the Sahara desert, the land suitable for the agricultural production is quite limited, being confined along the Senegal river, namely in Senegal River Valley and Delta. The major agricultural products are paddy, millet, maize, wheat, pulse, vegetables, etc. However, those production in quantity, particularly cereal crops, are still insufficient for the national requirement of about 250 thousand tons. Therefore, the Government has to rely on the import of foods which occupies about 30% of the whole import. The strengthening of food security by increasing agricultural production is the most important policy of the Government.

The majority of labour force in the agricultural sector belong to livestock farming which has been traditionally practiced in nomadic way. A spell of drought since 1973 and advancing of desertification has given severe damages to livestock farming. The reservation of pasture land is also an important policy in the agricultural sector.

The Government of Maulitania is implementing the agricultural development in the right bank of the Senegal River Valley and Delta within the framework of "Program of Adjustment of the Agricultural Sector", aiming at expansion of irrigated farming area.

(2) *Problems to be solved in the Sector*

To mitigate the current situation which adversely affected the national economy, the problems to be solved are as follows:

i) Attainment of self-sufficiency of foods at 55% at least;
ii) Modernization of livestock farming;
iii) Development of water supply facilties in villages;
iv) Prevention of desertification;
v) Improvement of agricultural supporting system; and
vi) Modernization of agricultural production system.

(3) *Necessity and Importance of Improvement in the Sector which lead to the formulation of the Project*

- To strengthen the food security of the country; and
- To save foreign exchange.

(4) *Relations between the Sector and the Project*

The proposed project is formulated within the framework of the development of Senegal River Valley and Delta, and under the Program of Reconstruction of Economy and Finance (PREF).

(5) *Reasons why Japan's Grant Aid is requested for this particular Project*

The Government of Japan has granted annually to Maulitania a sum of nearly Yen 150 million in the form of food aid since 1981 and a sum of Yen 200 to 300 million for increasing program of agricultural production (KR2) since 1983. Along with these aids and under the same concept of aids, the Government of Maulitania requests the Government of Japan to continue the technical and financial cooperation in a form of project type which can transfer the technical knowledge, especially rice farming, to the country.

2. *Objectives and Outline of the Project*

(1) *Objectives of the Project*

- to secure irrigation water;
- to improve drainage condition;
- to improve agro-transportation network;
- to strengthen agro-supporting facilities; and
- to conserve environment.

(2) *Outline of the Project (Please give a full description of each facility and equipment and their detailed specifications)*

Description	Dioup	N'Diader	Total
Irrigation area (ha)	2,630	2,030	4,660
Pasture area (ha)	2,490	4,700	7,190
Main irri. canal (km)(*1)	35	17	52
Main drain (km)(*2)	0	4	4
Rural road (km)(*1)	15	15	30
Building with equip.(nos.)	2	2	4

(*1) rehabilitation and new construction
(*2) new construction

(3) *Location Plan of each Facility and/or Equipment*

See attachment - 1

(4) *Cost Estimates (Please describe in detail all the premises on which the cost estimates are based such as basic unit prices, inflation rate, foreign exchange rate, and so on. Please attach detailed tables of estimated costs of each facility and item of equipment. If estimated in local currency, please mention the latest exchange rate of the currency to the U.S. dollar or the Japanese yen.)*

- Canal, road and buildings in Dioup : Yen 1,200 million
- Canal, road and buildings in N'Diader : Yen 1,300 million

Total (provisionally estimated) Yen 2,500 million

The above cost is provisionally estimated based on the conditions that:

- cost of the works estimated in the 1991 study by the Government of Maulitania with an assistance of French Consultant is updated;
- construction will be carried out by a Japanese contractor; and
- taxes and duties on construction materials and equipment to be imported from abroad are exempted.

3. *Benefit, Effect and Publicity of the Project*

(1) *Population that will benefit directly from the project*

About 19,000 in and around project area, represented by Keur Macene

(2) *Population that will benefit indirectly from the project*

About 203,000 in Trarza Region

(3) *Area that will benefit from the project*

Trarza Region

(4) *Economic and Social Effects of the Project (Please describe in detail)*

Within the framework of Senegal River Development Program, the following economic and social effects are anticipated:

- Secure and improve the income of inhabitants in the river basin and surrounding areas;
- Ensure the ecological balance in the basin and promote it in the Sahelian Region; and
- Make the economy of the country free from the adverse climatic conditions and from external factors such as fluctuation of international market prices.

(5) *Publicity (How many people are expected to notice the benefit or positive effect of the project implemented with Japan's grant aid when it is completed?)*

People more than age of 15 years:

About 111,600 in Trarza Region, about 110,000 in Brakna Region and 220,000 in Nouakchott

4. *Request to Other Donors*

(1) *Is there any request made to other donors for assistance closely related to this project?*

1. Yes 2. No

(2) *If yes, please fill in below:*

(i) *Name of the donors;*

The Government of France

(ii) *Title and outline of the assistance;*

EXECUTION DES INFRASTRUCTURES HYDRAULIQUES DU HAUT-DELTA MAURITANIEN

(iii) *Possibilities that the donor will extend the assistance requested;*

Implementation of a part of study area except the project area (Dioup and N'Diader), namely Gouere Area, on a grant aid basis

(iv) *In the case where other donors do not extend assistance, please describe in detail appropriateness and effectiveness of this project;*

(v) *In the case where other donors extend loans, please describe the reason why Japan's Grant Aid is requested for the project.*

5. *Priority*

(Please describe priority of this project among other projects for which requests are made to Japan)

The Government of Maulitania has given the highest priority to the implementation of the proposed project within the framework of Senegal River Development Program, and in view of urgent restoration of adverse environmental situation.

(Please attach project list with priorities)

6. *Ministry and Agency in charge of the Project*

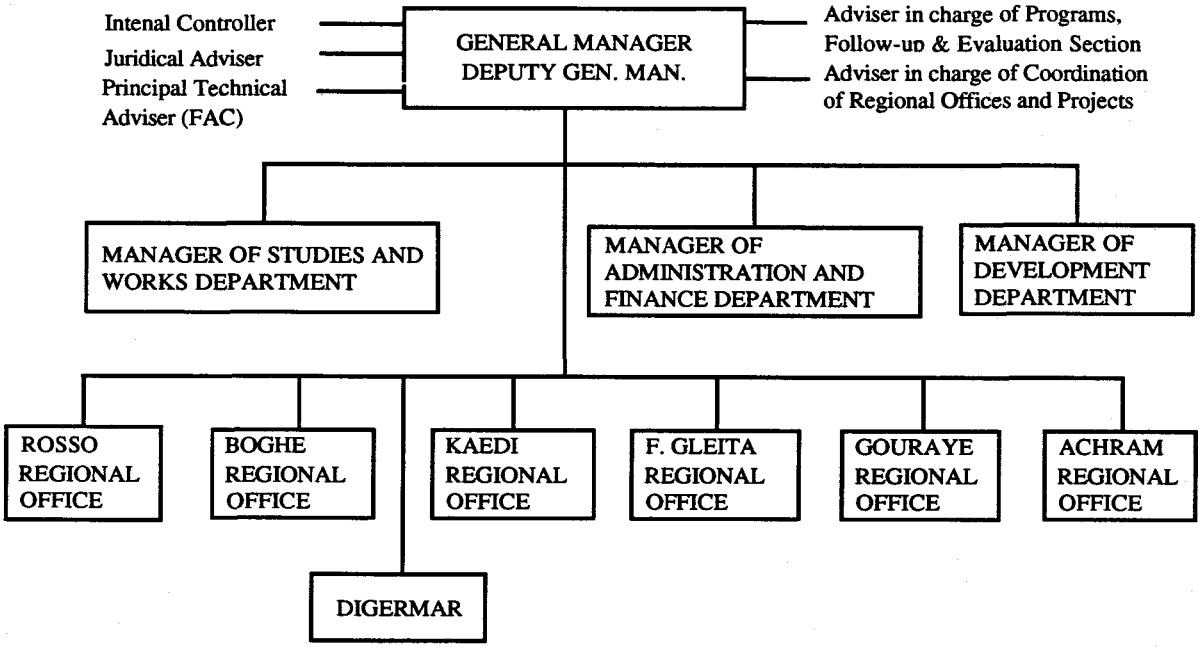
(1) *Outline of Implementing Agency (Please describe in detail) (the Agency in charge of the execution of the Project)*

The implementing agency is Societe Nationale pour le Development Rural (SONADER), national company for rural development supervised by the Ministry of Rural Development and Environment. SONADER is executing the implementation of the agricultural development projects,in the basin of Senegal River within the territory of Maulitania. SONADER is also engaged in the development of Senegal River basin in collaboration with the Organization for Development of the Senegal River (OMVS). The major duties of SONADER are to:

- implement programs of studies and construction of general and main infrastructures in order to improve the operational conditions of irrigated farming areas, pasture lands and the environment; and
- provide farming guidance including more responsibility to farmers organizations and promote intensification of farming.

(i) *Organization Chart of the Agency (in general)*

(Please mark the responsible department and division in charge of the project)



(Please attach detailed organization chart pointing out the responsible department, division and sections in charge of this project)

(ii) *Authorities and Duties of the Agency*

- implement programs of studies and construction of general and main infrastructures in order to improve the operational conditions of irrigated farming areas, pasture lands and the environment; and
- provide farming guidance including more responsibility to farmers organizations and promote intensification of farming.

(iii) *Personnel (Please mention the number of staff, workers, and employees of the agency and the responsible department, division and section in charge of the Project)*

- Number of staff of the Agency (by category):
  - Total: 390
  - Engineers and assistant engineers: 56
  - Technicians: 43
  - Extension workers: 82
  - Administrative supervisory staff and accountants: 28
  - Supporting staff: 181

(iv) *Budget (Revenue and Expenditure)*

(If mentioned in local currency, please mention the latest foreign exchange rate of the currency to the U.S. dollar or the Japanese yen) :

243 million UM in 1990(1US$ = UM 120 in 1993) for the Ministry of Rural Development and Environment including budget for SONADER.

(2) *Outline of Supervising Ministry (Please describe in detail)*

The Ministry of Rural Development and Environment is responsible for supervision of all activities of SONADER.

(i) *Organization Chart of the Ministry (in general)*

(Please mark the responsible department and division in charge of the project and implementing agency)

Please see Attachment - 2

(Please attach detailed organization chart pointing out the responsible department, division, and sections in charge of the project and implementing agency)

(ii) *Authorities and Duties of the Ministry*

- responsible for agriculture, livestock and environment
- responsible for supervising SONADER

(iii) *Personnel (Please mention the number of staff, workers and employees of the Ministry and the responsible department, division and section)*

(iv) *Budget (Revenue and Expenditure)*

(If mentioned in local currency, please state the latest foreign exchange rate of the currency to the U.S. dollar or the Japanese yen)

243 million UM in 1990(1US$ = UM 120 in 1993)

7. *Preparation*

(1) *Project Site (Please attach photographs and maps of the site with the various scales including that of 10,000:1)*

Please see Attachment - 3

(i) (a) *Address of the Site*

Haut Delta, Trarza Region

(b) *Total Area of the Site*

About 230 sq.km

(ii) *Land Preparation*

(a) *To which extent has the land been expropriated for the project?*

Land is owned by individual farmers.

(b) *When will the expropriation of the land be completed?*

(Please attach the laws and procedures concerning the expropriation of land)

(2) *Electricity, Water Supply, Telephone, Drainage and Other Facilities*

(Please describe the extent to which above mentioned incidental facilities have been prepared)

All the facilities are available in Rosso city, but generally unavailable in the project area.

(3) *Is there any information, statistics and data regarding geographical, geological, meteorological, oceanographical situations, etc.*

(If any, please attach those information)

Available in Department of Statistics and other responsible Ministries

8. *Capabilities of the Implementing Agency*
(Please describe the capabilities of the agency to manage, sustain, and operate the project)

(1) *Current Situation*

SONADER is successfully managing, sustaining and operating similar projects.

(2) *Problems of the Agency*

Lack of fund

(3) *Improvement Plan (If any, please describe in detail the contents of such a plan that will enable the Agency to handle the project more effectively and efficiently)*

9. *Operation and Management of the Project*

(1) *Personnel (Please fill in the number of personnel)*

(In the case of hospital, research institutes, training centres, please attach the functional personnel charts.)

(In the case where necessary personnel are not yet secured, when and how this is to be done)

(2) *Budget (Please fill in the budget in the below table)*

(if mentioned in local currency, please refer to the latest foreign exchange rate of the currency to the US dollar of Japanese yen)

(In the case where additional budgetary allocation is needed for the implementation of the project, please answer the following question.)

(i) *Has the additional budget been already allocated?*

1. Yes. 2. No.

(ii) *If no, how and when will the additional budget be allocated?*

(3) *Technical Abilities of Local Staff*

(i) *Please describe technical abilities of local staff operating the project.*

The staff have been well trained through practice and co-working with Foreign Donors' Experts. However, further training through "Transfer of Knowledge Program" will be required.

(ii) *Please describe in detail educational background of those who are in charge of the operation and management of the facilities and equipment.*

10. *List of Related Projects*

(Please fill in below if there is a project executed by another donor country or international organization in related areas.)

(1) *Name of donor*

The Government of France

(2) *Project Title*

Construction works for hydraulic infrastructure for Gouere for agriculture and restoration of environment

(3) *Project Outline*

The same concept of the proposed project mentioned hereof

(4) *Type of Assistance*
(grant, loan, technical assistance, etc.)

Grant aid

(5) *Project Period*

From 1994 onward

(6) *Relations with this Project*

The Government of France conducted the detail study and design of this area together with the proposed project area mentioned hereof.

(If there are many project, please attach a list of those projects explained in the same way)

11. *Technical Assistance*

(1) *Has technical assistance been extended to this project?*

(i) Yes. **(ii) No.**

(2) *Is technical assistance needed for the implementation of this project?*

(i) Yes. **(ii) No.**

(3) *If no, please describe the reasons why technical assistance is not needed.*

SONADER is capable to operate and maintain the proposed project after the infrastructure be constructed by giving the guidance to benefited farmers.

(4) *If yes, please fill in below.*

(i) *Long-term experts* (4 persons)

(ii) *Acceptance of trainees* (10 persons)

(iii) *Project-type Technical Cooperation*
(If needed, please describe the proposed project outline)

(iv) *Japan Overseas Cooperation Volunteers*

(If needed, please describe the proposed sector and related information.)

(v) *Development Survey Programme (Feasibility Studies; and Master Plan)*

(If needed, please describe the outline of the proposed development survey programme.)

(5) *Has an official request for technical assistance been already made?*

(i) Yes. (ii) No.

(iii) *If yes, please mentioned the date of the request.*

(iv) *If no, please describe the reason why the official request has not yet been made.*

(v) *When will the request be made to the Embassy of Japan?*

II. General Development Plan

1. *Title of the Plan (Please attach the whole volume of the latest general development plan.)*

Reconstruction Program of Economy and Finance (PREF) since 1989

2. *Economic and Social Situation*
(Please mention the basic statistics of economic fundamentals.)

(1) *GDP*

82,515 million UM in 1990 (Equivalent to US$ 961 million) in current price

(2) *National Income, Sector by Sector*

GDP in 1990 in setoral wise is as follows (US$ million and %):

-	Agriculture	248 (26%)
-	Mining	119 (12%)
-	Industry	90 (9%)
-	Construction, Transport and Communication	102 (11%)
-	Hotel and Restaurant	124 (13%)
-	Other	278 (29%)
	Total	961 (100%)

(3) *Unemployment Rate*

3%

(4) *Inflation Rate*

(5) *Growth Rate*

3.9% in GDP during 1987 - 1990

(6) *Balance of international payments*

US$ 70 million deficit in 1990

(7) *Labour Population (as a whole, and sector by sector)*

Total population 1,864,000
Labour population 1,221,000 (age more than 10)

(8) *Debt Service Ratio*

(9) *Outstanding Debts*

(10) *Major Items of Exports and Imports and their value*

Import (UM million)

Food (Cereal)	2,427
Sugar	2,146
Flour	1,672
Tea	1,148

Export (UM million)

Iron ore	18,043
Fish	16,357
Other	724

(11) *Major Trading Partner*

Japan, Italy, France, Belgium, Germany, Spain, Algeria

(12) *Population and its Growth Rate*

1,864,000 in 1988, 2.93% (estimated)

(13) *Average Life Expectancy (Male and Female)*

Male 49, Female 52

(14) *Death Rate and Birth Rate*

Infant death rate 13.2%

(15) *Medical Structure*

Major hospital	16
Health post	150
Bed	1,600

(16) *Ten Diseases most afflicting the nation*

(17) *Illiteracy Rate (or Literacy Rate)*

(18) *Other data*

3. *Outline of the Plan*

(1) *Most Important Sectors in the Plan*

Agriculture

(2) *Basic Objectives of the Plan*
(Please describe in detail the objectives by using concrete figures.)

For agricultural sector, emphasis is place on rural development, aiming at inducing farmers to take more responsibility in order to improve their self-management as well as ensuring food security and ultimately saving the foreign exchange.

(3) *How will the above-mentioned objectives be achieved?*

By irrigation and drainage development

(Please mention specific projects and programme to achieve the objectives.)

4. *When will the plan be executed and completed?*

The plan started in 1990 on the basis of Post-Dam study.

5. *Relations between this project and the general development plan. (Please describe the significance of the project in the general plan.)*

A part of General Development Plan

6. *Is there any assistance that other donors have extended/will extend to the projects and/or programme listed in the general plan?*

(i) Yes. (ii) No.

(iii) *If yes, please give basic information on the assistance*

(a) *Name of donor*

World Bank, EC, France, Spain, AfDB, etc.

(b) *Project Title*

Development of Senegal River Valley and Delta

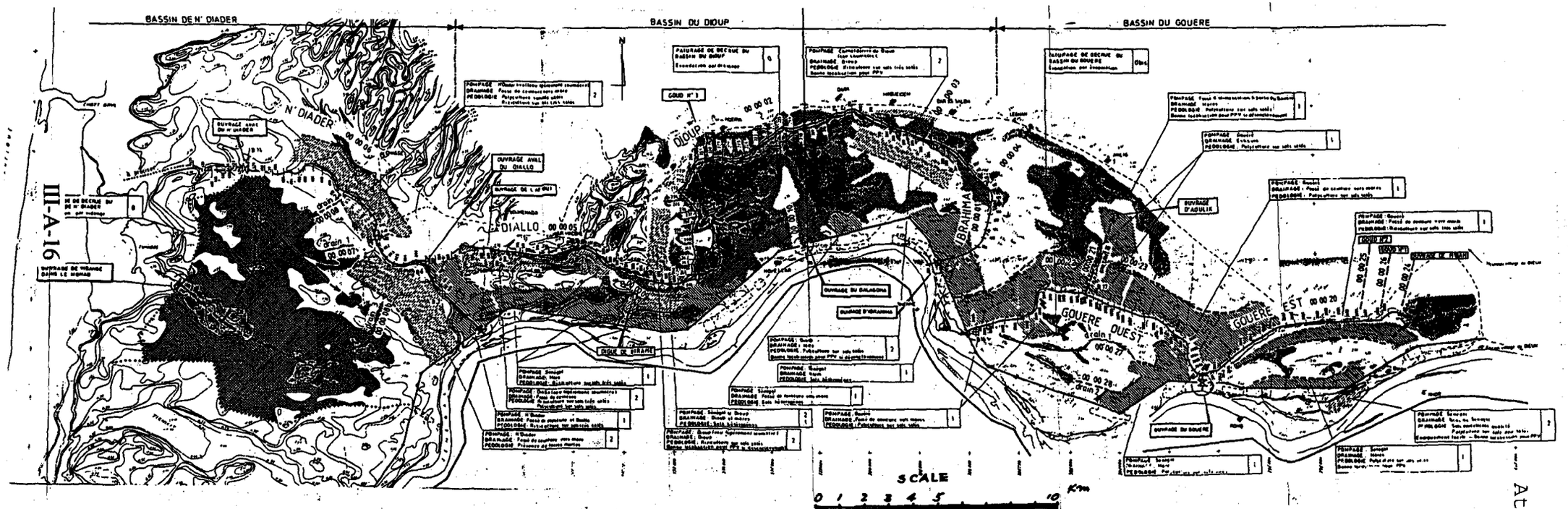
(c) *Project Cost*

(d) *Type of Assistance (Grant, Loan, Technical Assistance, etc.)*

Grant, Loan and Technical Assistance

(e) *Project Outline*

Irrigated agriculture, flood protection and environment protection



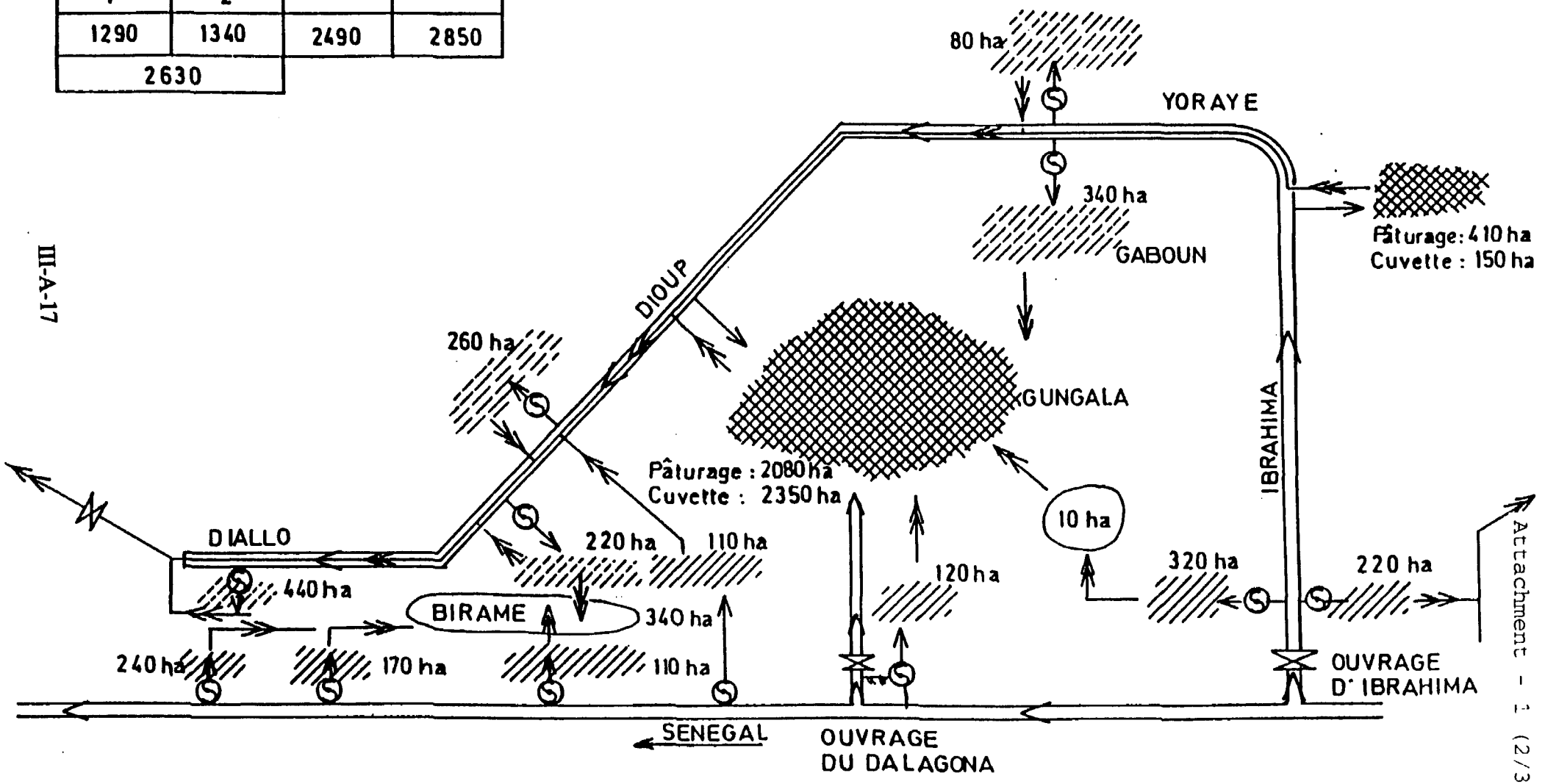
III-A-16

Attachment - 1 (1/3)

BASSIN DU DIOUP

Dioup Area

SUPERFICIES DES ZONES (ha)			
Périmètres irrigables Irrigation Area 1	2	Pâturages Pasture	Cuvettes Pond
1290	1340	2490	2850
2630			



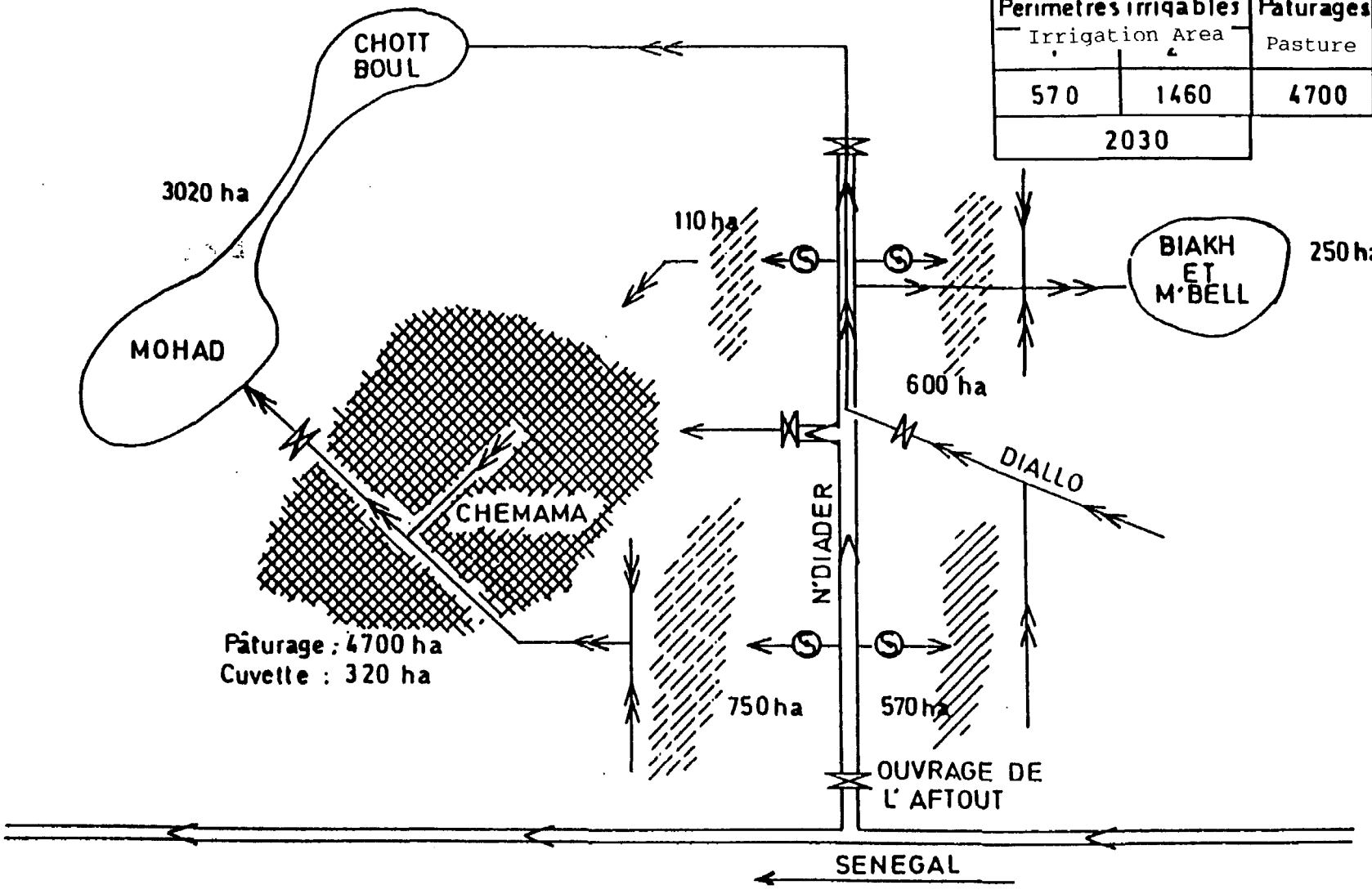
III-A-17

Attachment - 1 (2/3)

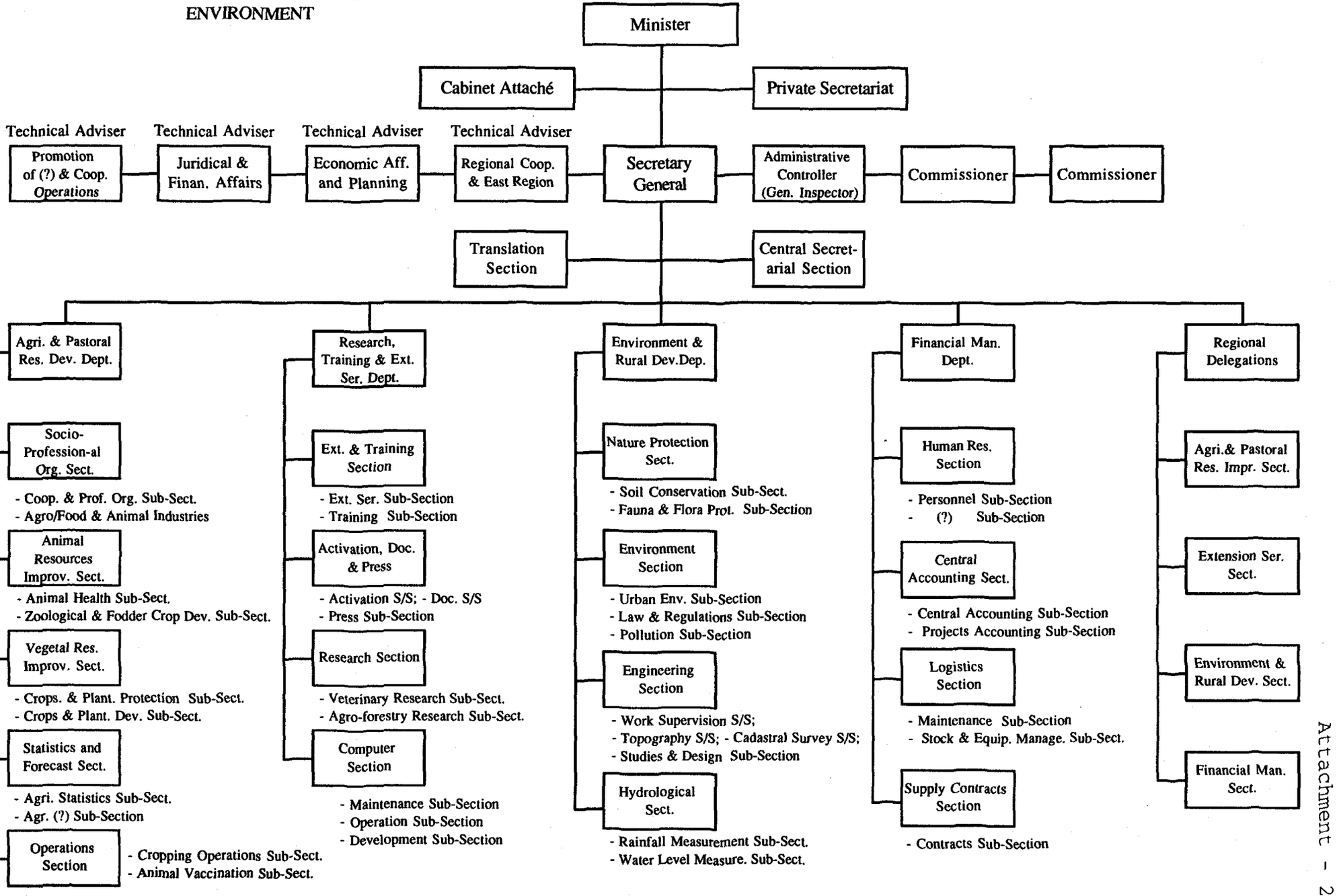
BASSIN DE N'DIADER

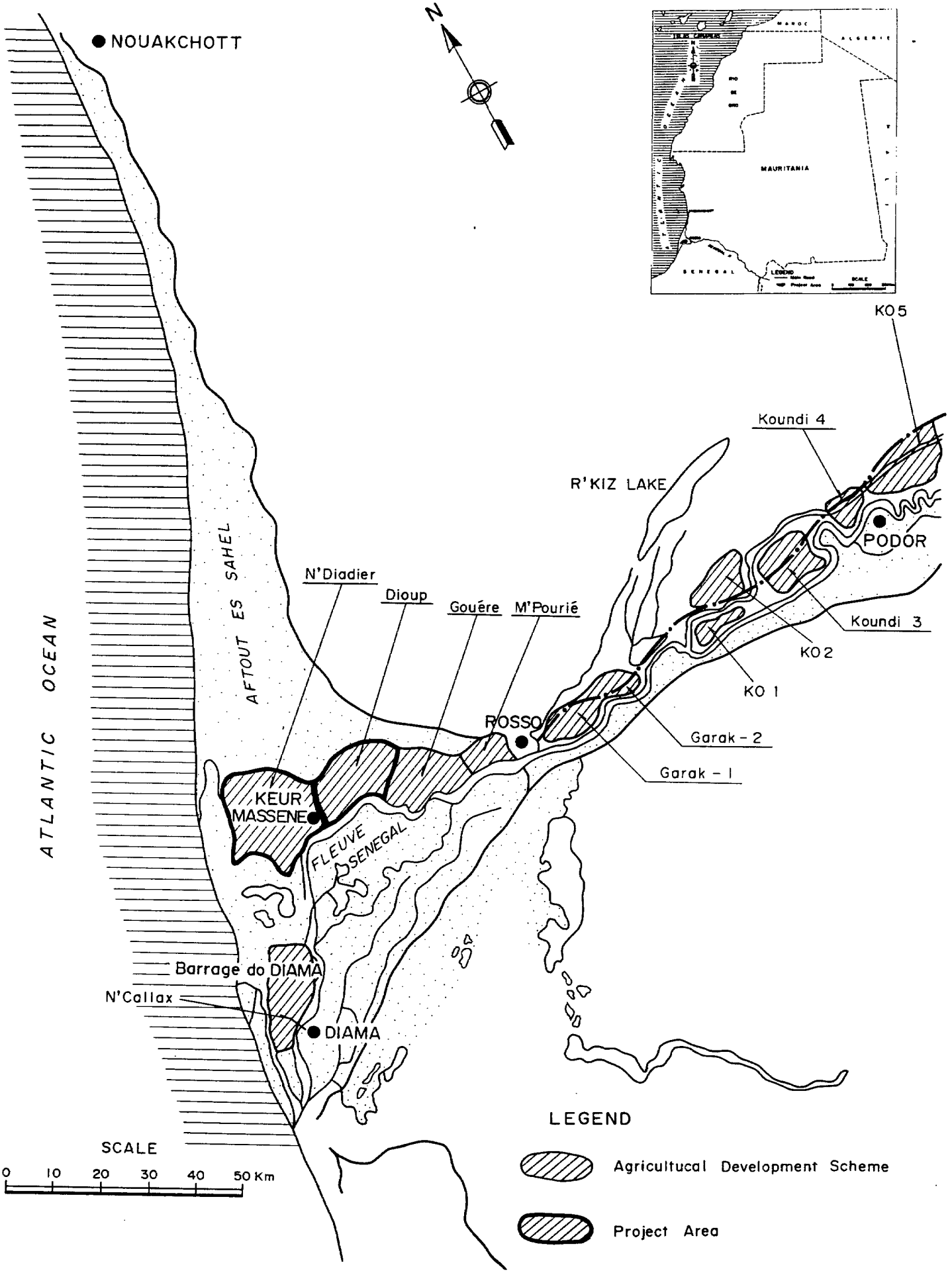
N'Diader Area

SUPERFICIES DES ZONES (ha)			
Périmètres irrigables — Irrigation Area		Pâturages Pasture	Cuvettes Pond
570	1460	4700	3590
2030			



MINISTRY OF RURAL DEVELOPMENT AND ENVIRONMENT





LOCATION MAP

TECHNICAL AID PROPOSAL FOR FEASIBILITY STUDY ON GARAK AND KOUNDI IRRIGATED AGRICULTURE DEVELOPMENT PROJECT

1. Project Title	:	**Garak and Koundi Irrigated Agriculture Development Project**
2. Location	:	**Trarza-Est, Trarza Region, Islamic Republic of Mauritania**
3. Executing Agency	:	**Sociate Nationale pour le Development Rural (SONADER), Ministry of Rural Development and Environment**
4. Proposed Source of Assistance	:	**The Government of Japan through a technical assistance program by Japan International Cooperation Agency (JICA)**
5. Objective of the Study	:	**The objective of the study is to formulate the irrigated agriculture development, aiming at increasing the production of cereal crops, particularly paddy and placing an emphasis on the enhancement of small - scale farming at the village level.**

6. Background

The major components supporting the national economy of Mauritania are mining industry and fishery in the northern part of the country, irrigated agriculture in the south along the Senegal river and livestock farming which have been traditionally practiced in nomadic way. These economic components contributes to about 50% of GDP, and agricultural sector including fishery and livestock shares about 30%. As almost all the land is occupied by the Sahara desert, the farming area is as little as 0.2% of the whole land, being confined along the Senegal river, namely Senegal River Valley and Haut Delta. The major crops are millet, sorghum, paddy, maize, pulse, vegetables, etc. The production of cereal crops in 1990 was about 150,000 tons which was far less than the national requirement of about 250,000 tons. Such chronic food shortage has imposed the Government to rely on the import of foods which occupied about 30% of the whole import. Therefore, self-sufficiency of foods is one of the most important policy coupled with food security and saving foreign exchange.The expansion of irrigation area and extension of modern technology of agriculture are the main objectives in the agricultural sector.

The majority of labour force in the rural area belong to livestock farming. A spell of drought since 1973 and advancing of desertification has given severe damages to livestock farming and related industry. The conservation of pasture land is also an important policy in the agricultural sector.

The development of Senegal river has been initiated by a multi national cooperation of Mauritania, Mali and Senegal since 1972 through establishing the "Organization for Development of the Senegal River" (OMVS). The Senegal river, having a catchment area of about 300,000 Km^2, is characterized by very irregular hydrologic conditions and is almost dry for the half of year. About 2 million people is living in the basin. Two dams were constructed

in the Senegal river, one was Manantali Dam in the upstream for regulating run-off and power generation and the other Diama Dam at the estuary for preventing saline water intrusion and storing water for irrigation. The combined functions by two dams will make it possible to irrigate 375,000 ha of land in the basin, of which 126,000 ha belongs to Mauritania. The land of about 35,000 ha has been irrigated, and the Government of Mauritania is accelerating to implement the irrigated agriculture development projects in the rest potential lands through having technical and financial cooperation of various donor countries and international funding agencies.

The main objectives of the development of Senegal river basin, so called Senegal River Valley and Delta, are to:

- optimize the exploitation of the development potential created by the Manantali and Diama dams to mitigate food shortage and to improve the living conditions of farmers;
- disengage the Government from the agricultural production and related sectors; and
- increase efficiency of the Government's operations.

To achieve the above objectives, the Government formulated a general plan - called "Post - Dams Plan" - for rural development on the right bank of the Senegal River Valley and Delta. In the Valley, Trarza - Est is regarded as the most important development region geographically as the nearest agricultural zone from Nouakchott, the capital of Mauritania. The preliminary development plan of Trarza - Est with an estimated irrigable area of 46,600 ha from Rosso to Lexeiba including land use plan and layout of project facilities was prepared by the group in charge of the Post - Dams Study and approved by the Government in 1990.

The proposed project area is extending on the alluvial flood plain with a width of 10 to 20 km, called Trarza - Est. The project area of about 25,000 ha occupies the major parts of Trarza - Est, being composed of the following three sub-areas:

(1)	Garak - 1 & 2	:	13,000 ha;
(2)	Koundi - 3	:	10,000 ha; and
(3)	Koundi - 4	:	2,000 ha.

The main concept of the irrigated agriculture development in the project area is to establish small - scale farming at the village level to ensure adequate farm income for the individual farmers. The Government also aims at inducing farmers to take more responsibility in order to improve their self-management capability and to ensure smooth marketing of cereal crops. The major works required for the project include the construction of flood levee along the Senegal river, pump stations, irrigation and drainage canals including rehabilitation of the existing systems,control structures and roads.

The Feasibility Study is needed prior to the implementation of the project The Government of Mauritania requests the Government of Japan the technical cooperation in carrying out the Feasibility Study.

7. Terms of Reference

The Terms of Reference for the Feasibility Study on Garak and Koundi Irrigated Agriculture Development Project are given in Attacment Paper hereto.

8. Experts Assigned

The following foreign experts will be required for executing the Study:

- Team Leader;
- Irrigation Engineer;
- River Engineer;
- Structural Engineer;
- Hydrologist;
- Soil Mechanical Engineer;
- Mechanical Engineer;
- Electrical Engineer;
- Agro-infrastructure Expert;
- Pedologist;
- Agronomist;
- Agro-economist;
- Institutional Expert;
- Environmentalist;
- Geodetic Engineer; and
- Topographic Survey Engineer.

9. Schedule of the Study

The Study will be carried out in the following two stages:

Stage-1 : Preparation aerial topographic maps, collection of data, and field survey of agriculture and agro-economy, soil, geology, topography and hydrology, socio-economy, and environment; and

Stage-2 : Formulation of irrigated agriculture development plan and preparation of feasibility study report.

The period required for the Study is estimated to be 18 months in total.

(Attached Paper)

TENTATIVE TERMS OF REFERENCE FOR FEASIBILITY STUDY ON GARAK AND KOUNDI IRRIGATED AGRICULTURE DEVELOPMENT PROJECT

Project Title	:	Garak and Koundi Irrigated Agriculture Development Project
Executing Agency	:	Sociate Nationale pour le Development Rural (SONADER), Ministry of Rural Development and Environment, The Government of Mauritania
Proposed Source of Assistance	:	The Government of Japan

1. Introduction

The major components supporting the national economy of Mauritania are mining industry and fishery in the northern part of the country, irrigated agriculture in the south along the Senegal river and livestock farming which have been traditionally practiced in nomadic way. These economic components contributes to about 50% of GDP, and agricultural sector including fishery and livestock shares about 30%. As almost all the land is occupied by the Sahara desert, the farming area is as little as 0.2% of the whole land, being confined along the Senegal river, namely Senegal River Valley and Haut Delta. The major crops are millet, sorghum, paddy, maize, pulse, vegetables, etc. The production of cereal crops in 1990 was about 150,000 tons which was far less than the national requirement of about 250,000 tons. Such chronic food shortage has imposed the Government to rely on the import of foods which occupied about 30% of the whole import. Therefore, self-sufficiency of foods is one of the most important policy coupled with food security and saving foreign exchange.The expansion of irrigation area and extension of modern technology of agriculture are the main objectives in the agricultural sector.

The majority of labour force in the rural area belong to livestock farming. A spell of drought since 1973 and advancing of desertification has given severe damages to livestock farming and related industry. The conservation of pasture land is also an important policy in the agricultural sector.

The development of Senegal river has been initiated by a multi national cooperation of Mauritania, Mali and Senegal since 1972 through establishing the "Organization for Development of the Senegal River" (OMVS). The Senegal river, having a catchment area of about 300,000 Km^2, is characterized by very irregular hydrologic conditions and is almost dry for the half of year. About 2 million people is living in the basin. Two dams were constructed in the Senegal river, one was Manantali Dam in the upstream for regulating run-off and power generation and the other Diama Dam at the estuary for preventing saline water intrusion and storing water for irrigation. The combined functions by two dams will make it possible to irrigate 375,000 ha of land in the basin, of which 126,000 ha belongs to Mauritania. The land of about 35,000 ha has been irrigated, and the Government of Mauritania is accelerating to implement the irrigated agriculture

development projects in the rest potential lands through having technical and financial cooperation of various donor countries and international funding agencies.

The main objectives of the development of Senegal river basin, so called Senegal River Valley and Delta, are to:

- optimize the exploitation of the development potential created by the Manantali and Diama dams to mitigate food shortage and to improve the living conditions of farmers;
- disengage the Government from the agricultural production and related sectors; and
- increase efficiency of the Government's operations.

To achieve the above objectives, the Government formulated a general plan - called "Post - Dams Plan" - for rural development on the right bank of the Senegal River Valley and Delta. In the Valley, Trarza - Est is regarded as the most important development region geographically as the nearest agricultural zone from Nouakchott, the capital of Mauritania. The preliminary development plan of Trarza - Est with an estimated irrigable area of 46,600 ha from Rosso to Lexeiba including land use plan and layout of project facilities was prepared by the group in charge of the Post - Dams Study and approved by the Government in 1990.

2. Project Background

The proposed project area is extending on the alluvial flood plain with a width of 10 to 20 km, called Trarza - Est. The project area of about 25,000 ha occupies the major parts of Trarza - Est, being composed of the following three sub-areas:

(1)	Garak - 1 & 2	:	13,000 ha;
(2)	Koundi - 3	:	10,000 ha; and
(3)	Koundi - 4	:	2,000 ha.

The area of Garak -1 & 2 is located at the immediate east of Rosso or western end of the Trarza - Est, while Koundi - 3 and Koundi - 4 is located at the eastern end of Trarza - Est, being about 60 to 90 km away from Rosso. The project area has a very flat topography with the elevation of 20 m more or less. The width of Senegal river ranges from 200 m to 400 m with meandering, and the low land facing the Senegal river has been inundated by flood every year. The soil in the project area is clayey one, locally called "Oualo".

The climate of the project area is defined as the semi - arid one with annual rainfall ranging from 30 mm to 340 mm. The rainy day is only 10 to 30 days a year, concentrating in July to September. The maximum temperature is 38°C and the minimum 20°C.

The major crops grown in the project area are paddy, maize and sorghum. These crops are generally cultivated on a small holder basis. The farming practices are generally of labour intensive type and partly with farm machinery. The yield of paddy is estimated to be 2.5 ton/ha. There are several irrigation systems in the project area, drawing water from the Senegal river through lake or ponds, having storing and regulating functions. Most of the irrigation facilities are primitive and deteriorated.

The main concept of the irrigated agriculture development in the project area is to establish small - scale farming at the village level to ensure adequate farm income for the

individual farmers. The Government also aims at inducing farmers to take more responsibility in order to improve their self-management capability and to ensure smooth marketing of cereal crops. The major works required for the project include the construction of flood levee along the Senegal river, pump stations, irrigation and drainage canals including rehabilitation of the existing systems,control structures and roads.

3. Objective of the Study

The objective of the study is to formulate the irrigated agriculture development, aiming at increasing the production of cereal crops, particularly paddy and placing an emphasis on the enhancement of small - scale farming at the village level.

4. Scope of the Study

4.1 Extent and Schedule of the Study

The feasibility study (the Study) will cover:

a. irrigation and drainage developments in the project area composed of three sub-project area with an area of 25,000 ha in total, taking the small - scale farming system at the village level;

b. agricultural, social and economic activities which encourage the irrigation development in the project area; and

c. Environmental aspect.

The Study will be carried out in the following two stages:

Stage-1 : Preparation aerial topographic maps, collection of data, and field survey of agriculture and agro-economy, soil, geology, topography and hydrology, socio-economy, and environment; and

Stage-2 : Formulation of irrigated agriculture development plan and preparation of feasibility study report.

4.2 Stage - 1

In carrying field investigation and study, the study team may use the following aerial photographs, maps and data available from the Government of Mauritania:

- IGN (National Geographic Institute) maps on a scale of 1:50,000 with contour lines prepared from aerial photographs in 1957;
- Soil maps on a scale of 1:50,000 prepared in 1973;
- Aerial photograph on a scale of 1:10,000 taken in 1988 and non-adjusted photo mosaics on a scale of 1:20,000; and
- aerial photographs on a scale of 1:40,000 and adjusted photo mosaics.prepared in 1992.

4.2.1 Preparation of Aerial Photo Maps

Carry out field topographic survey for mapping of the project area and prepare the topographic maps on a scale of 1 : 10,000

4.2.2 Data Collection and Review

Review and analyze data and information on the human, land and water resources, socio-economy, agriculture, agro-infrastructure and environment in connection with the project as well as the previous studies on the basin development.

4.2.2 Field Survey

a) Carry out agricultural and agro-economic survey on land use, farming practice, crops and cropping patterns, yields, agricultural production and inputs, prices of crops, etc.;

b) Carry out soil survey and test soil samples;

c) Carry out geotechnical survey at the major structures including pump stations and flood levee paying attention to sand layer;

d) Carry out the route survey along the proposed flood levee along the Senegal river and inventory of existing project facilities

e) Carry out hydrological surveys including measurement of river flows, inventory of the existing meteo-hydrological stations, water sampling for sedimentation and water quality analysis, etc.;

f) Conduct construction material survey;

g) Carry out socio-economic survey; and

h) Identify and observe the environmental components in connection with the agricultural developments of the project area.

4.3 Stage - 2

4.3.1 Evaluation of Water and Land Resources

a) Identify and evaluate the present conditions for and constraints to the agricultural development of the proposed project area, including rainfall, run-off and flood, sedimentation, water quality, adverse soil condition, etc;

b) Carry out the meteo-hydrological studies to evaluate the water resources available for the irrigated agricultural development of the project area; and

c) Carry out studies on land use, soils and land capability, geology, topography to evaluate the development potentials of the project area.

4.3.2 Irrigation and Drainage Development Studies

a) Identify the irrigation development area on the basis of soils, land capability, topography, flood condition, water availability, etc;

b) Prepare preliminary layout and design of irrigation and drainage facilities including flood protection to be constructed and rehabilitated; and

c) Carry out topographic route survey of major irrigation and drainage canals including related facilities.

4.3.3 Agricultural and Agro-economic Studies

a) Evaluate all the available data related to present land use, soil classification, cropping pattern, crop yields, input levels and farming practices in the project area;

b) Recommend practical and suitable cropping patterns, farming practices, input levels and labour requirement for the project area;

c) Assess the adequacy of existing agricultural support services and recommend appropriate measures to strengthen such services under the project;

d) Clarify the prices and marketing system of agricultural products and farm ;input on the project and regional levels; and

e) Evaluate farm budgets for typical farm households under the project.

4.3.4 *Agro-infrastructure Studies*

a) Examine the adequacy of existing agro-infrastructure such as farm road networks, storage facilities and other post harvest system in the project area;

b) Prepare plans for improvement of agro-infrastructures fro irrigation development under the project, and

c) Prepare the preliminary design of the agro-infrastructures to be provided under the project.

4.3.5 Environmental Aspects and Women Involvement Studies

a) Clarify the present constraints to the irrigation development from the view point of environment in the project area;

b) Clarify the present environmental problems and assess impacts of the irrigation development on social and natural environment in the project area, including losses of social and farming practices, effect on wild life and water pollution, etc;

c) Assess measure for controlling tropical diseases; and

d) Clarify women involvement in the present agricultural and irrigation activities and assess that under the project.

4.3.6 Formulation of Development Plan

a) Formulate the irrigated agricultural development plans for the respective three sub-areas, namely Garak-1 & 2, Koundi - 3 and Koundi - 4, based on the results of field survey and development studies;

b) Calculate the work quantities and estimate the costs for investment and operation and maintenance;

c) Estimate the direct project benefit, and also indirect benefits;

d) Evaluate economic and financial feasibility for implementation of the *project of the respective sub-areas;*

e) Recommend organization and procedures best suited for effective operation and maintenance of the project;

f) Recommend the priority order of the project implementation including overall project viability;

g) Prepare the implementation schedule for the irrigated agricultural development project;

5. Transfer of Technology

In the course of the Study, transfer of technology and training will be provided to Mauritanian experts participating the Study directly and indirectly by foreign experts in the following fields:

a) Field survey and investigation for every lines of foreign experts assigned; and

b) Plan and design of facilities for irrigation, drainage and agro-infrastructure.

The above transfer of technology will be carried out in the form of on-the-job training and seminar. Overseas training will also be programmed.

6. Schedule of the Study and Reporting

The period required for the Study is estimated to be 18 months in total. A tentative study schedule is shown in Attachment-2.

The following reports will be prepared in the course of the Study:

a) Inception report - 1	:	Report on aerial photo mapping within one (1) months from the commencement of the Study;
b) Inception report - 2	:	Report on the field survey and investigation and the studies within four (4) months from the commencement of the Study;
c) Mapping report with aero-photo maps	:	Within nine (9) months from the commencement of the Study;
d) Draft feasibility Study report	:	Within 16 months from the commencement of the Study; and
e) Feasibility report	:	Within 18 months from the commencement of the Study.

7. Experts Assigned

The following foreign experts will be required for executing the Study:

- Team Leader;
- Irrigation Engineer;
- River Engineer;
- Structural Engineer;
- Hydrologist;
- Soil Mechanical Engineer;
- Mechanical Engineer;
- Electrical Engineer;
- Agro-infrastructure Expert;
- Pedologist;
- Agronomist;
- Agro-economist;
- Institutional Expert;
- Environmentalist;
- Geodetic Engineer; and
- Topographic Survey Engineer.

8. Undertaking of the Mauritanian Government

In order to facilitate a smooth and effective conduct of the Study, the Government of the Islamic Republic of Mauritania shall take the necessary measures;

(a) to secure the safety of the Study Team

(b) to permit the members of the Study Team to enter, leave and sojourn in the Islamic Republic of Mauritania in connection with their assignment therein, and exempt them from alien registration requirement and consular fees.

(c) to exempt the Study Team from taxes, duties and other charges on equipment, machinery and other materials brought into and out of the Islamic Republic of Mauritania for conduct of the Study.

(d) to exempt the Study Team from income tax and charges of any kind imposed on or connection with any emoluments or allowances paid to the members of the Study Team for their services in connection with the implementation of the Study.

(e) to provide necessary facilities to the Study Team for remittance as well as utilization of the funds introduced in the Islamic Republic of Mauritania from Japan in connection with the implementation of the Study.

(f) to secure permission or entry into private properties or restricted areas for the conduct of the Study.

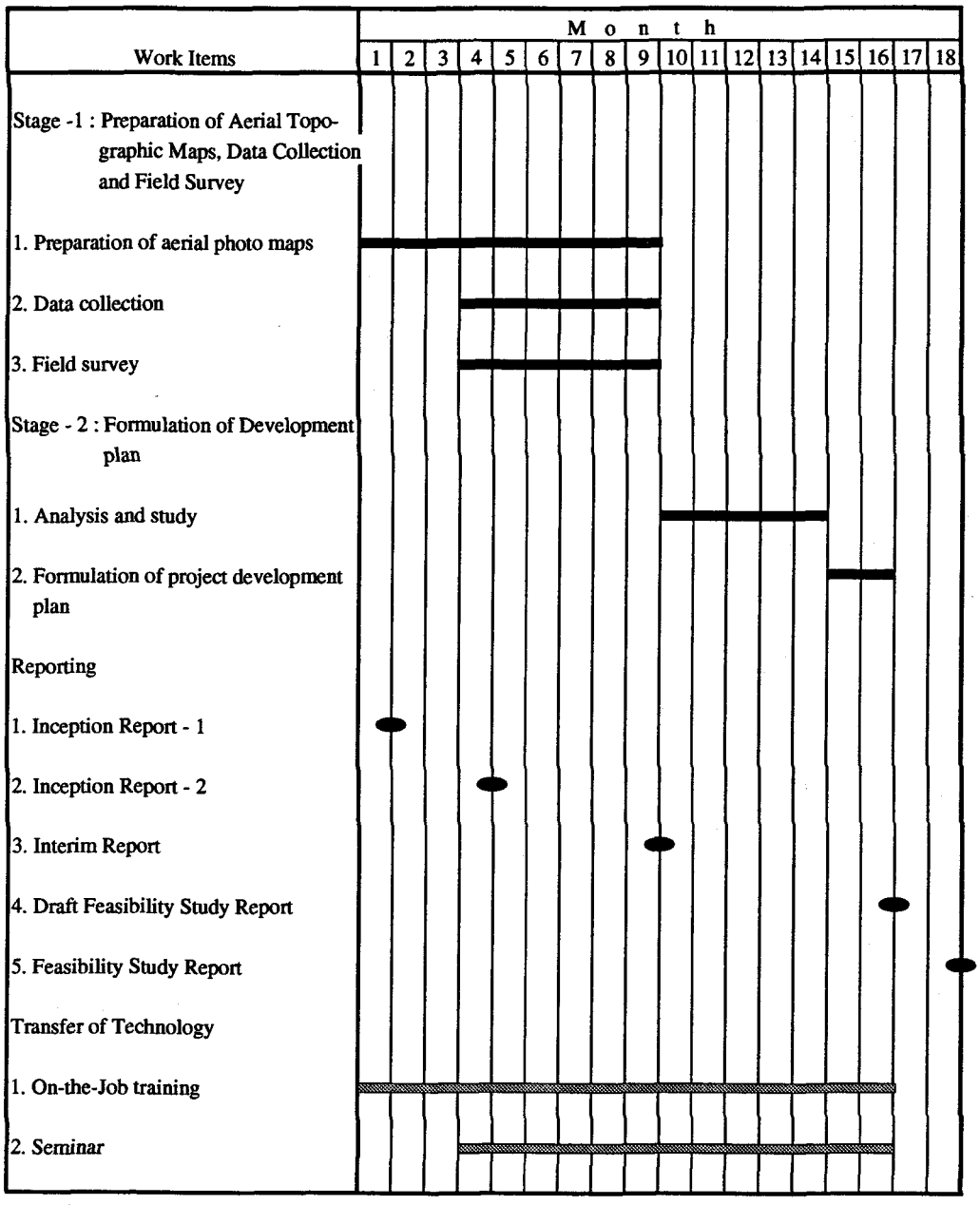
(g) to secure permission for the Study to take all data, documents and necessary materials related to the Study out of the Islamic Republic of Mauritania to Japan.

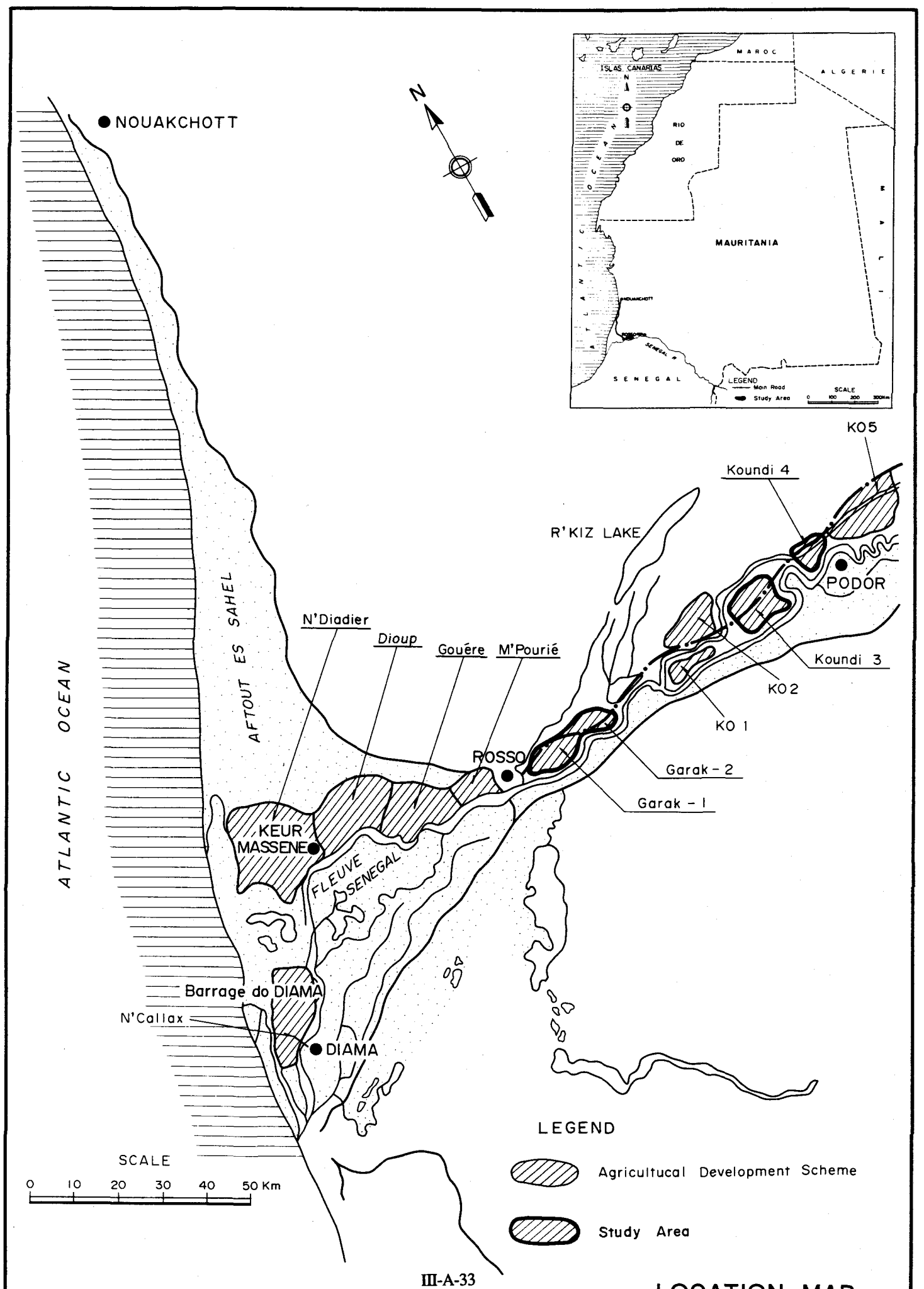
(h) to provide medical services as needed. Its' expenses will be chargeable to members of the Study Team.

The Government of the Islamic Republic of Mauritania will bear claims, if any arises against members of the Japanese Study Team resulting from, occurring in the

course of or otherwise connected with the discharge of the their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Study Team. The Government of the Islamic Republic of Mauritania shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non governmental organizations concerned for the smooth implementation of the Study.

Study Schedule for Feasibility Study on
Garak and Koundi Irrigated Agriculture Development Project





LOCATION MAP

調査団長略歴

調査員名	略歴
村井　浩	
1947.11.19生	
1971.3	九州大学農学部農業工学科卒業
1971.4	日本工営株式会社入社
1971.4	日本工営（株）農業部
1971.7	日本工営（株）設計第１部
1975.9	日本工営（株）メスケネ開発事務所（シリア）
1977.4	日本工営（株）農業水利部
1979.11	日本工営（株）カンカイ開発事務所（ネパール）所長
1985.6	日本工営（株）第１農業水利部副参事
1987.1	日本工営（株）ナラヤニ開発事務所（ネパール）所長
1990.1	日本工営（株）農業開発部　課長
1992.2	日本工営（株）メスケネ開発事務所（シリア）所長

主な海外業務実績

案件名	対象国	従事期間	担当業務
ビンディン灌漑開発計画	ヴェトナム	1973.7- 1975.4	灌漑排水計画・設計
メスケネ灌漑計画	シリア	1975.9 - 1977.4	灌漑排水計画・設計
リアムカナン灌漑計画	インドネシア	1977.7 - 1979.3	灌漑排水計画
カンカイ灌漑計画	ネパール	1979.11 - 1985.6	総括／灌漑排水計画・設計 施工監理・水監理
スンサリモラン灌漑計画	ネパール	1986.7 - 1986.12	灌漑排水計画
ナラヤニ灌漑計画	ネパール	1987.1 - 1991.1	総括／灌漑排水計画・設計 施工監理・水監理
メスケネ灌漑計画	シリア	1992.2 - 現在	総括／灌漑排水計画 施工監理・水監理

調査行程表

日順	月日	起点・経由地	目的地・滞在地	活動
1	12月10日（金）	アジスアベバ		移動
2	12月11日（土）		ダカール	大使館報告
3	12月12日（日）		ヌアクショット	地方開発・環境省表敬訪問、SONADER協議、世銀事務所訪問
4	12月13日（月）	ヌアクショット	ロッソ	地方開発・環境省／SONADER協議、移動
5	12月14日（火）		ヌアクショット	現地調査、移動
6	12月15日（水）		ヌアクショット	地方開発・環境省／SONADER、計画省協議・資料収集
7	12月16日（木）		ヌアクショット	資料整理、SONADER、計画省協議
8	12月17日（金）	ヌアクショット	パリ	移動
9	12月18日（土）	パリ	ダマスカス着	村井団長
10	12月19日（日）		東京着	伴団員

面会者リスト

Ministry of Rural development and Environment

1. H.E. Mr. Sghair Ould M'Bareck Minister
2. Mr. Ahmed Youra Ould Imame Secretary General
3. Dr. Moulaye Ould Moulaye Oumar Head of Research and Evaluation Division
4. Mr. Courbois J. Michel Technical advisor
5. Mr. Sall Brahim Chief of Research and Evaluation Department

Ministry of Planning

6. Mr. Youssouf Abdel Jelil Assi. Director of Financial Department
7. Mr. Limam Ahmed

Rural Development Authority (SONADER)

8. Mr.Mohamed O. Babetta Director General
9. Mr. Guisset Al Assane Cherif Director of Study and Construction Division
10. Mr. Koita Tocka Chief of Plan, Design and Evaluation Division
11. Mr. Moussa Sy Chief of Construction Department
12. Mr. Sy Moussa Djiby Chief of Infrastructure Department
13. Mr. Ahmedou Habibouuah Director of Rosso Regional Office

在セネガル国日本大使館

14. 近藤　茂 書記官

収集資料リスト

- Etude D'application Des Schemas Directeurs De La Vallee Et Du Delta Rive Droite Du Fleuve Senegal, World Bank, EC, Dec. 1991
- Etude D'execution Des Infrastructures Hydrauliques Du Haut-Delta Mauritanien, Jul. 1991, Ministere Du Developpment Rural, SONADER
    (1) Avant Project Detaille, Plans D'execution
    (2) Etude Topographique
    (3) Etude Economique Et Financiere
    (4) Etude Du Mode E'exploitation
- Schema D'amenagement De L'espace Rural, Dans Le Delta Du Fleuve Senegal, Dossier Definitif, Caisse Francaise de Development, Jan. 1993
- Study and Design of General and Main Infrastructures in Trarza-Est Area, June 1993
- Stistics published by Office National de la Statistique
    (1) Annuaire Statistique, 1990
    (2) Statistiques du Commerce Exterieur, 1990
    (3) Agregats de la Comptabilite Nationale et Indicateurs Socio - Economiques, 1990
    (4) Bulletin Trimestriel de Statistique, 1992
    (5) Resultats Prioritaires du Recensement Dela Population et de L'habitat 1988, 1992

現地写真集（モーリタニア・イスラム共和国編）

ディウプ地区既存幹線水路

ディアデール地区内水田

現地写真集（モーリタニア・イスラム共和国編）

ガラク地区既存水田と灌漑施設

セネガル河とガラク地区揚水機場予定地