

フィリピン共和国
流域保全管理計画
事前調査団報告書

平成 9 年 5 月
(1997年 5 月)

国際協力事業団

序 文

フィリピン共和国政府は、近年の流域の荒廃による灌漑施設の機能低下により灌漑農業の振興が停滞している現状を解決するため、我が国に対し、流域保全管理に関するプロジェクト方式技術協力を要請してきました。国際協力事業団はこの要請を受けて、1997年(平成9年)4月2日から4月9日まで国際協力事業団農業技術協力課長中原正孝を団長とする事前調査団を現地に派遣しました。

同調査団は、本プロジェクトの要請背景等について確認し、今後の対応方針を検討するため、フィリピン共和国政府関係者と協議及び現地調査を行いました。

本報告書は、同調査団による協議結果等についてとりまとめたものであり、今後、本プロジェクト実施の検討に当たり広く活用されることを願うものです。

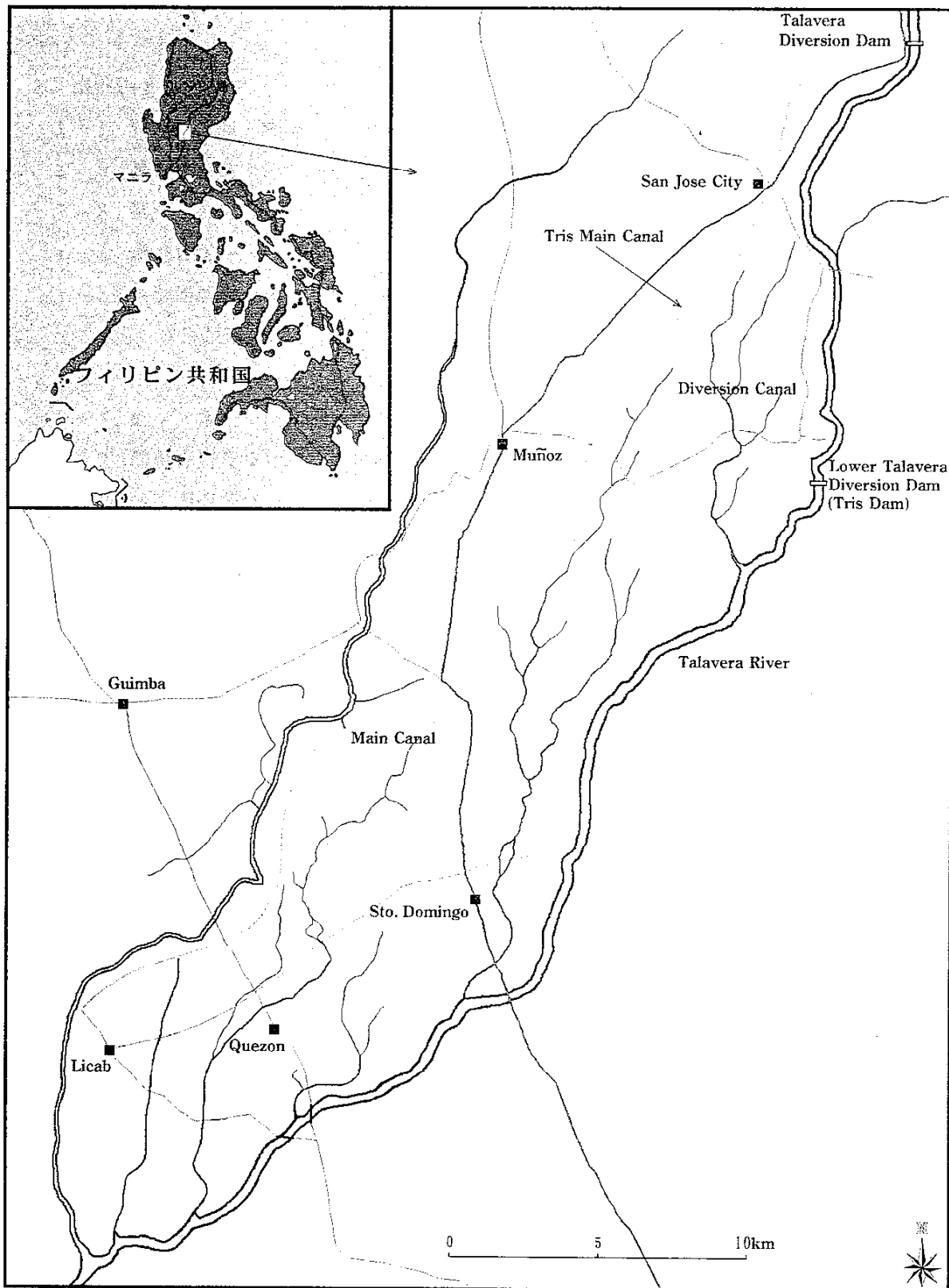
終わりに、この調査にご協力とご支援を頂いた内外の関係各位に対し、心より感謝の意を表します。

1997年5月

国際協力事業団

理事 亀若 誠

プロジェクトの予定サイト タラベラ川灌漑事業区(TRIS)の位置図



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1. 事前調査団の派遣

1 - 1 派遣の背景・経緯

フィリピンでは年率2%を超える人口増加に対し、主食である米の生産が十分に追いつけず、1995、96両年には大量の米を輸入している。農地の外延的拡大が困難ななかこれに対処するには、灌漑地区の生産性の向上及び灌漑面積の拡大が有効な手段の一つであるが、近年は流域の荒廃による灌漑施設の機能低下が進み、十分に対応できない状況にある。

こうした背景からフィリピン政府は、平成7年度案件として、公共事業省を実施機関とする灌漑農業の振興を目的とした「小規模ため池計画」を要請したが、その後、農業省案件とする方向での再検討作業を経て、同案件の後継案件と位置づけられる「流域保全管理計画（仮称）」を1997年3月、改めて要請してきた。

この動きに対するこれまでの経過及び対応は以下のとおり。

- (1)平成7年度に「小規模ため池技術開発センター計画」を事前調査案件として採択（ただし要請が出されれば検討するという条件付き）。
- (2)本件に関する背景調査を兼ねて1995年（平成7年）5月、草野農業技術協力課長（当時）がフィリピンに出張した結果、当初実施機関として想定されていた公共事業省は、その実施体制（土木的事業への傾向が強く、農業開発との関連性が弱い等）に問題があることなどから、むしろ農業省内の実施体制を確認のうえ、例えば土壌水管理局（BSWM）を実施機関として検討することが、より適当と判断された。その時点では国家灌漑庁（NIA）の位置づけについては更に検討が必要とのコメントもあった。
- (3)小規模ため池案件に係る事前調査は、要請があれば調査団派遣を検討するという条件付きであったが、平成7年度中は具体的要請に結びつかず、「繰越」案件として対応処理した。
- (4)平成8年度に入り、BSWMはNIAと連名で、小規模ため池技術開発センター計画実施に係るプロポーザルを国家経済開発庁（NEDA）に提出したが、NIAとの事前調整が不十分だったこともあり、NIAの協力が得られないことが明らかになった。
- (5)その結果、1996年（平成8年）6月、BSWMは単独で「水資源研究開発計画」プロポーザルをNEDAに提出した。
- (6)一方、1996年7月、NIAは「流域保全管理計画」プロポーザルをBSWM要請に対するカウンタープロポーザルとしてNEDAに提出。これに対し、NEDA側は、関係機関及び地元自治体との調整などに関する宿題をNIAに与えつつ、エンドースをペンディングにした。
- (7)1977年（平成9年）2月の年次協議において、日本側はフィリピン側に、コンタクト的な

調査を実施する用意があるので、上記2案件に係る要請をあげるよう依頼し、先方は了解した。

- (8)本件要請は、農業省が調整した結果、NIAを主たる実施機関としつつ、一部の分野をBSWMと共同で実施する形のプロジェクトプロポーザルをNIAが再提出し、NEDAからエンドースされたものである。
- (9)一方、年次協議を踏まえてNEDAは、BSWMの単独案件についても、エンドースの手続きを進めることとなったが、直前でのフィリピン側の修正作業を経て、従来予定されていた「水資源研究開発計画」ではなく「小規模ため池研究計画(“SWIP SEARCH”）」として要請された(1997年4月8日に要請書発出)。
- (10)最終的に、事前調査団が派遣された際には、(8)のプロポーザルを農業省が整理・修正したプロポーザル(NIA・BSWMの共同案件)の方が、(9)のプロポーザル(BSWMの単独案件)よりも、フィリピン国内の課題解決のための緊急性が高いと判断されたため、(8)の共同案件に絞って、今後協議を進めていくことで、フィリピン側の上承を得た。

1 - 2 派遣の目的

(1) コントラクト的調査

本調査団の目的は、年次協議の結果を踏まえ、NEDAから要請のあったNIA案件「流域保全管理計画(仮称)」に対してコントラクト的な調査を行い、要請案件の背景、内容及び実施体制(組織・予算)等について調査・確認し、今後の対応方針を検討することとなった。

これは、「小規模ため池」から「流域保全管理」に要請内容及び想定される実施機関が大きく変化していること、NIAの組織・予算はプロ技実施には十分な体制といえないこと(NIAに派遣中の個別専門家からも「NIA2次円借款によって、ようやく組織・予算が活性化されるであろう」との意見を聞いている)などから、通常の協力基本計画策定を目的とした「事前調査団」を派遣することは適当ではないと判断されたためである。

調査団派遣以降は、第22次円借款等の関連分野の援助動向を踏まえつつ、かつNIAの組織・予算の活性化も見極めつつ、拙速を避けて慎重に取り進めることとする。

また、1997年4月中旬に実施された「フィリピン灌漑農業セクター評価調査」(評価監理室担当)とも情報交換しつつ取り進める。

(2) BSWM単独案件への対応

本調査の主たる目的は、上述のとおりNIA所管案件についての内容確認であるが、BSWM単独案件のエンドースが予定されたので、この点に係る本調査団の対応方針案は以下のとおりとした。

基本的には本調査はNIA案件の内容確認を主目的としていることを明確にしつつ、農業省国際農業開発協力調整室(IADCCO)及びBSWM側から、同局単独案件の扱いについて意見を求められた場合(案件採択の可能性等について)は、フィリピン灌漑農業の最大の問題は、NIAを中心とした灌漑事業が現在直面している施設の維持管理体制の改善、土壌流亡対策を含む流域管理体制の整備、灌漑施設の機能回復、結果的に生じている水利費徴収率の低下、NIAの運営状況の悪化等の深刻な問題への取り組み(問題解決型の取り組み)の方が、新規の技術開発型案件よりも優先度が高いと思われること、現在実施中のプロジェクトをまずは優先させるべきであると判断すること等について説明し、BSWM単独案件を排除しないとしつつも、NIA案件に対する具体的調査を優先させることに理解を得る。

1 - 3 調査団の構成

- | | | | |
|-------------|------|--------------------|---------|
| (1) 団長 / 総括 | 中原正孝 | JICA農業開発協力部農業技術協力課 | 課長 |
| (2) 協力企画 | 井原昭彦 | 農林水産省経済局国際部技術協力課 | 海外技術協力官 |
| (3) 灌漑農業 | 大内幸則 | 北海道開発局農業水産部農業設計課 | 課長補佐 |
| (4) 技術協力 | 岩谷 寛 | JICA農業開発協力部農業技術協力課 | |
| (5) 業務調整 | 園山昌和 | JICA農業開発協力部農業技術協力課 | |

1 - 4 調査日程

1997年(平成9年)4月2日～4月9日

日順	月日(曜)	行程	調査内容
1	4/2(水)	成田 マニラ(JL741)	JICA事務所打合せ、大使館表敬
2	4/3(木)		NIA長官、BSWM、農業省(DA)次官補を表敬 NIA、BSWM、及びDA-IADCCOと合同協議
3	4/4(金)	マニラ カバナトゥアン	UPRIIS灌漑事業区を視察調査
4	4/5(土)	カバナトゥアン マニラ	同上
5	4/6(日)		団内協議及びミニッツ作成作業
6	4/7(月)		BSWM局長表敬、NIA及びBSWM各セクションの個別訪問調査 合同会議(ミニッツ案協議)
7	4/8(火)		ミニッツ署名・交換、NEDA報告、JICA及び大使館報告
8	4/9(水)	マニラ 成田(JL742)	資料整理

(1) フィリピン側関係機関 (NEDA、NIA、BSWM) 及び日本国大使館表敬、JICA フィリピン事務所訪問

農業省国際農業開発協力調整室 (IADCCO) は全調査行程に同行した。

(2) 関係機関 (IADCCO、NIA、BSWM) との合同協議

案件内容 (フレームワーク) 及び実施体制案を聞き取り調査した。

フィリピン側は、あらかじめ準備・作成した目的分析系図、組織体制図等の説明資料に基づき、新規案件 (NIA 案件) の概要説明を行い、質疑応答により理解を深めた。

(3) 予定サイトの現地視察調査

NIA のパンパンガ川上流域総合灌漑事業 (UPRIIS) 地方事務所 (DISTRICT4)、環境自然資源省 (DENR) 地方事務所、サンホセ市庁、ムニヨス市庁等の関係機関を訪問。聞き取り調査を行うとともに、UPRIIS 事業区内及びタラペラ川上流域を視察調査した。

1 - 5 主要面談者

(1) フィリピン側

- ・ 国家経済開発庁 (NEDA) MR. JOSE DOMINADOR C. GOMEZ, JR
MS. CRISTINA C. SANTIAGO
- ・ 農業省 (DA) 次官補 DR. RODOFO C. UN DAN
- ・ 農業省国際農業開発協力調整室 (IADCCO) MS. LUNINGNING J. BONDOC
- ・ 国家灌漑庁 (NIA) 長官 MR. ORLANDO V. SORIANO
- ・ 国家灌漑庁畑地灌漑技術開発計画フェーズ (DCIEP)
MR. SERAFIN A. PALTEMG プロジェクトマネージャー
MR. EDUARDO B. ALDABA
MR. RICARD V. JOSON
- ・ 国家灌漑庁パンパンガ川上流域総合灌漑事業 (UPRIIS) 事務所長
UPRIIS 第1区マネージャー
- ・ 農業省土壌水管理局 (BSWM)
DR. ROGELIO N. CONCEPCION (局長)
DR. RODOLFO M. LUCAS (水資源管理部長)
DR. PERFECT P. EVANGELISTA (土壌水資源研究部長)
DR. VIRGILIO A. CASTANEDA
- ・ 環境自然資源省 (DENR) 地方事務所長
- ・ サンホセ市長 MR. ATTY JOSE FELIMON
- ・ ムニヨス市長 MR. ALVAREZ

(2) 日本側

- ・在フィリピン日本国大使館 奥田透一等書記官
- ・JICA フィリピン事務所 後藤 洋所長
中村 明所員
- ・農業省研究局 下方芳美専門家
- ・国家灌漑庁 坂元雄次専門家
- ・畑地灌漑技術開発計画フェーズ 専門家チーム
(井上淳二、伊藤良輔、山田浩二、桂井正司、出川博文、森瀧亮介)
- ・土壌研究開発センター計画(SRDC)フェーズ 専門家チーム
(蘭 道生、原田 徹、新井重光、大倉利明、上野義視)

2 . 要 約

4月3日の各関係機関(農業省、NIA、BSWM)への表敬訪問及び合同会議において、小規模ため池に係る新規技術開発を目標とするBSWM単独要請案件よりも、フィリピンの灌漑農業が現在直面している深刻な課題であるNIAの運営体制強化と灌漑施設の復旧・改善を目標としているNIA及びBSWMの共同要請案件の方が問題解決型案件として優先度が高いものにとらえられる旨の確認・合意を取り付けた。そのうえで、本調査団の調査対象はNIA及びBSWM共同要請案件である「流域保全管理計画(仮称)」(要請書タイトル: Basinwide SEARCH on Innovative Irrigation and Agricultural Development)とした。

調査は、先方関係機関からの要請案件の背景・内容に係るプレゼンテーション及びそれに対する意見交換、予定サイトであるタラベラ川灌漑事業区・上流域の現地調査及びプロジェクト実施機関と想定されているNIA及びBSWMの各部局への訪問・聞き取り調査の3段階構成で実施した。

調査結果の総括を2-1に示す。また調査結果及びフィリピン側との確認・合意事項として2-2~2-6の諸点をミニッツで確認し、農業省次官補Dr. Undanと署名・交換した。

2 - 1 総 括

(1)本要請案件は、環境保全との関連が根本的な問題であることを認識したうえで既存の灌漑農業システムの改善手法の開発を目的とする、従来にない技術協力案件であり、他の援助スキーム(有償及び無償資金協力)による灌漑施設の復旧・改修及び改善計画をより効果的に実施するための技術開発というべき、いわば事前の体制整備型プロジェクトと位置づけるべきものと判断された。

(2)しかしながら、案件自体のフレームワークの組み立てを検証するためには、総合的な問題・目的分析により、問題点の所在及び解決のアプローチの明確化、中長期的開発計画の策定、同開発計画実施のための現実的な実施体制(組織体制)の整備を、更に行う必要が認められた。

農業省、NIA及びBSWMは、世銀、アジア開発銀行等の国際機関及び二国間援助機関によるこれまでの灌漑施設復旧・改修計画の実績を分析・評価したうえで、問題・目的分析、長期計画(戦略)策定及び実施体制整備を行う必要を認めている。これには特に、NIAの機構改革計画の動向を見極めつつ慎重に対応する必要がある。

(3)さらに、フィリピンの灌漑農業の課題を効果的に解決することは、単に灌漑農業分野の技術協力のみでなし得るものではなく、他の援助スキーム(有償・無償)との連携や森林保全、地域開発計画、農林開発等、他の分野の開発援助計画との連携など、フィリピンにおける総合的な農林分野の開発援助戦略のなかでの位置づけを明確にすることが必要と判断された。

(4)本案件は要請までの種々の経緯により、NIA及びBSWMの共同要請案件という形がとられたが、両機関の各部局及び両機関で実施中の2案件(DCIEPフェーズ及びSRDCフェーズ)からの聞き取り調査を通じて得た知見として、NIA及びBSWM共に双方の実施中案件の後継案件としての位置づけにかなり拘泥している様子がうかがえ、結果として次の点について懸念をもった。

1) NIA側においては、案件の企画立案にDCIEPのカウンターパートチームが主導的な役割を果たしており、必ずしも他の各部局における参加意識が十分に熟成されていない感があること。

2) BSWM側においては、SRDCにおける成果の発展的活用をうたいながらも、タイミング的に合致しないこと。

3) NIA及びBSWM共に、スタッフが少ない体制であり、拙速に新規案件に取り組むと実施中2案件への取り組みが無責任な状態になるおそれがあること。

よって、調査団としては、現在実施中の案件に対するフィリピン側の責任ある実施体制及び成果の持続性の確保を、新規案件実施の前提条件とする必要があると判断した。

(5)今次調査は、案件背景・内容の確認により実施の前提条件となる諸要件を整理することを目的としたため、フレームワークの妥当性及び技術的事項の適否の判断はマンドートとしておらず、今後の対応については、フィリピン側の機構改革等の動向も注視しつつ、更に慎重に検討を進めることが必要である。

2 - 2 問題分析及び目的分析の結果

フィリピン側はあらかじめ準備・作成した問題分析系図及び目的分析系図等を用いて要請案件の背景及びその内容についてプレゼンテーションを行った。

この問題・目的分析については、あらかじめ企画された要請案件の範疇に限定された暫定的分析にすぎず、流域管理の視点を取り入れた灌漑施設の改善を中心課題(コアプロブレム)と位置づける本案件の妥当性を確認するために求められるNIAの運営上の問題、灌漑施設の問題、集水域における問題等に対する包括的分析とは認められなかった。

今後さらに、関係機関(NIA、BSWM、DA、DENR、地方自治体等)及び集水域を含む住民の参加による総合的な問題分析と目的分析を行ったうえで、改めてプロジェクトのターゲットとすべき中心課題(コアプロブレム)の再吟味及び同定並びに必要なとされる各活動の見直しを行うべきである。

2 - 3 現地調査結果

限定された調査期間における視察調査及びNIA、BSWM、DENRの地方事務所及び地方自治

体（サンホセ及びムニョス）農業普及担当者等からの聞き取り調査であり、農民からの直接の聞き取り調査は実施していない。しかし、タラベラ灌漑事業区上流地区内の農業生産状況に関しては、稲作を中心としつつタマネギ及びニンニクの作付けを定着させているなどの現状から推定して、一定の生産技術水準が確保されているものと思われた。

一方、それに比べて灌漑農業におけるハードウェア分野での問題は大きいものと判断された。

集水域及び事業区内に分けて現地調査を行った結果として、次の各課題の現状について確認した。

集水域の荒廃、ダイバージョングラムの機能低下、滞砂問題、水利用管理、排水不良問題、営農指導及び農業生産

各事項の内容についてはミニッツを参照されたい。

2 - 4 要請案件の背景及び内容について

(1) フィリピンの灌漑農業が直面している最も緊急な課題の一つは、流域の荒廃に起因する灌漑施設の機能低下と灌漑用水の不足、受益面積の低下、水利費徴収率の停滞及びNIAの組織の弱体化・機能低下という悪循環構造である。この課題は各国営灌漑事業区（NISs）内受益地域のみでは解決できず、上流部（集水域）をも含んだBasinwideの概念を取り込んだアプローチが必要となる。全国171のNISsのうち83事業区の集水域で、無秩序な森林伐採、土地利用の変更及び地震などによる浸食問題が深刻になっている。

(2) 本要請案件の予定サイトであるタラベラ川灌漑事業区（TRIS）では、以下の問題があった。

1) タラベラ頭首工の集水域の荒廃は著しく、裸地化した斜面には、地震及びその後の降雨によると思われる地滑りが多く見られた。

2) 同頭首工は1920年代に建設され1970年代に一部補修されてはいるが、ゲートなどの老朽化は著しい。固定堰の前面は滞砂で埋まっている状況が見られ、沈砂池等の防砂施設は設置されていない。

3) 雨期に大量の土砂が頭首工の取水口から用水路内に流入しており、年平均数回の排砂を行っているとのことであるが、相当下流まで影響があるものと思われる。

4) 用水路はライニングされておらず、部分的に法面崩壊及び床掘れが発生している。また、取水分水施設は老朽化による機能低下がうかがわれた。さらに、乾期の取水量が少ないため分水位が十分確保されておらず、各所でポンプアップによる取水が見受けられた。

5) TRIS流末端部の排水不良地では、用排水兼用水路のチェックゲートが老朽化しており、この作動不良が排水不良の一因と思われる。

(3) 本要請案件においては、活動内容を次の5分野としているが、必ずしも各活動内容は練れておらず、フレームワークの位置づけ及び必要な活動項目・内容について、更に詳細な検討

が必要である。

- 1) 流域管理、灌漑・排水システムに関するデータ収集システム及びデータベースの確立
- 2) 灌漑システム設計のための革新的アプローチの確立
- 3) 集水域の保全と開発
- 4) 灌漑排水プロジェクトの研究と開発
- 5) 流域における農村地域計画及び開発

2 - 5 案件の成果の効用について

従来の世銀等による灌漑施設リハビリテーションプロジェクトは、必ずしも流域管理の視点
が十分ではなかったと思われる、その結果、灌漑施設の部分的な復旧・改修にとどまって、集水
域での土壌流亡等の問題を抱える地域の灌漑施設改善のためには不十分なアプローチであった
と認識される。

本要請案件は、流域管理に必要な活動分野 土壌保全及び農村開発等 を含んだInnovative
な内容と認められる。フィリピン側は本案件の成果をもって、カセクナム多目的ダム流域にお
ける灌漑コンポーネントの改善計画に反映させることをはじめ、その他の同様な問題を内包す
る国営灌漑事業区への成果の適用を期待している。

2 - 6 更に協議・検討すべき事項

(1) 中長期的灌漑開発計画及び復旧・改修計画

地震復旧計画(1990～1993年)、灌漑運営支援計画(IOSP、1988～1997年)等、
過去の実績のレビューを踏まえ、流域管理の概念とも連携させつつ、灌漑開発及び復旧・改
修に係る中長期計画について、更に検討する必要がある。

(2) NIAの機構改編計画

環境に配慮した流域管理への取り組みは、NIAにとって全国規模で取り組むべき課題であ
り、NIAは現在検討中の組織改編のなかで取り組み課題の達成に必要な効率的・効果的な体
制を確立すべきである。

(3) 現実的な実施組織体制

案件の成否は組織体制の確保に左右されるものである。今次調査における現地調査を通じ、
環境及び農村生活改善と調和した効率的な灌漑システムの開発をめざす本要請案件の実施の
ためには、関係組織間のコーディネーションが極めて重要であり、現実的に機能する実施組
織の確保に関して更に検討を進める必要がある。

3. 協力要請分野の現状と課題

3 - 1 現状と課題

(1) 総論的コメント

人口増加が年率2%に達するフィリピンにあっては、主食である米の増産は緊急かつ重大な課題である。これに対応するためには、農地の外延的な拡大が困難な状況であることから（聞き取りによれば、都市周辺部中心に農地の他用途転用が進んでいる）灌漑面積の拡大が最も有効な手段の一つである。

既存の国営灌漑事業区（NISs）の流域は、森林の伐採の進行、土地利用の変更、地震による地滑り等の発生に加え、土壌や気象条件によって、急激に荒廃しており、土壌浸食が進行している。171灌漑事業区のうち、83事業区の流域が深刻な状態になっている。

流域の土壌浸食の進行によって、NISsは次のような事態に陥っている。

- 1) 頭首工の取水口から土砂が用水路に流れ込み、滞積することによる、用水路の通水断面の狭窄
- 2) 排砂並びに頻繁なゲート操作などによる管理経費の増大
- 3) 貯留ダムの滞砂の進行による貯留能力の減退（近傍流域のマガットダムの実態調査結果あり）
- 4) 河川の基底流量の低下による頭首工における利用可能量の低下（特に乾期）
- 5) 流出形態の変化により洪水ピーク流量が増大し、排水被害が拡大すること

土壌浸食による上記の問題に加え、ゲート等の水管理施設を含む頭首工、用水路施設の老朽化、乾期の渇水対応のための貯水施設をもたない頭首工地区がほとんどであること、不適切な水管理実態などから、作付け率（Cropping Intensity）は、全国営灌漑事業区平均で通年138%であり、特に乾期は50%台と低い。これらのことが、NIAの灌漑費（ISFs）の徴収率を下げている一つの原因と考えられ、ひいては、NIAの組織の弱体化につながっていると思われる。

NIAはこれらの事態、特に既存施設の機能低下に対応するため、国営灌漑事業区を対象に施設改修事業をIOSP（Irrigation Operation Supporting Program）などによって進めている。しかし、これらは既存施設の機能回復をなるべく広域に行うことを目的としており、流域崩壊によるセグメンテーションに対応するなど、機能向上の内容とはなっていないのが実情である。

(2) タラベラ川上流灌漑事業区等(UTRIS、TRIS)の現地調査

要請案件の予定サイトはタラベラ川上流灌漑事業区等(UTRIS、TRIS)であり、ルソン島中部のヌエバエシハ、ブラカン、パンパンガ3州にまたがる約10万ヘクタール、フィリピン最大の灌漑地区であるパンパンガ川上流総合灌漑事業(UPRIIS)地区の4 Districtの最上流部・District1に位置する(付属資料7.及び付属資料10.図-1参照)。

この灌漑事業区は、タラベラ頭首工掛かりのタラベラ川上流灌漑事業区(UTRIS)と、パンタバンガンダム貯留水及びタリス頭首工掛かりのタラベラ川灌漑事業区(TRIS)で構成されている(付属資料8.及び付属資料10.図-2参照)。最近年のタラベラ川上流灌漑事業区(UTRIS)の灌漑率(実灌漑面積/施設面積×100)は、雨期が51~82%、乾期が17~38%となっている。

タラベラ頭首工流域の荒廃は著しく、1990年7月に発生した地震やその後の降雨によって発生したと思われる地滑り等が多く見られた。また、流域の一部では環境自然資源省(DENR)などにより植林された森林がごく一部で見られたが、それ以外の流域のほとんどは裸地だった。流域の土地利用などについてのDENRの地方事務所(Communal Environmental Natural Resource Office:CENTRO)からの聞き取り結果は付属資料9.のとおりである。

タラベラ頭首工は1920年代に建設され、一部は1970年代に補修されてはいるがゲート等の傷みは著しい。また、固定堰の上流側は全面的に滞砂で埋まっており、沈砂池等の防砂施設は設置されていない。取水口と河川の敷高は聞き取れなかったが、用水路に流入している土砂の粒径から判断すると、両者には大きな段差はないと推察される。

雨期に大量の土砂がタラベラ頭首工の取水口から用水路に流入しており、年平均2回以上排砂している。用水路上流部の土砂の粒径は砂利といえるほど大きく、多くは掃流砂に分類される。

用水路はライニングされておらず、一部では法面が崩れたり床掘れが見られる。また、取水・分水施設、特にゲート類は老朽化が著しいように見受けられる。また、乾期の取水量が少ないこと、水位確保のためのチェックゲートが十分設置されていないことから、分水位が十分確保されておらず、各所で簡易ポンプによる取水が見られる。

タラベラ川灌漑事業区(TRIS)下流部の排水不良地は、乾期であったためその排水被害の実態を把握できなかったが、用排兼用水路のチェックゲートが老朽化により作動不良となっていることも一つの原因であると思われる。

(3) 関係する組織に対する聞き取り結果

BSWM並びにNIAの、特にこのプロジェクトに関係の深い課を中心に業務内容、人員配置状況、プロジェクトに対する考え方などについて聞き取りを行った。

BSWMの全体組織と既存プロジェクト(SRDC)は、活動実態では8割程度オーバーラップしている感がある。水資源管理開発課を除き、研究集団としての色彩が強い。土壌保全・エロージョンコントロールについての技術は、タナイのモデルサイトにおいて等高線栽培などを中心に一応確立されており、今後は全国的な展開が必要と考えているとのコメントがあった。本プロジェクトに対しては、NIAとの分野別の所掌区分を明確にすることが重要との意見であった。

水資源管理開発課は、地方自治体(LGUs)と連携しながら、年間4億ペソの予算で小規模ため池(SWIP、受益100ヘクタール以下対象)を建設し、土地改良区に対してのトレーニングも行っている。

NIAの各部長からの聞き取りでは、流域の崩壊によって灌漑事業に様々な問題が生じていることは一致した見解であったが、本プロジェクトについての認識がNIA全体として十分醸成されていないように感じた。特に国営灌漑事業区についての計画や管理を通して流域保全や環境アセスメントを担当している計画部(PDD)並びに施設管理部(SMD)にプロジェクト内容が十分伝わっていないようであった。したがって、このプロジェクトと現在NIAが進めている施設改修事業であるIrrigation Operations Support Project(IOSP)やWater Resources Development Project(WRDP)との関係について、十分聞き取ることはできなかった。

3 - 2 要請案件のフレームワーク案について

今回の調査団は、調査期間が短いなどの制約から、個々の要請内容の活動方針について、詳細に背景、必要性などを確認することはできなかった。よって、活動内容については今後十分な取舍選択などの継続検討が必要である。

今回の調査で、活動内容等について感じたことを以下に列挙する。

(1) 流域管理、灌漑排水システムのためのデータ収集システムの確立

流域管理、灌漑排水システムの基礎となる気象、水文の長期定量的なデータ、地形、土壌、植生、土地利用などのデータについては、事業の調査計画・設計の段階で十分収集・検討されていない。これらは、最近の流域の環境変化による流出形態の変化の実態把握のためにも、また適切な水管理のためにも重要であることから、基礎的データ収集システムの確立が重要である。これに加えて、灌漑システムにおける取水量、分水量、受益面積など、灌漑データについても、観測機器や体制も含めた検討が必要である。

(2) 流域の保全と開発

灌漑用水の質並びに量を把握し、灌漑施設構造上の改善と水・施設管理の改善を図るために、流域の浸食の状況と流出土砂発生メカニズムの把握・検討が必要である。この検討結果により、適正なエロージョンコントロール法を見だし、DENRやLGUsと協調して、流域保全のマスタープランづくりを進める必要がある。

なお、抜本的な対策としては裸地への植林、植生工、防砂ダム、地滑り対策工、土地利用の規制、住民対策など、長期的・大規模なものが考えられるが、このプロジェクトでは目的が拡散しないように、あくまでも灌漑施設の設計や水・施設管理上必要な項目に絞っていく必要があると思われる。

また、関係する組織としてNIA、BSWM、DAのみならず、DENR、LGUsが考えられるので、プロジェクト開始前に、十分な調整が必要である。

(3) 灌漑排水の改善計画の樹立

流域の浸食と流出土砂発生メカニズムの把握検討結果を踏まえ、頭首工における土砂排除工（沈砂池、排砂管等）の設計手法の確立を行うことに加え、これら施設の管理手法の確立が重要である。

また、流域の流出形態の変化に対応した水管理手法の確立が必要である。特に雨期並びに乾期の取水量の変化に対して、適切な水配分が可能なチェックゲートなどのシステムづくりが重要であり、このためには用水路の水管理施設など、既存施設の改善も含めた検討を、併せて行う必要がある。

雨期の排水不良地については、排水本川の滞砂状況を把握するとともに、流出形態の変化による排水ピークの発生状況を検討し、排水計画に反映させるべきである。また、用排兼用工作物の施設の改善並びに施設管理計画の樹立が同時に必要であると思われる。

水配分の自由度を高め、かつ、乾期の作付け率の向上のために、水路システム内に調整池（バッファープOND）を検討することも有効であろう。また、地区によっては沈砂池との兼用も検討する価値がある。

(4) 農村開発

流域の保全と開発のためには、流域に住む住民の生活の維持・改善と意識改革が必要であり、土地利用調査、社会経済調査、営農調査や開発手法の検討が必要である。

国営灌漑事業区の灌漑システムの改善により農作物の生産並びに農家の社会・経済状況が改善されるよう、DA、LGUsとの連携による対応が必要である。

3 - 3 留意事項

要請項目フレームワークにおいては、要請内容が非常に多岐にわたっていることから、今後の絞り込みが必要である（例えば、事業との関連性が薄い地下水調査の除外など）。

NIAとBSWMのプロジェクト上でのデマケーションがいまだ不明瞭である。今後項目ごとのデマケーション並びに、どのように全体をコーディネートしていくかも含めて十分検討する必要がある。

NIAはDCIEPのプロジェクトマネージャーのバルテン氏や彼の部下が主体的にこのプロジェクトに関する準備を進めているが、既存組織の対応がよく見えてこない。NIA全体の対応、特に計画部（PDD）、施設管理部（SMD）などとの連携強化が今後必要と考えられる。

プロジェクトの成果が具体的に見える形で発現されるために、予定サイトでの無償、有償事業との連携、IOSPやWRDPなど施設改修事業での成果の活用などを詰めておく必要がある。

4．協力実施検討上の留意点

(1)平成7年度採択案件としての整理

別途説明のとおり、本件要請について国家灌漑庁(NIA)と農業省土壌水管理局(BSWM)に対して、日本側の対応方針を説明し、要請されている複数案件の絞り込みを行った結果、NIAの流域保全管理計画を対象に検討することとした。

(2)要請とNIAの事業及び各組織のかかわり

本件要請は経緯で説明したとおり、BSWM要請に対するカウンタープロポーザルという位置づけであるが、NIAのなかでは現在進行中の畑地灌漑技術開発計画(DCIEP)フェーズのカウンターパートを中心に計画が策定されている。このため他部局では、本件要請に関して「当事者」としての認識が現状では薄い。

要請については昨今新たに生じてきた課題というよりも、ダム上流部の土壌流亡により灌漑施設が設計耐用年数未満で当初機能を著しく損なっていること、その問題の解決が、本件協力要請のコアになっている。

このような「流域保全」という、面的に従来の概念を広げた問題に的確に対応する現状組織はないが、現在計画中のNIAの組織改革のなかで環境と流域を専門的に取り扱う部署の設置が検討されている。

あらかじめフィリピン側に要望しておいた問題分析は、本件要請から逆算してつくったと判断される系統図であり、灌漑事業と灌漑事業区が抱える包括的な問題のなかでの位置づけは明確ではない。灌漑開発、灌漑稲作普及などにより派生する多様な問題(上流下流の水配分に関する社会学的な問題、農家経営、マーケティング、土壌流亡等)のうち、プロジェクトが取り組む課題が全体のなかでどのように位置づけられるか、よく整理する必要がある。

(3)NIAの組織と予算

NIAの現状は、ミニッツに示したとおり「水利費徴収による独立採算性の強化」「集水域の土壌流亡顕著化」「灌漑用水の不足」「水利費徴収率の低下」「組織の弱体化」という悪循環が現在でも残っている。これは、プロジェクトの実施により早急に解決される問題ともいえず、むしろこのような問題を抱える組織を対象としたプロジェクト要請であることを十分認識しておく必要がある。

NIA本庁の各部職場を訪問したが、全体として組織・活動が停滞している印象を受けた。執務スペースの6割程度(設置されている机で執務している職員の状況)しか有効活用され

ていない印象である。DCIEPフェーズ のために無償資金協力で建設した4階建ての建物のうち、現在のフェーズ では1階と半分程度、残りはNIAコンサルタント事務所や肥料農薬庁(FAP)などの事務所として活用され、賃貸収入がNIAの自己収入財源となっている。

予算削減・過剰人員問題を抱えている組織に対する技術協力実施により人員を固定化し、本来進めるべき組織活性化が停滞してしまわないよう配慮する必要がある。

(4) 今後の検討のための条件

1) NIAの組織改革の確認

2) DCIEPフェーズ の終了時評価の実施

上述のとおりNIAの組織とすれば、現行畑地灌漑のプロジェクトが終了したら(1998年5月27日まで)、その成果と組織はどのように継承・展開されていくのか、しっかりと把握していく必要がある。協力成果の普及・展開の見込みが不明確な実施機関に対して新たな協力を開始することは、類似の問題をはらむことにもなるので、1997年度の評価調査団派遣により確認する必要がある。

3) 土壌研究開発センター計画(SRDC)フェーズ の中間評価の実施

今回整理した要請の先方関係機関には、現行協力中のSRDCフェーズ (2000年1月31日まで)のBSWMが含まれる。本プロジェクトに直接関与はしていない「小規模ため池灌漑技術開発」を担う水資源管理部(Water Resource Management)が中心となっている。

SRDCフェーズ は、1997年度に中間評価を迎える段階となる。同一部局(この場合BSWM)に対し、複数のプロジェクトを実施する妥当性・可能性の検討とともに、現行プロジェクトの成果の活用が検討されるとすると、現在タナイ、ブラカンで実施されている土壌浸食に係る試験研究のサイトを新規案件要請サイト地域内に再設定するにとどまる可能性もあり、中間評価時点で新規要請との関連を十分吟味しておく必要がある。

付 属 資 料

資料 1. ミニッツ

資料 2. 要請書 (Basinwide Research)

資料 3. 農業省組織図

資料 4. 国家灌漑庁 (NIA) の組織図

資料 5. 土壌水管理局 (BSWM) 及び土壌研究開発センター (SRDC) の組織図

資料 6. NIA の組織・機構再編計画

資料 7. パンパンガ川上流域総合灌漑事業 (UPRIIS) 運営実績

資料 8. タラベラ川灌漑事業区 (TRIS) 関係資料

資料 9. タラベラ頭首工上流域の土地利用状況

資料 10. 参考図面

資料 11. 参考文献

**MINUTES OF UNDERSTANDING
BETWEEN THE JAPANESE CONTACT MISSION TEAM
AND
THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF
THE REPUBLIC OF THE PHILIPPINES
ON JAPANESE TECHNICAL COOPERATION
FOR
THE BASINWIDE RESEARCH FOR INNOVATIVE IRRIGATION AND
AGRICULTURAL DEVELOPMENT IN TALAVERA RIVER BASIN
IN THE REPUBLIC OF THE PHILIPPINES**

The Japanese Contact Mission Team (hereinafter referred to as "the Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") headed by Mr. Masataka NAKAHARA visited the Republic of the Philippines for the purpose of fact-finding the proposed project entitled "Basinwide Research for Innovative Irrigation and Agriculture Development in Talavera River Basin" (hereinafter referred to as "the Project").


During its stay in the Republic of the Philippines, the Team acknowledged a revised project proposal and had a series of discussions with the authorities concerned of the government of the Philippines on the Project from technical and administrative points of view necessary for sharing the understandings on the Project.

As a result of the discussions, the Team and the Philippines authorities concerned agreed to report to their respective Governments the matters referred to in the document as attached hereto.

Manila, April 8, 1997



Mr. Masataka NAKAHARA
Team Leader
Japanese Contact Mission
Japan International Cooperation Agency
Japan



Dr. Rodolfo C. UNDAN
Assistant Secretary
Department of Agriculture
Republic of the Philippines

ATTACHED DOCUMENT

After the Annual Bilateral Consultation on Feb. 17 to Feb. 21, the Japanese side started to prepare the dispatch of the contact mission for the following proposed projects, which had been received by the Japanese side at that time:

- (1) Basinwide Research for Innovative Irrigation and Agricultural Development in Talavera River Basin requested by the National Irrigation Administration (NIA) and Bureau of Soils and Water Management (BSWM)
- (2) Water Resources Research and Development Center requested by the BSWM.

Gradual increase of rice production can't be paced with the rapid increase of its consumption. Thus, imbalance of supply and demand of rice in the Philippines has been again inducing outlays of foreign exchange reserves in order to import rice.

The ultimate goal of BSWM's proposal is to develop more irrigated area by increasing small impounding with less government expenditure than large-scaled irrigation development.

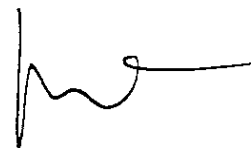
The joint proposal of NIA and BSWM aims at improving the irrigation practices, not simply presenting a new technology package for future irrigation development.

The Team explained that the Japanese side is keen to the present situation of irrigation development and management that is a vicious cycle as follows: (1) shortage of irrigation water (2) reduced irrigated service area (3) low payment of irrigation service fees (4) limited or low expenditure for operation and maintenance (5) deteriorated irrigation systems.

In this sense, NIA and BSWM's joint proposal must be more relevant to solve these problems urgently.

In consideration of the difficulty in providing two technical cooperation concurrently, the Team explained that the Japanese side would like to prioritize NIA and BSWM's joint proposal as a problem-solving approach compared to BSWM's proposal.

The Philippines side agreed on this. The Team, then, conducted its study along with the NIA and BSWM proposal.



I. FINDINGS FROM PROBLEM AND OBJECTIVE ANALYSES

The Philippines side explained Problem and Objective Analysis Trees attached as ANNEX III.

The Team finds that these analysis trees have been formulated based on the proposed requests with inadequate presentation of the core problem such as low irrigation service area and low recovery rate of irrigation service fees. More comprehensive analysis will be requested for identifying the extent of importance and urgency to implement technical cooperation.

In this context, the Philippines side is requested to make the problem and objective analysis more extensively through local workshop(s) inviting relevant institutions and representatives from the Department of Agriculture (DA), especially NIA and BSWM, the Department of Environment and National Resources (DENR), and beneficiaries including habitants in basin wide area.

II. FINDINGS FROM THE FIELD TRIP

During the field trip, the team has surveyed the area of the Talavera River Irrigation System (TRIS) and the catchment area of Talavera river of the proposed study site.

The Team was not able to interview farmers in the TRIS. However, through the hearing-survey from the agricultural officer of municipal office it seems that the present level of farmers production techniques are at above national average in well irrigated areas and lower than the national average in flood, drought and silt-affected areas.

On the other hand, it is recognized that the problem about the irrigation hardware is relatively serious.

The team understands the following situation through the field survey:

(1) Degraded catchment area

The catchment area of the proposed model study site of the TRIS is long and narrow area with about 300 km² and about 40 kms. in length. The watershed has been seriously denuded. The earthquake in 1990 has aggravated the situation and these even promoted massive soil erosion and siltation.

(2) Malfunction of the diversion headworks

The Talavera diversion dam was built in the 1920's and partly repaired in the 1970's. But these works has been already worn out. The upstream side of the fixed weir is buried fully, and none of the facilities like stilling basin are installed.

(3) Sedimentation problem

A large amount of sedimentation flow into the main canals through intake gates of the Talavera diversion dam in wet seasons, therefore, NIA has to desilt several times annually. Desiltation cost is high.

(4) Water Management

Canals are not lined, slope and bottom of several portions of canals are scoured. Control facilities such as headgate, check gates and turn-out gates of canals are observed to be defective.

It was found out that due to low water level of canals during the dry season, a shallow tube well pump is being used to supply irrigation water.

(5) Problem of drainage

The Team was informed that the lower portion of the service area is inundated during wet seasons.

The check gate of the dual-purpose canal in the lower part of the TRIS doesn't work well which is due mainly from the drainage problem.

(6) Farming guidance services and agricultural production.

Agricultural extension activities in Munoz municipality in the Upper part of the TRIS are performed by 37 agricultural extension officers. There is one agricultural extension officer assigned in one village. Some agricultural training courses are conducted for farmers.

Rice and onion are major crops in the wet and dry season in some parts of the municipality respectively. In other parts where water is available, the farmers plant rice in both seasons.

According to the agricultural officers, major complaints by farmers are inadequate irrigation facilities, credit, postharvest facilities and agricultural cooperatives.

III. VISIT TO BSWM'S DIVISIONS AND NIA'S DEPARTMENTS

The team visited BSWM's divisions and NIA's departments and made interviews on job descriptions, recent outputs, staffing and existing problems.

The Japanese side will further consider the results of survey when the Project organization is examined.

IV. RATIONALE OF THE PROPOSED PROJECT

As stated above, the Upper Talavera River irrigation System (UTRIS) shows one of the serious deteriorating catchment areas of the National Irrigation Systems (NISs). Deforestation and excessive land use have been inducing soil erosion causing the critical problems for NISs.


Eighty three (83) out of one hundred seventy one (171) watersheds of NISs are reported to be in critical condition.

Progressive soil erosion at catchment areas has been resulting in:

- (1) Constricted cross-sectional areas of the canals due to the earth and sand flow from headworks.
- (2) Increased operational costs due to the desilting works and unscheduled gate operations.
- (3) Shortened utility life of reservoir dam due to the sedimentation
- (4) Low availability of irrigation water especially in the dry season due to the shortage of river baseflow
- (5) Problematic drainage due to the change of run-off

Water shortage during dry season resulting from the deterioration of the catchment areas has no doubt been one of the major reasons of the unwillingness to pay irrigation service fees by farmers.

Finally, lower recovery rate of irrigation service fees has become a fundamental issue to NIA's sound development in future.



The proposed project aims at developing a package of technology with interacting related agencies and institutions necessary for solving critical problems mentioned above from the basinwide approach.

The project consists of five fields of activities mentioned below. In order to define necessary activities and contents of each activity, it is necessary to do further analysis about the project framework.

- (1) Establishment of data collection system and database for water management and irrigation and drainage systems
- (2) Establishment of an innovative approach for designing irrigation systems involving geological investigation and analysis specially for areas with unstable geological landscape
- (3) Catchment area conservation and development
- (4) Research and development on irrigation and drainage projects
- (5) Basinwide rural planning and development network will be established to assure the sustainability of the project outputs.


V. EXPECTED UTILIZATION OF THE OUTCOME OF THE PROPOSED PROJECT

The Philippine side has been taking possible measures for rehabilitating and improving NISs in cooperation with the multilateral and bilateral agencies such as World Bank, Asian Development Bank (ADB) and Overseas Economic Cooperation Fund (OECF) and other international funding institutions. Previous rehabilitation works were focused only on minor repairs.

The Philippine side assured that the outcome of the Project would be utilized to increase irrigation efficiency and cropping intensity, reduce flood inundation and sedimentation damages in the design of the rehabilitation works for future irrigation development project including the irrigation component of the Casecan Multi-purpose Irrigation and Power Project (CMIPP).

VI. FURTHER ISSUES TO BE DISCUSSED

- (1) Short-run and Long-run Perspective of Irrigation Development Plan and Rehabilitation Plan

 In addition to the overall review of the lessons learned from the past projects such Earthquake Rehabilitation Project (1990-1993) and the Irrigation Operations Support Project (IOSP I and II, 1988-1997),

long-run perspectives of irrigation development and rehabilitation works remain to be further studied in connection with the concept of basinwide watershed management.

How to integrate with or/and to reflect to the Water Resources Development Project (WRDP) will be the one issue.

(2) Future Streamline Plan of the NIA

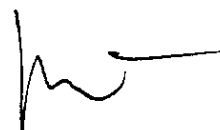
The issue of watershed management coped with environment is crucial for the NIA to tackle on nationwide scale. Thus, it makes sense that NIA takes serious consideration on reorganizing it into more effective and efficient body for this purpose. Although an immediate reorganization plan remains still unclear, this will be no doubt important to the successful implementation of the project in future.

(3) Realistic Institutional Structures for the Project

Success and failure of the technical cooperation project often attributes to the institutional framework.

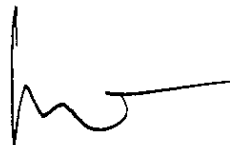
Through the field study, the Team is fully convinced that coordination among the related agencies, institutions and others would be inevitably an important factor for realizing the ultimate goal of the project which is ***to develop effective irrigation system in harmony with environment and rural life improvement.***

Both the Japanese and Philippines side need more discussion on establishing a realistic and functional implementing organization.



LIST OF ANNEX

- I. MEMBER LISTS OF THE PARTICIPANTS
- II. TENTATIVE SCHEDULE OF THE TEAM
- III. PRESENTATION MATERIALS
 - (1) PROBLEM ANALYSIS
 - (2) OBJECTIVE ANALYSIS
 - (3) PROJECT DESIGN MATRIX
 - (4) NIA ORGANIZATION CHART
 - (5) BSWM ORGANIZATION CHART
- IV. PROPOSAL FOR A PROJECT-TYPE COOPERATION PROGRAM ON BASINWIDE RESEARCH FOR INNOVATIVE IRRIGATION AND AGRICULTURAL DEVELOPMENT



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ANNEX I LIST OF PARTICIPANTS

ATTENDANCE SHEET

4th Floor - DCIEP 2, Conference Room
 IEC Building, NIA Compound
 EDSA, Diliman, Quezon City
 April 7, 1997 (Monday)
 Final Meeting : 2:30 PM

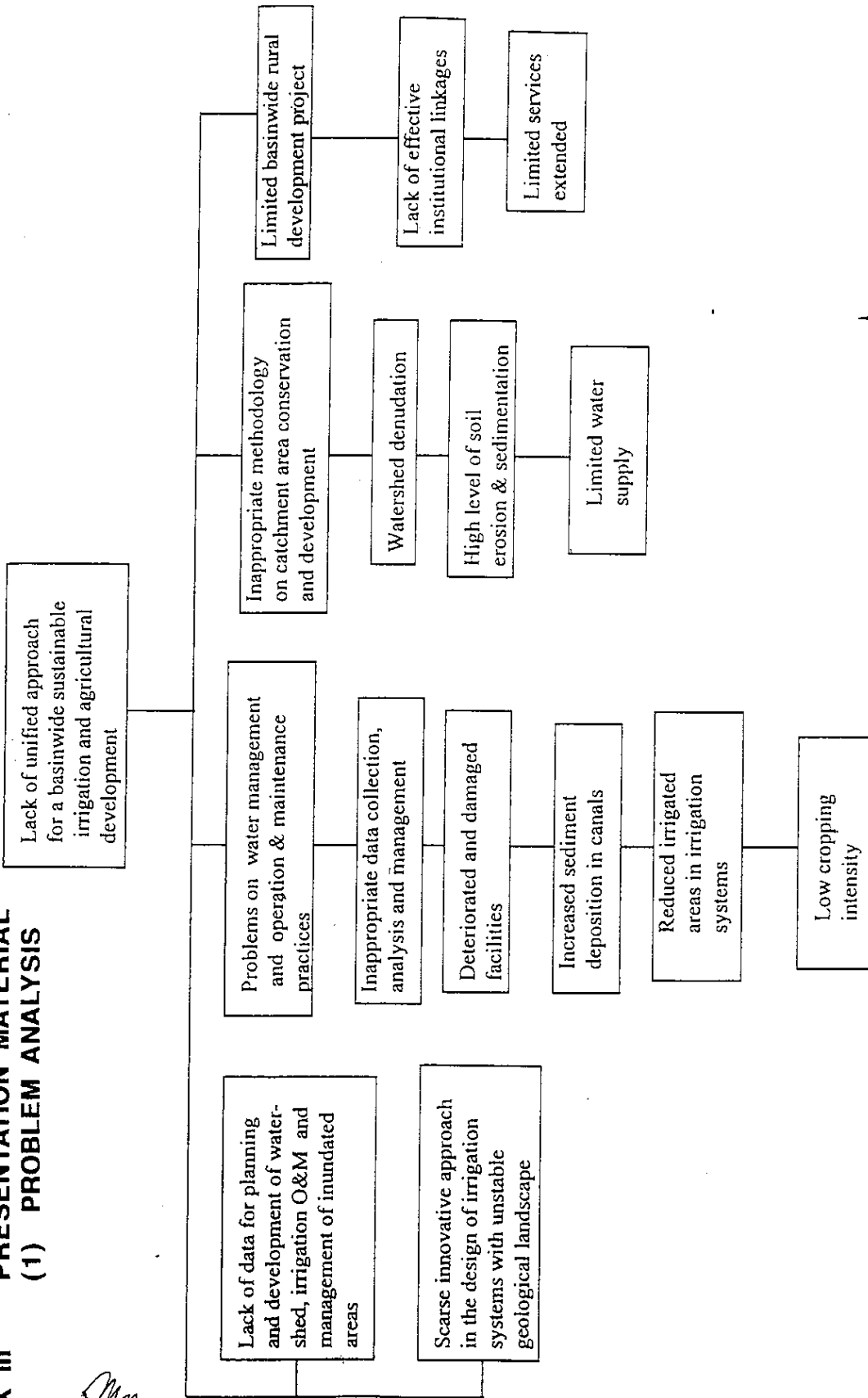
NAME	DESIGNATION	OFFICE
1. Luningning Bondoc	Dev. Management Officer III	Dept. of Agriculture
2. Rodolfo M. Lucas	Chief of Agriculture	BSWM
3. Serafin A. Palteng	Project Manager	NIA-DCIEP 2
4. Eduardo B. Aldaba	Division Manager	NIA-DCIEP 2
5. Ricardo V. Joson	IRD Chief	NIA-DCIEP 2
6. Yoshimi Shimokata	JICA Expert/BAR	DA-BAR
7. Yuji Sakamoto	NIA/JICA Expert	NIA-PDD
8. Virgilio A. Castaneda	Supervising Agriculturist	BSWM
9. Masataka Nakahara	Director, Agricultural Cooperation Division	JICA
10. Akihiko Ihara	Senior Technical Officer	MAFF
11. Yukinori Ouchi	Deputy Dir., Agriculture Construction Div.	Hokkaido Dev. Bureau
12. Yutaka Iwatani	Staff, Agricultural Technical Cooperation Div.	JICA
13. Masakazu Sonoyama	Staff, Agricultural Technical Cooperation Div.	JICA

ANNEX II TENTATIVE SCHEDULE OF THE TEAM

Contact Study Team on Basinwide for Innovative Irrigation and Agricultural Development in Talavera River Basin

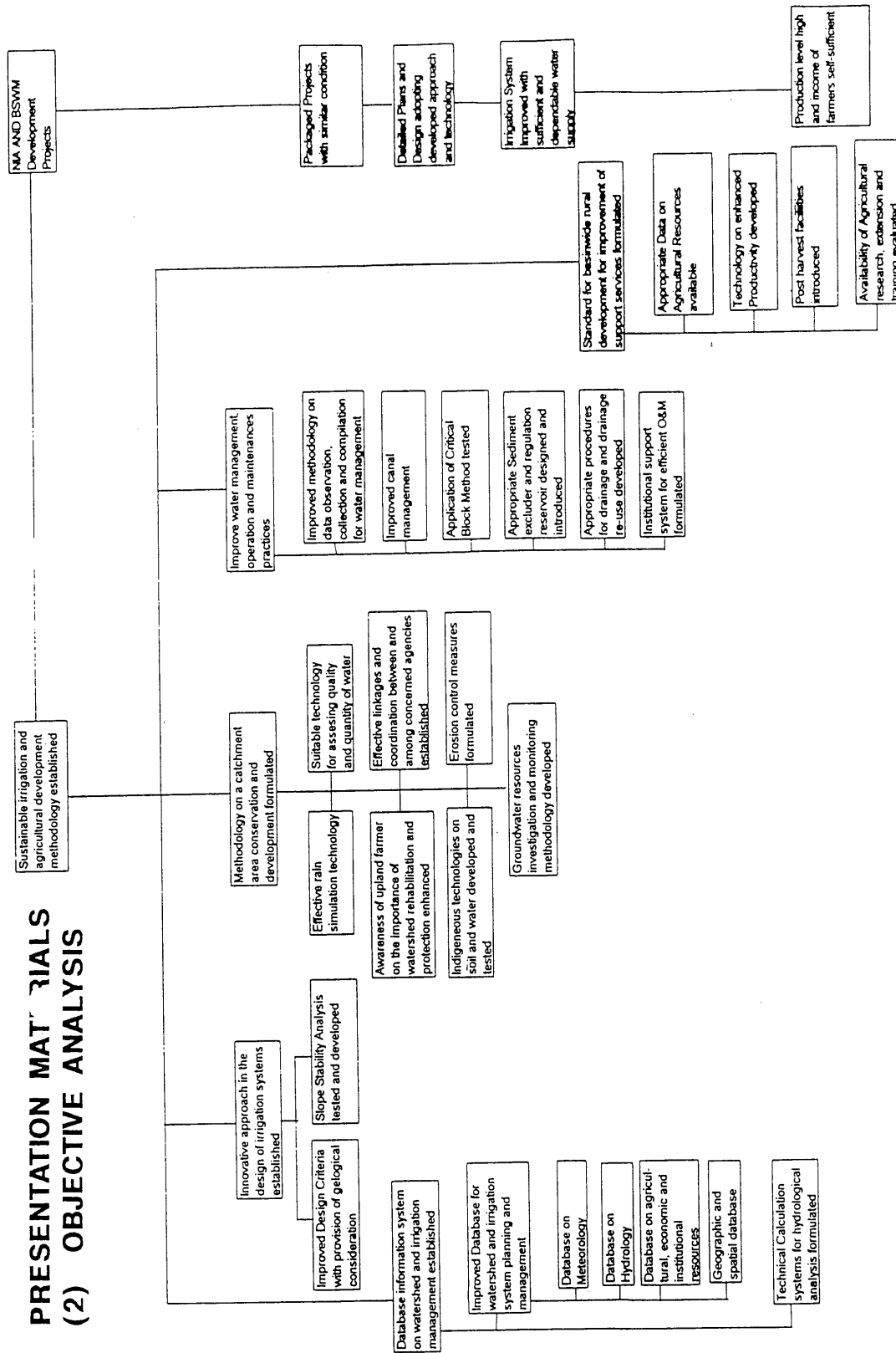
Date	Day	Time	Activity	Venue	Phone No.
02 Apr.	Wednesday	13:10	Arrival in Manila from Tokyo, Japan via JL-741	Accommodation Primetown Century Tower	897-23-70
		16:00	Courtesy call to Mr. Hiroshi Goto, Resident Representative, JICA	JICA Philippine Office	893-30-81
		16:45	Courtesy call to Mr. Toru Okuda, First Secretary, EOJ	Embassy of Japan	895-90-50
03 Apr.	Thursday	9:00	Courtesy call to Administrator Orlando V. Soriano, NIA	Administrator's Office	922-27-95
		10:00	Courtesy call to Director Rogelio N. Concepcion, BSWM	Director's Office	923-04-54
		11:00	Courtesy call to Assistant Secretary Rodolfo C. Urdan, DA	Assec's Office, BSWM	920-14-07
		14:00	Meeting with DA, NIA & BSWM	BSWM Office	
04 Apr.	Friday	6:00	Leave Manila for Cabanatuan City	Accommodation Manrio Hotel Maharlika Hi-way, Cabanatuan City at the project site	044-463-0814
		10:00	Visit and conduct project site survey		
05 Apr.	Saturday	AM	Project site survey	Accommodation Primetown Century Tower	
		PM	Leave Cabanatuan City for Manila		
06 Apr.	Sunday		HOLIDAY		
07 Apr.	Monday	9:30	Meeting with DA, NIA & BSWM	NIA Office	
08 Apr.	Tuesday	AM 14:00 15:00 16:00	Meeting with DA, NIA & BSWM Meeting with Public Investment Staff (PIS)-NEDA Report to Embassy of Japan Report to JICA Philippine Office	NIA Office PIS-NEDA EOJ JICA Office	631-09-46
09 Apr.	Wednesday	14:45	Leave Manila for Tokyo, Japan via JL-742		

PRESENTATION MATERIAL
(1) PROBLEM ANALYSIS



ANNEX III

PRESENTATION MATERIALS
(2) OBJECTIVE ANALYSIS



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(3) PROJECT DESIGN MATRIX

PROJECT DESIGN MATRIX (PDM) FOR THE BASINWIDE RESEARCH ON INNOVATIVE IRRIGATION AND AGRICULTURAL DEVELOPMENT

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>OVERALL GOAL To develop effective irrigation system, increase crop productivity, farm income, and living standards of the populace to effect stable and pleasant environment.</p>	<ul style="list-style-type: none"> - Existence of NIA & BSWM staff capable of planning sustainable irrigated agricultural development. - Presence of adequate and reliable information on watershed, irrigation, drainage and rural planning and development. - Sustained water flow and controlled soil erosion and sedimentation to increase cropping intensity and crops productivity. - Number of farmers/populace attained self-sufficient income level. - Increased area covered with stable and pleasant hazard free environment. 	<ul style="list-style-type: none"> - Survey and other means - Statistics included in the project report - do - - Survey and other means - do - 	<ol style="list-style-type: none"> 1. Proper agreement between and among implementing and coordinating agencies must be forged. 2. No extreme condition affect the study area, such as strong typhoon, earthquake, flood and forest/watershed, fire. 3. Volume/Quantity of agricultural products are monitored and marketed.
<p>PROJECT PURPOSE To establish a sustainable irrigation and agricultural development methodology through the study of Talavera River Basin.</p> <p>OUTPUTS</p> <ol style="list-style-type: none"> 1. Database information/technology for planning and development of watershed, irrigation, O&M and management of inundated areas is established. 2. The planning capability of NIA/BSWM on basinwide irrigated agricultural development is enhanced. 3. The improved methodology on O&M of irrigation and drainage facilities and water management is established. 4. The awareness of upland farmers on watershed rehabilitation and protection is enhanced. 5. The coordination between NIA, BSWM, DENR, LGU's and other line agencies on watershed management planning and program implementation is strengthened. 6. Erosion control measures and popularization of indigenous technologies on soil and water conservation is developed and implemented. 7. Following studies on catchment area conservation and development are conducted. <ol style="list-style-type: none"> 7.1. Studies on soil loss, water yield and quality and siltation rate at various watershed condition. 7.2. Conjunctive use study to the groundwater availability. 	<ul style="list-style-type: none"> - Number of manuals, pamphlets and computer programs for irrigation planning, design management and operation. - Adequate number of technical staff trained and with developed skills. - Number of barangays/ farmers informed/participated in the program both at the catchment and irrigation service canal. - Number of agencies/applied/disseminated project outputs. - A memorandum of agreement is forged and properly complied with by concerned bureaus/agencies. - Number of pilot areas/farms established and operated. - Number of supervised study sites and results reports. - Enumerated number of sites/location and tabulated results. 	<ul style="list-style-type: none"> - Survey and other means - do - - do - - do - - Survey and other means - Field visitation and survey - Survey and other means - Survey and other means 	

<p>7.3 Study on the effectiveness of rain simulation improving water availability.</p> <p>7.4 Assessment of the quality and suitability of water effluents from river for irrigation purposes.</p> <p>8. Irrigation and drainage practices is improved</p> <p>9. Sediment extcluder and regulation reservoir is introduced.</p> <p>10. Results of study on the project requirements for the production of food and other agricultural products on how they can be met on a sustainable basis is adopted and used in planning.</p> <p>11. Productivity -enhancing technologies that provide opportunities for increased income and employment in the rural sector is developed and disseminated.</p>	<p>- Frequency, intensity and wideness of effectiveness.</p> <p>- Number of stations and frequency of assessment.</p> <p>- Number of appropriate manuals, pamphlets, reference materials developed and disseminated to to users.</p> <p>- Number of research reports/documents.</p> <p>- Usefulness of installed structures.</p> <p>- Number of upland and lowland farmers acquired and practiced developed technologies.</p>	<p>Statistics included in the project report</p> <p>- do -</p> <p>Survey and other means</p> <p>Survey and other means</p> <p>Survey and other means</p>	
<p>COMPONENT/ACTIVITIES</p> <p>I. Establishment of Data Collection System and Database for Water Management and Irrigation and Drainage Systems</p> <p>1.1 Study and review of current methodologies and parameters in data collection and management.</p> <p>1.2 Develop data collection and information system.</p> <p>1.3 Formulate technical calculation systems for hydrologic analysis.</p> <ul style="list-style-type: none"> - field run-off estimation - infiltration estimation - evaluation of mountain land degradation - stream water quality evaluation - transpiration - geologic and spatial data management and modeling - flow simulation model - flood peak estimation <p>II. Establishment of an Innovative Approach for Designing Irrigation Systems Involving Geological Investigation and Analysis. Specifically for Areas with unstable geological landscape</p> <p>2.1 Review and assessment of existing design criteria for irrigation and drainage facilities</p> <p>2.2 Conduct soil layer and underground water level for slope stability analysis</p>	<p>INPUTS</p> <p>Japanese Side</p> <p>A. Dispatch of long-term Experts</p> <ol style="list-style-type: none"> 1. Team Leader 2. Project Coordinator 3. Hydrology Expert 4. Watershed Management 5. Irrigation and Drainage 6. Rural Development <p>B. Dispatch of short-term Experts</p> <ol style="list-style-type: none"> 1. Geologist 2. Agronomist/Pedologist 3. Economist/Project Impact Assessment Expert 4. Forester/Forestry Expert 5. Sociologist/Extension Expert 6. Aerial Photo Analysis Expert <p>C. Acceptance of Philippine Counterpart Personnel to Training in Japan</p> <p>D. Provision of machinery and Equipment</p> <ol style="list-style-type: none"> 1. Machinery, equipment, instrument, tools, apparatus and other materials for the field survey and tests 2. Other related or accessory equipment and materials necessary to the implementation of project activities 	<p>Philippine Side</p> <p>A. Creation of Project Committee</p> <p>B. Provision of Project Personnel/ Counterparts and Support Staff</p> <p>C. Provision of Buildings, Facilities and Equipment</p> <p>D. Project Management and running cost (Operating Budget)</p> <p>E. Trial/Pilot Farms for productivity enhancing technologies</p>	<p>PRE- CONDITIONS</p> <ol style="list-style-type: none"> 1. Budget and personnel are allotted and assigned to the project. 2. Machinery and Office facilities are provided as scheduled. 3. The Project is well planned, coordinated and implemented by concerned agencies.

III. Catchment Area Conservation and Development

- 3.1 Conduct studies on soil loss, water yield and quality and siltation rate of various watershed condition.
 - identification and investigation of critical drainage ways
 - identification and development of control/conservation approaches on soil loss and siltation (vegetative and structural measures)
 - study strategy development and implementation
- 3.2 Conjunction use study to the groundwater availability
 - Evaluation of total area and identification of probable specific site for investigation
 - Technology generation and development of strategies
 - Implementation of groundwater study
- 3.3 Study on the effectiveness of rain simulation in improving water availability
 - technology generation and strategy development
 - collection of available data/information and delineation of existing rainfall monitoring station
 - implementation of study
- 3.4 Assessment of the quality and suitability of water effluents from rivers for irrigation purposes
 - technology generation and development of strategies
 - collection of available past data and delineation of existing discharges monitoring stations
 - implementation of the study
- 3.5 Enhancement of the awareness of upland farmers on watershed rehabilitation and protection in collaboration with DENR and LGUs
 - collection, collation and evaluation of existing developed technologies
 - establish a collaborative effort with other concern offices/institutions and developed promotion program of awareness to communities within the watershed
 - conduct awareness promotional activities on catchment conservation and development
- 3.6 Strengthening the coordination between NIA, BSWM, DENR, and LGUs on watershed management planning and program implementation.
 - develop in collaboration with concern agencies strategies in handling planning and program implementation
 - conduct collaborative piloting on development strategies
 - evaluate and improvement of strategies
- 3.7 Piloting of erosion control measures and popularization of indigenous technologies on soil and water conservation
 - collect, compile and evaluate indigenous technologies and develop on site testing plans

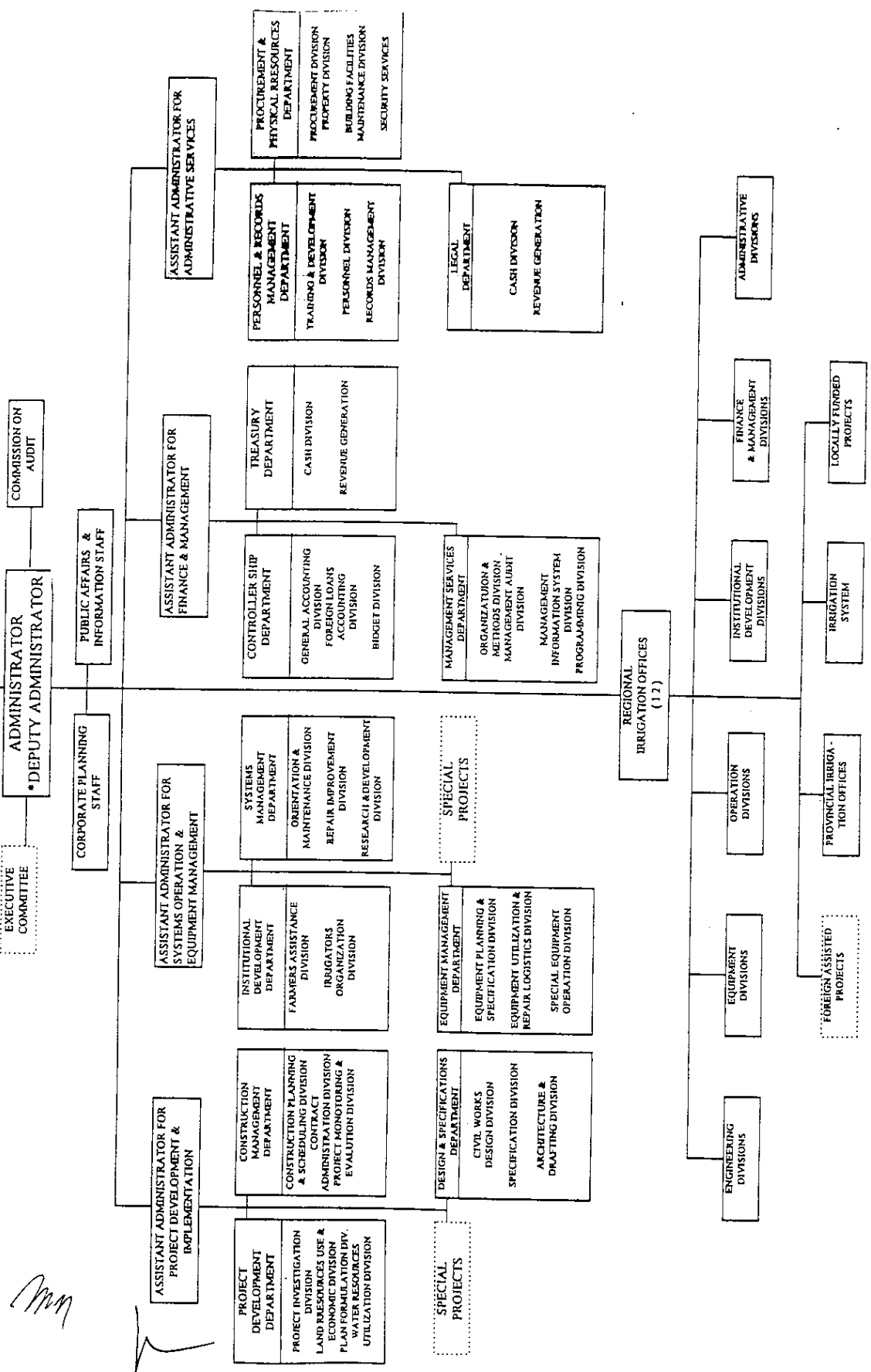
<ul style="list-style-type: none"> - coordinate and conduct consultative measures and gather needed production inputs - establish pilot areas and conduct trials <p>3.8 Study of erosion control measures</p> <p>3.9 Groundwater resources investigation and monitoring</p> <p>IV. Research and Development on Irrigation and Drainage Projects</p> <p>4.1 Improvement on methodology concerning data observation, collection and compilation for water management and field hydrological data</p> <p>4.2 Mathematical modeling/flow measurement for improving canal management</p> <p>4.3 Field testing of critical block method</p> <p>4.4 Introduction of sediment excluder and regulation reservoir</p> <p>4.5 Drainage and drainage re-use investigation</p> <p>4.6 Development of institutional supporting system of O&M services</p> <p>V. Basinwide Rural Planning and Development</p> <p>5.1 Survey and Evaluation of Agricultural Resources</p> <p>5.2 Study on Agricultural Institutions in the Area (Agricultural research, Extension and Training)</p> <p>5.3 Improvement of the land and soil conservation practices</p> <p>5.4 Promotion of marketing development</p> <p>5.5 Development and transfer of productivity enhancing technologies</p> <p>5.6 Improvement and development of post harvest facilities and transport and communication infrastructure</p>			
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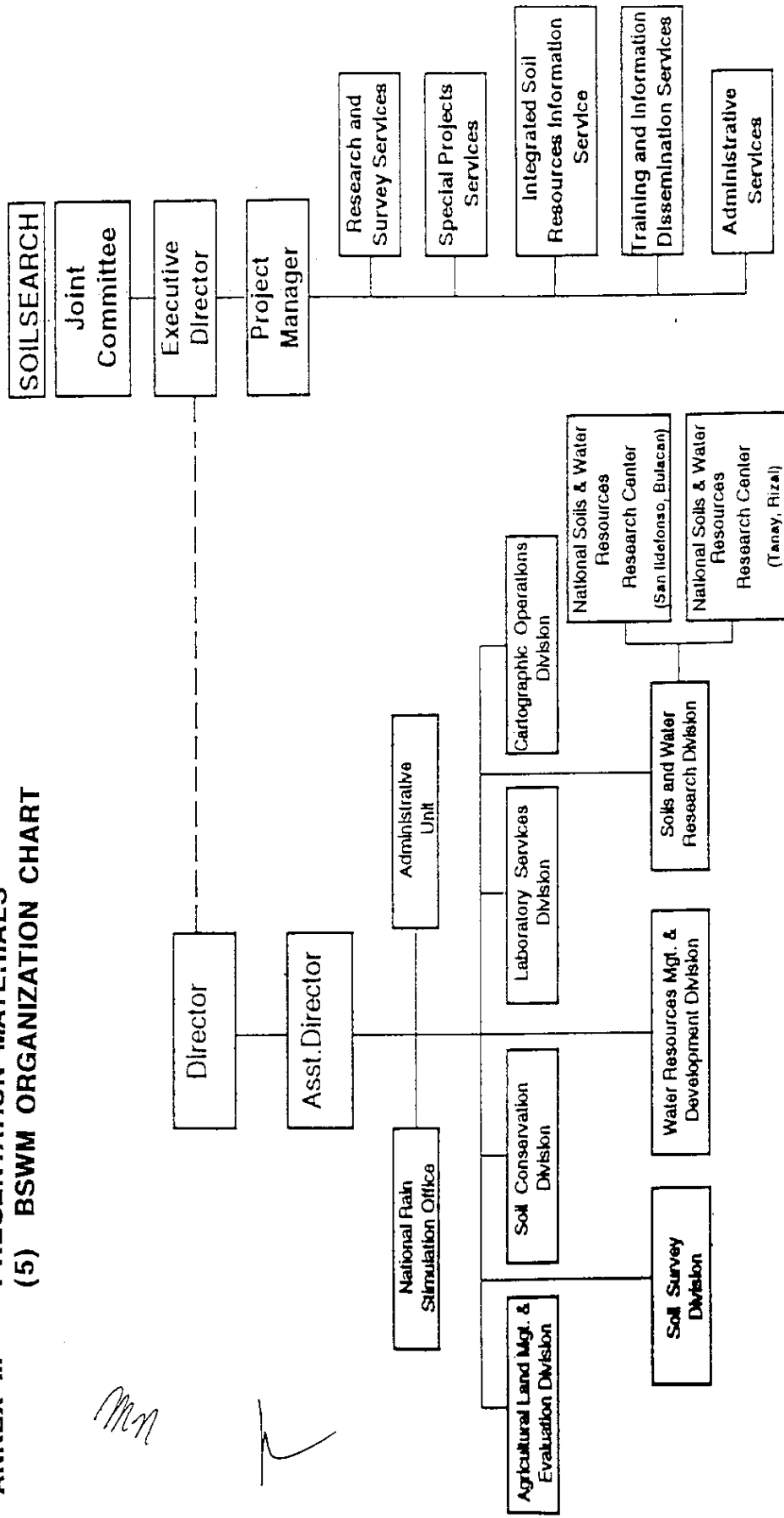
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ANNEX III

PRESENTATION MATERIALS
(4) NIA ORGANIZATION CHART



ANNEX III PRESENTATION MATERIALS
 (5) BSWM ORGANIZATION CHART



資料2. 要請書 (Basinwide Research)

ANNEX IV

PROPOSAL FOR A
PROJECT-TYPE TECHNICAL COOPERATION PROGRAM

ON

BASINWIDE RESEARCH FOR INNOVATIVE IRRIGATION AND
AGRICULTURAL DEVELOPMENT
(BASIN SEARCH)

SUBMITTED TO THE
GOVERNMENT OF JAPAN

THROUGH

NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY
AND
DEPARTMENT OF FOREIGN AFFAIRS
GOVERNMENT OF THE PHILIPPINES

PROPONENT

NATIONAL IRRIGATION ADMINISTRATION
BUREAU OF SOILS AND WATER MANAGEMENT

MARCH, 1997

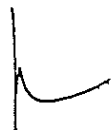


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 3. Related Government Department -----

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 Database for Watershed Management, Irrigation
 and Drainage Systems** -----


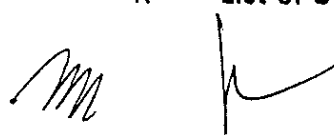


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PROJECT-TYPE TECHNICAL COOPERATION PROGRAM
(PTTCP)

I. Title of the Project:

Basinwide Research for Innovative Irrigation and Agricultural
Development

II. Implementing Organizations

1. Name of Implementing Organization

National Irrigation Administration (NIA)
Bureau of Soils and Water Management (BSWM)

2. Study Area

Talavera River Basin, Nueva Ecija, Philippines

3. Related Government Department

Department of Environment and Natural Resources (DENR)

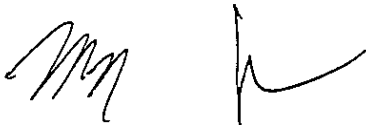
4. Outline of Implementing Organizations

NIA is a government owned and controlled corporation which is attached to the Department of Agriculture. It was created by virtue of Republic Act No. 3601 on June 22, 1963. Its charter was later amended by Presidential Decree No. 552 (PD-552) in 1974 and Presidential decree No. 1702 (PD-1702) in 1980, increasing its capitalization and authority.

BSWM is a government organization and one of the staff bureaus of the Department of Agriculture. It is headed by a Director and consists of 8 Technical Divisions that include the National Rain Stimulation Office.

5. Mandate and Activities

The NIA is primarily responsible for the development and management of irrigation systems in the country. Its activities include investigation, planning, design, construction including repairs, operation and maintenance and delegation of partial and/or full management of irrigation systems to duly organized associations and cooperatives. NIA also charges beneficiaries of irrigation systems constructed or administered by them with appropriate fees to cover the cost of operation, maintenance and repair. NIA, also, has to recover the cost of construction or rehabilitation of communal irrigation systems within a reasonable period of time.



The BSWM advises and renders assistance on matters relative to the utilization and management of soils and water as vital agricultural resources; formulates measures and guidelines for effective soil, land and water resource utilization, as well as conservation in croplands and other agricultural areas, undertakes soil-research programs, coordinate with relevant government agencies in resettlement areas and prepares the necessary plans for the provisions of technical assistance in soil related problems, prevention of soil erosion, fertility preservation, and other related matters; engages in rain-making projects for agricultural areas and watersheds to solve problem of prolonged droughts and minimize their effects on standing agricultural crops; for its own sector, recommends plans, programs, policies, rules and regulations to the Secretary and provides technical assistance in the implementation of the same.

6. Annual Budget

NIA activities for the past five (5) years had been sustained out of the corporate funds and annual budget sourced from the national government and foreign lending and/or donor institutions. The last 5 year budget is reflected in Table 1 below.

Table 1. NIA Budget for CY 1992-1996 ('000 pesos)

Particular	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Regular Program	<u>2,374,610</u>	<u>2,200,810</u>	<u>2,222,162</u>	<u>3,160,896</u>	<u>3,303,816</u>
a. Local	598,110	185,500	559,186	1,411,351	1,537,580
b. Foreign	1,776,500	2,015,310	1,662,976	1,749,545	1,766,236
Current Operating Budget	<u>872,507</u>	<u>1,042,453</u>	<u>1,196,612</u>	<u>1,203,884</u>	<u>1,436,706</u>
Total	3,247,117	3,243,263	3,418,774	4,364,780	4,740,522

Bureau of Soils and Water Management activities during the last (5) years had been sustained by the annual budget sourced out from

Department of Agriculture local fund. The 5-year budget (1992-1996) is reflected in Table 2.

Table 2. BSWM Budget, 1992-1996 ('000 pesos)

Particular	1992	1993	1994	1995	1996
Personal Services (PS)	16,802	17,955	23,586	25,135	33,238
Maintenance & Other Operating Expenses (MOOE)	47,876	44,800	51,813	38,857	55,907
Capital outlay		7,500			
TOTAL	64,678	70,255	75,399	63,992	89,645

III. Project Proposal

1. Rationale

The deterioration of the country's irrigation watershed has resulted in the occurrence of soil erosion and flooding during rainy months and drought during the dry seasons which often cause huge damage to crops and properties. The normal development action of the government to this situation is reforestation as well as the construction of dams and reservoirs to control river flows and to irrigate some downstream areas based on topography, land class and uses. However, in many instances the effectiveness of these dams and irrigation facilities is shortened because of massive siltation and reduction of river baseflow particularly during dry season.

In addition, these measures are not sufficient to address the problem of erosion induced either by natural calamities or by human agricultural activities. There are localities that has unstable geological landscape such as areas lying on an earthquake fault as in the case of the Talavera River Irrigation System, where soil mass movement cannot be addressed by traditional soil conservation measures. This unique setting requires watershed geological investigation and analysis against natural hazards which can be considered as an innovative approach in designing efficient irrigation systems.

1.1 Current Initiatives from Various Agencies

Recently, the Department of Environment and Natural Resources (DENR) in coordination with the National Irrigation Administration (NIA) formulated project proposal entitled "Water Resources Development Project" to address both agencies concerns, that is to properly manage

the watershed areas in an integrated manner and the selected National Irrigation Systems (NISs) for improvement. The general objective of the project is to sustainably manage critical watershed areas following a community-based approach in order to achieve desired level of water yield and quality, land productivity and protective capability.

The project will initially comprise three to five watersheds to be selected from eighteen (18) NIS with hydrologically critical catchment areas. Nevertheless, the project envisioned to include any or all of the following component activities: (1) reforestation; (2) improved upland agriculture through agro-forestry and silvi pasture; (3) natural forest improvement and protection; (4) application of soil erosion control measures; and (5) others. The whole program is targetted to be implemented for a minimum of 3 years and scheduled to start as early as 1998 or upon completion of Phases I (Strategy Formulation), II (Watershed Management Program), III (Watershed Management Plan) of the WRDP-Catchment Management Improvement Component. The Talavera basin was not included because of its wide variation in the biophysical (local topography, land use, soil, micro climate, etc.) conditions. etc.) conditions.

Studies that have been undertaken within and outside the proposed study area that could be related to this proposal is enumerated in Annex 4

1.2 NIA's Current Programs and Activities on Watershed Development

The DENR has the jurisdiction over all irrigation watershed areas and co-manage by LGU's. However, with the creation of LOI 1002 s. 1980, NIA was authorized to rehabilitate, develop and manage 24,500 ha in Pantabangan and 7,500 ha pilot area in Magat watersheds. In addition other current programs and activities by the agency on watershed development/management and erosion control measures are the following:

- 1.2.1. Provision of assistance to the DENR in protection of the Casocnan watershed.
- 1.2.2 Provision of technical support and assistance in the Multi-Sectoral Management of the Kabulnan watershed.
- 1.2.3 Watershed studies in support to the feasibility study of proposed irrigation projects.
- 1.2.4 Conduct of soil erosion and sedimentation studies in selected critical irrigation watersheds.
- 1.2.5 Implementation of the Erosion control Measure (ECM) Pilot Areas in all on-going foreign assisted irrigation projects. The pilot areas involve the establishment of vegetative hedgerows within the immediate vicinity of the irrigation diversion structures and along the canal embankments.




1.3 BSWM's Current Program and Activities Related to Watershed Development

The BSWM, along its mandated function of promoting the conservation and proper utilization of Soil and Water Resources undertakes the following programs nationwide in coordination with the DA, RFU, LGUs, NGO's

1. Implementation of small water impounding projects (SWIPs), shallow tube wells (STWs) and small farm reservoir (SFRs) to conserve soil and water and provide supplemental irrigation to increase productivity and optimize land utilization of the upland areas.
2. Land resources inventory and data management to provide database for comprehensive land use planning and development.
3. Organization and Training of small scale irrigation projects (SSIPs) on watershed management and system operation and maintenance.
4. Establishment of soil conservation guided forms to show case application of appropriate soil and water conservation practices and proper land use for the upland and rolling areas.

1.4 NIA's and BSWM's Current Strategies on Irrigation Watershed

- 1.4.1 Rapid appraisal and regular monitoring of the critical irrigation watersheds
- 1.4.2 Enhance the awareness of the irrigators association and upland farmers on watershed rehabilitation and protection
- 1.4.3 Strengthen the coordination between NIA, DENR and LGU's on watershed management planning and program implementation.
- 1.4.4 Membership of the DENR Secretary in the NIA Board to facilitate policy decisions of the Agency on matters pertaining to watershed rehabilitation and protection.
- 1.4.5 Organize Watershed Multi-Sectoral Management Councils involving the DENR, NIA, LGU and NGO's to develop and implement integrated watershed Management plans through participatory approach.
- 1.4.6 Piloting of erosion control measures and popularization of indigenous technologies on soil and water conservation like Sloping Agricultural Land Technology (SALT).



- 1.4.7 Organization and Training of SWIP Irrigators' Association on system operation and maintenance including watershed management.
 - 1.4.8 Land use planning and establishment of soil conservation guided farms in the upland to showcase appropriate farming and soil and water conservation practices to minimize soil erosion.
 - 1.4.9 Research/studies on land use and soil management to generate information for basinwide planning and development.
- 1.5 Present Condition of the Talavera River Irrigation System

Among the NISs, the Upper and Lower Talavera Rivers Irrigation Systems (UTRIS/LTRIS) located at the North Central Luzon Valley has faced chronically shortage of water, undermining its agricultural production capability. Moreover, the System's irrigation and drainage facilities were damaged by floods, heavy siltation and the earthquake of 1990 which caused heavy damage to crops and infrastructures. The feasibility study on the improvement project of the operation and maintenance of Upper Pampanga River Integrated Irrigation System (one of the largest NIS in the Philippines) wherein UTRIS/LTRIS is a part was conducted by Japan International Cooperation Agency (JICA) from 1982 to 1984. Through the survey and study works, the improvement plans were formulated on agriculture, irrigation, drainage, river, management of O&M, UPRIIS organization and farmers-association set-up. After the JICA study, several minor repair works have been made mainly under the Earthquake Rehabilitation Project (1990-93) and the Second Irrigation Operations Support Project (IOSP II, 1993-1997). While the major rehabilitation works on the increasing irrigation efficiency and cropping intensity, reducing flood, inundation and sedimentation damages have not been implemented.

Now, that the Casecanan Multi-Purpose Irrigation and Power Project (CMIPP) has been implemented under a Build-Operate-Transfer (BOT) arrangement with NIA since 1994 and its construction works started in February, 1996, it is planned that part of TRIS water requirement could be supplemented. The additional discharges are estimated at 801.9 million m³/year which could irrigate around 50,000 ha. NIA plans to allocate the water to the existing UPRIIS area of 20,000 ha and to the newly irrigable area of 30,000 ha located at the western part of UPRIIS District. The irrigation water will be taken by the Pampanga River System (Rizal) diversion dam and diverted to the irrigation expansion area parallel with the diversion canal No. 1

With the above status, the Project Type Technical Cooperation Program (PTTCP) under Japan International Cooperation Agency (JICA) entitled "Basinwide Research for Appropriate Innovative Irrigation and Agricultural Development" is urgently required to materialize its design



and implementation with the on-going Casecanan Multi-Purpose Irrigation and Power Project. The project, if realized would provide database information system to ease-up the complexities of the O&M of UPRIS expansion area of about 30,000 ha and will ensure appropriate irrigated agricultural development in TRIS (UTRIS/LTRIS combined service area) with more than 6,000 ha in particular as pilot area and of UPRIS with about 1,03,000 ha at present in general and other NIS area with similar condition.

1.6 Project Justification

The project has been formulated as a Project-Type Technical Cooperation Program (PTTCP) under the Japan International Cooperation Agency (JICA) with primary emphasis to develop database information system and technology on watershed management, irrigation and drainage, basin-wide rural development for planning and pilot testing aimed at increasing agricultural production and improving income and living standards of both the upland and lowland farmers.

The implementation of this research project in a run-of-the-river irrigation system will help in planning effectively the proper operation of the system particularly on the sediment concentration on the main canal and its tributaries. The effect of sedimentation in storage projects (Magat and Pantabangan) is less in the distribution but more on the storage capacity of the storage dam.

2. Background Information

2.1 General: The Philippines is basically an agricultural country with about 70% of the population living in the countryside and depending on agriculture related activities for their livelihood. In the national economy, the agricultural sector accounts for about 20% of the Gross Domestic Product (GDP), about 60% of export earnings and about 50% of the total employment. The living condition of the rural residents, especially the small farmers has worsened due to occurrences of natural disasters such as earthquakes, droughts and floods.

In order to improve the situation, the Philippine Government established the Medium-Term Development Plan, aiming at "World Economic Competitiveness Through People Empowerment." On the basis of the said plan, the National Irrigation Administration (NIA) has formulated the Corporate Plan (1993-2002), and is making efforts to enhance agricultural productivity as the basis of self-sustaining economic growth, attaining self-sufficiency in agricultural products and enhancing small farm income.

Irrigation development is one of the most important factors which support agricultural growth in the Philippines. Irrigation systems now serve an area of about 1.268 Million hectares representing 41% of the total arable area estimated suitable for irrigation. Most of the irrigated areas are served by water from diverted river flow. Presently, due to watershed denudation and deterioration of the systems facilities,

only 60% of the systems command area are served during dry season due to dwindling water supply and on the other hand vast tracks of land lying in low area within the system were under waterlogged conditions during rainy months because of the uncontrolled massive run-off. With this situation, both the availability of water uses and quality of output to sustain agricultural economic growth are greatly affected.

2.2 Irrigation Watershed

The Philippine watersheds comprise some 419 river basins with a total area of about 21 Million hectares. These are the major source of water requirement of several irrigation systems, hydro-electric dams and domestic as well as industrial water systems. To date, 112 watersheds with an aggregate area of 1.36 million hectare have been designated as "Proclaimed Watersheds" under Presidential Decree No. 705 (PD 705). The proclaimed watersheds were intended to be managed as protected areas, but most are heavily encroached and subjected to slash and burn and other form of cultivation. As a consequence, about 90% of the proclaimed watershed reservations are categorized as "hydrologically critical" implying degraded physical conditions and pose risk to downstream infrastructures.

The total watershed areas of National Irrigation Systems (NISs) is about 4.78 M hectare. Based on systems performance report (service area vs irrigated area, size of the catchment area, land use and degree of soil erosion) eighty three (83) NIS are considered in critical situation. The land-use of these NIS watershed areas are 1.48M ha (31%) forest, 1.48M ha (31%) grassland and 1.82M ha (38%) cultivated/built-up areas. The extent of the protective vegetative cover of a watershed indicates its capacity to retain rainfall in the wet season for river baseflow in the dry season. The presence or lack of vegetation also affects the erosivity of the soils in the watershed. Grassland areas for instance record erosion rates as high as 1930 ton/ha/year while forested areas have only 10 ton/ha/year.

The major problems confronting irrigation systems are erosion, sedimentation, and the diminishing water supply for dry season operation. The primary sources of soil erosion largely contributing to the sedimentation problems in the NISs are the grassland and cultivated areas which summed-up to about 3.25M ha or 68% of the total watershed area. At an average erosion rate of 80 tons/ha/yr, it is expected that some 260M tons or 197 MCM of soil eroded from the catchment areas. Out of this volume of sediments, it is assumed that about 16 MCM is deposited annually in the NIS reservoir/diversion structure, canal network and drainage systems. With the average desilting cost of P 100 per cubic meter, about P 1.6 B would be needed yearly to extract the total volume of sediments deposited in the irrigation diversion structures/reservoirs, canal and drainage system. Irrigation watersheds, without management intervention, would continue to deteriorate and would end-up mostly denuded and eroded areas. Preservation and protection of the forest lands and rehabilitation

of grasslands within irrigation watersheds must be given serious attention to protect our existing irrigation systems.

2.3 Irrigation System

Irrigation systems in the country cover an aggregate area of 1,268,428 which is approximately 41 percent of the total potential irrigable area. Of this, about 651,812 hectares are covered by national irrigation systems, 442,006 hectares by communal systems and 174,610 hectares by individual (mainly pump) systems. Reported average cropping intensity of the agency in the national irrigation systems is 138 percent, which is considered low.

Identified factors that contributed to the non-attainment of the cropping intensity which redounds to reduction of opportuned agricultural crops productivity are (1) limited water supply due to irrigation watershed denudation, (2) reduced river baseflow and water storage due to high level of soil erosion and sedimentation, (3) massive run-off which caused drainage problem in areas with lower elevations.

2.4 Study Area and Location

The study area covers the Talavera River Basin which includes portions of the provinces of Nueva Vizcaya and Nueva Ecija.

The Upper Talavera River Irrigation System (UTRIS) is a run-of-the-river type irrigation system served by a diversion dam across the Talavera river in Tayabo, San Jose City. It has an approximate service area of 4,000 ha. and about 21 percent is served during the dry season. It has two main canals located on both banks. The left bank main canal is called the San Agustin Extension (SAE) serving 750 hectares in the wet season and 150 ha. in the dry season. The right bank main canal is called UTRIS Main Canal. Based on record it served about 3,250 ha in the wet season and 700 ha in the dry season.

Studies conducted by NIA showed that the sediment concentration was tripled from 1.30 gm/li in 1986 to 4.173 gm/li after the earthquake in 1990 due to massive landslides. Moreover, the sediment deposition in the main canals had also increased proportionately. The lower portion of the service area experience annual water submergence due to lack of drainage systems during the wet season and inadequate water supply during the dry season. Consequently, the irrigated area of the irrigation system has been reduced. Thus, agricultural production and farmer's income were affected.

2.5 Current Situation

The present conditions and problems in the study area, countermeasures against such problems under the Project, and



beneficiaries/benefits of the Project are summarized as follows:

Present Conditions and Problems	Counter measures	Benefits/beneficiaries
a. Lack of database information on Watershed Management appropriate for irrigation and drainage development.	Conduct research and establish database information/technology for planning and development of watershed, irrigation O&M and management of inundated areas.	Easy access to reliable information for irrigation, drainage and rural development planning.
b. UTRIS facilities have deteriorated and damaged due to floods and earthquakes hence effective water management cannot be instituted.	Improvement/Modernization of irrigation facilities and empowerment of human resources.	Proper water and land use to increase cropping intensity and crops productivity.
c. Irrigation watershed denudation, high level of soil erosion and sedimentation.	Preservation and protection of the forest and rehabilitation of grasslands within irrigation watersheds.	Sustenance of water storage and flow in the reservoir and prevention and control of massive soil erosion and sedimentation.
d. UTRIS service area is 4,000 ha but only about 21% is being served during dry season.	Develop water resources, modernize irrigation facilities, improve O&M practices and empower human resources.	Lasting effective irrigation system; increased crop productivity, farm income and living standards of the populace and effect stable and pleasant environment.
e. Limited basinwide development project.	Develop and provide basinwide rural development plans through implementation of infrastructure improvement projects.	Alleviate poverty and enhancement of regional economy.
f. Lack of effective Institutional Linkages	Create and strengthen Institutional linkages to ensure agri-institutional development support services both to upland and lowland farmers	Effect sustainable food production and uplift economic condition.

3. Objective of the Project

- 3.1 General : To establish a sustainable irrigation and agricultural development methodology through the study of the Talavera RIS catchment and service areas which maybe applied to other areas.
- 3.2 Specific : The specific objective are the following:
- 3.2.1 To establish database information system concerning watershed and irrigation management for the appropriate irrigation and drainage development processes.
 - 3.2.2 To establish an innovative approach in the design of irrigation systems with geological consideration.
 - 3.2.3 To formulate a methodology on catchment area conservation and development that will provide an optimal watershed hydrological condition, better soil stability and sound environment
 - 3.2.4 To conduct applied research and development study purposely to improve water management, operation and maintenance practices of the irrigation systems thereby increasing the cropping intensity, crop productivity, farm income and living standard of the rural populace.
 - 3.2.5 To study basinwide rural development standard for improvement of support services such as institutional and extension services and enhance the infrastructure such as post-harvest facilities, introduction of agro-industry, domestic water supply, and transport/communication system.

4. Project Content and Activities:

4.1 Establishment of Data Collection System and Database for Watershed Management and Irrigation and Drainage Systems

Information technology resources will be integrated to develop and improve comprehensive and flexible relational databases for the storage and processing of data needed in the management of watersheds and irrigation and drainage systems. Specifically, it will focus on:

behaviour of irrigation canals to serve as a decision-support tool for managing manually operated irrigation systems; field run-off estimation, infiltration estimation, evaluation of mountain land

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degradation, stream water quality evaluation, transpiration and geographic and spatial data management and modeling.

- 4.2 Establishment of an innovative approach for designing irrigation systems that would involve geological investigation and analysis specifically for areas with unstable geological landscape.

- 4.3 Catchment Area Conservation and Development

A Memorandum of Agreement (MOA) will be forged between and among NIA and BSWM of the DA, DENR, and LGU to ensure the successful implementation of this work item. Specifically, NIA, BSWM, DENR, LGUs and other relevant organization will be involved in the following proposed activities:

- 4.3.1 Conduct studies on soil loss, water yield and quality and siltation rate at various watershed condition.
- 4.3.2 Conjunctive use study to the ground water availability.
- 4.3.3 Study on the effectiveness of rain simulation in improving water availability
- 4.3.4 Assessment of the quality and suitability of water effluents from rivers for irrigation purposes.
- 4.3.5 Enhancement on the awareness of upland farmers on watershed rehabilitation and protection in collaboration with the DENR and LGUs.
- 4.3.6 Strengthening the coordination between NIA, BSWM, DENR and LGUs on watershed management planning and program implementation.
- 4.3.7 Piloting of erosion control measures and popularization of indigenous technologies on soil and water conservation like Sloping Agricultural Land Technology (SALT).

- 4.4 Improvement of Irrigation and Drainage Practices

This will focus on two main measures for improvement. Improvements on irrigation operation (software) and on irrigation and drainage structures or facilities (hardware). It will be conducted in close coordination with NIA's District I of the Upper Pampanga River Integrated Irrigation System (UPRIIS) in Munoz, Nueva Ecija. The following activities are proposed:

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- 4.4.1 Improvement on methodology concerning data observation, collection and compilation for water management and field hydrological data.
- 4.4.2 Mathematical modeling/flow measurements for improving canal management.
- 4.4.3 Improvement on irrigation water distribution technology by field testing of the Critical Block method for estimating the diversion requirement in large-scale paddy irrigation project.
- 4.4.4 Introduction of sediment excluder and regulation reservoir.
- 4.4.5 Drainage and drainage re-use investigation
- 4.4.6 Groundwater resources investigation and monitoring.
- 4.4.7 Development of institutional supporting system of O&M services.

4.5 Basinwide Rural Development

Placing the well-being of the farmers and the rural population at the center of development concerns is sound and logical path to country's industrialization and economic recovery. Towards this direction, the basin wide rural development component will be studied in coordination with LGUs and other related agencies in the area through the Central Luzon Agriculture and Resources Research and Development Consortium (CLARRDEC). It will focus on:

- 4.5.1 Study on the projected requirements for the production of food and other agricultural product on how they can be met on a sustainable basis. This will include survey and evaluation of land use; farm size and land tenure; crops and production; crop damages; cropping pattern and intensity; planting method and variety; farming practice and input materials; farm labor and mechanization; and livestock and poultry.
- 4.5.2 Study on agri-institution in the area which include agricultural research; extension and training; associations related to agricultural production; agricultural credit and input distribution; and post harvest facilities.
- 4.5.3 Improvement of the land and soil conservation practices that provide sustainable development in basin wide.
- 4.5.4 Promotion on marketing development that will give farmers incentives in improving their practices.
- 4.5.5 Development and transfer of productivity-enhancing technologies that will provide opportunities for increased income and employment in the rural sector.

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4.5.6 Improvement and development of post-harvest facilities and transport & communication infrastructures to facilitate the movement of products from farms to market; reduce post-harvest losses; have a better and more stable prices; increase the trading of goods and services; and attract more investors.

5. Expected Benefits : The benefits that the project intends to achieve are the following:

5.1 Enhancement of planning capability of NIA and BSWM staff from the viewpoint of basin wide sustainable irrigated agricultural development.

5.2 Establishment of quantitative analysis methodology in NIA and BSWM by introducing data collection and data base systems.

5.3 Recognition of needs on enhancement of watershed management and basinwide rural development through study by all affiliated agencies and persons.

5.4 Establishment of improved methodology on irrigation and drainage facilities and water management.

5.5 Provision of useful proposals to irrigation component of Casecan Project, as well as national projects/systems having similar problems.

6. Expected JICA Experts and field of Activities

6.1 Long Term Experts

- a. Team Leader (1)
- b. Project Coordinator (1)
- c. Watershed Management Expert/Environmentalist (1)
- d. Irrigation, Drainage Water Management Expert (1)
- e. Rural Development Planning Expert (1)
- f. Hydrologist/Hydrology Expert (1)

6.2 Short-Term Experts

- a. Geologist
- b. Agronomist/Pedologist (1)
- c. Economist/Project Impact Assessment Expert (1)
- d. Forester/Forestry Expert (1)
- e. Sociologist/Extension Expert (1)
- f. Aerial Photo Analysis Expert (1)

7. Requested Number of Counterpart Training and Fields

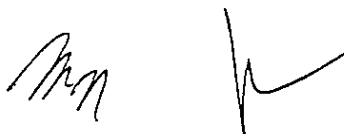


NIA and BSWM shall send local counterparts/ individual or in group, to attend appropriate training courses in Japan of about (5-8 participants per year).

- 7.1 Watershed Management
- 7.2 Irrigation and Drainage
- 7.3 Irrigation Water Management
- 7.4 Rural Development Planning and Management
- 7.5 Database Information Systems
- 7.6 Soil Conservation and Farming Systems
- 7.7 Environment Management
- 7.8 Agricultural Economics
- 7.9 Hydrology/Hydrometeorology
- 7.10 Environmental Impact Assessment
- 7.11 Computer Application and Development
- 7.12 Pressurized Irrigation System
- 7.13 Environmental Policy
- 7.14 Environmental Monitoring
- 7.15 Nature Conservation and Natural Parks Management
- 7.16 Regional Development Policy Seminar
- 7.17 Hydrographic Survey (International Accredited Category B Course)
- 7.18 Surveying and Mapping
- 7.19 Agricultural and Rural Development of Environmental Conservation
- 7.20 Effective Utilization of Tropical Agriculture and Forestry Resources
- 7.21 Agricultural Land and Water Resources Development II
- 7.22 Pedology/Forest Soils
- 7.23 Production of Audio Visual Communication Media

8. Required Equipment/Instrument (Approximately US \$0.75M)

- 8.1 Water Collecting/Measuring Devices - Direct reading current meter, automatic water and sediment sampler, electronic water level recorder with weather computer.
- 8.2 Automatic weather station with 15 climatic elements and accessories and weather computer, rain memory, water memory.
- 8.3 Surveying Instruments - Global positioning system (GPS) with two receivers for differential positioning with community base station, Geo-resistivity survey apparatus and Total Station survey instrument with accessories.

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- 8.4 Material Testing Devices - Compaction test apparatus, slump test apparatus, soil moisture meter, etc.
- 8.5 Water and Soil Sample Testing Devices
- 8.6 Data processing equipment - computers and accessories, printers and computer softwares.
- 8.7 Vehicles
- 8.8 Motor Boat
- 8.9 Electric generating set
- 8.10 Water Pumps and accessories pressurized irrigation system (sprinkler/drip)
- 8.11 Audio-visual equipment, overhead, slide projector
- 8.12 Radio-transceiver/communication network system.

IV. Situation of Project Facilities

1. Existing Buildings, Facilities and Equipment

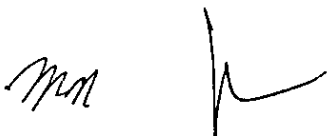
- a. The Main Project Office is at the Irrigation Engineering Center in Quezon City
- b. Field Office, Pilot and Test Sites

The site shall be selected within the catchment and command areas of the Talavera River Irrigation System in Nueva Ecija in consultation with between both Philippine and Japanese side:

- c. The Training Center in IEC, Quezon City
- d. Soil and Materials Testing Laboratory at the IEC and San Rafael, Bulacan.
- e. Other land, equipment and facilities mutually agreed upon as necessary.

2. Counterpart Personnel

- a. Counterpart Personnel
 - 1) Project Manager



- 2) Counterpart Personnel in fields of:
 - Watershed Management/Environmental Engineering
 - Water Management/ Irrigation and Drainage
 - Hydrology/Management Information
 - Rural Development Planning
 - Training Management
- 3) Administrative Personnel
 - Administrative
 - Accounting
- 4) Counterpart personnel for each field of Short-Term Expert
- 5) Other necessary support staff

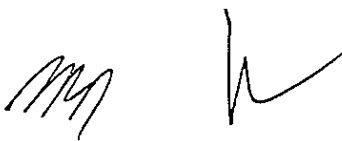
V. Implementation Strategy

5.1 Committees

This proposed research project once approved will be implemented jointly by NIA and BSWM under the Project-Type Technical Cooperation Program (PTTCP) of the Government of Japan.

A Joint Committee will be established for the Project which will provide policy direction and guidance during the implementation. The committee shall be composed of the following :

1. Asst. Secretary for Soils, Irrigation Research and Training, DA
2. NIA Administrator
3. Director, BSWM
4. NIA Assistant Administrator for SOEM/PDI
5. Project Manager
6. JICA Experts
7. Representative from JICA Philippine Office
8. Representative from NEDA (PMS-Agriculture Staff)
9. Representative from DENR (Foreign Assisted and Special Projects Office)
10. Representative from LGU
11. Representative from DA (PPG-IAADCO)

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As such the Joint Committee will convene at least once a year and function as follows:

- 1) To give direction and guidance to the Project and coordinate inter-related activities within NIA and other related agencies;
- 2) To review and approve the Annual Work-Plan of the Project to be formulated under the framework of the Records of Discussion between NIA, BSWM and JICA and Memorandum of Understanding among line agencies involved in the implementation of the project.
- 3) To review the overall progress of the technical cooperation program as well as the achievements of the Annual Work Plan;
- 4) To review and exchange views on major issues arising from or in connection with the technical cooperation program.

Coordination with the Local Government Units (LGUs) who have administrative control of the project will be ensured. Involvement of the Non-Government Organization (NGOs) and People Organization (PO) will also be encouraged. Likewise, linkage with the Central Luzon Agriculture and Resources Research and Development Consortium (CLARRDEC) and other related organizations will be undertaken.

CLARRDEC is a conglomeration of 17 agencies/institutions where NIA and DENR are member-agency conducting or promoting agriculture, forestry and natural resources research and development in Central Luzon which has been grouped to work together along specific objectives, share expertise and resources and complement with each other to push further the horizons of R&D in the region.

A Project Management Group will be created to ensure efficient management of day-to-day operations of the Project. This committee will be composed of:

1. Project Manager from NIA
2. Technical Staff from BSWM
3. Technical Staff from FMB
4. Technical Staff from UPRIIS District I
5. Provincial/Municipal Agriculturist
6. JICA Experts

5.2 Roles and Relationship for Project Management Implementation

5.2.1 In coordination with FMB, LGU and other line agencies, NIA and BSWM will implement the project as leading agencies to achieve the objectives as mentioned in paragraph 3. All together there will be about 21 technical staff working in the research study.



5.2.2 The progress and results of the studies will be shared to coordinating agencies and other interested parties.

VI. Project Cost

The total project cost is estimated at US\$ 6.6M. Of this, the Department of Agriculture thru the NIA and BSWM will provide the necessary GOP counterpart budget amounting to approximately US\$ 2.8M (Annex 1 and 1a) and the foreign counterpart is US\$ 3.8 M for the implementation of the project

VII. Other Pertinent Information

7.1 Relation with other Japanese Cooperation

7.1.1 Diversified Crops Irrigation Engineering Project

Other project-type technical cooperation (PTTCP) regarding irrigation development identified is the Diversified Crops Irrigation Engineering Project (DCIEP). At present, this project-type technical cooperation is being implemented at the Angat-Maasim Rivers Irrigation System (AMRIS) in Bulacan and Pampanga. Its main office is located at the 4th floor of Irrigation Engineering Center NIA Compound, EDSA, Diliman, Quezon City. The main target output of DCIEP Phase-2 are the following; (a) enhancement of technical capability of NIA staff, (b) improvement of the Irrigation Manual for Diversified Cropping, (c) upgrade of hydrological analysis method and implementation of case study, (d) improvement of methodology for water distribution planning and rehabilitation, (e) introduction of low-cost technology for the maintenance and rehabilitation, (f) improvement of database on irrigation planning and management and (g) establishment of at least fourteen (14) Diversified Cropping Promotional Projects (DCPP) nationwide. This project has no relation with watershed management but of course it has some relation in terms of farmland and water uses within the irrigation service area.

7.1.2 Overseas Economic Cooperation Fund (OECF)

The NIA has a plan to apply for the 22nd OECF Loan for the improvement and expansion of the Upper Pampanga Integrated Irrigation System (UPRIIS). The result of the project will be applied in the implementation of Casecanan Irrigation Component geared towards the improvement and expansion of UPRIIS.

7.2 Relation with any Assistance from other Donor Agencies

The government has launched several programs and projects for the rehabilitation of degraded watersheds and/or protection of those still in good condition. Among these are the National Forestation Program



(with support from the ADB and OECF), the Environment and Natural Resources Sector Adjustment Project (supported by the World Bank), and several integrated area development projects in the uplands supported by various multilateral and bilateral agencies. Furthermore, soil conservation and watershed management is one of the major component programs of the Philippine Master Plan for Forestry Development (MPFD). The MPFD recommended a Department of Environment and Natural Resources (DENR) policy shift of logging from virgin forests to the residual forests, and the imposition of logging ban in critical areas, namely: (a) areas with slope of 50% or more; (b) areas above 1,000 meter elevation, (c) areas proclaimed for ecological and environmental protection, and (d) areas proclaimed for watersheds reservations.


However, the policies and programs/projects have not effectively addressed the alarming rate of watershed degradation due to lack of a clear overall strategy, limited financial resources, fragmented implementation responsibility, lack of properly trained manpower, and increasing socio-economic pressure resulting from the rapid increase of population in the uplands/forest lands where the watersheds are located.

7.3 Relation with National Development Program

The project is in line with national development program relative to land and water resource planning and development to meet the increasing demands arising from rapid population growth and economic expansion.

The government's efforts to adopt needed measures to meet the country-wide water supply demands of both domestic and agriculture is reflected in the passage of the Republic Act No. 8041, otherwise known as the Water Crisis Act of 1995. The Act addresses the issues on water crisis, including the supply, distribution, financing and protection and conservation of watersheds.

Furthermore, soil conservation and watershed management is one of the major component programs of the Philippine Master Plan for Forestry Development (MPFD). The principal goal of a watershed management program for the Philippines is the creation of an environmentally sound, sustainable, productive and equitable resource utilization system. This approach explicitly recognizes watershed management as a multi-dimensional problem that has physical, social, economic and institutional components. The implementation of the project is very timely to address this problem.



ESTIMATED LOCAL FUNDING REQUIREMENT (In Thousand Pesos)

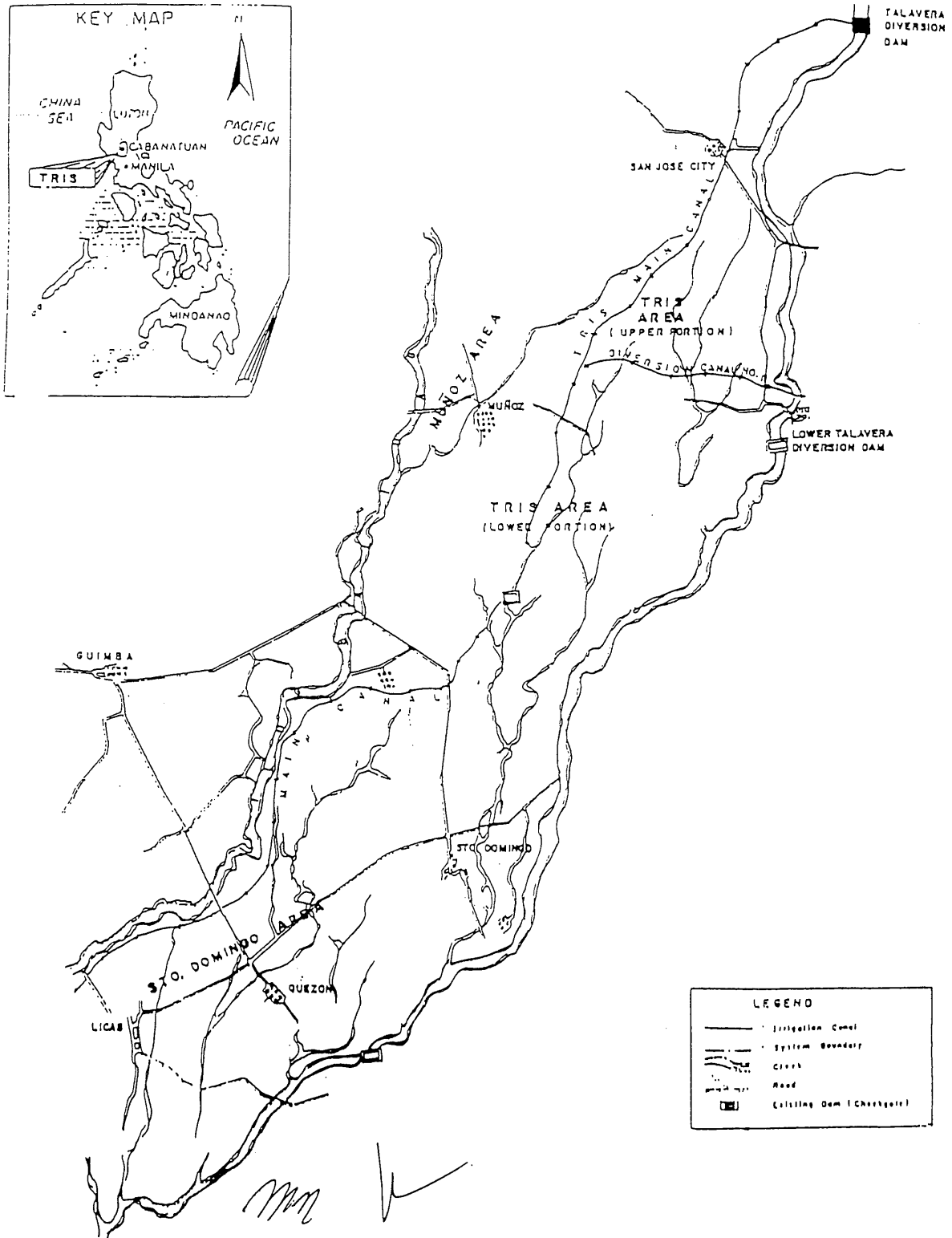
EXPENDITURE ITEMS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
A. PERSONNEL SERVICES						
Salaries	5,794	5,794	5,794	6,605	6,605	30,592
Wages	2,120	2,120	2,120	2,416	2,416	11,192
Allowance	650	750	850	950	1,200	4,400
13th mo. Pay	483	483	483	550	550	2,549
Cash Gift	76	90	100	150	170	586
RATA	168	190	209	230	253	1,050
Overtime	100	110	121	133	146	610
GSIS	550	550	550	627	627	2,906
PAG-IBIG	30	40	45	50	60	225
SUB-TOTAL	9,971	10,127	10,272	11,712	12,028	54,111
B. OPERATING EXPENSES						
Traveling	300	400	450	500	550	2,200
Supplies & Materials	100	200	250	300	330	1,180
Fuel & Lubricants	150	200	250	300	330	1,230
Water, Illumination and Power Service	90	100	120	132	145	587
Communication Service	90	100	150	200	220	760
Janitorial Service	50	60	70	80	88	348
Vehicle Registration & Insurance	150	200	250	300	330	1,230
Training Program	1,500	1,800	2,000	2,500	3,000	10,800
Sundries	200	250	300	350	400	1,500
SUB-TOTAL	2,630	3,310	3,840	4,662	5,393	19,835
GRAND TOTAL	12,601	13,437	14,112	16,374	17,421	73,946

ESTIMATED FINANCIAL REQUIREMENT (JAPANESE SIDE) IN
 YM : Million Yen

ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
A. Regular Budget						
1. JICA Cooperation Fund	12.64	15.80	12.64	12.64	9.48	63.20
2. Provision of Instrument/Equipment	50.56	63.20	50.56	50.56	37.92	252.80
- Purchased in Japan	40.45	50.56	40.45	40.45	30.33	202.24
- Local Procurement	10.11	12.64	10.11	10.11	7.59	50.56
SUB-TOTAL	63.20	79.00	63.20	63.20	47.40	316.00
B. Special Budget						
1. Technical Exchange Program	2.84	3.55	2.84	2.84	2.13	14.20
2. Trial Farm Construction	7.62	9.52	7.62	7.62	5.72	38.10
3. Irrigation and Drainage Facilities Rehabilitation	10.00	12.50	10.00	10.00	7.50	50.00
4. Project Seminar	1.00	1.25	1.00	1.00	0.75	5.00
5. Research Program	3.50	4.38	3.50	3.50	2.62	17.50
6. Group Training	2.26	2.82	2.26	2.26	1.70	11.30
7. Public Information	1.16	1.45	1.16	1.16	0.87	5.80
SUB-TOTAL	28.38	35.47	28.38	28.38	21.29	141.90
GRAND TOTAL						
YM	91.58	114.47	91.58	91.58	68.69	457.90
US\$M	0.76	0.95	0.76	0.76	0.57	3.80

Conversion Rate: 120.5 Yen = 1 US Dollar

LOCATION MAP



BASINWIDE RESEARCH ON INNOVATIVE IRRIGATION AND AGRICULTURAL DEVELOPMENT
TENTATIVE SCHEDULE OF IMPLEMENTATION

COMPONENT/ACTIVITIES	Y E A R					IMPLEMENTING AGENCY	COORDINATING AGENCIES	REMARKS
	1	2	3	4	5			
I Establishment of Data Collection System and Database for Water Management and Irrigation and Drainage Systems 1.1 Study and review of current methodologies and parameters in data collection and management 1.2 Develop data collection and information system 1.3 Formulate technical calculation systems for hydrologic analysis - field run-off estimation - infiltration estimation - evaluation of mountain land degradation - stream water quality evaluation - transpiration - geologic and spatial data management and modeling - flow simulation model - flood peak estimation						NIA		NIA C/P - full time BSWWM C/P - part time
						NIA/BSWWM	CLSU/DENR CLARRDEC -do-	
						NIA/BSWWM		
						NIA/BSWWM	DPWH/BRS NWRB/CLSU CLARRDEC	
II Establishment of an Innovative Approach for Designing Irrigation systems involving geological investigation and analysis specifically for areas with unstable geological landscape 2.1 Review and assessment of existing design criteria for irrigation and drainage facilities 2.2 Conduct soil layer and underground water level for slope stability analysis						NIA		NIA C/P - full time BSWWM C/P - part time
						NIA/BSWWM	CLSU	
						BSWWM/NIA	CLSU	

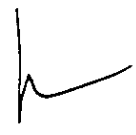
COMPONENT/ACTIVITIES	Y E A R					IMPLEMENTING AGENCY	COORDINATING AGENCIES	REMARKS
	1	2	3	4	5			
<p>III Catchment Area Conservation and Development</p> <p>3.1 Conduct studies on soil loss, water yield and quality and siltation rate of various watershed condition</p> <ul style="list-style-type: none"> - identification and investigation of critical drainage ways - identification and development of control/conservation approaches on soil loss and siltation (vegetative and structural measures) - study strategy development and implementation 						BSWM/NIA	BSWM C/P - full time NIA C/P - full time	
<p>3.2 Conjunctive use study to the groundwater availability</p> <ul style="list-style-type: none"> - Evaluation of total area and identification of probable specific site for investigation - Technology generation and development of strategies - Implementation of groundwater study 						DPWH/LGU's DENR		
<p>3.3 Study on the effectiveness of rain simulation in improving water availability</p> <ul style="list-style-type: none"> - technology generation and strategy development - collection of available data/information and delineation of existing rainfall monitoring stations - implementation of study 						CLSU/ CLARRDEC		
<p>3.4 Assessment of the quality and suitability of water effluents from rivers for irrigation purposes</p> <ul style="list-style-type: none"> - technology generation and development of strategies - collection of available past data and delineation of existing discharges monitoring stations - implementation of study 						PAGASA/ CLSU		
<p>3.5 Enhancement of the awareness of upland farmers on watershed rehabilitation and protection in collaboration with DENR and LGUs</p> <ul style="list-style-type: none"> - collection, collation and evaluation of existing developed technologies - establish a collaborative effort with other concern offices/institutions and develop promotion program of awareness to communities within the watershed - conduct awareness promotional activities on catchment conservation and development 						NWRB/UPRIIS CLSU/DPWH		
						NIA/BSWM	DENR/CLSU LGUs	

COMPONENT/ACTIVITIES	Y E A R					IMPLEMENTING AGENCY	COORDINATING AGENCIES	REMARKS
	1	2	3	4	5			
3.6 Strengthening the coordination between NIA, BSWM, DENR and LGUs on watershed management planning and program implementation - develop in collaboration with concern agencies strategies in handling planning and program implementation - conduct collaborative piloting on development strategies - evaluate and improvement of strategies						ALL CONCERN OFFICES	CLSU	
3.7 Picking of erosion control measures and popularization of indigenous technologies on soil and water conservation - collect, compile and evaluate indigenous technologies and develop on site testing plans - coordinate and conduct consultative measures and gather needed production inputs - establish pilot areas and conduct trials						BSWM	DENR/LGUs CLSU/NGOs	
3.8 Study of erosion control measures						BSWM/NIA	DPWH	
3.9 Groundwater resources investigation and monitoring						BSWM/NIA	CLSU	
IV Research and Development on Irrigation and Drainage Projects						NIA		NIA C/P -full time BSWM C/P - part-time
4.1 Improvement on methodology concerning data observation, collection and compilation for water management and soil hydrological data						NIA/BSWM	CLARRDECI CLSU	
4.2 Methodological modeling/flow measurement for improving canal management.						NIA/BSWM	CLSU	
4.3 Field testing of critical block method						NIA	UPRIIS	
4.4 Introduction of sediment excluder and regulation reservoir						NIA	BRS	
4.5 Drainage and drainage re-use investigation						NIA/BSWM	UPRIIS	
4.6 Development of institutional supporting system of O&M services						NIA/BSWM	CLSU/LGUs	

COMPONENT/ACTIVITIES	Y E A R					IMPLEMENTING AGENCY	COORDINATING AGENCIES	REMARKS
	1	2	3	4	5			
V Basinwide Rural Planning and Development						NIA		NIA C/P - full time
5.1 Survey and Evaluation of Agricultural Resources						NIA/BSWM	LGUs/DENR	BSWM C/P part time
5.2 Study on Agricultural Institutions in the Area (Agricultural research, Extension and Training)						NIA	CLSU/DENR	
5.3 Improvement of the land and soil conservation practices						BSWM/NIA	CLSU/DENR	
5.4 Promotion of marketing development						NIA	NAPHIRE/ CLARDECC	
5.5 Development and transfer of productivity enhancing technologies						NIA	LGUs	
5.6 Improvement and development of post harvest facilities and transport and communication infrastructure						NIA	NAPHIRE/ CLARDECC	

TECHNICAL COOPERATION PROGRAM (JAPANESE SIDE)
Dispatch of JICA Experts

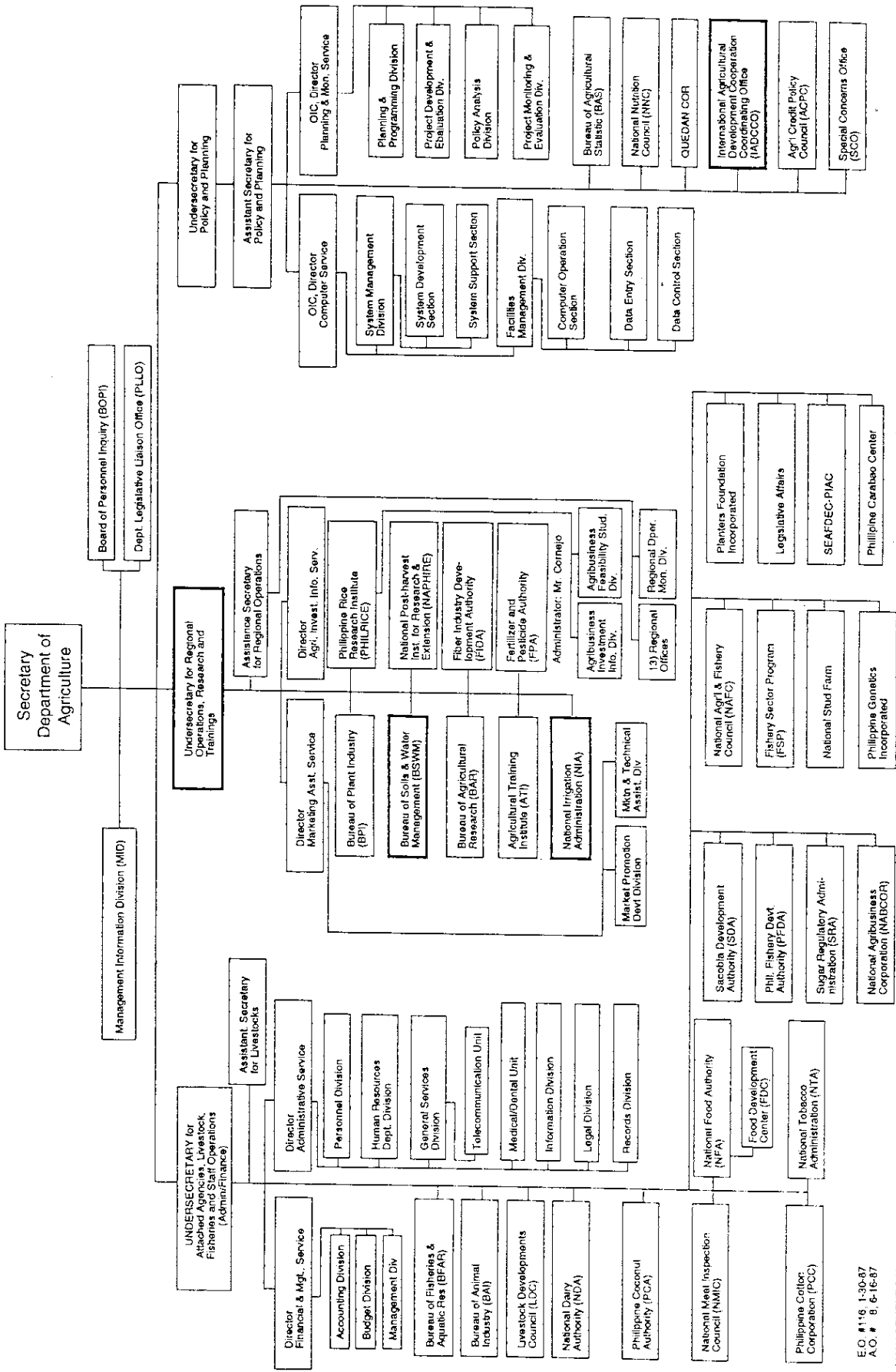
PARTICULAR	YEAR					REMARKS	
	1	2	3	4	5		
A. LONG-TERM EXPERTS							
1. Team Leader							
2. Coordinator							
3. Watershed Management/Environmentalist							
4. Rural Development Planning							
5. Hydrology/Database Management							
6. Irrigation/Drainage							
B. SHORT TERM EXPERTS							If the need arises
C. PROVISION OF MACHINERY AND EQUIPMENT							
D. TRAINING OF PHILIPPINE PERSONNEL IN JAPAN							
E. DISPATCH OF SURVEY TEAM							If the need arises

mm 

LIST OF STUDIES UNDERTAKEN BY VARIOUS AGENCY(ies)

STUDY TITLE/DEVELOPMENT INITIATIVES	AGENCY/INSTITUTION	DATE/DURATION
1. Establishment and Cultural Treatment of Selected Reforestation Species in Grasslands of Talavera Watershed	PCARRD	August, 1980 - July, 1990
2. Planting Stock Production and Establishment of Tiger Grass in Upland Areas	DENR	August, 1992 - 1995
3. Hydrometeorologic Characterization of Casuarina Equisetifolia Stand Established in Degraded Grassland	DENR	October, 1991 - 1996
4. Integrated Forestry Program	CENTRO Western Luzon	1991 - 2000
5. Water Quality Study	NIA	1990
6. Collaborative Irrigation System Management Research Results from the Upper Pampanga Integrated Irrigation System (Seminar Paper)	IRRI	1982
7. Drainage Problems in Irrigated Areas and Plans for Improving the situation (Concept Paper)	NIA	1987
8. Soil Conservation Planning and Development in an Upland Agriculture (Seminar Paper)	BSWM	
9. Drainage Consideration in Frequently Inundated Agricultural Areas (Libmanan - Cabúsao PIS)	NIA-IRRI	1981 - 84

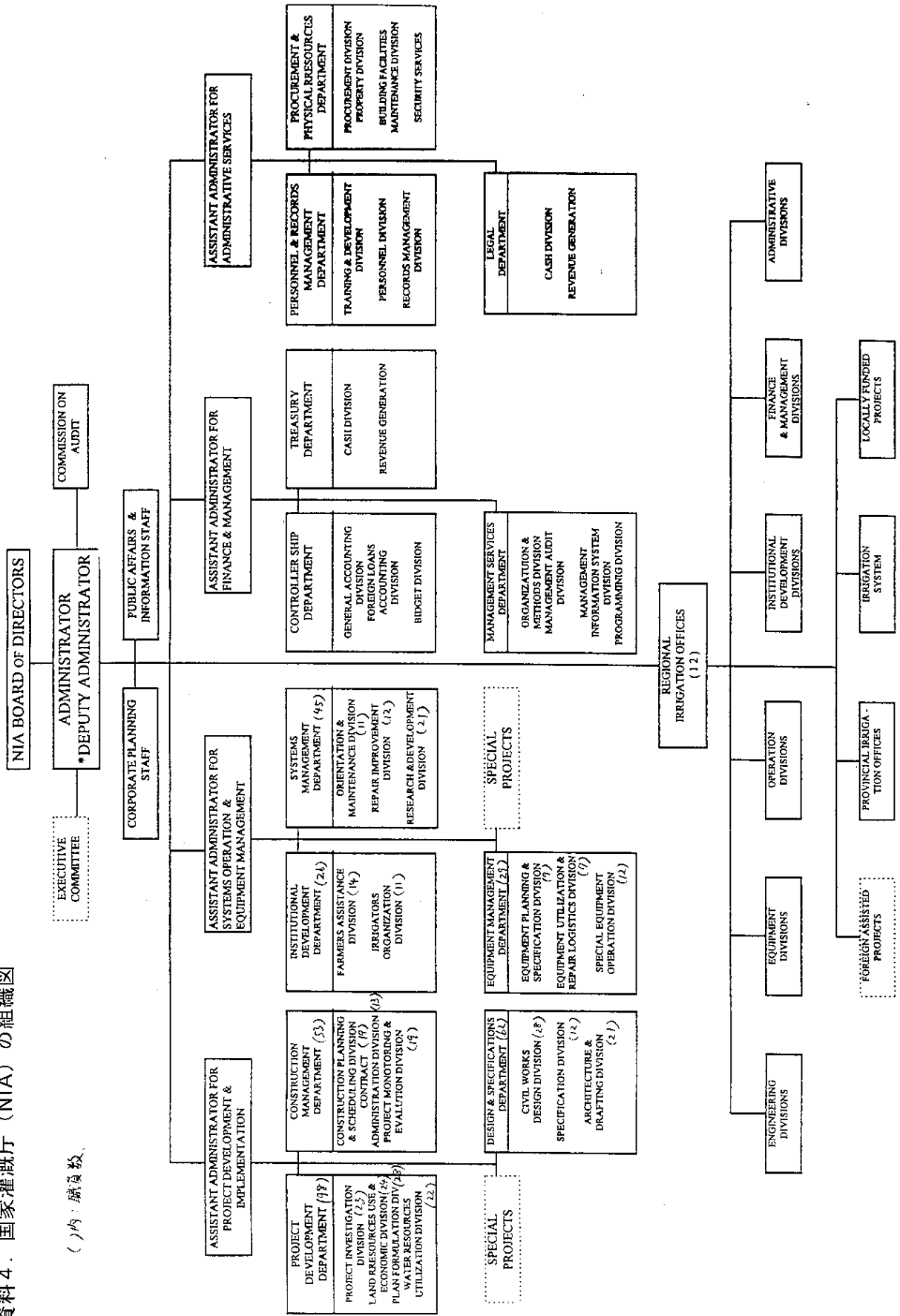
Organization of the Department of Agriculture



E.O. #116 1-30-87
A.O. # 8, 6-16-87

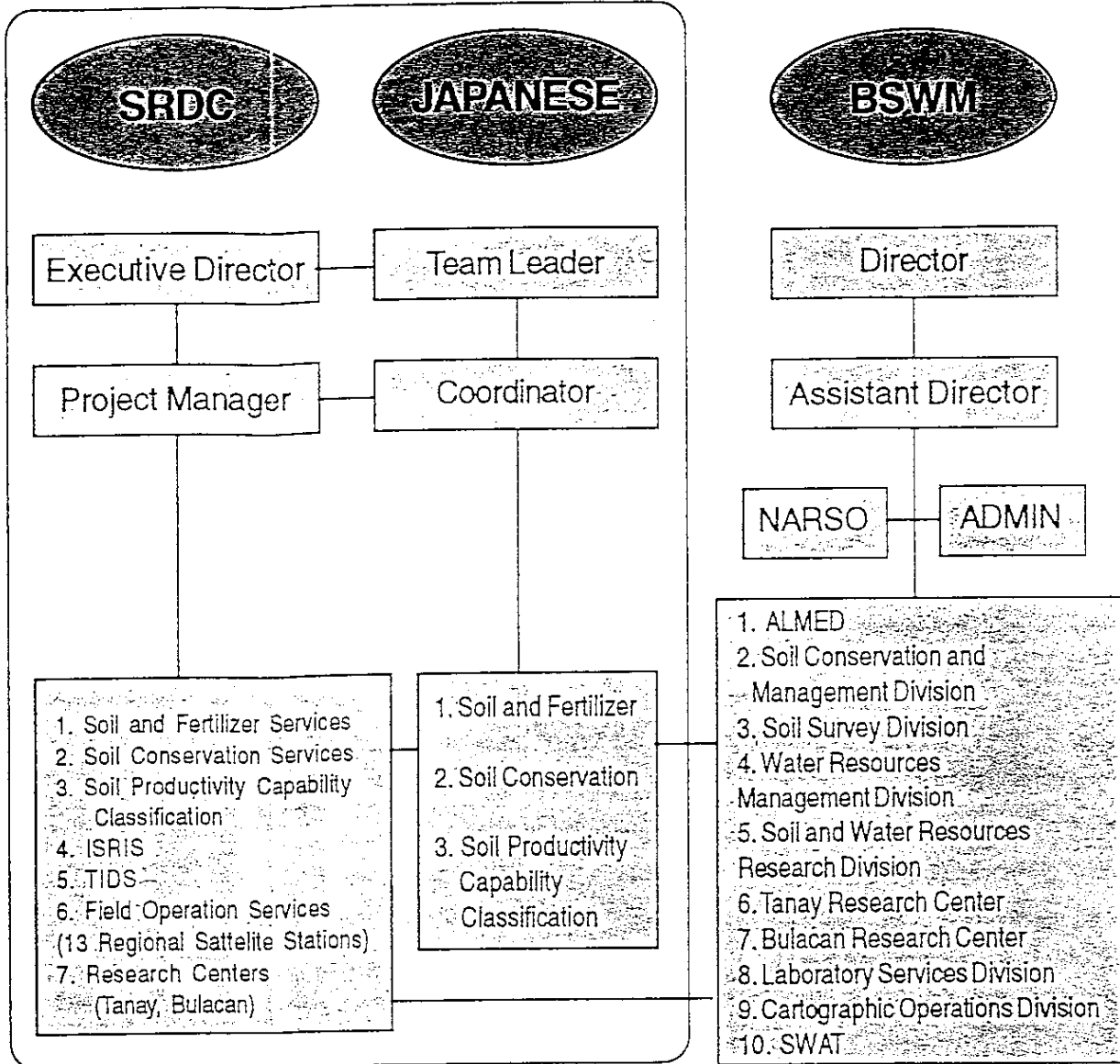
MANAGEMENT DIVISION
1995

資料 4. 国家灌漑庁 (NIA) の組織図



()内: 職員数

ORGANIZATIONAL CHART OF SRDC PROJECT AND BSWM

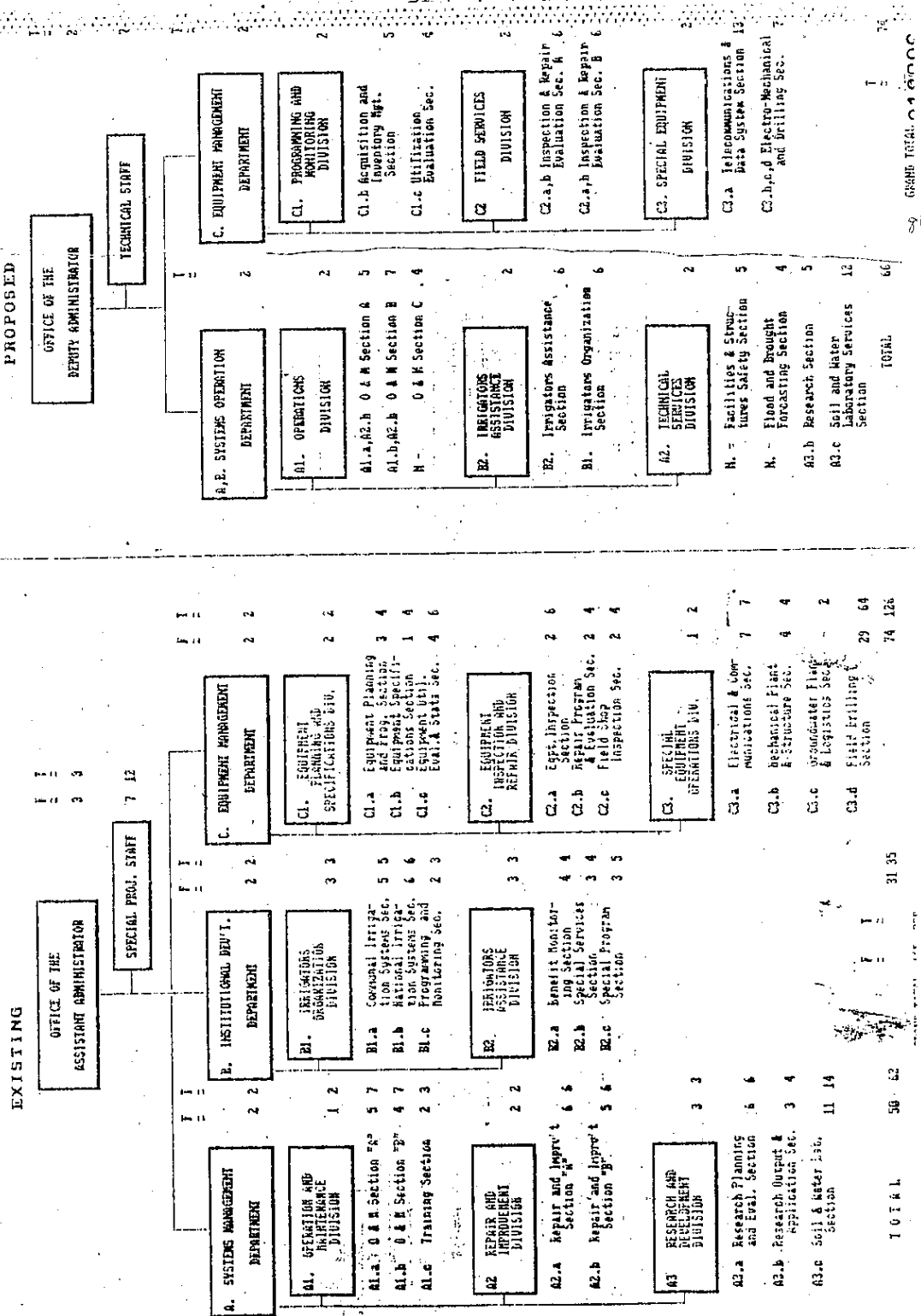


Note: ISRIS, TIDS and Field Operation Services are managed by the Philippine side.

資料 6. NIA の組織・機構再編計画

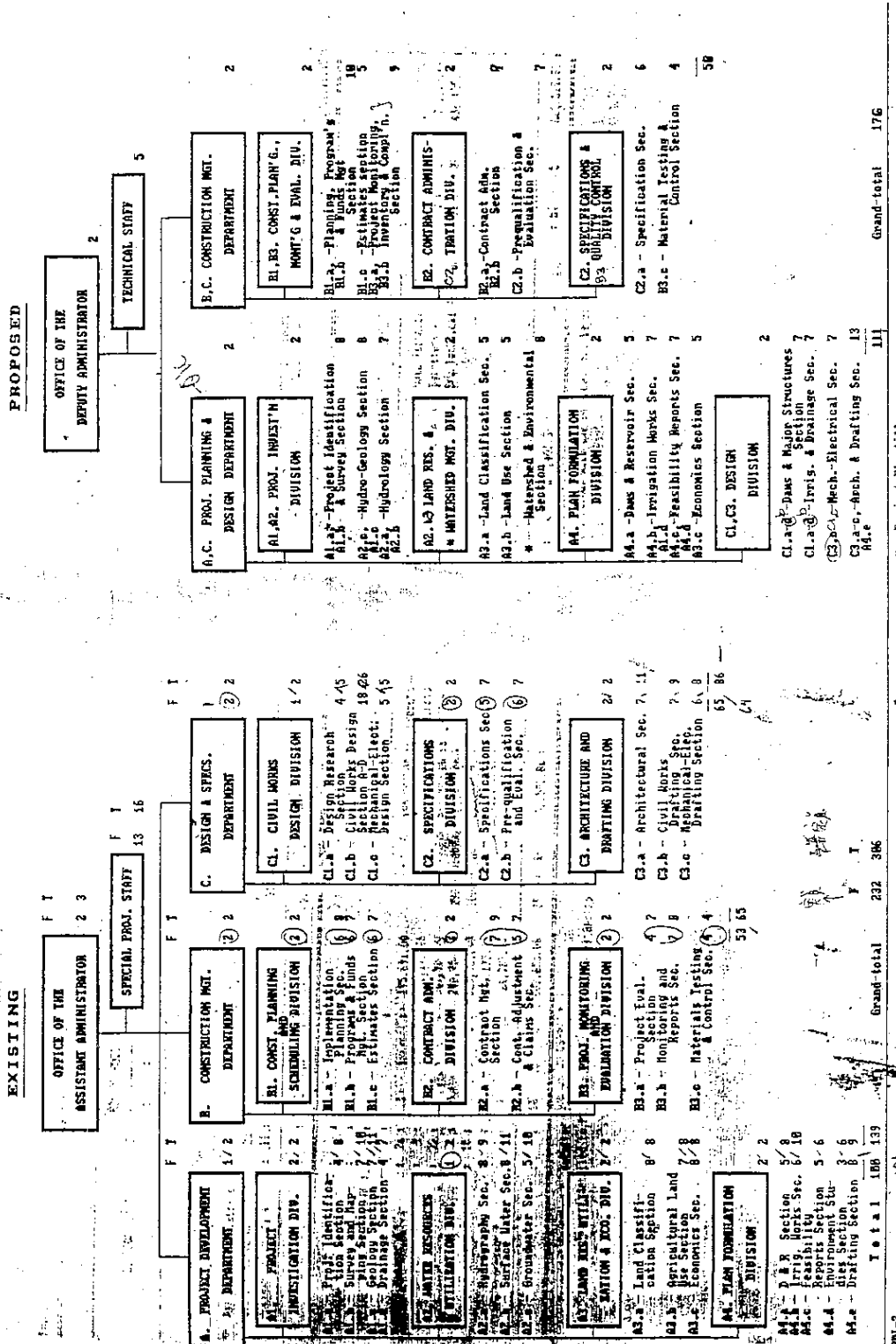
U.S. ORGANIZATION CHART
 AGENCY: NATIONAL IRRIGATION ADMINISTRATION

REPAIR SYSTEMS OPERATION & EQUIPMENT MAINTENANCE
 FORMAL STRUCTURE MODIFICATIONS



II - ORGANIZATION CHART
 AGENCY: NATIONAL IRRIGATION ADMINISTRATION

FORMAL STRUCTURE MODIFICATIONS



資料 7. パンパンガ川上流域総合灌漑事業 (UPRIIS) 運営実績

PERFORMANCE EVALUATION OF RRS
1983 - 1996

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
REGION : UPRIS														
1. NO. OF PERSONNEL														
a. Total Allocation	838.00	838.00	854.00	872.00	872.00	897.00	897.00	894.00	777.00	770.00	655.00	511.00	758.00	717.00
b. Additional	42.00	42.00	42.00	35.00	35.00	184.00	184.00						32.00	43.00
c. No. of Systems/No. of Responsibility Center	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
2. SERVICE AREA (Ha.)														
a. IRRIGATED AREA (Ha.)	105,285.77	105,285.77	105,285.77	105,285.77	105,285.77	105,285.77	105,285.77	104,221.89	104,087.64	102,532.21	102,532.21	102,532.21	102,532.21	102,532.21
b. Wet Season	52,735.68	52,735.68	52,735.68	52,735.68	52,735.68	52,735.68	52,735.68	51,044.14	50,756.83	49,145.40	45,281.32	47,861.01	49,232.85	49,005.85
1. Program	73,806.52	73,806.52	73,806.52	73,806.52	73,806.52	73,806.52	73,806.52	71,813.75	71,405.40	69,566.71	65,456.71	68,695.63	71,412.83	71,412.83
2. Actual	79.59	79.59	79.59	79.59	79.59	79.59	79.59	78.41	78.41	76.42	72.42	74.77	76.42	76.42
3. Actual/Program (%)	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	71,492.01	71,492.01	70,282.84	68,695.63	70,282.84	70,282.84	70,282.84
c. Dry Season	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41
1. Program	91.36	91.36	91.36	91.36	91.36	91.36	91.36	91.36	91.36	91.36	91.36	91.36	91.36	91.36
2. Actual	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32
3. Actual/Program (%)	96.78	96.78	96.78	96.78	96.78	96.78	96.78	96.78	96.78	96.78	96.78	96.78	96.78	96.78
3. BENEFITED AREA (Ha.)														
a. Wet Season	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	71,492.01	71,492.01	70,282.84	68,695.63	70,282.84	70,282.84	70,282.84
1. Program	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	83,112.00	82,756.45	80,756.85	77,492.01	80,756.85	83,112.00	83,112.00
2. Actual	74.62	74.62	74.62	74.62	74.62	74.62	74.62	73.90	73.90	72.42	69.41	72.42	73.90	73.90
3. Actual/Program (%)	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58
b. Dry Season	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41
1. Program	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32
2. Actual	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09
3. Actual/Program (%)	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34
4. IRRIGATED AREA (Ha.)														
a. Wet Season	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	71,492.01	71,492.01	70,282.84	68,695.63	70,282.84	70,282.84	70,282.84
1. Program	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	83,112.00	82,756.45	80,756.85	77,492.01	80,756.85	83,112.00	83,112.00
2. Actual	74.62	74.62	74.62	74.62	74.62	74.62	74.62	73.90	73.90	72.42	69.41	72.42	73.90	73.90
3. Actual/Program (%)	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58
b. Dry Season	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41
1. Program	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32
2. Actual	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09
3. Actual/Program (%)	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34
5. BENEFITED AREA (Ha.)														
a. Wet Season	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	71,492.01	71,492.01	70,282.84	68,695.63	70,282.84	70,282.84	70,282.84
1. Program	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	83,112.00	82,756.45	80,756.85	77,492.01	80,756.85	83,112.00	83,112.00
2. Actual	74.62	74.62	74.62	74.62	74.62	74.62	74.62	73.90	73.90	72.42	69.41	72.42	73.90	73.90
3. Actual/Program (%)	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58
b. Dry Season	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41
1. Program	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32
2. Actual	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09
3. Actual/Program (%)	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34
6. IRRIGATED AREA (Ha.)														
a. Wet Season	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	72,603.59	71,492.01	71,492.01	70,282.84	68,695.63	70,282.84	70,282.84	70,282.84
1. Program	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	85,199.92	83,112.00	82,756.45	80,756.85	77,492.01	80,756.85	83,112.00	83,112.00
2. Actual	74.62	74.62	74.62	74.62	74.62	74.62	74.62	73.90	73.90	72.42	69.41	72.42	73.90	73.90
3. Actual/Program (%)	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58	87.58
b. Dry Season	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41	66,335.41
1. Program	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32	88.32
2. Actual	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09	85.09
3. Actual/Program (%)	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34	96.34

PERFORMANCE EVALUATION OF NIS
1983 - 1996

	1983	1984	1985	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
SECTION : UPRITE													
7. EXPENSES (P'000)													
A. Budget (Total Approved)			31,400:	34,948:	69,555:	71,022:	75,744:	75,877:	75,877:	72,178:	83,023:	162,240:	
B. Budget (System Level)			26,856:	31,498:	46,254:	46,254:	46,254:	46,254:	46,254:	46,254:	46,254:	46,254:	77,541:
C. Actual Expenses (System)	25,741:	25,753:	25,708:	25,179:	34,176:	44,240:	61,630:	51,108:	52,300:	59,700:	71,034:	65,982:	64,58:
I. Actual/Budget (System)			96.02:	105.62:	97.80:	111.55:	85.15:	68.70:	68.70:	82.87:	104.07:	64.58:	
5. INCOME (P'000)													
A. ISF COLLECTION													
1. Estimated Collectibles	24,617:	36,943:	60,906:	81,977:	46,011:	64,421:	135,463:	135,926:	136,711:	137,280:	146,704:	145,716:	
2. Target	17,232:	25,666:	42,454:	57,398:	37,208:	45,137:	94,824:	95,148:	91,498:	82,424:	75,863:	75,400:	93,288:
3. Actual	15,859:	13,543:	22,152:	31,341:	21,347:	30,448:	40,436:	52,572:	45,279:	43,627:	58,616:	44,058:	51,734:
a. Current Accounts			1,310:	1,087:	880:	2,947:	5,987:	6,900:	7,071:	5,243:	9,084:	10,299:	9,084:
b. Back Accounts			23,472:	32,254:	20,467:	27,491:	34,449:	45,585:	38,208:	38,386:	49,532:	33,759:	42,644:
c. Total	17,710:	14,361:	23,472:	33,428:	22,227:	32,438:	40,436:	52,572:	45,279:	43,627:	58,616:	44,058:	51,734:
B. Other Income			594:	3,054:	1,200:	1,738:	3,806:	12,921:	10,051:	4,957:	2,088:	7,428:	7,428:
C. Total Income	17,710:	14,361:	24,066:	36,482:	23,427:	34,186:	44,242:	65,447:	55,330:	48,584:	60,704:	51,486:	59,162:
9. CROPPING INTENSITY													
1. Program	164,06:	126,69:	162,33:	170,58:	149,48:	155,41:	162,46:	163,21:	165,60:	166,76:	163,24:	156,53:	135,00:
2. Actual	139,06:	116,84:	149,48:	163,78:	152,38:	153,16:	155,64:	156,21:	158,63:	155,32:	156,36:	151,62:	137,02:
3. Actual/Program (%)	84.76:	90.66:	92.03:	96.03:	98.53:	98.75:	95.84:	95.10:	95.22:	93.49:	95.49:	90.48:	101.3:
10. COLLECTION EFFICIENCY													
1. Program	70,00:	70,00:	70,00:	70,00:	70,00:	70,00:	70,00:	70,00:	70,00:	70,00:	70,00:	70,00:	64:
2. Actual	71,94:	36,87:	39,54:	39,69:	48,31:	50,03:	32,03:	43,10:	39,61:	41,62:	45,88:	38,34:	35.3:
3. Actual/Program (%)	102.77:	52.53:	56.49:	56.59:	68.91:	71.47:	45.73:	61.57:	56.58:	59.49:	65.54:	54.85:	55.47:
11. VIABILITY INDEX													
1. Program													
2. Actual	.59:	.60:	.93:	1.14:	1.06:	2.19:	1.82:	2.15:	2.03:	1.12:	1.45:	1.42:	1.51:
3. Actual/Program (%)													
12. O & M COST/HA. (P/HA.)													
A. Expenses/Service Area	246,22:	229,97:	249,67:	282,43:	325,13:	329,72:	474,48:	581,95:	577,70:	736,15:	494,48:	652,80:	639,63:
B. Exp./Total Benefited Area	192,33:	215,18:	185,91:	185,69:	371,68:	271,09:	282,60:	384,07:	527,16:	584,94:	324,87:	381,11:	381,11:
C. Budget/Service Area	unc. data:	unc. data:	266.03:	272.57:	304.01:	336.72:	452.96:	536.63:	589.33:	809.29:	510.43:	655.73:	754.70:
13. INSTITUTIONAL DEVELOPMENT													
A. No. of HAs to be organized	177,00:	232,00:	252,00:	283,00:	306,00:	306,00:	306,00:	326,00:	333,00:	333,00:	345,00:	358:	358:
B. No. of HAs Organized	21,00:	125,00:	176,00:	211,00:	241,00:	278,00:	319,00:	349,00:	333,00:	333,00:	345,00:	346:	350:
14. AVERAGE YIELD/HA.													
A. Wet Season	59.57:	65.50:	54.58:	67.48:	70.82:	63.40:	64.13:	64.13:	55.88:	49.75:	62.84:	49.13:	49.13:
B. Dry Season	81.24:	67.49:	78.72:	81.76:	81.70:	86.24:	91.17:	91.17:	82.62:	94.57:	97.86:	83.44:	90.37:
15. SYSTEMS EFFICIENCY													

UTRIS OPERATIONS BACKGROUND DATA

1. Service Area

UTRIS	-	3,700.82 has
SAE	-	744.72 has

2. Planted Area (See Table 1)

3. Average Yield (See Table 1)

4. Daily Discharges (See Table 2)

5. Hydromet Data (Same in item 4)

6. Land Classification Map

7. Status of FIA

8. WUE (No available)

9. ISF Collection for Zone I (UTRIS & SAE)

YEAR	Collection Efficiency, %	
	Dry	Wet
1991	36.83	21.66
1992	53.23	23.58
1993	69.70	9.28
1994	32.00	13.39
1995	35.00	14.23
1996		15.12

10. Estimated Rate of Siltation :

YEAR	Estimated Rate of Siltation (cu.m/Irrigation Day)
1991	180-200
1992	90-140
1993	60-80
1994	30-50
1995	20-30
1996	10-20

Note : In case of water suspension due to rainfall, flushing of the sluice gate is undertaken thus, siltation is zero.

Table 1. UTRIS and SAE Six Year Irrigation Performance

SYSTEM Service Area (Ha)	YEAR	DRY SEASON				WET SEASON		
		IRRIGATED AREA (HA)		Benftd Area (has)	Average Yield (cav/ha)	IRRIG. AREA (has)	Benftd Area (has)	Average Yield (cav/ha)
		Rice	Div'd.					
(SAE) 744.72 has	1991	6.80	34.20	41.00	38.00	68.25	39.00	69.78
	1992	23.83	101.17	125.00	117.62	51.67	354.15	48.05
	1993	63.55	89.25	152.80	152.80	80.00	620.00	7275.00
	1994	20.00	208.6	228.60	228.60	83.00	191.93	64.00
	1995	16.30	205.62	221.92	221.92	76.99	187.62	69.27
	1996	49.25	247.19	296.44	290.04	83.84	250.00	75.67
UTRIS 3700.82 has	1991	313.67	399.77	713.44	713.44	85.13	3621.59	74.97
	1992	322.42	483.45	805.87	805.02	93.28	3360.73	63.09
	1993	354.50	343.31	697.81	697.81	93.76	2808.31	58.99
	1994	522.85	356.21	879.06	879.06	83.00	2057.55	84.29
	1995	314.91	411.62	726.53	726.53	84.14	2945.39	65.35
	1996	793.25	580.10	1373.35	1364.29	73.08	3122.00	76.07
TOTAL 4445.54 has	1991	320.47	433.97	754.44	751.44	84.77	3660.59	74.91
	1992	346.25	584.62	930.87	922.64	90.42	3714.88	61.66
	1993	418.05	432.56	850.61	850.61	91.67	3428.31	61.48
	1994	542.85	564.81	1107.66	1107.66	83.00	2249.48	82.56
	1995	331.21	617.24	948.45	948.45	83.79	3133.01	65.58
	1996	842.50	827.29	1669.79	1654.33	73.71	3372.00	

$754.44 \sim 1669.79$
 $17.0\% \sim 37.6\%$
 $3660.59 \sim 3660.59$
 $50.6\% \rightarrow 82.3\%$

FIA PROFILE
As of June 30, 1996

Table 4

WMT/DIV/FIA	CANAL	Station		Length Km	Total Length	TSA	Farmer	Parceley Area	Date Organized	Reg. No. Number	Date		MTO		KM	ISF	
		FR	TO								Registered	Orig. Date	Sta. Fr.	Sta. To		Date	Area
I-A SAN AGUSTIN IA	SAE MC	0+000	4+060	4.060								8/16/95	1+000	3+297			
	Lat. A	0+000	2+653	2.653									0+000	2+653			
	Lat. A1	0+000	1+420	1.420								8/3/83	0+000	1+420			441.05
	Lat. A2	0+000	2+244	2.244	10.377	27	573	744.72	10/14/82	109420		2/7/83	0+000	2+440	8.810		
CATANAKA IA CRISTAMAKITA	Lat. B	0+000	2+400	2.400	2.400	8	174	226.77	2/21/86	137745		5/8/87	1+500	5+000	3.500		240.00
	MC	0+000	9+400	9.400								6/1/95	1+500	5+000	3.500		
* MACANNAE	Panlaxian	0+000	3+000	3.000	12.400	21	557	769.07	12/9/82	108763		12/9/82	terminate				447.09
	MC	0+000	2+972	2.972		23	351	875.00	1991			1992					272.46
	Lat. A	0+000	3+080	3.080								10/1/95	0+000	3+080			
	Lat. A1	0+000	2+360	2.360									0+000	2+360			
	Lat. B	0+000	1+520	1.520													
* PINAGUARTELAN	Lat. B1	0+000	2+920	1.400	11.332								0+000	2+920	8.360		
	MC	0+000	2+100	2.100									0+000	2+100			150.72
CAMACALAO	Lat. A	0+000	1+750	1.750	3.850	8	220	193.52	10/10/90	186752		1/9/91	0+000	1+750	3.850		
	MC	9+400	13+640	4.240		12	325	357.26	10/30/90	182619		10/16/90	0+000				357.06
	Lat. C	0+000	1+840	1.840	6.08												
DALANGIRIN	Lat. E	0+000	3+380	3.380									0+000	3+380	3.380		
	Dal. Dam	0+000	1+000	1.000	4.380	7	140	187.19	6/7/90	181803		9/25/90	0+000				187.19
SITOSAN	Lat. F1	0+000	1+483	1.483									0+000	1+483			
	Lat. F	0+000	4+672	4.672	6.337	9	139	276.95	2/15/90	182300		10/5/90	0+000	4+672	6.155		276.95
STO. PAG-ASA TUSITA	MC	13+640	17+530	3.890	3.890	12	183	355.45	5/18/90	182088		10/2/90					355.45
	Lat. A	0+000	3+790	3.790													
CCSR	Lat. A1	0+000	0+757	0.757													
	Lat. A2	0+000	1+380	1.380	5.927	9	241	337.70	4/17/90	182619		10/16/90					337.70
	Lat. D	2+900	3+790	0.748													
	Lat. D1	0+000	3+840	3.840								9/1/95	0+000	3+840			
DICA	Lat. D2	0+000	0+650	0.650	5.238	9	261	349.96	2/9/90	181801		9/25/90	0+000	0+650	4.490		349.96
	Lat. D	0+000	2+900	2.900													
TALIPA	Lat. D3	0+000	4+040	4.040	6.940	13	331	478.80	2/12/90	182831		10/19/90	0+000	4+040	4.040		454.64
	Lat. D	3+648	6+353	3.900									5+000	6+353			
* NAMULANDAYAN	Lat. D4	0+000	1+250	1.250	5.150	10	213	351.67	5/18/90	182248		10/5/90	0+000	1+250	2.603		351.67
	Auz	0+000	2+480	2.480	7.000	97	125	125.00	6/25/91								125.00

Note: * SEPARATE SYSTEM-OUTSIDE UTRIS SERVICE AREA

資料9. タラベラ頭首工上流域の土地利用状況

Land use Statistics of March 31, 1997

CENRO, Muñoz, N. Eciija

(7 Municipalities)

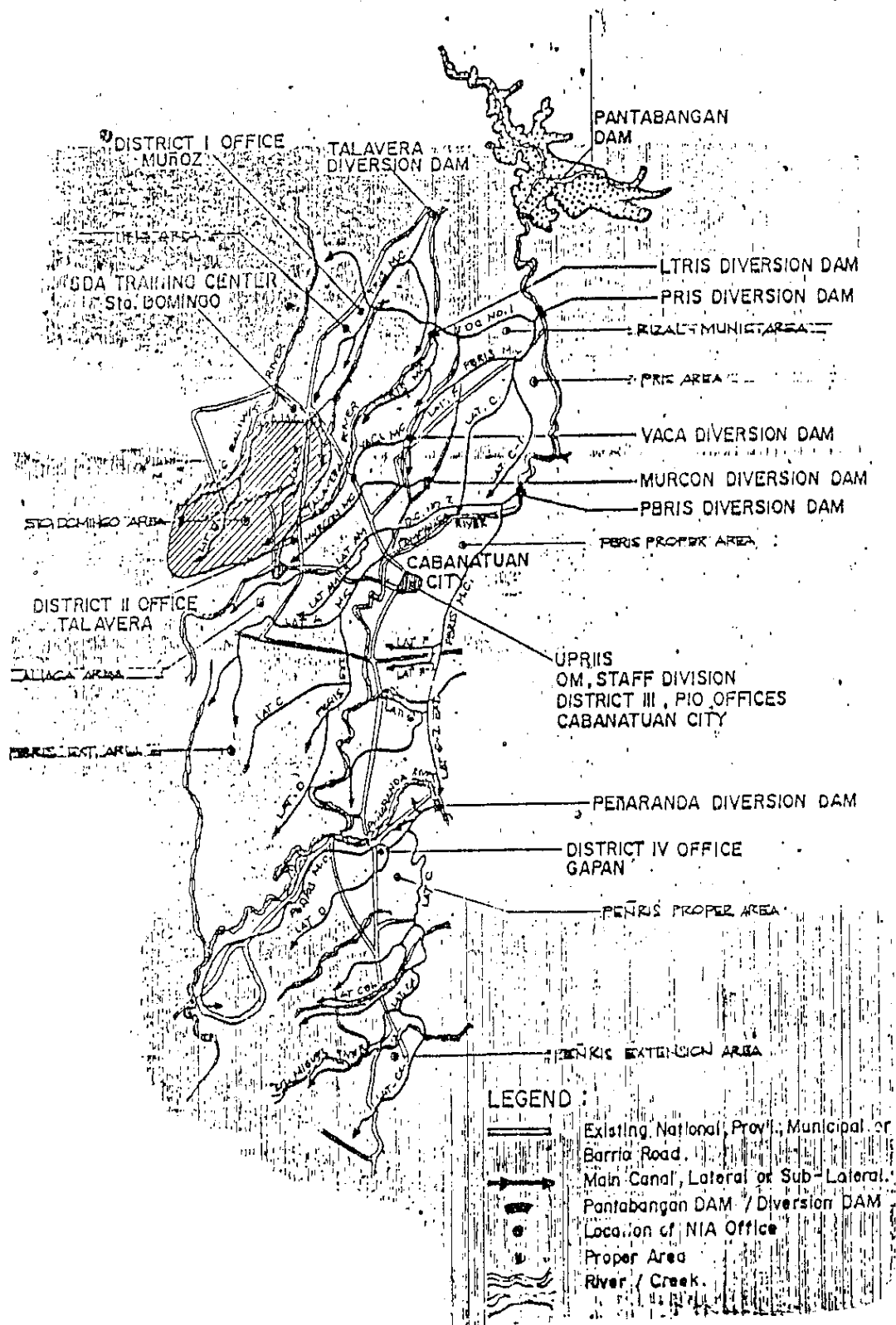
ALIENABLE AND DISPOSABLE LAND - - - - -	78,995.492 Has.
FOREST LAND + - - - - -	74,599.508 Has.
	<u>153,595.00 Has.</u>
SITMA - - - - -	1,267.00 Has.
TREE FARM - - - - -	100.60 Has.
AGRO-FOREST FARM - - - - -	499.00 Has.
SALT - - - - -	11.981 Has.
CONTRACT REFO :	
TURNED OVER - - - - -	4,823.00 Has.
ON-GOING - - - - -	1,032.00 Has.
ABANDONED - - - - -	1,733.00 Has.
REGULAR REFO. - - - - -	4,785.01 Has.
URBAN FORESTRY - - - - -	30 Hms.
DIPYROCARP PLANTATION - - - - -	61.00 Has.
	Regional Office - 51.00 Has.
	CENRO Office - 10.00 Has.
	<u>61.00 Has.</u>
IST AREAS - - - - -	3,898.18 Has.
TALAVERA WATERSHED RESERVATIONS - - - - -	36,387.51 Has.
CARRanglan-PANTABANGAN WATERSHED RESERVATIONS - - - - -	37,647.846 Has.
TOTAL NUMBER OF CSC AWARDED- - - - -	2672

Prepared by :

Lina L. Villajuan
LINA L. VILLAJUAN
Carac.

Maintenance - Puro / la / annam
& protection

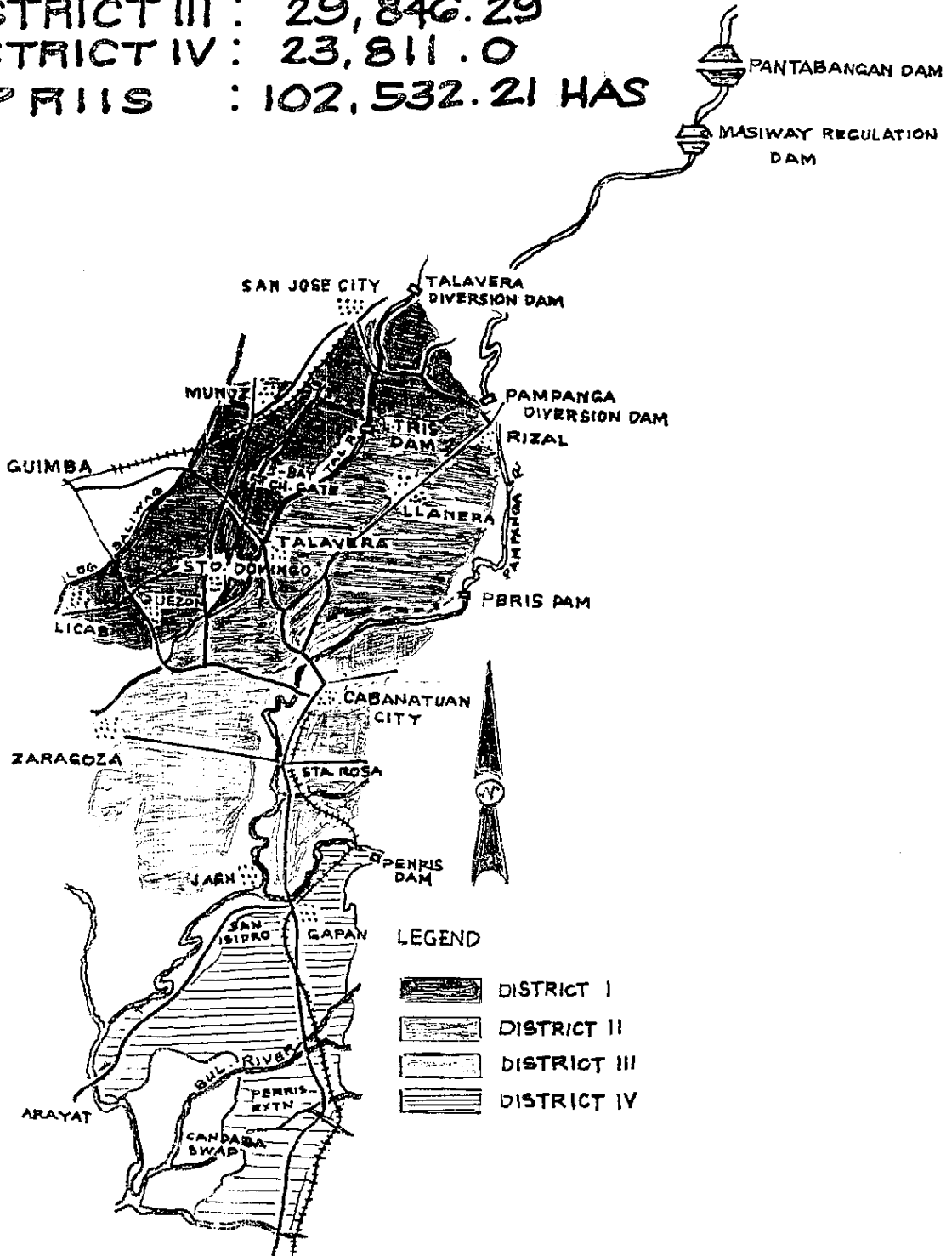
GENERAL LAYOUT
UPRIIS SERVICE AREA



(圖 - 1)

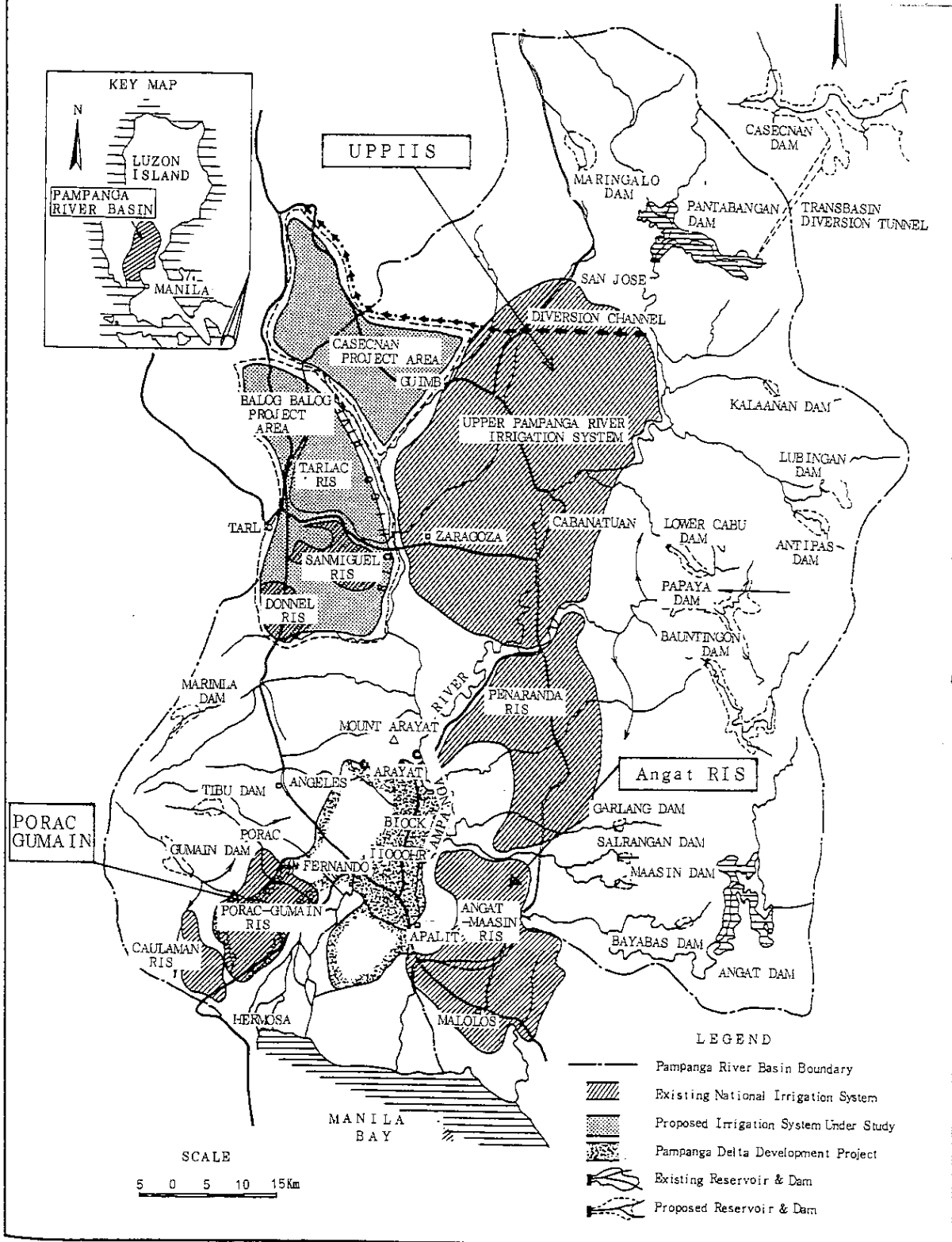
UPRIIS SERVICE AREA

DISTRICT I : 24,962.0
 DISTRICT II : 23,912.92
 DISTRICT III : 29,846.29
 DISTRICT IV : 23,811.0
 UPRIS : 102,532.21 HAS

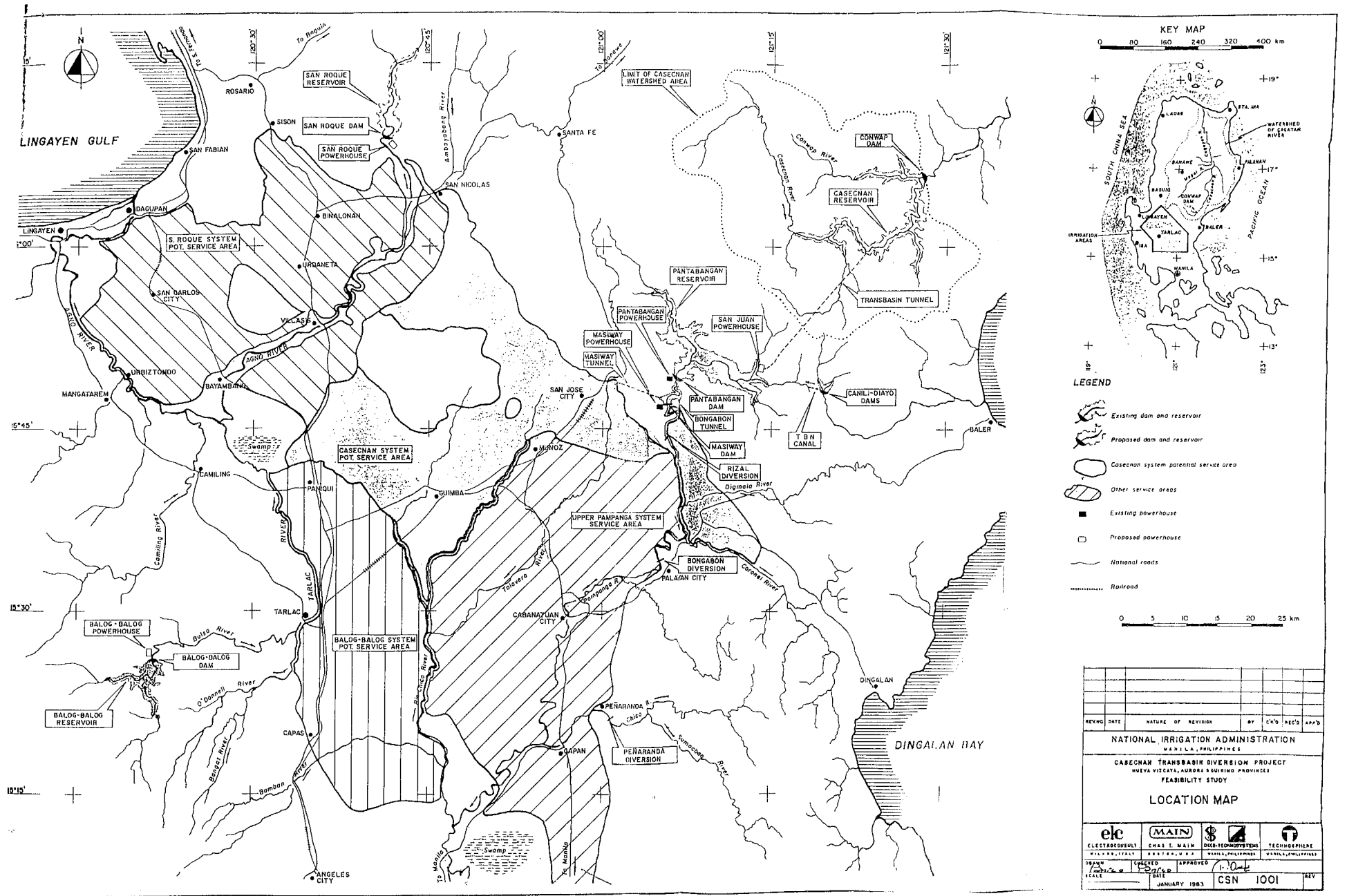


(图 - 3)

MAP 2 LOCATION MAP OF IRRIGATION DEVELOPMENT PLAN IN PAMPANGA RIVER



(图 - 4)



(图 - 5)

資料11. 参考文献

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