

10. 実施体制案・協力計画案の検討

10-1 実施体制案

本件プロジェクトの実施体制案は、9月16～17日の会議での修正を経て、N I Aの最終案として、図10-1-(1)のように提案された。長期調査では、最終案である組織図チャートについて詳細討議するには至らず、最終決定には、更に討議が必要である旨を伝えておいた。

プロジェクトサイトは次の通りである。

- 1) 本部 - N I A本庁内。
- 2) 試験圃場 - サン・ラファエル。

なお、本部として使用する場所について早急に決定するように依頼しておいたところ、9月29日付で報告されたので、図10-1-(2)に示す。

10-2 協力計画案

協力計画内容については、N I Aと詳細討議するには至らなかったが、長期調査に基づく素案としては次のように考える。

- 1) 協力期間 5年
- 2) 協力内容
 - ① 試験圃場において畑利用水田における灌漑技術に関する基準作成のために、用水量調査、灌漑方法、灌漑技術、末端施設の基礎的及び実証的研究を行う。
 - ② 基準作成のために、全国的に気象・水文等のデータもしくはその編集資料の収集整理を行い、加えて関係機関の調査研究結果・文献等の分析を行い、また必要な場合は現地調査も行って、基準作成に必要な地域分類を行い、作物多様化の可能性を検討する。
 - ③ 試験圃場における研究結果及び気象や土壌等の基礎データを基に、地域分類を終えた中から選出した特定の地区について、畑利用水田における灌漑に関する標準的な適正ガイド及び計画設計基準を作成し、その手法を技術移転することによって他地区の基準作成を促す。
 - ④ 畑利用水田における畑地灌漑について、N I Aの職員及び関係者を対象にした研修プログラムを開発する。

3) 専門家派遣

日本側チームの長期専門家は本プロジェクトを推進していく上で、5～6名必要であると考え。即ち、その構成は次の通りである。

- (1) チームリーダー
- (2) 技術基準
- (3) 灌漑研究
- (4) 栽培(野菜)

図10-1-(1) 組織図チャート

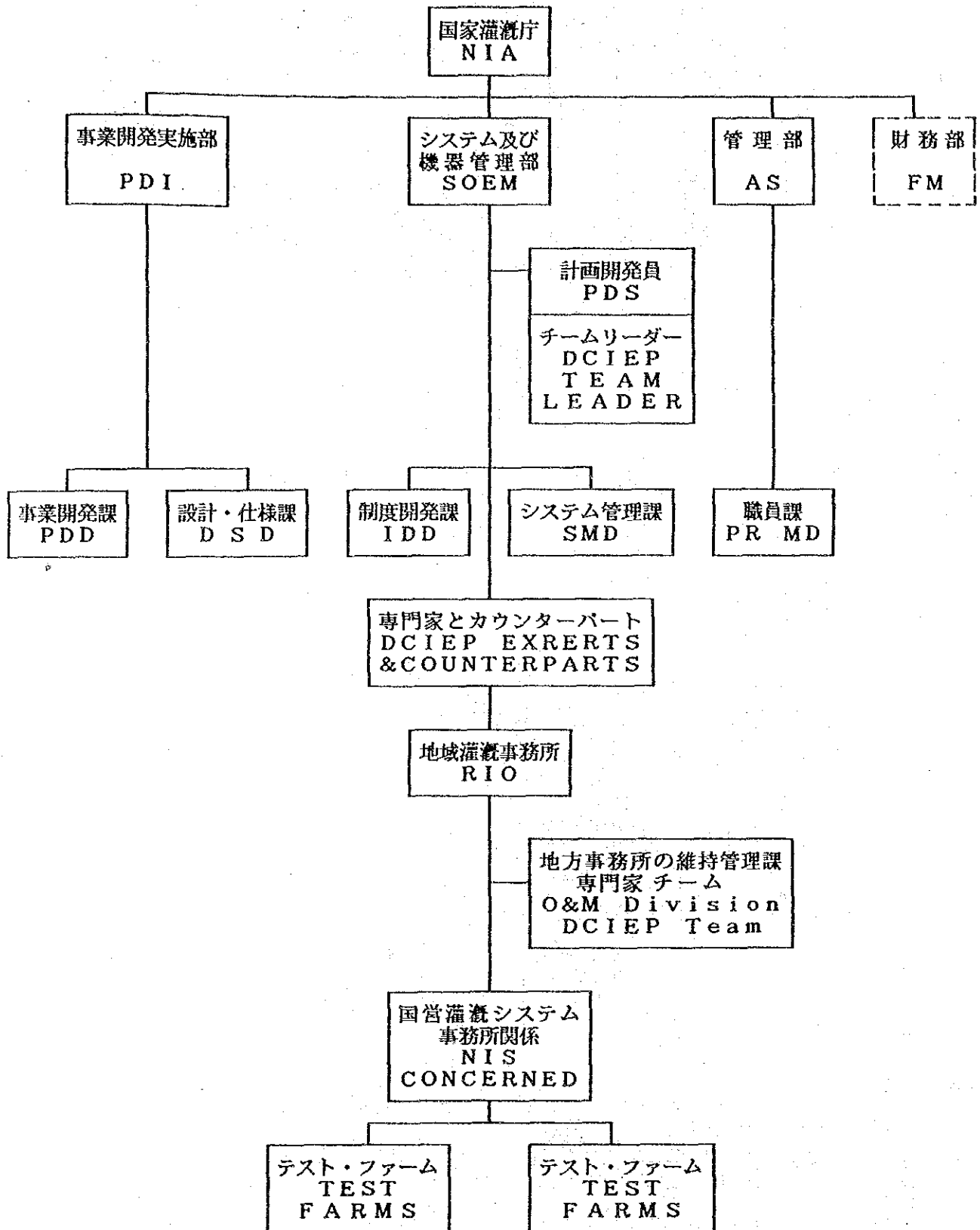
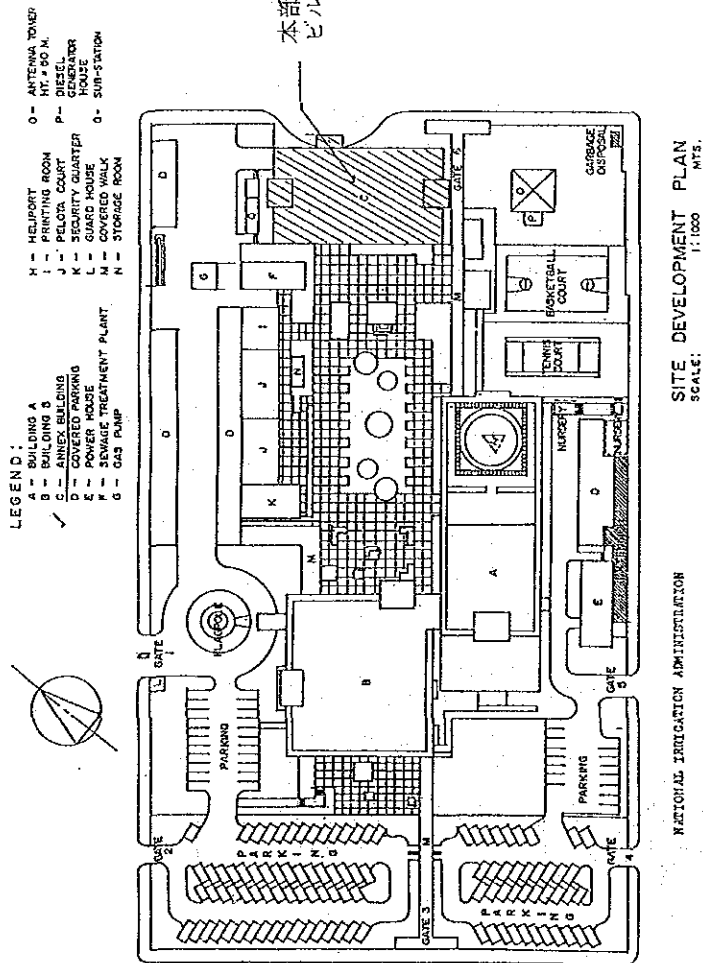
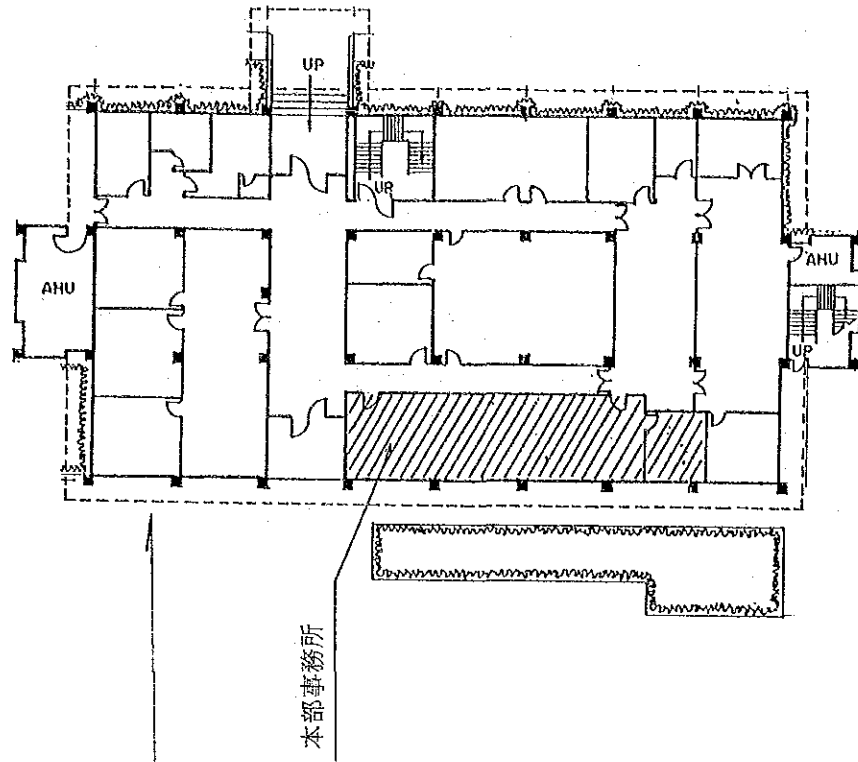


図 10-1-1-(2) プロジェクト本部事務所位置図

本部事務所ビルディング位置図



本部事務所位置図



(5) 土 壤

(6) 技術研修（農業土木）

(7) 業務調整

なお必要に応じて教育訓練（訓練技法）、システム開発、水理モデル実験、農業経済（流通）の短期専門家の派遣を行うものとする。また本プロジェクトの性格上、圃場試験の計画及び中間段階においては土地改良事業調査計画に精通する農学の専門家の派遣が特に望まれるところである。

長期専門家の協力内容の概要は次の通りである。

チームリーダー：

- ・チームの代表者として総合調整及びとりまとめを行う。
- ・N I A及びADB, I I M I等、他の関係機関との連絡調整

技術基準：

- ・全国的に基準作成に必要な気象・水文等のデータもしくはその編集資料の収集整理を行う。加えてADB, I I M I, I F P R I, I R R I, U P ロスバノス校等の調査研究結果、文献等の分析を行う。それらを基礎に基準作成に必要な地域分類を行い、作物多様化の可能性を検討する。
- ・研究圃場、実証圃場における研究結果及び気象、土壌等の基礎データを基にフィリピンにおける畑利用水田における灌漑に関する標準的な適正ガイド・計画設計基準を作成する。

灌漑研究：

- ・主として現地の研究圃場、実証圃場について農業土木的な事項について調査、研究を行う。
- ・ADB, I I M I, I F P R I, I R R I, 農業食糧省, U P ロスバノス校等から既存の試験研究結果、文献等を収集、聴取し、整理分析する。

栽培（野菜）：

- ・主として現地の研究圃場、実証圃場において、供試作物の肥培、管理等に当たる。なお栽培等の担当者は、供試作物が畑作物となるので、野菜の専門家が望ましい。
- ・なお試験研究実施の準備として、ADB, I I M I, I F P R I, I R R I, 農業食糧省, U P ロスバノス校等から既存の試験研究結果、文献等を収集、聴取し、整理検討する。

土壌：

- ・現地の研究圃場、実証圃場において、本調査に必要な土壌調査、土壌分析及び土壌水分管理を行う。
- ・なお、調査研究実施の準備段階として灌漑研究、栽培と同様、関係する既存の試験研究結果、文献等を収集し、聴取し、整理・検討する。

技術研修（農業土木）：

- ・畑利用水田における畑地灌漑技術について、N I Aの職員及び関係者を対象に研修を行う。

業務調整：

・本プロジェクトの総合的な調整業務を行う。

長期専門家の派遣及び作業スケジュールを内容とした協力スケジュール案を次に示す。

作業内容	1年度	2年度	3年度	4年度	5年度
1. 準備作業	←→				
2. データ収集及び検討	←→	→			
3. 圃場試験					
1) 試験研究 (試験圃場)	←				→
2) 実証調査 (実証圃場)			←		→
4. 技術基準			←		→
5. 技術研修				←	→
専門家派遣日程					
1. チーム・リーダー	←				→
2. 灌漑・研究	←				→
3. 灌漑基準	←				→
4. 栽培 (野菜)	←				→
5. 土壌	←				→
6. 技術研修			←		→
7. 業務調整	←				→

協力実施に必要な資機材については、前述の7 & 8章の中で説明したので、本節での記述を省く。

11. 関係機関／プロジェクト調査の概要

11-1 農業食糧省

農業食糧省は、農業金融・農協・市場等の農民に直接係わる事項の指導機関であり、米の単収増加を目標とするマサガナ99プログラムを実施して来たが、今は天水畑作物“UP-land Rainfed Crops”に重点を置きつつある。研究施設としては、マニラの中央研究所、11カ所の地域研究所“Regional Labo.”と24カ所の地区研究所“District Labo.”の計36の研究施設を持っている。地区研究所は、1カ所で2～3プロジェクトを担当している。研究項目は次の5項目である。

- 1) 土壌分析
- 2) 土質分析
- 3) クロマトグラフィ分析
- 4) ミクロ栄養分析
- 5) 水質分析

中央研究所及び地域事務所の試験機器の状況を表11-1に示す。

表 1 1 - 1 農業食糧省の中央研究所及び地域研究所の試験機器の状況

EXISTING STATUS AND PROPOSED (REPLACEMENT) BASIC LABORATORY EQUIPMENT

I T E M	BS-CD	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8	R-9	R-10	R-11	R-12	REMARKS
1. Atomic Absorption Spectrophotometer	S	S	US	US	S	US	US	S	US	S	US	S	None	Some are serviceable, still need replacement due to unavailability of spare parts.
2. Flamaphotometer	S	S	S	S	S	S	S	S	S	S	S	S	S	Although all serviceable, they are already old frequent breakdown.
3. Spectrophotometer/Colorimeter	S	S	S	S	S	S	S	S	S	S	S	S	S	Few are new but most of them were the old Leitz photometer.
4. Analytical Balance	S	S	S	S	S	S	S	S	S	S	S	S	S	-
5. Toploading Balance	S	None	None	None	None	S	None	S	None	None	None	None	None	Only few region have them.
6. Electrical Conductivity	S	None	None	None	None	S	S	S	None	None	S	S	None	-do-
7. pH Meter	S	S	S	S	S	S	S	S	S	S	S	S	S	-
8. Distilling Apparatus	S	S	S	S	S	S	S	S	S	S	S	S	S	Most of them have one gallon capacity and must be replaced with bigger one.
9. Oven	S	S	S	S	S	S	S	S	S	S	S	S	S	-
10. Fumshood	US	S	US	S	None	S	S	S	S	S	US	S	None	Most of them needs to be replaced with bigger one.
11. Hot plate	S	S	S	S	None	S	S	S	S	S	S	S	S	Although serviceable they are already old and rusty.
12. Muffle furnacs	US	None	None	None	None	None	None	None	None	None	None	None	None	Need to be acquired.
13. Shaker	S	S	S	S	S	S	S	S	S	S	S	S	S	-
14. Analytical Laboratory Mill (Grinder)	S	None	None	None	None	None	None	None	None	None	None	None	None	Although serviceable they are already old and rusty.

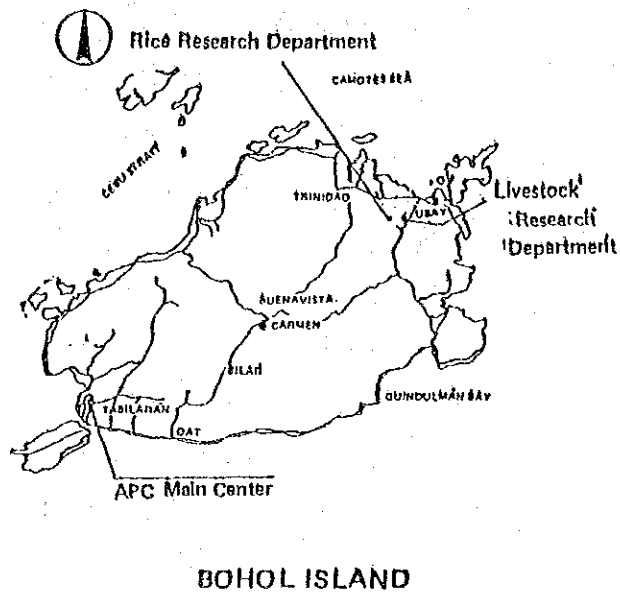
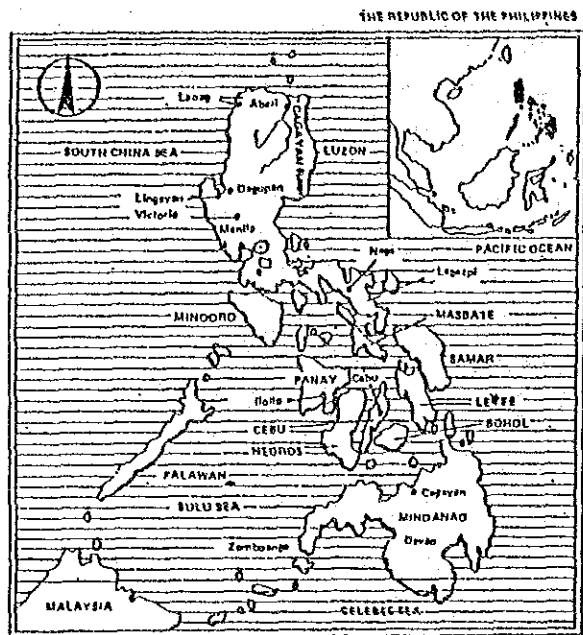
Legend:
S - Serviceable
US - Unserviceable

11-2 ボホール農業開発計画

11-2-1 プロジェクトの概要

1) ボホール島概要

- (1) 面積：411,726ha (フィリピンの中で10番目の島で福井県、徳島県とほぼ)
- (2) 人口：806,013人 (同様の面積及び人口である。)
- (3) 州都：タグビララン市 (人口42,314人)



(4) 農業データ

作 目	作付面積 (ha)	生産高 (トン)	平均収量
水 稲	50,192	154,439	3.08 (t/ha)
トウモロコシ	5,190	7,317	1.41
イモ類	5,783	32,378	5.60
野 菜	892	1,812	2.03
豆 類	966	1,187	1.23

(* 78 ~83年の平均)

(1982)

作 目	作付面積 (ha)	生産高 (トン)	平均収量(t/ha)
バナナ	23,029		
カカオ	721	2,946	4.09

コーヒー	771	2,175	2.82
ココナツ	58,596	38,500	0.65
フィリピンサイザル	223	112	0.5

ボホールの特産品：キナンパイ（ヤム）及びフィリピンサイザル

年平均降雨量：1352.1mm(min,835.5mm;max.1926.8mm)

2) プロジェクト協力期間, 相手国関係機関

① 協力期間 : 昭和58年2月2日~63年2月1日

② 相手国関係機関：ボホール総合開発プロジェクト

(Bohol Integrated Area Development Project)

農業食糧省

(Ministry of Agriculture & Food)

3) 無償協力

・無償援助額 : 9億7千万円

①メイン・センター（ダオ） ②サブセンター（ウバイ） ③畜産センター（ウバイ）

・着工 : 昭和58年12月15日

・竣工 : 昭和60年2月

・基本設計, 調査：国際協力事業団（JICA）

・設計, 監理 : 久米建築事務所

・施工 : 熊谷組

4) 技術協力

① 派遣専門家

安尾正元（チーム・リーダー）

坪井達史（稲作）

正崎雄三（調整員兼畑作）

白石勝恵（土壌肥料）

大柿隆（普及）

日高健夫（野菜）

② 機材供与

昭和57年度 5,500万円

昭和58年度 6,100万円

昭和59年度 5,500万円

昭和60年度 7,000万円

③ 研修員受入実績

- 1) ボホール総合開発プロジェクトディレクター } 視察研修 (S.58 Dec.)
農業省 Region 7 ディレクター }
- 2) APC 研究部長技術研修 (S.59. Nov.)
- 3) ボホール州知事他 1 名視察研修 (S.60. Mar.)
- 4) APC プロジェクトマネジャー, ボホール農業部長視察研修 (S.60. Oct.)
- 5) APC 普及カウンターパート普及教育研修 (S.60. AUG)
- 6) APC 稲作カウンターパート技術研修 (S.61. Feb)

本年度 (61年度) 研修員受入計画

- 1. 技術研修 2 名
- 2. 視察研修 2 名

④ 基盤整備

1) モデルインフラ整備

- | | | | | |
|-------------|-------|---|------------|----------|
| ・ダオ畑作圃場造成 | 1.0ha | } | S.59. MAR. | 工事費 |
| ・ビラール水田圃場造成 | 2.5ha | | 完工 | 3,500 万円 |
| ・ウバイ水田圃場造成 | 2.0ha | } | S.59. DEC. | 2,000 万円 |
| ・ウバイ畑作圃場造成 | 1.0ha | | 完工 | |

2) パイロットインフラ整備

- ・カルメンパイロット圃場造成 20.0ha S.60. DEC. 着工
約 6,000 万円

3) 野菜試験展示圃 (応急対策) 整備

- ・ツビゴン野菜試験展示圃整備 1.0ha
S.61年 2月完工
約 200 万円

11-2-2 本件プロジェクトへの提言

赴任しておられる専門家より、本件プロジェクトに対し貴重なアドバイスを頂いたので、次の通り箇条書きにして示す。

- 1) 研修プロジェクトであっても普及の段階を考慮し、市場性等に留意してプロジェクトを計画し、協力を進めるべきである。
- 2) 試験圃場の設計は、現地の状況に適合するように、十分な配慮が必要である。
- 3) フィリピン政府機関の調査結果は、例えば土壌局の調査のように信頼性の低いものがある。
- 4) 作物多様化で導入する畑作物は、現地の状態に適したものを選ぶべきで、例えばモンゴなどは、ボホールの水田裏作に推薦できる。
- 5) 試験圃場施設として堆肥舎及び倉庫、機器としては中型トラクター、ティラー及びパワースプ

レヤーが必要。小型の播種機や堆肥散布機も考慮した方がよい。重量計も色々なものを備えた方がよい。育苗圃は是非必要である。ラインメーターも推薦できる。

6) フィリピンは、効果の高い害虫防除剤はあるが、病気に対しては効果の高い薬剤がないので留意すべきである。

7) 種は“Bureau of Plant Industry”が供給しているが、時には在庫がないこともあるので、他の種の入手先を見つけておくべきである。I R R I が種の入手先として推薦できるが“San Miguel Corporation”も販売している。

12. サマリーレポート

サマリーレポート (抄訳)

フィリピン国畑地灌漑技術開発プロジェクト

1986年10月

ワン・マンズ サーベイ チーム

国際協力事業団

I. 序文

フィリピン共和国政府は米自給達成後、米以外の作物に重点を置いた。この作物多様化政策のために政府は、国家灌漑庁（N I A）を責任機関とする技術協力プロジェクト “ Diversified Crops Irrigation Engineering Project ”（D C I E P）－畑地灌漑技術開発プロジェクト（内容は英語の “ Diversified Crops” が示すように作物多様化を目的として掲げている）－を、1984年 5月29日付で日本政府へ要請した。本プロジェクトでは4つの基本的な目的を掲げている。すなわち

- 1) 最も経済的で適切な灌漑方法／技術、用水量、末端施設の検討、
- 2) 設計基準を開発し、本プロジェクトの促進のための具体的／包括的な提案を行う、
- 3) 利用可能な水資源・土地資源をより効率的に活用するために多様化灌漑の必要性及び可能性を検討し、具体的／包括的な灌漑プロジェクト／システムを立案する、
- 4) 作物多様化灌漑システムの設計及び計画技術者や維持管理委員の育成を計る。

要請の重要性は、1985年 9月に末松氏を団長とするコンタクト調査団によって確認された。その際、1985年10月 5日に調印された議事録（ミニッツ）により、本プロジェクト開始のための次の段階として、プロジェクト実施計画作成のための追加的調査を目的とする調査団を派遣することが提案された。本提案により、日本政府は国際協力事業団（J I C A）を通じて、2人の専門家を1ヶ月間派遣した。

この長期調査チームは1986年 8月20日から 9月18日まで、関係者との協議及び現地調査を行った。調査結果の中間報告要約は、1986年 9月16・17日にN I Aの全関係責任者を集めて、開催された会議において説明された。そこで数々のコメント／提言がN I A側からなされた。それら協議内容は第IV章に示した通り、日本国政府の担当責任者に報告された。

II. 調査員の構成

氏名	専門	所属
塩尻 紀明	畑作栽培	農林水産省 近畿農政局資源課課長補佐
金森 秀行	灌漑排水	国際協力事業団 国際協力総合研修所、国際協力専門員

III. 目的

コンタクト調査を補足するために、主として技術的な観点から本プロジェクトの協力計画を立てるための基礎資料の整備を行う。

相互の理解を促進するために実施体制に関する討議を行う。

IV. 活動内容

主として3種の調査活動を行った。すなわち

- 1) 質問表の提示と応答内容の検討
- 2) 現地踏査及び調査
- 3) 本プロジェクトが関連する機関の技術者及び職員との討議

それら討議を行った技術者及び職員のリストを APPENDIX A に示す。調査活動の詳細を APPENDIX B のワーク・スケジュールに示す。

V. 調査結果概要

1. プロジェクトの背景

1. 1 食糧需給に関する調査

『開発途上国メンバーのための食糧需要供給及び関係戦略の研究』（フェーズⅠ）と称する調査研究が、アジア開発銀行（ADB）の技術協力で1983年5月から1984年9月まで実施された。実施に当たっては、国際食糧政策研究所（IFPRI）と国際稲研究所（IRRI）に依頼された。この調査研究は将来の食糧消費を満足させると共に、農業開発のための適切な政策の分析及び決定に利用できる適切な方策と方法を開発するという実際的な観点で実施された。この調査研究では他の諸国を分析するための方法論の開発のために、フィリピンをケース・スタディとして使用した。そのフィリピンに関する分析に関し、次のような発見が報告された。

- 1) 米消費予測の結果、もし実施中及び実施を計画されているNIAの灌漑事業が完工されたとしても、1980年代末にはフィリピンは多少の不足に陥り、その不足は西暦2000年に向って、徐々に増大していくことが指摘されている。トウモロコシ消費予測の結果、トウモロコシ生産力の伸びが過去の傾向より高いと想定しても、主として飼料用トウモロコシ需要の増加によって、急速に不足が進展することが指摘されている。
- 2) 米とトウモロコシを総合した不足の感度分析の結果、両方の不足を同時に解決することは困難であろうと指摘されている。しかしながら、もしもトウモロコシが灌漑水田の乾季作として導入されるならば、トウモロコシ高収量品種による急速な生産力増加はトウモロコシ不足を120万t減少させるが、一方それによる米不足増大への影響は677,000tであることが予測された。すなわち、乾季の米作をトウモロコシで置き換えることは、トウモロコシ生産増の半分を相殺するにすぎない。
- 3) 米の長期間過剰が発生することは、基本的にはコスト高につながる。この米生産過剰の対処策の1つとして、灌漑能力の過剰分を米からトウモロコシ他の作物（綿花や大豆等）の生産に振り向けることが提案される。

これらの指摘を基礎に、“Diversified Irrigation Agriculture”（直訳：多様化灌漑農業）が、過剰灌漑能力を振り向けることを目的として提言された。この提言では、乾季灌漑米作地域を直接トウモロコシや他の作物に振り向けること、もしくは天水田地域を他の作物に振り向けることの2方法が提言された。また乾季灌漑農地利用を米からトウモロコシや他の作物に振り向けることは、灌漑システムの管理方法の改善を必要とすることも提言された。

1. 2 作物多様化調査研究

1984年5月、フェーズⅠ調査研究の指摘に基づいて、ADBはフィリピン政府とインドネシア政府に対し、フェーズⅡ調査研究の技術協力を提案した。両政府とも、その提案を受け入れた。フィリピンにおいてADBはフェーズⅡへの技術協力を、1985年1月から2年間行った。フェーズⅡ調査研究の主目的は、米及びトウモロコシの自給達成を促進するための開発計画に資すること、及びフィリピンの様々な灌漑地域や天水農業地域における農業生産の多様化に資することの2つである。その具体的内容としては次の3項目が掲げられている。すなわち

- 1) 効果的な価格政策及び農業生産諸目的のための方策の準備、
- 2) フィリピンの様々な資源を高度利用できるようにフェーズⅠの結果を地域化する、
- 3) 作物多様化のための実用的な灌漑技術の開発。

ADBは再びIFPRIに上述2項目の1)及び2)を委託した。上述項目中の3)については1983年5月にスリランカに設立された、国際灌漑管理機構“International Irrigation Management Institute”(IIMI)に委託された。IIMIはNIAと協力の上でその調査研究を実施している。

IFPRIは、その最終報告書を1986年11月に、IIMIは12月に提出する予定である。

1. 3 I I M I 第2フェーズ調査研究案

I I M I の調査研究実施期間は、1985年 2月から22ヶ月間であった。しかし、この期間では1乾季しか研究できなかったため、第二フェーズとして調査研究期間を延長して、3乾季が含まれるようにすることが検討されている。この第二フェーズは、1987年 1月から30ヶ月間実施されることが期待されている。第二フェーズの内容は主に第一フェーズと同様に、異った土壌条件における様々の作付体系、特に雨季の灌漑稲作の後に米以外の作物を栽培することの社会経済的且つ技術的可能性を分析する観点から、作物多様化のための灌漑営農に主な焦点を当てている。第二フェーズでは次の事項を試験する。すなわち

- 1) 作物多様化の制約要因、
- 2) 灌漑営農により、これら制約要因を克服する方法、
- 3) 水田地を畑地条件に変えるための栽培及び営農代替案、
- 4) 灌漑作物多様化の促進に必要な維持管理組織の評価、
- 5) すでに実施されている作物多様化の灌漑営農の評価と普及可能性。

主試験サイトとして Allah River Irrigation Project 及び Second Laguna Bay Irrigation Project (Cavite もこれに含まれる) が、副試験場サイトとして Talaver River Irrigation System (Munoz の近く) Laoag-Vintar Irrigation System 及び Taralac-San Miguel-O'Donnell River Irrigation System が提案されている。

1. 4 その他の関連調査研究活動

作物多様化を主たる調査研究目的として唱えてはいないが、種々の機関がその主たる研究項目に関連する研究項目として、この調査研究を実施している。農業食糧省 (M A F) は、作物多様化を作物強化プログラムの中で調査研究している。I R R I は、複作部門及び水管理部門で部分的に研究している。世界銀行は、砂糖

キビ地帯の多様化と称する調査研究を行った。フィリピン大学ロスバ、ノス校は、米及びその他の作物の用水量を研究している。農業開発センタープロジェクト（APC）は、米作を主たる研究として焦点を当ててはいるが、部分的に米以外の作物についても、生育期間の研究を行っている。これらの関連調査研究活動の詳細を APPENDIX C に示す。

2. DCIEP活動の基本構想

2.1 DCIEPプロポーザル

1984年5月、これはADBがフェーズII調査研究プロポーザルを提出したのと同じ月であるが、NIAはDCIEPの名称の下に、作物多様化灌漑事業の導入のためのプロポーザルを提出した。そのプロポーザルは作物多様化の目的として、畑作物の自給に加えて、2つの観点を唱えた。それは次のとおりである。

- 1) 小用水量作物の栽培を特に乾季に行うことによって、小島地域での高い開発費用の低減を計ること、
- 2) 灌漑率の向上、管理費の低減及び収入向上を図ることによって、灌漑システムの管理における活力の維持を計ること。

このプロジェクトにより、作物多様化を促進し、既存灌漑システムにおける収穫強度の改善、及び灌漑プロジェクトの開発と管理のための有効な情報提供に寄与することが期待されている。

2.2 DCIEP活動に関する検討

多毛作化に関して多くの調査研究活動がすでに実施されている中で、DCIEPを来年に開始することが計画されている。これら既存の調査研究活動と効率的に協力するために、DCIEPの調査研究について明確にすることが必要になった。特に

DCIEPとIIMIの調査研究が類似しているために、その重複について検討することが求められた。そこでADB、IIMI、NIA、そして我々チームの担当責任者で会議を持ち、調査研究の重複の可能性について討議された。その会議出席者の間で、次のことが確認された。すなわち、DCIEPの多毛作化における主たる課題は、エンジニアリングの側面からの調査研究である。よって二次レベル及びシステムレベルのアプローチを主とした、研究／実証活動に基づく技術基準の作成が主たる課題である。一方IIMIの調査研究は、圃場経営レベルの観点からのものである。二次レベルアプローチとは、主に支線用水路もしくはそれ以上のレベルの土工によって、既存施設／農地の改善に新しい方法を導入することである。システムレベルアプローチとは、作物多様化に利用可能な開発に新しい方法を導入することである。加えてDCIEPの第一目的は、基準作成及び研究／実証活動を通して技術移転を行うことである。従って、研究主題において重複がないことが明らかにされた。

2. 3 多様化作物灌漑技術（DCIE）の定義

DCIEは、主として二次もしくはそれ以上のレベルでの既存施設／農地の改良を行う、及び米及び畑作物の両方の生産に利用可能な圃場の確立を新規計画地で行う、という2つの目的でエンジニアリングの新しい方法を作り出す開発活動と定義される。またDCIEの研究基礎として、研究／実証活動が必要とされる。加えて、全ての他の関係する調査研究が他の関係調査研究活動と補完しあうために、DCIEPの副次的定義として含まれる。それらには農学・社会・経済的側面、水管理の側面等が上げられる。

3. 要請協力活動の検討

要請された協力内容は、3項目に要約される。すなわち、畑利用水田における灌漑試験研究（英文は「多様化作物灌漑研究」であるが、わかり易くするために「多様化作物」を「畑利用水田における」と訳した）技術基準の作成、及び灌漑技術研修である。

3. 1 畑利用水田における灌漑試験研究

3. 1. 1 試験圃場の設定

研究圃場と実証圃場の2圃場を授けることが望ましい。研究圃場は、計画／設計基準の作成のための基礎的な研究の実施を意図し、実証圃場は、提示された計画／設計基準を実験するために、作物多様化灌漑営農技術の実証を行うことを意図している。よって、実証圃場は研究圃場での研究が実証を行うに十分な程度に達した後に設定されることが望ましい。これらの研究及び実証作業の結果は、技術基準及び訓練スケジュールの作成基礎を提供する。

3. 1. 2 研究圃場での試験項目と内容

研究圃場では、主要な作物について次のような項目／内容の試験が行われることが望ましい。

1) 用水量を計算する灌漑諸元

図1に示した諸元に係る項目に試験を行う。なお土壌水分については、特徴的土壌型の研究のために異なった地域での調査を実施する。

2) 灌漑方法

灌漑方法（うね間灌漑、ボーダー灌漑、その他）について灌漑効率、灌漑用水分布係数等の調査を行う。

3) 作物生育のための最適土壌水分

灌漑開始時の土壌水分張力を異にする区を設定し、主要な（米以外の）作物の最適土壌水分について調査を行う。

4) 圃場条件と栽培方法

畑利用水田での畑作物灌漑のために様々な圃場条件と栽培方法の適用性について調査する。

5) 気象観測

気温、雨量、日照時間、蒸発量、及び他の関係する気象要素の観測を実施する。

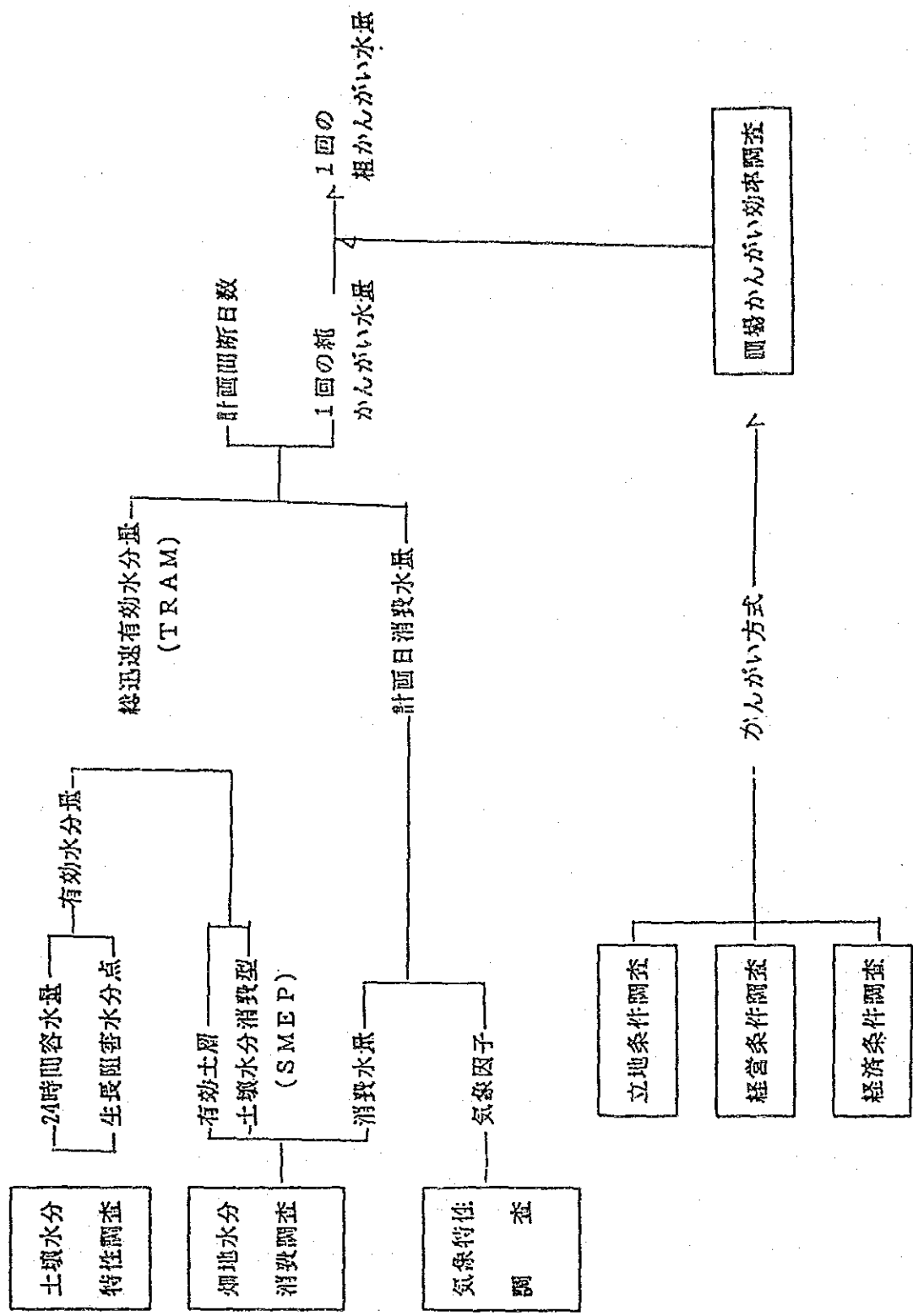


図1. 畑地灌漑用水量計算フロー

3. 1. 3 実証圃場での研究項目と内容

実証開始が可能な程に研究圃場での研究が進んだ後に、次の項目の実証試験を行うことが望ましい。

- 1) 土壌調査： 土壌断面、土壌分析 (三相分布、粒径組成、その他)
- 2) 土壌水分調査と土壌水分の追跡観測
- 3) 用水量調査： 灌水量の測定記録等
- 4) 耕種的調査： 施肥、防除等
- 5) 生産調査： 成育状況、生産力、収量等
- 6) 農場経営調査： 粗収益、経営費、労働時間、維持管理費等
- 7) その他： マーケット調査等

3. 2 技術基準の作成

現在、土木構造物の設計のための設計ガイド1つとマニュアル1つが米国開拓局の標準及び基準を基礎に完成されている。それらは、「灌漑水路、維持管理道路、排水路及び付帯構造物のための設計ガイド及び基準」と「分水堰、水路及び水路構造物のための設計マニュアル」である。コンクリート構造物に関しては、米国のACIコードが今も使用されている。

基準作成は体系的なフィード・バックによって行われる。NIAではフィード・バックを計画者及び設計者をプロジェクトの実施/建設に施工及び完成まで参加させることによって行っている。加えて、フィード・バックは建設従事者及び維持管理担当者から計画書及び設計者に現場調査及び相互作用を通じても行われる。しかしながら、水理模型実験等の実証試験を使用したフィード・バックは、国家水理研究センターに大規模ダム構造物の試験を委託する以外は、実施されていない。

畑利用水田における畑地灌漑技術（DCIE）の使用は灌漑部分のみではなく種々の補助的な作業によって実行し得る。補助的な作業とは水制御及び送水施設の建設、維持管理計画の準備、システム分析等である。よって作成されたDCIE基準を実施するにはこれらの補助的な作業項目に係る技術基準の準備が必要である。しかしながら、現在わずか2つの基準が、すなわち1設計ガイドと1マニュアルが作成されているのみである。また実証試験、特に水理模型実験を使用した体系的なフィード・バックは行われていない。従って、これら補助的な基準の準備が本件協力プログラムの中に含まれることが望ましい。しかし、補助的技術基準の作成を本件に含めることの最終決定は施設、機器の利用可能性、予算状況等を考慮してなされるべきである。

3.3 灌漑技術研修

NIAは水田灌漑には多くの経験を持っている。しかし、米以外の作物の灌漑には、非常に限られた経験しか持っていない。米以外の作物に対する設計用水量を試験研究を通じて実際の用水量と対照した経験もない。

全ての研修コースはそれぞれの部や事務所によって要望が出され、Personnel and Records Management Department の下の Training and Development Division (T.D. Div.) による調整を経て行われる。T.D.Divでは提出された要望を検査し、スケジュールの調整及び研修管理関係の調整を行う。研修は、その要望した部/事務所によって実施される。これら既存研修プロセスを図2に示す標準プロセスと対照した時、少なくとも「10. 教材の作成と試行」と「14. 訓練後評価」の2つの作業が補完されるべきことがわかる。これらの作業が行われていない理由は機器の不足と研修技術の不足である。

DCIEPの要請内容は訓練モジュールの開発である。しかし、畑作物開発及び訓練コースの現状から、補助的な協力活動が必要なことが知れる。開発された訓練モジュールの実施の前に、畑作物灌漑の基礎知識が日本の経験から補われることが望まれる。加えて、既存の研修能力が機器及び訓練技術の導入によって補強されることも望まれる。これらの補助的作業を協力プログラムに組み入れることの最終決定は施設及び機器の利用可能性、予算状況などを考慮して行われるべきである。

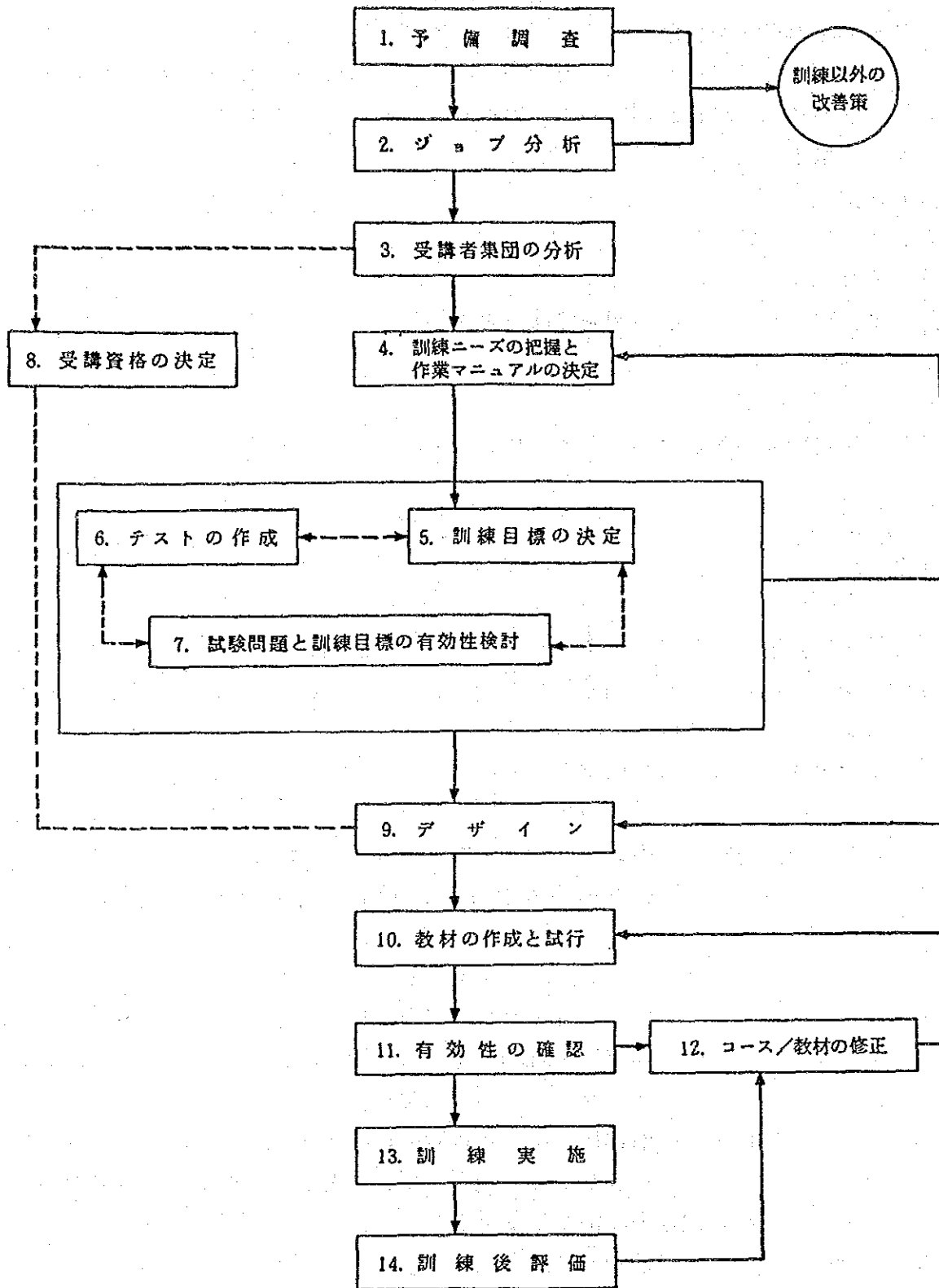


図2. 訓練モジュール開発プロセス

4. 試験圃場の現地調査概要

提案された4地区、計6つのサイトについて調査を行った。先のミニッツにおいて、次の4項目が試験圃場の選定事項として上げられている。

- 1) 土壌組成
- 2) 水源
- 3) 本部との交通状況
- 4) 便宜供与

加えて、次の2項目もこの調査では考慮された。

- 5) 土地所有
- 6) 土地利用の状況

これら項目別に調査結果概要を下記及び表1に示す。

4. 1 カビテ

4. 1. 1 候補サイト1 (N I Aプロジェクト敷地内)

総面積は2.5ha、使用可能面積は2.0haと見積られる。このサイトはN I Aのプロジェクト事務所の敷地内にある。

- 1) 土壌組成：小礫を含む埴壤土
- 2) 水 源：ポンプ施設を備えた新規井戸が設けられるべきである
- 3) 本部との交通状況：距離は69km (マニラ～カビテ沿岸道路を通った場合)で、約2時間を要する。道路状態は部分的にデコボコしている。
ミユノスへの距離は約164kmである。
カビテはサウス高速道路を通っても行くことができ、その場合は1時間半を要し、距離は64kmである。(カルモナ・インターチェンジ出口を利用)
- 4) 便宜供与：N I Aの敷地は、農業食糧省の野菜訓練センターの1室4.4m×4.4m = 19.4㎡がD C I E Pの現場事務所として、センター宿泊棟の1室が専門家の宿泊室に提供される。
- 5) 土地所有：N I Aの借用財産
- 6) 土地利用状況：サイトの圃場は農業食糧省が新野菜品種試験に使用している。現地調査時は、新たに試験を行う前の遊休時で雑草に覆われていた。

表 1 試験圃場の現地調査結果

項目	カビテ (Cavite)		サン・ラファエル (San Rafael)		ミュノス (Munoz)	ターラック (Tarlac)
	サイト1	サイト2	サイト1	サイト2		
1. 土壌組成	植壊土 (小礫含む)	植壊土	シルト質植壊土	植壊土	植土、粘土及び重粘土	シルト質植壊土 orシルト質粘土
2. 水源	井戸	灌溉用水路	灌溉用水路		灌溉用水路	灌溉用水路とポンプ
3. 交通状況	N I A へ 6 4 k m ミュノスへ 1 6 4 k m		N I A へ 5 1 k m ミュノスへ 1 0 0 k m		N I A へ 1 5 1 k m	N I A へ 1 5 0 k m ミュノスへ 6 1 k m
4. 便宜供与	農業食糧省 (M A F) の訓練センターと宿泊棟		リサーチステーションビルディングと訓練センターゲートルーム		水質土壌試験室と訓練センター	プロジェクト事務所と公舎
5. 土地所有者	N I A (借用財産)	農民	農民 (多くの小作有)	農民	中部ルソン州立大学	農民
6. 土地利用状況	M A F の試験圃	水稲栽培 野菜栽培	水稲栽培 野菜栽培	水稲作	水稲作	水稲作 トウモロコシ 野菜栽培
Note	1) 要新井戸 2) M A F と調整	1) 高い畑田	1) 良質土壌 2) 未土地貸借同意	1) 水管理容易 2) 未土地貸借同意	1) 排水不良	1) 借地料 一括支払い

Note: 既存井戸の能力は十分でなく、新井戸を設置する必要があることが提言されている。加えて、農業食糧省の野菜試験とDCIEPとの調整が必要である。

4. 1. 2 候補サイト 2 (農民有地)

サイトはプロジェクト事務所から約1 kmの所に位置している。そこは高い棚田地帯である。試験圃場の規模は適宜、既存の圃場から選択し得る。規模調査結果に関しては、2)・5)・6)を除く全ての項目は候補サイト1と同様である。2)・5)・6)については下記の通りである。

2) 水 源: 水は灌漑水路から引くことができる

5) 土地所有: 既存の圃場は農民の個人有地であり、彼らはDCIEPのために土地を賃借に出す意思があることが報告されている

6) 土地利用状況: 雨季は米作、乾季は野菜作が部分的に行われている。

Note: 棚田が高く、試験圃場整備費用が高くなるであろう。

4. 2 サン・ラファエル

4. 2. 1 候補サイト 1 (総合訓練センター隣)

候補サイトは総合訓練センターから、ほんの140mに位置しており、且つ Region III 事務所から 6kmの所にある。試験圃場の規模は既存の地域から選び得る。

1) 土壌組成: シルト質埴壌土

2) 水 源: サイトはアングット・マシム河灌漑システムの北部幹線水路に沿って位置しているため、その水路からポンプで水を引くことが容易である。その深い幹線水路の存在は地下水位を低下して排水条件に利益をもたらす。

加えて、当該地域のための新幹線用水路も重力灌漑のために計画されている。

- 3) 本部との交通状況：サイトはN I Aケソン市本町事務所から51kmの所にあり、道路条件も良くて1時間で通える。ミュノスへの距離は100kmである。
- 4) 便宜供与：遊休施設であるリサーチ・ステーションビルディング、床面積約80m² (8.5m×9.5m) が現場事務所として提供される。これはサイトから8kmの所である。サイトから、ほんの140mにある総合訓練センターのゲスト・ルームの1室が専門家の宿泊所として提案される。
- 5) 土地所有：その地域は数人の農民に所有されており、さらに多くの小作によって耕作されている。
- 6) 土地利用状況：3haの高位地はオクラ、ナス、カボチャ等の栽培に使用されており、残りの低位地7haは米作に使用されている。

Note: 土壌条件及び排水条件は非常に試験研究圃場として適している。しかしながら、土地所有者1人を除く、他の土地所有者及び小作人からの借地に対する同意は未だ確認されていない。

4. 2. 2 候補サイト2 (ビリヤンカ氏の農地)

候補地9haはビリヤンカ氏という1人の農民によって、所有されている。そのビリヤンカ農場に上流側の農場を含めて、国道と旧鉄道敷堤で囲まれた1ブロック全体、計19haが最終的に候補地として推薦された。その理由は、そのブロックが外水位から独立しているの、内側の水供給の管理が容易であるためである。そのサイトはN I AのRegion III事務所から2kmの所にある。

- 1) 土壌組成：埴壤土
- 2) 水源：灌漑水は幹線用水路からポンプ (プエナビスタ・ポンプ) で揚水されている。
- 3) 本部との交通状況：サイト1と同様
- 4) 便宜供与：空施設のリサーチ・ステーションビルディングはサイトから、ほんの500mに位置している。総合訓練センターはサイトから8kmに位置している。

5) 土地所有：全ての圃場は農民の個人有地

6) 土地利用状況：19haの全域にわたり、乾季も雨季も米作が行われている。

しかし、この地域を担当する灌漑水利組合は水利量が高いため
に乾季作にトウモロコシとピーナッツを導入することを決定
している。

Note: 外水位から独立していることは、内水位の管理を容易にする。国道に
接していることは、高い展示効果をもたらす。しかしながら、ビリ
ンカ氏を除き、他の土地所有者の借地への同意は確認されていない。

4. 3 ミュノス

サイト 3haは水質土壌試験場及水管理訓練センターの敷地に隣接し、中部ルソン
大学に面している。

1) 土壌組成：表層は埴土、下層は粘土及び重粘土である。

2) 水 源：水は水路から重力供給されている。

3) 本部との交通状況：距離は 151kmで3時間を要する。道路状態は部分的に
デコボコしている。

4) 便宜供与：水質土壌試験室のあるADDビルディングの空室もしくは訓練
センターの空室の1つが現場事務所として提供される。訓練
センター宿泊棟の寢室の1つが専門家の宿泊所として提供される。

5) 土地所有：土地は中部ルソン大学の所有する研究圃であり、以前はNIAが
種生産と水管理試験の研究に使用していた。

6) 土地利用状況：米作

Note: 粘土壌は畑作物栽培には排水不良の原因になると思われる。

4.4 ターラック

試験圃場規模は、適宜既存の100haの地区から選び得る。位置はTASMORIS事務所から10kmの所である。

- 1) 土壌組成：シルト質壇壤土～シルト質粘土
- 2) 水源：重力用水施設と3基のポンプ施設がある。乾季に重力用水が不足するので、補足的な地下水供給が必要である。しかしながら、ポンプ運転費用が高いためポンプ運転は停止されている。
- 3) 本部との交通状況：調査時は国道に沿って測り、150kmに3～4時間を要した。しかし、ハイウェイ道路（Dan, Pawpangaを出口として、北部高速道路を通過してチソン市からターラックへ直行）を使用した場合、約1時間半であるとの報告も得た。ミュノスへの距離は61km（グンバーバロック道路を通過して）である。
- 4) 便宜供与：TASMORIS事務所の空室の1室が現場事務所として提供される。室の広さは $11.5\text{m} \times 6.0\text{m} = 69\text{m}^2$ である。プロジェクト事務所に隣接した公舎が専門家の宿泊に提供される。両方ともサイトから10kmである。
- 5) 土地所有：計37農民がその100haを所有している。そのうち36農民が借地に合意していると報告された。
- 6) 土地利用状況：雨季は米作、乾季は畑作物（イエローコーンと野菜）が部分的に栽培されている。

Note: 報告によると、返答のあった内の94%が5年間の借地料の一括支払いを望んでいる。

加えて、既存ポンプの能力が大きすぎて2～3haの試験研究圃に利用するには効率的でないことも考慮すべきである。径200mmのパイプを持つ既存ポンプは乾季に50haを灌漑できる。このポンプ能力についての議論は1986年9月16・17日の会議では言及されなかった。

4. 5 試験圃場の推薦

提案された全てのサイトは試験圃場としての推薦に価する。しかしながら、諸々の困難によりプロジェクト実施の初段階では非常に限られた数のサイトしか推薦できない。現地調査の結果及び「3. 1 畑利用水田における灌漑試験研究」で示した、試験及び実証調査項目から検討した結果、サン・ラファエルの2つのサイトが適当と判断する。サイト1は研究圃場として推薦し得る。サイト2は実証圃場として推薦し得る。その理由は下記の通りである。

- 1) サイト1に関し、土壌組成及び排水状況が種々の基礎的な調査活動を行うのに適している。加えて、幹線用水路に隣接していることにより、水源が確保され、水管理が容易である。
- 2) サイト2に関し、周囲を道路と旧鉄道敷の堤で囲まれていることにより外水位の影響を受けないので、内側での水管理が容易である。加えて、国道沿に立地することにより高い展示効果を期待できる。
- 3) 本部への交通が便利である、N I A本部への距離は提案されたサイトの中で最も短く、且つ道路状況も良い。
- 4) これらのサイトは MunozにあるN I Aの土壌水試験室にも比較的近い。
- 5) 独立した現場事務所として、研究事務所の建物が利用できる。
- 6) 2つのサイトが研究圃場と実証圃場にそれぞれ利用でき、これらは1つの現場事務所管理できる。

しかしながら、本件プロジェクトの進捗により追加的な研究活動が必要になった時には Cavite, Munoz及び Taracは高い優先順位をもって推薦され得るであろう。

5. 実施体制案

本件プロジェクトに係わり提案された実施組織案を図3に示す。なおこの図は1986年9月16・17日に開催された会議における討議を通じて修正されたものである。本件プロジェクトの本部事務所スペース案については9月末日までにJ I C Aフィリピン事務所を通じて提出されることが確認されている。実施体制に係わる組織の最終案のためには、次のミッションでより詳細な討議が行われるであろう。

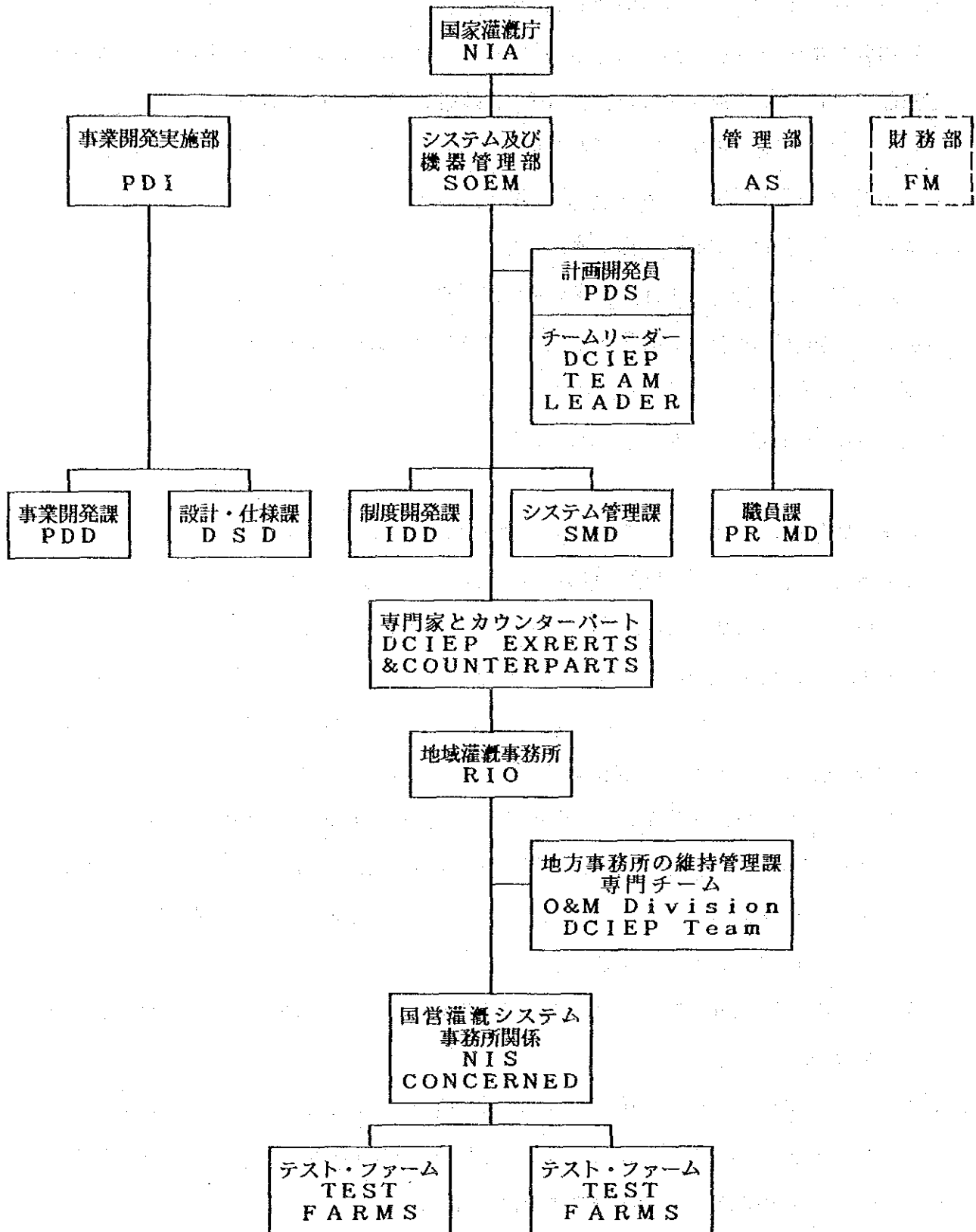


図3. 組織図チャート

IV. N I A 責任者との協議要約

長期調査結果の中間報告が1986年 9月16・17日にN I Aの全ての担当責任者を集めて開催された会議で発表された。報告の内容は第V章の説明とほぼ同じである。但し "V-1 PROJECT BACKGROUND" と "V-2 BASIC CONCEPT OF D C I E P ACTIVITIES" については本報告書の説明の方がその報告よりもより詳細に記述されている。会議出席者の名簿を APPENDIX D に示す。

会議において、N I A関係者は調査結果の内容をよく理解し、且つ賛同を示した。しかし、試験圃場現地調査結果と当初提案された組織図については、次のような意見／提言がなされた。これら意見／提言は1986年10月13日の会議でJ I C Aと日本政府の担当責任者に報告された。

1) 試験圃場の設定には、次の項目も考慮すべき事項とすべきである。

a) サイトは種々の土壌型／組成を持つ地区を選ぶべきである。よって、主要な土壌型／組成の数だけ多くのサイトを設定すべきである。

b) 乾季の灌漑地域を増やすために米以外の作物を導入すべきUPRISのようなシステム（土地改良区）の必要性も考慮すべきである。TASMORIS (Tarlacを含む土地改良区) の場合、水供給が非常に制限されており、サービス・エリア14,000haのうち、雨季に約9,000ha 乾季にも約2,000ha しか灌漑できない。

c) 本件プロジェクトによる野菜部門補足が必要な SLBIP/SFLIS (Caviteを含むプロジェクト) のようなプロジェクトやシステムでは、その計画が実施中であることも考慮に入れるべきである。

2) よって、試験圃場を SLBIP/SFLIS (Cavite) と TARMORIS (Tarlac) にも設定すべきである。

3) もしも ARMIS (San Rafael) の試験圃場がプロジェクトの第1段階として明確に選定されるならば、第2段階もしくは次の段階で同様の圃場を設定する中で、その他のサイトを考慮すべきである。

4) TASMORIS (Tarlac) は試験圃場の設定に強く推薦された。次の事項が論議に上げられた。

- a) 農民への土地賃借料の一括支払いの問題は解決され得るであろうし、また試験圃場として使用するための必要な処置について交渉が可能である。
- b) TASMORISは90%と非常に低い灌漑率である。
- c) 米以外の作物のポテンシャルは非常に高い。特に 39,200ha の灌漑を予定している Balog-Balog多目的プロジェクトの実施もある程である。(このプロジェクトは現在プロポーザルを提出し資金源を求めている段階である。)
- d) 品質管理研究所 (T I S I P中の実施中に建設された) に使用を予定されていた 200㎡の建物がありこれを本件プロジェクトの現場事務所に提供できる。
- e) TASMORISはMagat 洪水予報テレコミュニケーション・システムの“ホット・ライン”で連絡されるであろうから、N I A本部事務所との連絡に支障はない。

5) プロジェクト組織図の変更

- a) Design and Specification Department (D S D) を含める。

(修正後の組織図を図3に示してある。)

次の APPENDIX の訳は省略する。

APPENDIX A 面会者リスト

APPENDIX B 活動スケジュール

APPENDIX C 会議出席者名簿

— 1986年9月16・17日 —

作物多様化に関連する調査研究活動

1. 農業食糧省は1982年以来、作物多様化について「農場における技術実証プログラム」の中で研究している。このプログラムの中で「収穫強化」が研究されている。作物多様化と収穫強化のちがいは前者が米以外の作物の第二毛作・第三毛作としての導入を目的としているのに対し、後者は米も米以外の作物も含めて収穫強化の目的としている点である。
2. I R R I は作物多様化を1972年以来、複作部門で研究して来た。複作部門では乾季の遊休労働者の雇用促進及び土地利用の向上のために低地米作地帯における営農システムの開発の中で、畑作物の導入を研究している。複作の主な研究項目は適用作物の選択、品種改良及び構成技術、特に耕作方法である。灌漑方法、量及び期間については構成技術のなかで部分的に研究されているが、主たる観点は栽培耕種に焦点を当てている。
3. I R R I の水管理部門は 1983-84年の旱害期に旱害克服のための農民及び関係機関の活動を Upper Pampanga River Integrated Irrigation Systems について研究した。しかし、このような研究は最近5年間の研究報告書の中で1事例と非常に少ない。
4. 世界銀行は「サトウキビ地帯多様化研究」のために1985年6～7月ミッションを派遣した。ミッションの構成は、経済1人、農業経済1人、農業1人、灌漑技術1人と、コンサルタント3人である。この研究の目的は、フィリピンの砂糖セクターの現在の問題点を調べ、セクタープロセスの経営促進のための政策プログラムの提言を行うことであった。ミッションの調査結果を基礎に、1986年3月6日付で「フィリピン サトウキビ地域の多様化の研究」と称する報告書が提出された。

5. フィリピン大学ロスバノス校は1975年以来サトウキビ、タバコ、豆類、野菜その他の作物について用水量の研究を大学の試験圃場を使って実施して来た。さらに、フィリピンにおける1984年以前の全ての水文データをコンピューターで収集、整理している。

6. 農業開発計画 (A P C) はボホールにおける日本の技術協力プロジェクトであり1983年 2月から5年の技術協力期間で実施されている。A P Cはボホール島の種々の土壌に適した米及び畑作物品種の研究・開発のために研究、訓練、普及という3つの活動を行っている。現在、A P Cは Tagbilaran の中央センター Tubigon, Bilar 及び Ubay に計3つの実験圃場、そして Carmen に1つのパイロット・ファームを持っている。A P Cでは、実験圃場で畑作物も研究しているが、米作に焦点を当てている。理由はボホールにおける米の生産力は未だ低く、且つ他の優良換金作物も見つかっていないからである。作物多様化は米作技術が確立した後に導入すべきであり、よってA P Cは米作技術のレベル・アップに重点を置いていると説明された。畑作物については生育期間の把握が研究されている。スプリンクラー灌漑は整備されているが、用水量については未だ研究を行っていない。

THE SUMMARY REPORT
ON
ONE-MONTH SURVEY
FOR
DIVERSIFIED CROPS IRRIGATION ENGINEERING PROJECT
IN
THE REPUBLIC OF THE PHILIPPINES

October, 1986

The One-month Survey Team

Japan International Cooperation Agency (JICA)

I. Introduction

With the attainment of self-sufficiency in rice, the Government of the Republic of the Philippines placed more emphasis on the production of non-rice crops. For this crop diversification strategy, the Government proposed a technical assistance project called Diversified Crops Irrigation Engineering Project (DCIEP) with a responsible organization of the National Irrigation Administration (NIA) to the Government of Japan on May 29, 1984. Four general objectives of the project were stated: 1) to investigate/determine the most appropriate and economical irrigation method/techniques, water requirement, and tertiary development for diversified crops production, 2) to develop design criteria/standards and come up with comprehensive recommendations in developing diversified crops irrigation project/systems, 3) to study necessity and possibility of diversified crops irrigation with the objective of utilizing more efficiently available water resources and land resources, and come up with a comprehensive diversified crops irrigation projects/system and 4) to train planners, designers and prospective O & M staff of systems/projects planned and designed for diversified crops irrigation.

The importance of the proposal was fully understood with the study made by the Project Identification Study Team dispatched on September, 1985 under the leadership of Mr. Suemastu. In the Minutes of Discussions signed on October 5, 1985, it was suggested that the next step for commencement of the project be dispatch of a follow-up survey mission for further study on formulation of the project. Acting upon this suggestion, the Government of Japan, through the Japan International Cooperation Agency (JICA), dispatched two specialists for one month.

The one-month survey team conducted field investigation and discussions with the staffs related to DCIEP from August 20, 1986 to September 18. The preliminary summary of the one-month survey was presented at the conference held on September 16-17, 1986, with all the responsible officials in NIA. Several comments/suggestions were made by

NIA staffs. The discussion summary shown in Chapter V was reported to the responsible officials of the Japanese government.

II. SURVEY MEMBERS

Name	Speciality	Title & Organization
Noriaki Shioziri	Agronomy	Deputy Head Resources Division, Kinki Regional Bureau, Ministry of Agriculture, Forestry & Fisheries
Hideyuki Kanamori	Irrigation & Drainage	Development Specialist, Institute for International Cooperation, Japan International Cooperation Agency (JICA)

III. OBJECTIVES

To execute supplemental study, especially from technological viewpoints, for provision of basic data to formulate the project.

To discuss the implementation structure for promotion of mutual understanding.

IV. ACTIVITIES

Three main activities were carried out:

- 1) offering a questionnaire and studying the answers;
- 2) site reconnaissance and investigation, and

- 3) discussion with engineers and officers of the related organization to DCIEP.

A list of the engineers and officers with whom discussions were held during the survey are shown in Appendix A. Details of the survey activities are described in the work schedule shown in Appendix B.

V. SURVEY RESULT SUMMARY

1. PROJECT BACKGROUND

1.1. Study on Food Demand and Supply

A study called "Study on Food Demand and Supply and Related Strategies for Developing Member Countries" (Phase I) was conducted from February 1983 to May 1984 with the technical assistance of the Asian Development Bank (ADB), being undertaken jointly by the International Food Policy Research Institute (IFPRI) and the International Rice Research Institute (IRRI). The study had operational aspects of satisfying future food consumption requirement and of developing suitable approaches and methodologies for use in analysis and determination of optimum strategies for agricultural development. The Philippines was used as a case study to develop a methodology by which to analyze other countries.

The study included analysis for the Philippines with the following findings:

- 1) The results of projections for rice consumption indicate that even with the full completion of on-going and planned irrigation investments by NIA, the Philippines is likely to return to a modest deficit in the late 1980's, which will gradually increase through 2000. The results for corn indicated that despite projected growth in corn yields higher than past trends, a rapidly growing supply/demand deficit is projected, primarily due to growth in demand for corn for livestock feed.

2) The analysis by sensitivity tests of the projected combined deficit for rice and corn indicates that it will be difficult to eliminate the combined deficit. However, if corn displaces the dry season irrigated rice, rapid growth in HYV corn technology could reduce the corn deficit by 1.2 million metric tons but increase the rice deficit by 677,000 metric tons, the displacement of the dry season rice thus offsetting half the gain in corn production.

3) Generation long term surpluses in rice are potentially costly. One alternative for dealing with potential sustained rice surpluses suggests a shift of the excess capacity in irrigation out of rice and into production of corn or other crops such as cotton or soybeans.

Based on these findings, "Diversified Irrigated Agriculture" was suggested for the shift of excess irrigation capacity. This suggestion included two forms: direct conversion of rainfed rice cultivation into corn or other crops, or conversion of rainfed rice cultivation into other crops. It was also suggested that the conversion of the dry season irrigated cultivation from rice to corn or other crops requires improved management in irrigation systems.

1.2. Crop Diversification Study

In May 1984, based on the findings of the Phase I study, ADB proposed further technical assistance for the follow-up study (Phase II) to the Governments of the Philippines and Indonesia. Both Governments accepted the proposal. In the Philippines, the ADB has been conducting the assistance for phase II study for two years starting from January 1985. The main objectives of the Phase II study are to assist in developing plans to help meet the goals of self-sufficiency in rice and corn, and in diversification of agricultural production in different irrigated and rainfed regions of the Philippines. There are three major components: 1) to provide prescriptions for effective Government pricing policy and intervention in support of agricultural production objectives, 2) to regionalize the findings of the Phase I study to reflect the Philippines's highly variable resource endowments, and 3) to develop a practical technology for irrigation to achieve crop diversification.

The ADB again entrusted IFPRI to continue items 1) and 2). Item 3) was undertaken by the International Irrigation Management Institute (IIMI) established in Sri Lanka in May 1983, whose ultimate goal is to enhance independent national competence to improve irrigation performance with special emphasis on irrigation management. IIMI has conducted the study in cooperation with NIA.

IFPRI is going to submit the final report in November 1986, and IIMI in December.

1.3. IIMI Second Phase Study Draft

The IIMI implementation period was for 22 months, starting in February 1985. Because this period covered only one dry season, extension of the study into the second phase has been discussed, covering three dry seasons. The second phase is expected to be implemented for 30 months starting from January 1987. The components of the second phase will be similar to the first one, focusing primarily on irrigation management for crop diversification with a view to assessing the socio-economic and technical feasibility of varied crop rotations in different soil conditions, particularly the cultivation of irrigated non-rice crops following rice irrigated in the wet season. The second phase will examine: 1) the constraints to crop diversification; 2) ways in which the management of irrigation can overcome these constraints thereby promoting crop diversification; 3) agronomic and economic management alternatives converting puddled to upland soil condition in producing various crops; 4) assess O & M institution building requirements necessary in developing and managing irrigated crop diversification; 5) assess existing irrigation management for crop diversification technology and its feasibility for adoption. The primary sites will be located at the Allah River Irrigation Project and Second Laguna Bay Irrigation Project (including Cavite), and the secondary sites will be located at the Talavera River Irrigation System (near Muñoz), Laoag-Vintar Irrigation System and Tarlac-San Miguel-O'Donnel River Irrigation System.

1.4. Other Related Study Activities

Although crop diversification is not stated as the main study objective, several organizations have conducted this study as a related study to their main items. The Ministry of Agriculture and Food (MAF) has studied crop diversification in the program of Crop Intensification. IRRI has partly studied this item in the Multiple Cropping Department and Water Management Department. The World Bank has conducted one study called Sugar Lands Diversification Study. The UP Los Banos has studied water requirements of rice and non-rice crops. The Agricultural Promotion Center (APC) Project has studied non-rice crops to define the growing period of each crop, although rice crop cultivation is focused as the main study. Details of the related study activities are shown in Appendix C.

2. BASIC CONCEPT OF DCIEP ACTIVITIES

2.1. DCIEP Proposal

In May 1984, when the ADB submitted the Phase II study proposal, NIA submitted another proposal for introduction of diversified irrigated agriculture under the title of DCIEP. In addition to the self-sufficiency of non-rice crops, the proposal stated two other aspects for diversification, i.e. to reduce high development costs in small island areas by cultivation of low-water-requirement crops particularly during the dry season, and to maintain viability in the operations of the irrigation systems by attainment of higher irrigation cropping intensity, reduction of operating costs and making higher profit. The project was expected to promote crop diversification and contribute to the improvement of cropping intensities in the existing irrigation systems; as well as generate valuable information for the development and operation of diversified crop irrigation projects.

2.2. Discussion Regarding DCIEP Activities

In the environment where many study activities related to crop diversification have already been conducted, commencement of DCIEP is planned in the next year. To efficiently cooperate with the formerly started activities, the definition of DCIEP study was required. Especially study overlap between the proposed DCIEP study and IIMI study was suggested to be discussed for similar study items included in the objectives. In a meeting of the responsible staffs in ADB, IIMI, NIA and our team, the possibility of study overlap was discussed. It has been understood among the members that the DCIEP's main subject in crop diversification is defined as the study from engineering aspects, i.e. formulation of technology criteria based on research/experimental study results, mainly for secondary level approach and system level approach. However, IIMI study is from farm management level aspects. The secondary approach means to introduce innovative measures into improvement of the existing facilities/land by conducting mainly secondary canal or higher level civil work. The system level approach means to introduce innovative measures into development of the proposed area to be applicable to crop diversification. Further, the primary purpose of DCIEP has been defined to be technology transfer through the activities of formulating criteria and carrying out research/experimentation.

2.3. Definition of Diversified Crop Irrigation Engineering (DCIE)

It has been understood that DCIE is defined as a development activity to formulate innovative measures in engineering for improvement of existing facilities/land on mainly the secondary or higher level, as well as for development of the proposed area in the manner of establishing applicable farms to both rice and non-rice crop production. For the study base of DCIE, research/experimental activities are required in the DCIEP study. Further, all the related study aspects are included in DCIEP study for the secondary definition to complement other

related studies, which include agro-socio-economical aspects, water management aspects and others.

3. Discussion of the Proposed Cooperation Activities.

The proposed cooperation objectives are summarized into three subjects, i.e. Diversified Crop Irrigation Study, Technology Criteria Formulation and Diversified Crop Irrigation Training.

3.1. Diversified Crop Irrigation Study

3.1.1. Establishment of Test Farms.

It is desirable that two test farms, including a research farm and experimental farm, be established. The first is intended to conduct basic research for formulation of planning/design criteria, and the second is to experiment the suggested planning/design criteria by conducting crop diversification irrigation-farming technology on the designed farm. Thus, it is recommended that the experimental farm be established after sufficient progress of the former research to enable carrying out of the experiment. The results of this research and experimental work will establish the base of formulating technology criteria and training modules.

3.1.2. Research Farm Study Items and Contents

On the farm, research of the following items/contents should be conducted for main non-rice crops.

1) Irrigation factors to calculate water requirements: The related items to the figures/factors shown in Figure 1. are studied in this item. For soil moisture characteristics, research activities are conducted on the different regions to study the typical soil type.

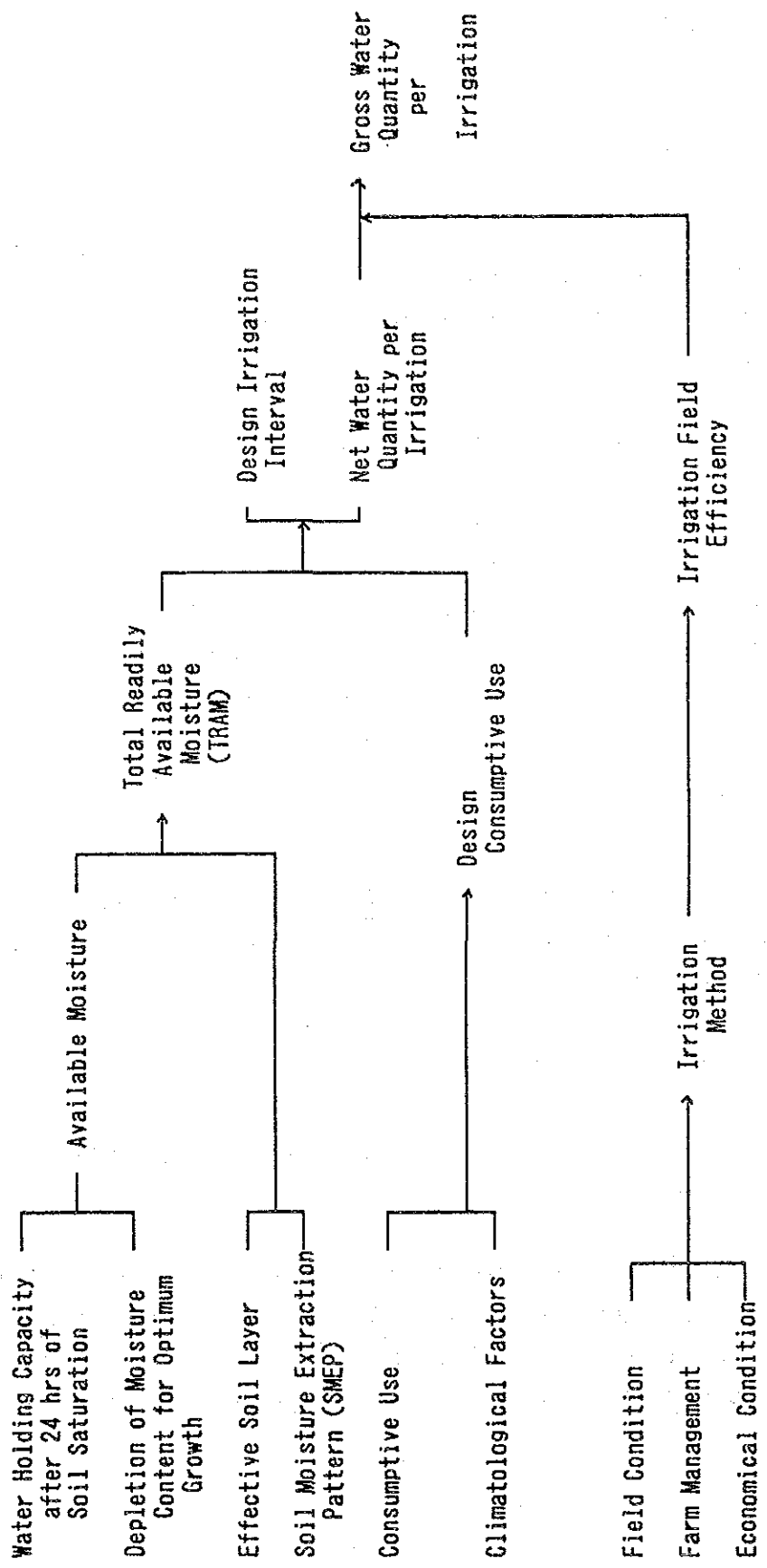


Figure 1 Calculation Flow of Field Irrigation Water Requirements

- 2) Irrigation Methodology: The irrigation water distribution coefficient, irrigation efficiency and other factors for the proposed irrigation methods (furrow, border irrigation, etc.) are studied.
- 3) Optimum Soil Moisture Contents for Crop Growing: The contents are studied for major non-rice crops by preparing test fields having different initial soil moisture suction.
- 4) Field Condition and Cultivation Methods: Applicability of various field conditions and cultivation methods for diversified crop irrigation are studied.
- 5) Climatological Observation: Observation of temperature, rainfall, sunshine duration, pan evaporation and other related climatological factors are conducted.

3.1.3. Experimental Farm Study Items and Contents

The following experimental activities are desirable to be carried out after sufficient progress of the former research to enable commencement of the experiments.

- 1) Soil Survey: Profile and soil analysis (three phase distribution, particle size analysis, etc.)
- 2) Soil moisture survey and observation of changing soil moisture contents.
- 3) Water use survey: Measuring and recording irrigation quantity, etc.
- 4) Agronomical survey: Fertilizer use, insecticide use etc.
- 5) Production survey: Growing condition, yield, quality, etc.

- 6) Farm management Survey: Gross income, farm expenditure, work hours, O & M expenses, etc.
- 7) Others: marketing research, etc.

3.2. Technology Criteria Formulation

At present, one design guide and one manual have been compiled for design of civil structures based on USBR Standards and Criteria, i.e. "Design Guides and Criteria for Irrigation Canals, O & M Roads, Drainage Channels and Appurtenant Structures" and "Design Manual for Diversion Dams, Canals, and Canal Structures". For concrete structures, the ACI Code of the US is still applied.

Criteria formulation conducted with systematical feedback. The NIA conducts feedback activities by involving the planners and designers in the implementation /construction of the projects up to completion and operation. Further, feedback is provided by construction and O & M staff to the planners and designers through field visits and interaction. However, feedback with experimental work such as hydraulic model experiments has not been conducted, although only large dam structures are examined by entrusting the model experiments to the National Hydraulic Research Center.

Practice of DCIE can be completed with various supplemental activities, i.e. installation of water regulation and water conveyance facilities, preparation of O & M plan, system analysis and other activities. For these supplemental items, provision of the related criteria is required to implement the formulated DCIE criteria. However, at present, only two criteria including one design guide and one manual have been provided, and systematical feedback by experimental work, especially hydraulic model experiments, has not yet been conducted. Therefore, provision of the supplemental criteria is desirable to be included in this cooperation program. The final decision for adoption of these supplemental activities should be made

according to applicable facilities and equipment, budgetary conditions etc.

3.3. Diversified Crop Irrigation Training

The NIA has vast experience in rice irrigation. But, only limited experience in non-rice crop irrigation. The designed water requirements for non-rice crops have not been examined through research activities.

All the training courses are proposed and conducted by the concerned department/office through coordination with the Training and Development Division (T.D. div.) under the Personnel and Records Management Department. The T.D. div. reviews the submitted proposal, schedules dates for implementation and facilitates administrative support for managing the training. Then the department/office implements the training. When these procedures are identified with the standard process description shown in Figure 2, it is found that at least two procedures are to be supplemented, i.e. 10) Making Aids and Trial and 14) Evaluation. The reasons why these are not included are due to lack of equipment as well as technology.

The proposed activity in DCIEP is development of training modules for DCIE. However, the existing level of non-rice crop irrigation and training course development shows the necessity of supplemental cooperation activities. Before practicing training with the developed DCIE training modules, the related basic knowledge on non-rice crop irrigation is desirable to be introduced from Japan's experience. Further, reinforcement of existing training is desirable to be made by introducing training equipment and technology. The final decision for adoption of these supplemental items in this cooperation program should be made according to available facilities and equipment, budgetary conditions, and others.

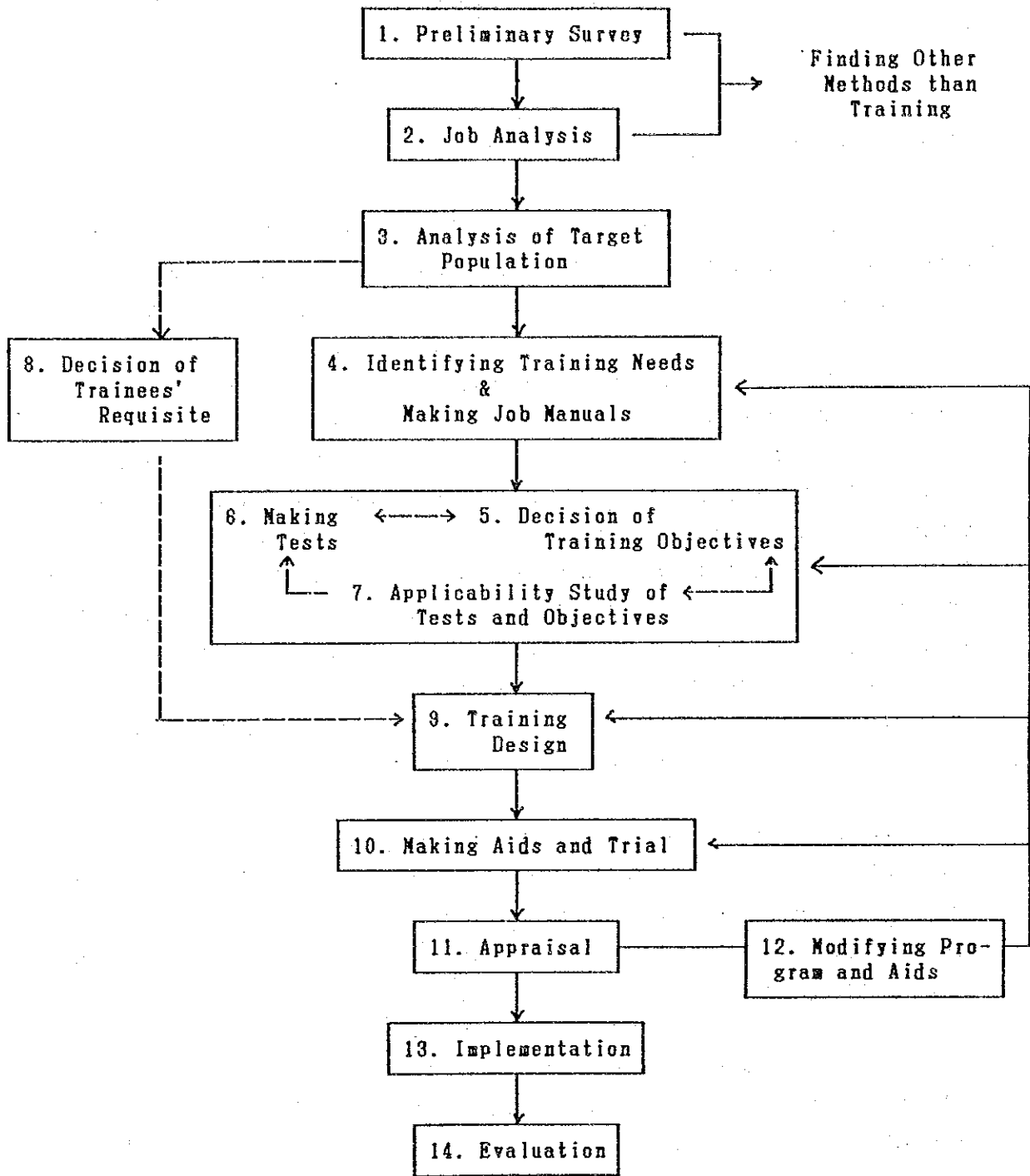


Figure 2 Process of Developing Training Modules

4. TEST FARM SITE INVESTIGATION SUMMARY

The proposed four places, including six sites, have been investigated. In the minutes of discussions, the following four items are suggested to be considered for site recommendation:

- 1) Soil texture (Dominant soil type).
- 2) Water resource availability (Availability of water for irrigation).
- 3) Accessibility to head office (Nearness to the head office.)
- 4) Convenience availability (Existence of an office of NIA in the vicinity for management of the test farm and field office).

In addition to the above, the following two items are included in this investigation.

- 5) Land ownership.
- 6) Existing land use.

Along with these items, the results of investigation are summarized below and in Table 1.

4.1. Cavite

4.1.1 Proposal Site 1. (in the NIA project office compound)

The total area is 2.5 ha, and the usable area is estimated to be 2 ha. This site is located in the NIA project office compound.

- 1) Soil texture: Clay Loam with some fine gravel.
- 2) Water resource availability: New tube well with a pumping facility should be provided.

Table 1. TEST FARM SITE INVESTIGATION SUMMARY

PLACE ITEM	CAVITE		SAN RAFAEL		MUNOZ	TARLAC
	SITE 1	SITE 2	SITE 1	SITE 2		
1. SOIL TEXTURE	C.L. (few fine Gravel)	C.L.	S.C.L	C.L	C.L. & C or H.C	S.C.L. to S.C.
2. WATER RESOURCE AVAILABILITY	Tube Well	Irrigation Canal	The North Main Canal	Irrigation Canal	Irrigation Canal	Canal & Pump
3. ACCESSIBILITY	64 km to N 164 km to M		51 km to N 100 km to M		151 Km to N	150 km to N 61 km to M
4. CONVENIENCE	MAF Training Center & Dormitory		Research Station Building National Training Center		Labo. or/and Training Center	Project Office & Official Residence
5. LAND OWNERSHIP	NIA	Farmers	Farmers	Farmers (many tenants)	CLSU	Farmers
6. EXISTING LAND USE	MAF Research	Rice Vegetables	Rice Vegetables	Rice	Rice	Rice, corn & Vegetables
NOTE	1) New tube well 2) MAF Research	High Terrace Fields	Good Soil No Lease A.C	Easy W.C.. No Lease A.C.	Drainage Difficulty	Lump Sum payment

NOTE: N - NIA Quezon City Head Office, M - Munoz, A.C. - Agreement Confirmation, W.C. - Water Control.

3) Accessibility to head office: The distance is 64 km (via the Manila-Cavite coastal road) and about a 2 hr trip is required. The road condition is partly rough. The distance to Muñoz is about 64 km.

The area could also be reached via the South Express way, and would take about $1\frac{1}{2}$ hr to negotiate the 69 km distance (Exit Carmona Interchange.)

4) Convenience availability: The NIA compound includes the MAF vegetable training center. One room of the center spacing 4.4 m x 4.4 m = 19.4 sq.m is proposed for the DCIEP site office, and one bed room of the center dormitory is proposed for experts' overnight stay.

5) Land ownership: NIA-leased Property.

6) Existing land use: The farm has been used by MAF for testing new vegetable varieties. When visited, the farm was idle before the next test, and covered with grass.

Note: The capacity of the existing tube well is not enough, and a new tube well is suggested to be provided. Further, coordination of DCIEP research activities with the MAF vegetable research will be required.

4.1.2. Proposed Site 2. (Farmers' land)

The site is located about 1 km from the project office. There are high-terrace fields. The suitable test farm size can be selected from the existing fields. Regarding investigation summary, along with the items, except 2), 5) and 6), all other conditions are as for the proposed Site 1. The 2), 5) and 6) are described below.

2) Water resource availability: Water can be drawn from the irrigation canal.

5) Land Ownership: Existing fields are farmers' private land, and it has been reported that they are willing to lend their farms for DCIEP with rent.

6) Existing land use: In the wet season rice is cultivated, and in the dry season vegetable growing is partly conducted.

Note: High terrace fields may push up consolidation costs for the test farm.

4.2. San Rafael

4.2.1. Proposed Site 1 (beside the National Training Center)

The proposed site is located at only 140 m from the National training center, and 6 km from the Region III office. The test farm size can be selected from the existing 10 ha area.

- 1) Soil texture: Silty Clay Loam
- 2) Water resource availability: The site is located along the north main canal of the Angat and Maasim Rivers Irrigation System, and thus, it is easy to draw water from the canal by pumping. The deep main canal brings another benefit into drainage condition by lowering ground water table.
Further a new main canal for the area has been proposed to supply water by gravity.
- 3) Accessibility to head office: The site is 51 km from NIA-Quezon City Head office, and could be reached in one hour on a good road. The distance to Muñoz is about 100 km.
- 4) Convenience availability: A vacant research station building with about 80 sq.m. floor area (8.5 m x 9.5 m) is proposed for the office, which is 8 km from the site. A guest room of the National Training Center located only 140 m from the site is proposed for experts' overnight stay.
- 5) Land ownership: The area is owned by several farmers, and cultivated by many tenants.
- 6) Existing land use: High land area of about 3 ha is used for growing okra, eggplants, pumpkin and others, although the remaining low land area of about 7 ha is used for rice.

Note: The soil condition and drainage condition are very suitable for test farming. However, willingness of owners and tenants to lease their land has not yet been confirmed except for one owner.

4.2.2. Proposed Site 2. (Mr. Villangca's farm)

The proposed farm having 9 ha is owned by one farmer called Mr.

Villangca. The farm and the upper several farms form one block surrounded with a national road and an un-used railway bank line. The whole block with a total area of 19 ha has finally been recommended because it is independent from the outside water level and easy to control the inside water supply. The site location is 2 km from the NIA Region III office.

- 1) Soil texture: Clay Loam.
- 2) Water resource availability: Irrigation water is drawn from the main canal by pumping (Buenavista Pump).
- 3) Accessibility to head office: Same as site 1.
- 4) Convenience availability: The vacant research station building is proposed for the office, which is located only 500 m from the site. The guest room of the training center located 8 km from the site is proposed for experts' overnight stay.
- 5) Land Ownership: All fields in the site are farmers' private land.
- 6) Existing land use: The whole area of 19 ha is used for rice cultivation in both dry and wet seasons. However, the irrigators' association in charge of this area has decided to introduce corn and peanuts in the dry season because of the high cost of water.

Note: The independence from outside water level can ease inside water control. The location along the national road is very suitable for demonstration.

However, the landowners' agreement for leasing, except Mr. Villangca's agreement, has not yet been confirmed.

4.3. Muñoz

The site, having about 3 ha is located beside the compound of the Soil and Water Laboratory and Water Management Training Center, facing Central Luzon State University (CLSU).

- 1) Soil texture: Clay Loam for the surface layer; and Clay or Heavy

Clay for the lower layer.

2) Water resource availability: Water is supplied from the canal by gravity.

3) Accessibility to head office: A distance of 151 km and about a 3 hr trip is required. The road condition is partly rough.

4) Convenience availability: A vacant room of the ADD Building where the Soils and Water Laboratory (SWL) is located or of the training center is proposed for the office, and a bed room of the training center dormitory is proposed for experts' overnight stay.

5) Land Ownership: The land is owned by CLSU for the research farm, and formerly NIA used it for studying seed production and water management.

6) Existing Land Use: Rice is grown on the site.

Note: The clay soil will cause drainage difficulty for non-rice crop growing.

4.4. Tarlac

The suitable farm size can be selected from the existing 100 ha area. The location is 10 km from the TASMORIS office.

1) Soil texture: Silty Clay Loam to Silty Clay

2) Water resource availability: Gravity water and three pumping facilities are available. Because of the gravity water deficit in the dry season, supplemental ground water supply is necessary. However, the expense of pump operation costs has stopped operating pumps.

3) Accessibility to head office: When surveyed, we went along the national road and spent 3-4 hrs for about 150 km. However, it has been reported that using the highway road (direct Quezon City to Tarlac via North Expressway, exit Dau, Pampanga) it will take about 1 1/2 hrs. The distance to Muñoz is 61 km. (via Guimba-Baloc road).

4) Convenience availability: One vacant room of the former TISIP project office is proposed for the site office, spacing 11.5 m x 6. m = 69. sq.m. An official residence beside the project office is proposed

for experts' overnight stay. Both are 10 km from the site.

5) Land Ownership: A total of 37 farmers own the 100 ha. It has been reported that 36 farmers are amenable to the lease agreement proposal.

6) Existing land use: Rice is planted in the wet season, and non-rice crops (yellow corn and vegetables) are partly planted in the dry season.

Note: According to the report, about 94% of the total respondents are in favor of the lump sum payment for a five year leasing arrangement. Further, the too large capability of the existing pump to be efficiently applied for test farm with 2 to 3 ha of the farm size should be considered; one existing pump having a diameter pipe of 200 mm can cover 50 ha irrigation in the dry season. This discussion about the pump capability was not mentioned in the conference held on Sept. 16-17, 1986.

4.5. Recommendation

All the proposed sites have potential for recommendation. However, some difficulties bring a very limited number of site recommendations for the initial stage of project implementation. For the results of site investigation and of analysis with the suggested research and experimental items and contents described in "3.1 Diversified Crop Irrigation Study," San Rafael's two sites are recommended as suitable sites. Site 1 is recommendable for the research farm. And Site 2 for the experimental farm. The reasons are described below.

- 1) For Site 1, the soil texture and drainage condition are very suitable for conducting various basic research activities. Further stable water resource and easiness of water control can be obtained with the large and deep main canal.
- 2) For Site 2, the independence from outside water level influence with the surrounding road and railway banks line can ease control of inside water control. Further, demonstration effectiveness is expected

being located along the national road.

- 3) The accessibility to head office is good; the distance to the NIA central office is minimum among the proposed sites and road condition is good.
- 4) These sites are relatively near to the Soils and Water Laboratory in Munoz.
- 5) An independent office, the research office building can be used.
- 6) The two sites can be applied for the research farm and experimental farm respectively, and these are managed by one site office.

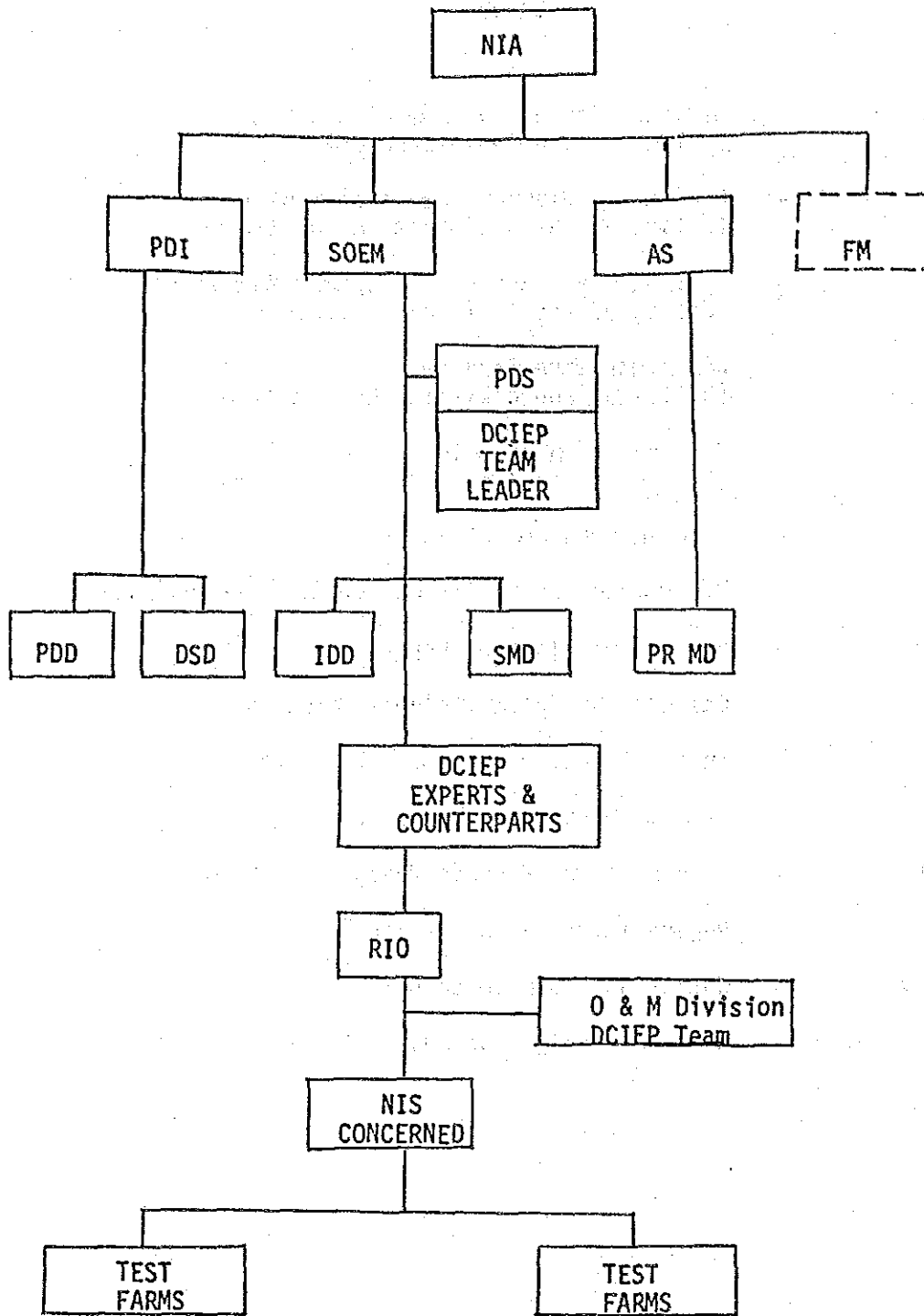
However, when supplemental study activities are required according to the progress of DCIEP study, Cavite, Muñoz and Tarlac will be recommended for the high potential sites.

5. PROPOSAL OF IMPLEMENTATION STRUCTURE

The proposed organization chart of DCIEP is shown in Figure 3, which is the revised chart through discussion in the conference held on Sept.16-17, 1986. The proposal of head office space in the NIA head office building is confirmed to be submitted before end of Sept. through the JICA Philippine office. For the final draft of the implementation structure, more discussions will be required with the following mission.

VI. DISCUSSION SUMMARY WITH NIA RESPONSIBLE OFFICIALS

The preliminary summary of the one-month survey RESULTS for DCIEP was presented at the conference held on Sept. 16-17, 1986 with all the responsible officials of NIA. The contents of the preliminary summary are almost same as the description in the Chapter V, although description of "V-1 PROJECT BACKGROUND" and "V-2. BASIC CONCEPT OF DCIEP ACTIVITIES" is more detailed than the description in the preliminary one. The list of conference attendance is shown in Appendix D.



Note: Abbreviation is described on the next paper.

Figure 3. ORGANIZATION CHART FOR DIVERSIFIED CROPS IRRIGATION ENGINEERING PROJECT

ACRONYMS

NIA	-	National Irrigation Administration (Office of the Administrator)
PDI	-	Project Development and Implementation (Office of the Assistant Administrator)
SOEM	-	Systems Operation and Equipment Management (Office of the Assistant Administrator)
AS	-	Administrative Services (Office of the Assistant Administrator)
FM	-	Finance and Management (Office of the Assistant Administrator)
PDS	-	Program Development Staff
DCIEP	-	Diversified Crops Irrigation Engineering Project
PDD	-	Project Development Department
DSD	-	Designs and Specifications Department
IDD	-	Institutional Development Department
SMD	-	Systems Management Department
PRMD	-	Personnel and Records Management Department
RIO	-	Regional Irrigation Office
O & M	-	Operation and Maintenance
NIS	-	National Irrigation System Office

At the conference, NIA officials well understood and agreed contents of the summary. However, regarding the results of test farm site investigation and the preliminary draft of the organization chart, the following comments/suggestions were made. These comments/suggestions have been reported to the responsible officials of the Government of Japan and JICA at the meeting held on October 13, 1986.

- 1) On the establishment of test farms, the following criteria should also be considered:
 - a) The sites should represent the different soil types/texture, hence the need to establish as many sites as the number of major soil types/texture.
 - b) The need of the system like UPRIIS where crops other than rice should be introduced during the dry season to increase the area irrigated. In the case of TASMORIS, it has very limited water supply and could serve only about 9,000 ha during the wet season and 2,000 ha during the dry season out of the potential service area of 14,000 ha.
 - c) The on-going programs in the projects/systems like SLBIP CFLIS where the vegetable component needs to be complemented by the DCIEP project.
- 2) It was recommended that a test farm be established in SLBIP/CFLIS (Cavite) and TASMORIS (Tarlac).
- 3) If AMRIS (San Rafael) test farms are definitely chosen for the initial phase, the second or succeeding phases of the study should consider other sites in establishing similar test farms.
- 4) TASMORIS (Tarlac) was strongly recommended for the establishment of the test farms. The following justifications were brought up:
 - a) That the problem of lump sum payment for lease on farmers' field could be solved and necessary arrangements with the farmers regarding the use of their farms as test sites could be negotiated.

- b) TASMORIS has a very low irrigated cropping intensity of only 90 percent.
 - c) Potentials for crops other than rice is great, especially with the implementation of Balog-Balog Multipurpose Project which would irrigate 39,200 ha.
 - d) A building with 200 sq. m. floor area which was intended to be used as a Quality Control Laboratory (constructed during the implementation of TISIP) could be used as an office for the DCIEP.
 - e) TASMORIS would be interconnected with the Magat Flood Forecasting, telecommunication System "Hot Line", hence no problem in communicating with NIA-Q.C. Head Office.
- 5) Some changes in the Project organization chart:
- a) Involve the Designs and Specification Department (DSD),
(The revised organization chart is shown in Figure 3.)

APPENDIX A. LIST OF MEETING MEMBERS

1. NIA

NIA-CENTRAL OFFICE

- Dr. Manuel M. Vergel : Acting Assistant Administrator
for Systems Operation & Equipment
Management (SOEM)
- Dr. Agustin N. Ramos, Jr. : Acting Assistant Administrator
for Project Development & Implementation
- Mr. Avelino S. Rivera : Manager, Project Development Department
- Mr. Sebastian I. Julian : Manager, Systems Management Department
- Mr. Avelino M. Mejia : Manager, Institutional Development
Department
- Ms. Ma. Ines Pinat-Bagadion : Assistant Program Manager,
Program Development Staff
Systems Operation and Equipment Management
(SOEM)
- Mr. Serafin A. Palteng : Program Manager, Programs Development Staff
(PDS) and Project Manager, National
Irrigation Systems Improvement Project
- Mr. Abelardo Dajano : Division Manager, Administrative Division
- Mr. Dominador D. Pascua : Principal Engineer and Head, Land Use
Section, Project Development Department (PDD)
- Mr. Abelardo Y. Armentia : Head, Feasibility Studies and
Environmental Section, PDD
- Mr. Liberato L. Piczon : Principal Engineer C, Research Division,
SMD
- Mr. Resty A. Macalalad : Manager, Training & Development Division
- Mr. Edgar C. Maglipon : Audio Visual Production Technician,
Training & Development Division
- Mr. Bonifacio M. Mangalindan : Manager, Public Affairs and Information
Staff.
- Mr. Salvador Salandanan : Division Manager, Research & Development
Division, Systems Management Department

Mr. Remeo G. Sidjo : Legal Staff in the Central Office
 Mr. Yasuhiko Mishima : JICA Expert
 Mr. Osamu Umekawa : JICA Expert
 Mr. Nariaki Tamura : JICA Expert

NIA-FIELD OFFICES

Mr. Nicasio San Miguel : Acting Regional Irrigation Director,
 Region IV
 Mr. Alexander A. Reuyan : O & M Division Manager, Region IV.
 Mr. Teofilo P. de Jesus : Project Manager, Second Laguna de Bay
 Irrigation Project (SLBIP).
 Mr. Vicente M. Olea : Chief, Agriculture Division, SLBIP
 Mr. Juanito R. Barlis : Supervising Engineer B., SLBIP
 Mr. Franklin G. Maunes : Engineer B., SLBIP
 Mr. Rolando T. Bonrostro : Regional Irrigation Director,
 NIA Region III
 Mr. Leonardo S. Gonzales : Angat-Maasim Rivers Irrigation System
 (AMRIS), Irrigation Superintendent V.
 Mr. Marcelino S. Santos : Irrigation Superintendent III, AMRIS
 Mrs. Lourdes C. Julian : Officer Incharge of NIA National Training
 Center, (San Rafael)
 Dr. Leonardo C. Lucero : Division Manager, Institutional Development
 Division (Cabanatuan)
 Upper Pampanga River Integrated Irrigation
 Systems (UPRIIS)
 Mr. Wilfredo S. Tiangco : Operations Manager, UPRIIS
 Mr. Mario M. Sagum : Head, Soils & Water Laboratory (SWL),
 (Muñoz)
 Mr. Noli Vinluan : Head of Agricultural Development Unit,
 TASMORIS

Mr. Juan Raña, Jr. : Chief of O & M Section, TASMORIS
 Mr. Leonardo T. Maniaul : Head of Institutional Organization, TASMORIS
 Mrs. Rosita M. Gregorio : Supervising Chemist, SWL
 Mr. Alfredo T. Aguilar : Water Master, TASMORIS

2 MINISTRY OF AGRICULTURE AND FOOD (MAF)

Ms. Jindra L. Demeterio : Chief Agricultural Project Officer, Agricultural Research Office
 Ms. Frida R. Ferrer : Sr. Project Officer, Special Projects Office
 Mr. Edgar Sandalo : Agricultural Research Officer, MAF
 Mr. Benedicto S. Ramos : Project Manager, SLBIP, Vegetable Component
 Mr. Alfonso M. Bergonio : SLBIP, Vegetable Component, Staff

3. ADB

Dr. Kunio Takase : Director, Irrigation and Rural Development Department
 Dr. Richard M. Bradley : Manager, Irrigation and Rural Development Department, Division II
 Mr. Graham Walter : Senior Project Economist, Irrigation and Rural Development Department
 Mr. Tetsuro Miyazato : Project Engineer, Irrigation and Rural Development Department

4. IIMI

Dr. Alfredo Valera : Project Coordinator, ADB-IIMI Research Project on Crop Diversification, IIMI Liaison Office, NIA

5. Irrigators Association

Mr. Pascual Maningas : Chairman of Kapatiran Irrigators Association, Group II, AMRIS (San Rafael)

6. Bohol

Mr. M. Yasuo : Team Leader of Japanese Experts, Agricultural Promotion Center Project (APCP)

Mr. Y. Syouzaki : Coordinator of Japanese Experts, APCP

Mr. T. Hidaka : Expert of APCP

Mr. N. Iguchi : Expert of APCP

Mr. T. Tsuboi : Expert of APCP

Mr. Calixto M. Seroje : Provincial Irrigation Engineer

Mr. Bonifacio Betco : Assistant Provincial Irrigation Engineer

7. International Rice Research Institute (IRRI)

Dr. Sadigul I. Bhuiyan : Agricultural Engineer & Head Water Management Department, Water Management Department

Mr. Ignacio C. Manalili : Assistant Design Engineer, Agricultural Machinery Department

Mr. Y. Shimizu : Visiting Research Fellow, Multiple Cropping Department

8. UP Los Baños

Dr. Wilfredo P. David : College of Engineering and Agro-Industrial Technology, Department of Land & Water Resources Engineering and Technology.

9. EMBASSY OF JAPAN

Mr. Y. Nakajo : First Secretary

10. JICA PHILIPPINE OFFICE

Mr. M. Miyamoto : Director

Mr. T. Iwata : Staff

Mr. Y. Okazaki : Staff

APPENDIX B WORK SCHEDULE

DATE	WORK DESCRIPTION
August 20 W	Make presentation to JICA.
21 Th	Make presentation to NIA.
22 F	Make presentation to ADB, Study Questionnaire.
23 Sat	Study the collected information.
24 Sun	do.
25 M	Make presentation to MAF. Discuss at NIA.
26 Tu	Visit CAVITE and make field investigation (overnight Manila).
27 W	Leave Manila for San Rafael and Angat, and make field investigation (overnight San Rafael)
28 Th	Leave San Rafael for Munoz and make field investigation (overnight Cabanatuan City).
29 F	Leave Cabanatuan City for Tarlac and make field investigation (overnight Tarlac).
30 Sat	Study the collected data/information.
31 Sun	Study the collected data/information.
September 1 M	Leave Manila for BOHOL (5:30a.m.) and visit APC.
2 Tu	Study the APC site.
3 W	Leave BOHOL for Manila.
4 Th	Visit IRRI and UP Los Banos.
5 F	Make interim report to EMB, and Discuss at JICA
6 Sat	Study the collected data.
7 Sun	do.
8 M	Collect questionnaire answers.
9 Tu	Study questionnaire answers.
10 W	Discuss with NIA, and Visit ADB.
11 Th	Study questionnaire answers, and Visit MAF.
12 F	Conduct summary work.
13 Sat	do.
14 Sun	do.
15 M	Make summary memorandum
16 Tu	Make presentation of summary memorandum.
17 W	do.
18 Th	Make presentatin to MAF/EMB/JICA.

APPENDIX C. STUDY ACTIVITIES RELATED TO CROP DIVERSIFICATION

1. MAF has studied crop diversification under the title of "technology verification Program on Farm" since 1982. In this program, "Crop Intensification" has been studied. The difference between crop diversification and crop intensification is that the former aims at introduction of only non-rice crops as the second and/or third crop while the latter aims at introduction of not only non-rice crops but also rice for intensification.
2. IRRI has conducted the study of crop diversification under the Multiple Cropping Department since 1972. The department has studied introduction of non-rice crops in development of a farming system based on low land rice for increase of land utilization rate and promotion of employing idle farm laborers in the dry season. The main study items are crop adaptation, variety approach, and component technology, especially tillage methods. Although irrigation method, quantity and period are partly studied as items of component technology, the main items are focused on agronomical aspects.
3. IRRI Water Management Department has studied Upper Pampanga River Integrated Irrigation Systems during the drought of 1983-84 with the items of farmers' and agencies' activities for overcoming the drought. However, such a study has been so seldom conducted that only one applicable research paper can be found within the last five years.
4. The World Bank dispatched a mission for sugarlands diversification study in June/July 1985, consisting of one Economist, one Agricultural Economist, one Agronomist, one Irrigation Engineer and three Consultants. The purpose of this study was to review the present problems of the country's sugar sector and recommend to the Government policies and programs to facilitate and manage the sectoral adjustment process under way. Based on the findings of the

mission, a report was issued on March 6, 1986 called "PHILIPPINES SUGARLANDS DIVERSIFICATION STUDY."

5. The UP Los Banos has studied water requirement of corn, tobacco, beans, vegetables and other crops since 1975 at the university research farm. Further, all hydrological data before 1984 in the Philippines have been collected and compiled by computer.
6. The APC is a Japanese technical assistance project located at Bohol with five years cooperation program starting from February 1983. There are three activities defined for APC including research, training and extension to study and develop the suitable varieties of rice and non-rice crops to Bohol island having various soil types. At present, APC has a main center at Tagbilaran, three experimental fields at Tubigon, Bilar and Ubay and one pilot farm at Carmen. APC has focused on rice although non-rice crops have been studied in the experimental fields, because the productivity of rice in Bohol is still low and no other profitable crops have been found. It was stated that crop diversification should be introduced after establishment of rice cultivation technology, and thus APC has focused on raising the level of rice cultivation technology. Some non-rice crops have been studied to define the growing period in the experimental fields. Although sprinkler irrigation is provided in one field, water requirements have not been studied.

APPENDIX D. CONFERENCE ATTENDANCE

- September 16-17, 1986, at Cavite -

Members of the JICA Survey Team:

- Hideyuki Kanamori - Development Specialist
Institute for International Cooperation, JICA
- Noriaki Shiojiri - Deputy Head, Resources Division
Kinki Regional Bureau, MAFF

NIA-JICA/MAFF (Government of Japan) Staff:

- Yasuhiko Mishima - Sr. Irrigation & Drainage Engineer, JICA
- Osamu Umekawa - Irrigation Engineer/JICA
- Nariaki Tamura - Irrigation Engineer, JICA

NIA Officials:

- Manuel M. Vergel, Jr. - Acting Assistant Administrator
for Systems Operations & Equipment
Management (SOEM)
- Avelino S. Rivera - Department Manager
Project Development Department (PDD)
- Sebastian I. Julian - Department Manager
Systems Management Department (SMD)
- Rolando T. Bonrostro - Regional Irrigation Director
Region 3, (San Rafael, Bulacan)
- Nicasio San Miguel - Regional Irrigation Director
Region 4, (Pila, Laguna)
- Avelino M. Mejia - Department Manager
Institutional Development Department

- Serafin A. Palteng - Project Manager, NISIP
and Acting Program Manager, PDS, SOEM
- Ma. Ines Pinat-Bagadion - Assistant Program Manager, PDS, SOEM
- Teofilo P. de Jesus - Project Manager,
Second Laguna de Bay Irrigation Project
(SLBIP)

- Wilfredo S. Tiangco - Operations Manager
Upper Pampanga River Integrated
Irrigation Systems (UPRIIS)
- Leonardo C. Lucero - Division Manager
Institutional Development Division (IDD),
UPRIIS
- Alexander A. Reuyan - Division Manager
Operations Division, Region 3
- Marcelino Santos - Assistant Irrigation Superintendent
AMRIS (San Rafael)
- Sixto N. Santiago - Division Manager
IDD, Region 3
- Honorio Encarnacion - Irrigation Superintendent
TASMORIS, (Tarlac)
- Juan Raña, Jr. - Assistant Irrigation Superintendent
TASMORIS, (Tarlac)
- Alberto dela Cruz - Irrigation Superintendent
Cavite Friar Lands Irrigation System
- Juanito Barlis - Staff, IDD, SLBIP
- Frank Maunes - Staff, IDD, SLBIP

NIA COUNTERPARTS TO JICA Survey Team

- Dominador D. Pascua - Principal Engineer; Head, Land Use Section,
PDD
- Salvador Salandanan - Division Manager
Research & Development Division (RDD), SMD
- Leo Piczon - Staff, RDD, SMD

16 September 1986

MEMORANDUM (For Discussion Use Only)

SUBJECT : Preliminary Summary of JICA One-month Survey for
Diversified Crops Irrigation Engineering Project (DCIEP)

FROM : JICA One-Month Survey Team for DCIEP

TO : The National Irrigation Administration (NIA)

I. BASIC CONCEPT OF DCIEP ACTIVITIES

A. BACKGROUND

1. A study called "Study on Food Demand and Supply and Related Strategies for Developing Member Countries" (Phase I) was conducted from February 1983 to May 1984 on the technical assistance of the Asian Development Bank (ADB), being undertaken jointly by the International Food Policy Research Institute (IFPRI) and the International Rice Research Institute (IRRI). The study had operational aspects of satisfying future food consumption requirements and of developing suitable approaches and methodologies for use in analysis and determination of optimum strategies for agricultural development. The study used the Philippines as a case study to develop a methodology by which to analyze other countries. The conclusions required that excess irrigation capacity in rice should be shifted to the production of corn, soybean, peanuts, mungbeans, and other non-rice crops by formulating an appropriate "agricultural diversification strategy" for varied regions of the Philippines. The study indicated that approximately 268,000 ha of currently irrigated areas are suitable for corn production based on soil and topographic characteristics.

2. Based on the findings of the Phase I study, the ADB conducted another technical assistance for a Phase II study with two years starting from January 1985. The main objectives of Phase II study are to assist in developing plans to help meet the goals of self-sufficiency in rice and corn, and in diversification of agricultural production in different irrigated and rainfed regions of the Philippines. There are three major components: 1) to provide prescriptions for effective Government pricing policy and intervention in support of agricultural production objectives, 2) to regionalize the findings of the Phase I study to reflect the Philippines' highly variable resource endowments, and 3) to develop a practical technology for irrigation to achieve crop diversification. The ADB again entrusted IFPRI to continue items 1) and 2). The item 3) was undertaken by the International Irrigation Management Institute (IIMI) established in Sri Lanka in May 1983, whose ultimate goal is to enhance independent national competence to improve irrigation performance with special emphasis on irrigation management.

3. IFPRI is going to submit the final report in November 1986, and IIMI is going to submit it in December.

B. IIMI SECOND PHASE STUDY DRAFT

4. The IIMI implementation period was for 22 months, starting in February 1985. Because this period covered only one dry season,

extension of the study as the second phase has been discussed, covering three dry seasons. The second phase is expected to be implemented for 30 months starting from January 1987. The components of the second phase will be mainly same as the first one, focusing primarily on irrigation management for crop diversification with a view to assessing the socio-economic and technical feasibility of varied crop rotations in different soil conditions, particularly the cultivation of irrigated non-rice crops following irrigated wet season rice. The second phase will examine: 1) the constraints to crop diversification; 2) ways in which the management of irrigation can overcome these constraints thereby promoting crop diversification; 3) agronomic and economic management alternatives converting puddled to upland soil condition in producing various crops; 4) assess O & M institution building requirements necessary in developing and managing irrigated crop diversification; 5) assess existing irrigation management for crop diversification technology and its feasibility for adoption. The primary sites will be located at Allah River Irrigation Project and Second Laguna Bay Irrigation Project (including Cavite), and the secondary sites will be located at the Talavera River Irrigation System (near Muñoz), Laoag-Vintar Irrigation System and Tarlac-San Miguel-O'Donnel River Irrigation System.

C. OTHER RELATED STUDY ACTIVITIES TO DIVERSIFICATION

5. Ministry of Agriculture and Food (MAF) has studied crop diversification under the title of "Technology Verification Program on Farm"

since 1982. In this program, "Crop Intensification" has been studied. The difference between crop diversification and crop intensification is that the former aims at introduction of only non-rice crops as the second and/or third crop although the latter aims at introduction of not only non-rice crops but also rice for intensification.

6. IRRI has conducted the study of crop diversification under the Multiple Cropping Department since 1972. The department has studied introduction of non-rice crops in development of farming system based on low land rice for increase of land utilization rate and promotion of employing idle farm laborers in dry season. The main study items are crop adaptation, variety approach, and component technology, especially tillage methods. Although irrigation method, quantity and period are partly studied in the item of component technology, the main items are focused on agronomical aspects.

7. IRRI Water Management Department has studied Upper Pampanga River Integrated Irrigation Systems during the drought of 1983-84 with the items of farmers' and agencies' activities for overcoming the drought. However, such a study has been so seldom conducted that only one applicable research paper can be found within the last five years.

8. The UP Los Baños has studied water requirements of corn, tobacco, beans, vegetables and other crops since 1975 at the university research farm. Further, all hydrological data before 1984 in the Philippines have been collected and compiled with the computer.

D. DISCUSSION REGARDING DCIEP ACTIVITIES

9. Among the formerly described study activities related to crop diversification in the Philippines, the DCIEP has been proposed. In a meeting of the responsible staffs in ADB, IIMI, NIA and our team, possibility of overlap study between the proposed DCIEP study and other studies was discussed. It has been confirmed among the members that the DCIEP's main subject in crop diversification is defined as the study from engineering aspects, i.e. formulation of technology criteria based on research/experimental study results, mainly for secondary level approach and system level approach. However, other studies are from price policy aspects (IFPRI) of farm management level aspects. The secondary approach means to introduce innovative measures into improvement of the existing facilities/land by conducting mainly the secondary canal or higher level civil work. The system level approach means to introduce innovative measures into development of the proposed area to be applicable to crop diversification. Further, the primary purpose of DCIEP has been defined to be technology transfer through the activities of criteria formulation and research/experiment conduction. Therefore, non-existence of overlap in major aspects of study has been clarified.

E. DEFINITION OF DIVERSIFIED CROP IRRIGATION ENGINEERING (DCIE)

10. It has been confirmed that DCIE is defined as a development activity to formulate innovative measures in engineering for improvement

of existing facilities/land on mainly the secondary or higher level, as well as for development of the proposed area in the manner of establishing applicable farm to both rice and non-rice crop production. For the study base of DCIE, research/experimental activities are required in the DCIEP study. Further, all the related study aspects are included in DCIEP study for the secondary definition to complement with other related studies, which include agro-socio-economical aspects, water management aspects and others.

II. DISCUSSION OF THE PROPOSED COOPERATION ACTIVITIES

11. The proposed cooperation objectives are summarized into three subjects, i.e. Diversified Crop Irrigation Study, Technology Criteria Formulation and Diversified Crop Irrigation Training.

A. DIVERSIFIED CROP IRRIGATION STUDY

12. Establishment of Test Farms.
Two test farms including research farm and experimental farm is expected to be established. The first is intended to conduct basic research for formulation of planning/design criteria, and the second is to experiment the suggested planning/design criteria by conducting crop diversification irrigation-farming technology on the designed farm. Thus, the experimental farm is expected to be established after obtaining enough progress of the former research to enable to make conduct the experiment. The results of these research and experimental work bring the base of formulating technology criteria and training modules.

13. Research Farm Study Items and Contents.

On the farm, research of the following items/contents are expected to be conducted for main non-rice crops.

1) Irrigation factors to calculate water requirements: The related items to the figures/factors shown on Figure 1. are studied in this item. For soil moisture characteristics, research activities are conducted on the different regions to study the typical soil type.

2) Irrigation Methodology

The irrigation water distribution coefficient and irrigation efficiency and other factors for the proposed irrigation methods (furrow, border irrigation, etc.) are studied.

3) Optimum Soil Moisture Contents for Crop Growing

The contents are studied for major non-rice crops by preparing test fields having different initial soil moisture suction.

4) Field Condition and Cultivation Methods.

Applicability of various field conditions and cultivation methods for diversified crops irrigation are studied.

5) Climatological Observation.

Observation of temperature, rainfall, sunshine duration, pan evaporation and other related climatological factors are conducted.

14. Experimental Farm Study Items and Contents.

The following experimental activities are expected to be made after obtaining enough progress of the former research to enable commencement of the experiments.

- 1) Soil Survey: profile and soil analysis
(three phases distribution, particle size analysis, etc.)
- 2) Soil moisture survey and observation of changing soil moisture contents.
- 3) Water use survey: measuring and recording irrigation quantity, etc.
- 4) Agronomical survey: fertilizer use insecticide use etc.
- 5) Production survey: growing condition, yield, quality, etc.
- 6) Farm management: gross income, farm expenditure, work hours, O & M expenses, etc.
- 7) Others: marketing research, etc.

B. TECHNOLOGY CRITERIA FORMULATION

15. At present, one design guide and one manual have been compiled for design of civil structures based on USBR Standards and Criteria, i.e. "Design Guides and Criteria for Irrigation Canals, O & M Roads, Drainage Channels and Appurtenant Structures" and "Design Manual for Diversion Dams, Canals, and Canal Structures". For concrete structures, the ACI Code of the US has still been applied.

16. Criteria formulation is conducted through systematic repeats of feedbacks, the NIA conducts feedbacks activities by involving the planners and designers in the implementation/construction of the projects up to completion and operation. Further, feedbacks are provided by construction and O & M staff to the planners and designers through field visits and inter actions. However, feedbacks with experimental work such as hydraulic model experiments has not been conducted, although only large dam structures are examined with the model by entrusting the National Hydraulic Research Center.

17. Practice of DCIE can be completed with various supplemental activities, i.e. installation of water regulation and water conveyance facilities, preparation of O & M plan, system analysis and other activities. For these supplemental items, provision of the related criteria is required to implement the formulated DCIE criteria. However, at present, only two criteria including one design guide and one manual have been provided, and systematical feed back by experimental work, especially hydraulic model experiments, has not yet been conducted. Therefore, provision of the supplemental criteria is expected to be included on this cooperation program. The final decision for adoption of these supplemental activities should be made according to applicable facilities and equipment, budgetary conditions etc.

C. DIVERSIFIED CROP IRRIGATION TRAINING

18. The NIA has kept tremendous experiences for rice irrigation. However, for non-rice crop irrigation, only limited experience has been kept. The designed water requirements for non-rice crops have not been identified to actual figures through research activities.

19. All the training courses are proposed and conducted by the concerned department/office through coordination with the Training and Development Division (T.D. Div.) under the Personnel and Records Management Department. The T.D.div. reviews the submitted proposal, schedules dates for implementation and facilitates administrative support for Training conduct. Then the department/office implement the training. When these procedures are identified with the standard process description shown in Figure 2, it is found that at least two procedures are to be supplemented, i.e. 10) Making Aids and Trial and 13) Evaluation. The reasons why these are not included are due to not enough equipment as well as technology.

20. The proposed activity in DCIEP is development of training modules for DCIE. However, the existing level of non-rice crop irrigation and training course development shows the necessity of supplemental cooperation activities. Before practicing training with the developed DCIE training modules, the related basic knowledge on non-rice crop irrigation is expected to be introduced from Japan's experiences.

Further, reinforcement of existing training is expected to be made by introducing training equipment and technology. The final decision for adoption of these supplemental items in this cooperation program should be made according to available facilities and equipment, budgetary conditions, and others.

III. TEST FARM SITE INVESTIGATION SUMMARY

21. The proposed four places including six sites have been investigated. In the minutes of discussions, the following four items are suggested to be considered for site recommendation:

- 1) Soil texture (Dominant soil type).
- 2) Water resource availability (Availability of water for irrigation).
- 3) Accessibility to the head office (nearness to the head office).
- 4) Convenience availability (existence of an office of NIA in the vicinity for management of the test farm and field office).

In addition to the above, the following items are included in this investigation.

- 5) Land ownership.
- 6) Existing land use.
- 7) Other notable subjects.

Along with these items, the results of investigation are summarized below and in Table 1.

A. CAVITE

22. Proposed Site 1. (in the NIA project office compound)

The total area is 2.5 ha, and the usable area is estimated to be 2 ha.

This site is located in the NIA project office compound.

1) Soil texture: Clay Loam with few fine gravel

2) Water resource availability: New tube well with a pumping facility should be provided.

3) Accessibility to the head office: The distance is 64 km (via the Manila-Cavite coastal road) and about 2 hrs trip is required. The road condition is partly rough.

The area could also be reached via the South Express way, and would take about 1 1/2 hrs to negotiate the 69 km distance (Exit Carmona Interchange).

4) Convenience availability: The NIA compound includes the MAF vegetable training center. One room of the center spacing 4.4 m x 4.4 m = 19.4 sq.m. is proposed for the DCIEP Staff office, and one bed room of the center dormitory is proposed for experts overnight stay.

5) Land ownership: NIA-leased property.

6) Existing land use: The farm has been used by MAF for testing new vegetable varieties. When visited, the farm was in idle time before the next test, and covered with grass.

7) Other notable subjects: The capacity of existing tube well is not enough, and new tube well is suggested to be provided. Further, coordination of DCIEP research activities with the MAF vegetable research will be required.

23. Proposed Site 2. (Farmers' land)

The site is located about 1 km from the project office. There are high-terrace fields. The proposed test farm is said to be selected from the existing fields. Regarding investigation summary, along with the items, except 2), 5) and 6), all other conditions are same as the proposed Site 1. The 2), 5) and 6) are described below.

2) Water resource availability: Water can be drawn from the irrigation canal.

5) Land Ownership: Existing fields are farmers' private land, and it has been reported that they are willing to lend their farms for DCIEP with rent.

6) Existing land use: In wet season rice is cultivated, and in dry season vegetable growing is partly conducted.

B. SAN RAFAEL

23. Proposed Site 1 (beside the National Training Center)

The proposed site is located at only 140 m from the National training center, and 6 km from the Region III office. The test farm size is said to be selected from the existing 10 ha area.

- 1) Soil texture: Silty Clay Loam
- 2) Water resource availability: The site is located along the north main canal of Angat and Maasim Rivers Irrigation System, and thus, it is easy to draw water from the canal by pumping. The deep main canal brings another benefit into drainage condition by lowering ground water table.
Further a new main canal for the area has been proposed to supply water by gravity.
- 3) Accessibility to the head office:
The site is 51 km from NIA-Quezon City Head office, and could be reached in 1 hr trip on good road. The distance to Muñoz is about 100 km.
- 4) Convenience availability:
A vacant research station building with about 80 sq.m. floor area (8.5 m x 9.5 m) is proposed as office. This is 8 km from the site.
The guest room is only 140 m from the site.
- 5) Land ownership: The area is owned by several farmers, and cultivated by many tenants.
- 6) Existing land use: High land area including about 3 ha is planted to okra, eggplants, pumpkin and others, although remaining low land area of about 7 ha is planted to rice.
- 7) Other notable subjects: The soil condition and drainage condition are very suited for test farm. However, willingness of owners and tenants to lease their land have not yet been checked.

24. Proposed Site 2. (Mr. Villangca 's farm)

The proposed farm having 9 ha is owned by one farmer called Mr. Villangca. The farm and the upper several farms form one block surrounded with a national road and an un-used railway bank line. The whole block with a total area of 19 ha has finally been recommended because it is independent upon outside water level and easy to control the inside water supply. The site location is 2 km from the NIA Region III office.

1) Soil texture: Clay Loam.

2) Water resource availability: Irrigation water is drawn from the main canal by pumping (Buenavista Pump).

3) Accessibility to the head office: The distance is 51 km and about 1 hr trip is required. The road condition is totally good. The distance to Muñoz is about 100 km.

4) Convenience availability: A vacant research station building spacing $8.5 \text{ m} \times 9.5 \text{ m} = 80.7 \text{ sq. m.}$ is proposed for the site office, which is located only 500 m from the site. A guest room of the National training center located 8 km from the site is proposed for experts' overnight stay.

5) Land Ownership: All fields in the site are farmers' private land.

6) Existing land use: All area of 19 ha is cultivated to rice in both dry and wet seasons. However, the irrigators association in charge of these area has decided to introduce corn and peanuts in dry season because of the expensive water fee.

7) Other notable subjects: The independency of the site upon outside water level can ease inside water control. The location along the national road will bring high demonstration. However, the landowners' agreement for leasing except Mr. Villangca's agreement, has not yet been checked.

C. MUÑOZ

25. The site having about 3 ha is located beside the compound of the Soil and Water Laboratory and Water Management Training Center, facing to the Central Luzon State University (CLSU).

1) Soil texture: Clay Loam for the surface layer, and Clay or Heavy Clay for the lower layer.

2) Water resource availability: Water is supplied from the canal by gravity.

3) Accessibility to the head office:

The distance 151 km and about 3 hrs trip is required. The road condition is partly rough.

4) Convenience availability: A vacant room of the ADD Building where the SWL is located or the training center is proposed for the site office, and a bed room of the training center dormitory is proposed for experts' overnight stay.

5) Land Ownership: The land is owned by CLSU for the research farm, and formerly NIA used it for studying seed production and water management.

- 6) Existing Land Use: The site is planted to rice.
- 7) Other notable subjects: The clayey soil will bring drainage difficulty for non-rice crop growing.

D. TARLAC

26. The farm sites are said to be selected from the existing 100 ha area. The location is 10 km from the TASMORIS office.

- 1) Soil texture: Silty Clay Loam to Silty Clay.
- 2) Water resource availability: Gravity water and three pumping facilities are available. Because of the gravity water deficit in dry season, supplemental ground water supply is necessary. However, the expensiveness of pump operation costs has stopped operating pumps.
- 3) Accessibility to the head office.

When surveyed, we went along the national road and spent 3-4 hrs for about 150 km. However, it is said that with highway road (direct Quezon City to Tarlac via North Expressway, exit Dau, Pampanga) it will take about 1 1/2 hrs. The distance to Muñoz is 61 km. (via Guimba-Baloc road).

- 4) Convenience availability: One vacant room of the former TISIP project office is proposed for the site office, spacing 11.5 m x 6. m = 69. sq.m. An official residence beside the project office is proposed for experts' overnight stay. Both are 10 km far from the site.
- 5) Land Ownership: The total of 37 farmers own the 100 ha. It has been reported that 36 farmers are amenable to the lease agreement proposal.

- 6) Existing land use: Rice is planted in wet season, and non-rice crops (yellow corn and vegetables) are partly planted in dry season.
- 7) Other notable subjects: According to the report, about 94% of the total respondents are in favor of the lump sum payment for five year leasing arrangement. Further, it should be considered that water may be irrigated over the whole continuous area to ease neighborhood farmers' local sense when water is irrigated into the test farm site.

E. RECOMMENDATION

27. All the proposed sites have potential for recommendation. However, some difficulties bring very limited number of site recommendation for the initial stage of project implementation. For the results of site investigation and of analysis with the suggested research and experimental items and contents in Chapter II, San Rafael's two sites are recommended for the suited sites. The site 1 is recommendable for the research farm. And Site 2 is for the experimental farm. The reasons are shown below.

- 1) For the Site 1. The soil texture and drainage condition are very suited to conduct various basic research activities. Further stable water resource and easiness of water control can be obtained with the large and deep main canal.
- 2) For the Site 2, the independence upon outside water level influence with the surrounding road and railway banks line can ease control of inside water supply. Further, high demonstration effectiveness is expected being located along the national road.

- 3) The accessibility to the head office is high; the distance to the NIA central office is minimum among the proposed sites and road condition is good.
- 4) These sites are relatively near to the Soils and water laboratory in Muñoz.
- 5) An independent office, the research office building can be used.
- 6) The two sites can be applied for the research farm and experimental farm respectively, and these are managed by one site office.

28. However, when supplemental study activities are required according to the progress of DCIEP study, Cavite, Muñoz and Tarlac will be recommended for the high potential sites.

IV. DISCUSSION OF IMPLEMENTATION STRUCTURE

29. The proposed organization chart of DCIEP is shown in Figure 3. More discussions will be required for the final draft.

Table 1. TEST FARM SITE INVESTIGATION SUMMARY

ITEM	PLACE	CAVITE		SAN RAFAEL		MUÑOZ	TARLAC
		SITE 1	SITE 2	SITE 1	SITE 2		
1. SOIL TEXTURE		C.L. (few fine Gravel)	C.L.	S.C.L	C.L	C.L. & C or H.C	S.C.L. to S.C.
2. WATER RESOURCE AVAILABILITY		Tube well	Irrigation Canal	The North Main Canal	Irrigation Canal	Irrigation Canal	Canal & Pump
3. ACCESSIBILITY		64 km to N 164 km to M		51 km to N 100 km to M		151 Km to N	150 km to N 61 km to M
4. CONVENIENCE		MAF Training Center & Dormitory		Research Station Building National Training Center		Labo. or/and Training Center	Project Office & Official Residence
5. LAND OWNERSHIP		NIA	Farmers	Farmers	Farmers (many tenants)	CLSU	Farmers
6. EXISTING LAND USE		MAF Research	Rice Vegetables	Rice Vegetables	Rice	Rice	Rice, corn & Vegetables
7. OTHER NOTABLE SUBJECTS		1) New tube well 2) MAF Research	High Terrace Fields	Good Soil No Lease R.	Easy W.C. No Lease R	Drainage Difficulty	Lump Sum payment whole water supply

NOTE: N - NIA Central Office, M - Muñoz, R - Report, W.C. - Water Control

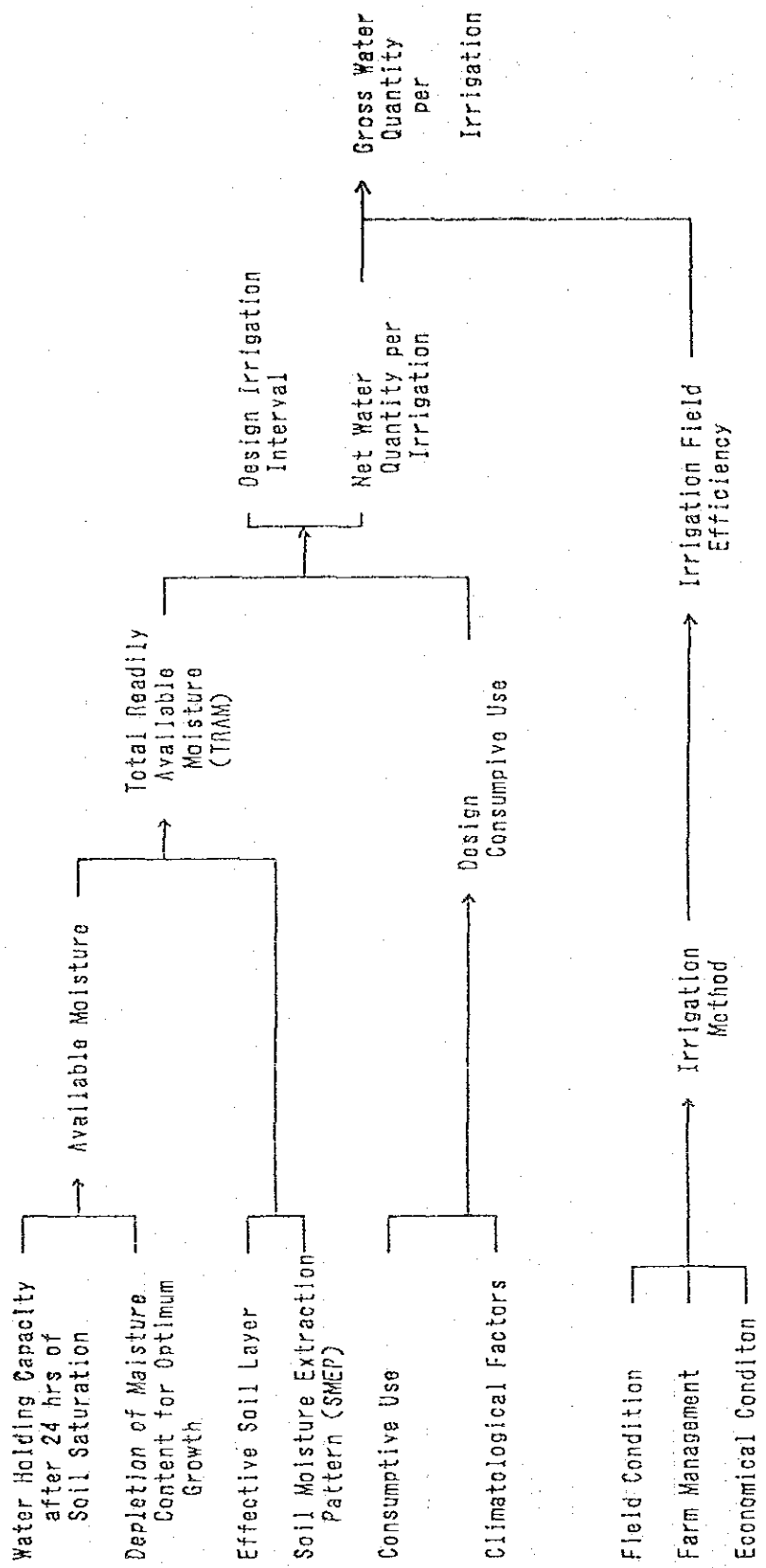


Figure 1. Calculation Flow of Field Irrigation Water Requirements

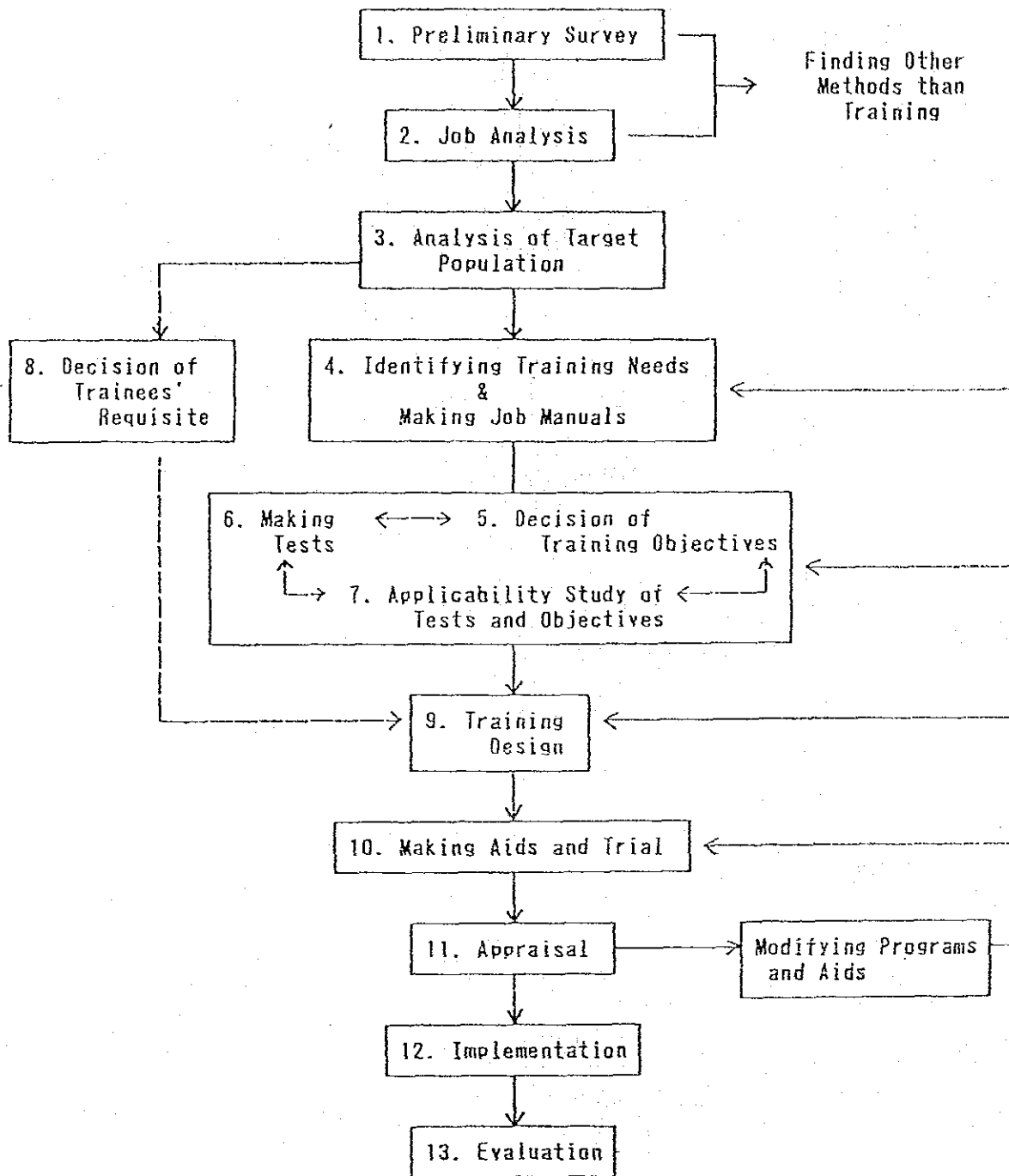


Figure 2 Process of Developing Training Modules

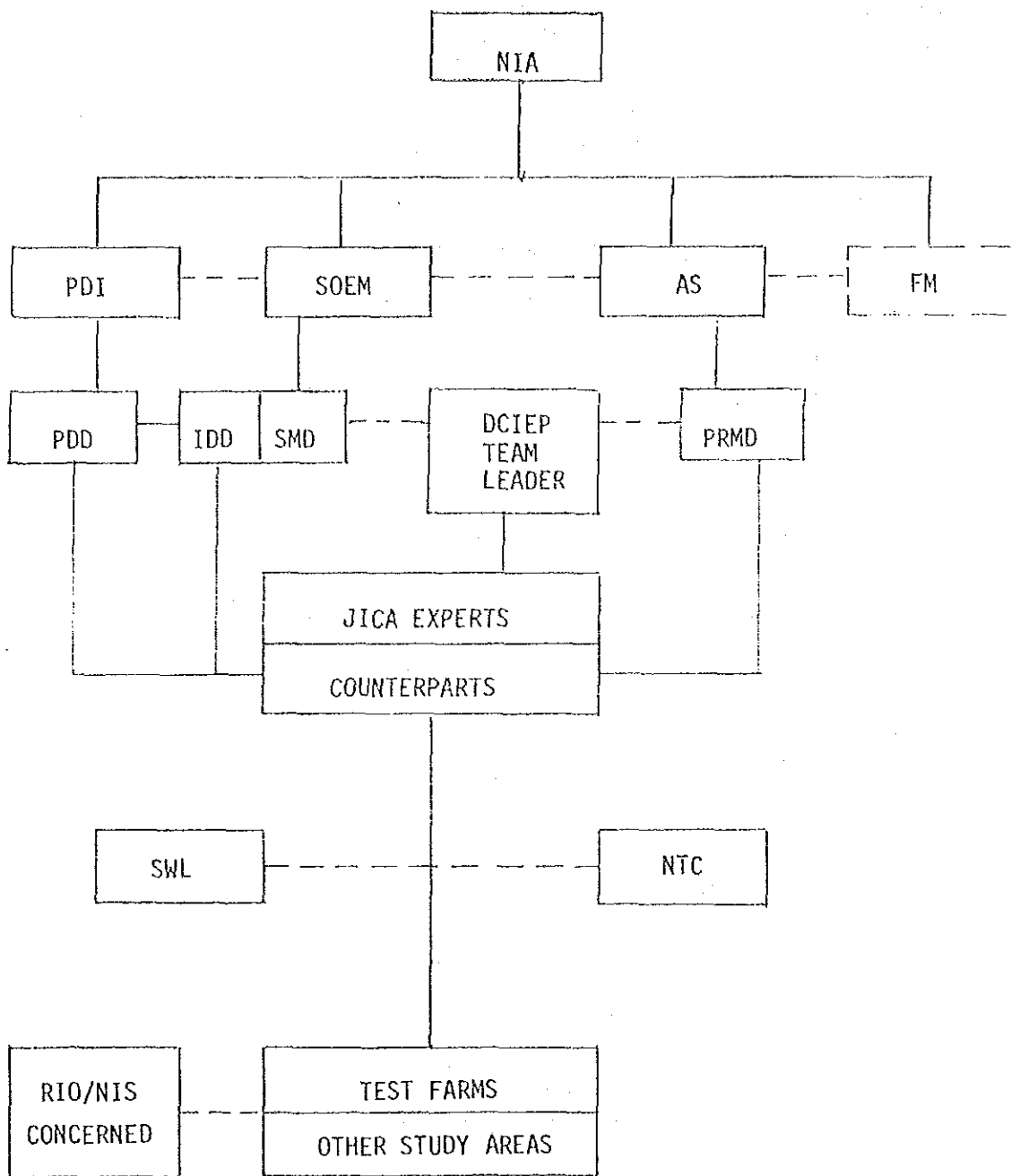


Figure 3 Organization Chart
 DIVERSIFIED CROPS IRRIGATION ENGINEERING PROJECT

ATTENDANCE : September 16-17, 1986

List of Officials present during the final presentation
and discussions of the results of the one-month survey for DCIEP

Members of the JICA Survey Team:

- | | |
|-------------------|---|
| Hideyuki Kanamori | - Development Specialist
Institute for International Cooperation, JICA |
| Noriaki Shiojiri | - Deputy Head, Resources Division
Kinki Regional Bureau, MAFF |

NIA-JICA/MAFF (Government of Japan) Staff:

- | | |
|------------------|--|
| Yasuhiko Mishima | - Sr. Irrigation & Drainage Engineer, JICA |
| Osamu Umekawa | - Irrigation Engineer/JICA |
| Nariaki Tamura | - Irrigation Engineer, JICA |

NIA Officials:

- | | |
|-----------------------|---|
| Manuel M. Vergel, Jr. | - Acting Assistant Administrator
for Systems Operations & Equipment
Management (SOEM) |
| Avelino S. Rivera | - Department Manager
Project Development Department (PDD) |
| Sebastian I. Julian | - Department Manager
Systems Management Department (SMD) |
| Rolando T. Bonrostro | - Regional Irrigation Director
Region 3, (San Rafael, Bulacan) |
| Nicasio San Miguel | - Regional Irrigation Director
Region 4, (Pila, Laguna) |
| Avelino M. Mejia | - Department Manager
Institutional Development Department |

- Serafin A. Palteng - Project Manager, NISIP and Acting Program Manager, PDS, SOEM
- Ma. Ines Pinat-Bagadion - Assistant Program Manager, PDS, SOEM
- Teofilo P. de Jesus - Project Manager, Second Laguna de Bay Irrigation Project (SLBIP)
- Wilfredo S. Tiangco - Operations Manager Upper Pampanga River Integrated Irrigation Systems (UPRIIS)
- Leonardo C. Lucero - Division Manager Institutional Development Division (IDD), UPRIIS
- Alexander A. Reuyan - Division Manager Operations Division, Region 3
- Marcelino Santos - Assistant Irrigation Superintendent AMRIS (San Rafael)
- Sixto N. Santiago - Division Manager IDD, Region 3
- Honorio Encarnacion - Irrigation Superintendent TASMORIS, (Tarlac)
- Juan Raña, Jr. - Assistant Irrigation Superintendent TASMORIS, (Tarlac)
- Alberto dela Cruz - Irrigation Superintendent Cavite Friar Lands Irrigation System
- Juanito Barlis - Staff, IDD, SLBIP
- Frank Maunes - Staff, IDD, SLBIP

NIA COUNTERPARTS TO JICA Survey Team

- Dominador D. Pascua - Principal Engineer; Head, Land Use Section, PDD
- Salvador Salandanan - Division Manager Research & Development Division (RDD), SMD
- Leo Piczon - Staff, RDD, SMD

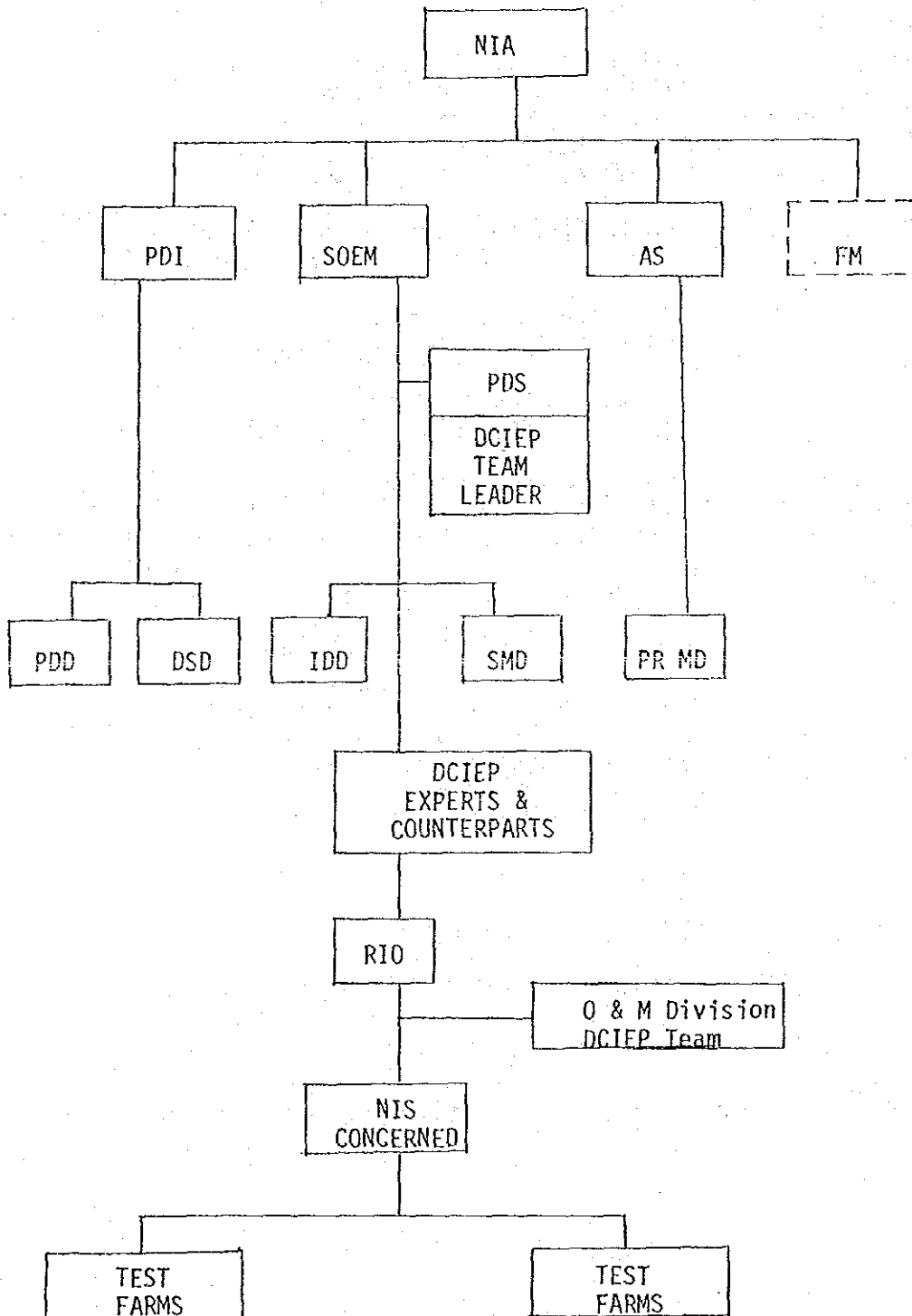
COMMENTS/SUGGESTIONS:

The following is a summary of the group's reactions during the discussions.

1. On the establishment of test farms, the following criteria should also be considered:
 - a) The sites should represent the different soil types/texture, hence the need to establish as many sites as the number of major soil types/texture.
 - b) The need of the system like UPRIIS where crops other than rice should be introduced during the dry season to increase the area irrigated. In the case of TASMORIS, it has very limited water supply that it could serve only about 9,000 ha during the WS and 2,000 ha during the DS out of the potential service area of 14,000 ha.
 - c) The on-going programs in the projects/systems like SLBIP (CFLIS) where the vegetable component need to be complemented by the DCIEP project.
2. It was recommended that test farm be established in SLBIP/CFLIS (Cavite) and TASMORIS (Tarlac).
3. If AMRIS (San Rafael) test farms are definitely chosen for the initial phase, the second or succeeding phases of the study should consider other sites in establishing similar test farms.

4. TASMORIS (Tarlac) was strongly recommended for the establishment of the test farms. The following justifications were brought up:
 - a) That the problem of lump sum payment for lease on farmers' field could be solved and necessary arrangements with the farmers regarding the use of their farms as test sites could be negotiated.
 - b) TASMORIS has a very low irrigated cropping intensity of only 90 percent.
 - c) Potentials for crop other than rice is great, especially with the implementation of Balog-Balog Multipurpose Project which would irrigate 39,200 ha.
 - d) A building with 200 sq. m. floor area which was intended to be used as a Quality Control Laboratory (constructed during the implementation of TISIP) could be used as an office for the DCIEP.
 - e) TASMORIS would be interconnected with the Magat Flood Forecasting, Telecommunication System "Hot Line", hence no problem in communicating with NIA-Q.C. Head Office.
5. Some changes in the Project organization chart;
 - a) Involve the Designs and Specification Department (DSD),
 - b) The revised organization chart is shown in Attachment 3.

ORGANIZATION CHART
DIVERSIFIED CROPS IRRIGATION ENGINEERING PROJECT



ACRONYMS

NIA	- National Irrigation Administration (Office of the Administrator)
PDI	- Project Development and Implementation (Office of the Assistant Administrator)
SOEM	- Systems Operation and Equipment Management (Office of the Assistant Administrator)
AS	- Administrative Services (Office of the Assistant Administrator)
FM	- Finance and Management (Office of the Assistant Administrator)
PDS	- Program Development Staff
DCIEP	- Diversified Crops Irrigation Engineering Project
PDD	- Project Development Department
DSD	- Designs and Specifications Department
IDD	- Institutional Development Department
SMD	- Systems Management Department
PRMD	- Personnel and Records Management Department
RIO	- Regional Irrigation Office
O & M	- Operation and Maintenance
NIS	- National Irrigation System Office

附属資料② 収集資料一覧表

収集資料一覧表

COLLECTED REFERENCES

NIA

1. MANAGEMENT BRIEF, Questionnaire answer results of Tarlac site. (6 pages)
2. Munoz level surveying result. (2 pages)
3. ANNUAL REPORT OF IRRIGATION AND BENEFITED AREAS CALENDAR YEAR 1985 (Computer print out)
4. "Annex A: BASELINE SURVEY FORM ON FMS" Monitoring papers for farmer training. (2 pages)
5. "EVALUATION FOR SEMINAR PROGRAM FOR NIA" Form of trainees' evaluation sheets. (3 pages)
6. BASIC INFORMATION, Pamphlet of NIA. (8 pages)
7. ANNUAL REPORT '85. (36 pages)
8. Communal Irrigation Development Project, Pamphlet of NIA. (6 pages)
9. PRIMER ON COMMUNAL IRRIGATION SYSTEM STRUCTURES, Pamphlet for farmers. (32 pages)
10. "nia digest" Quarterly publication by NIA.
11. TRAINING CALENDAR, CALENDAR YEAR 1986
12. サン・ラファエル借地同意書写し -Mr. BOB CASTRO (サイトー1)
-Mr. IRONEO S. VILLANGCA (サイトー2)

MAF

13. GUIDELINES IN CONDUCTING TECHNOLOGY VERIFICATION TRIALS ON FARMERS' FIELDS, First Edition, 1985, AGRICULTURAL RESEARCH OFFICE, MAF (121 pages)
14. SHORT-TERM RECOVERY PLAN FOR THE RURAL SECTOR, 14, May 1986 (14 pages)
15. LONG-TERM POLICY AGENDA FOR THE AGRICULTURAL SECTOR, June 1986. (46 pages)

ADB

16. REVIEW OF BANK OPERATIONS IN THE IRRIGATION SECTOR 1966-1985, March 1986. (76 pages)
17. TECHNICAL ASSISTANCE FOR A STUDY OF FOOD DEMAND AND SUPPLY AND RELATED STRATEGIES FOR DEVELOPING MEMBER COUNTRIES (PHASE II), October 1984. (27 pages)

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IIRI

19. A. SYARIFUDDIN AND H.G.ZANDSTRA. "SOIL FERTILITY, TILLAGE, AND MULCHING EFFECTS ON RAINFED MAIZE GROWN AFTER RICE" IRRIGATION RESEARCH PAPER SERIES NUMBER 66. SEPTEMBER 1981.
20. R.A.MORRIS, H.C.GINES, and R.O.TORRES. "CROPPING SYSTEMS RESEARCH IN THE PANGASINAN PROJECT" IRRI RESEARCH PAPER SERIES Number 92. August 1983.
21. "Rice Machinery Development" The International Rice Research Institute.

BOHOL AGRICULTURAL PROMOTION CENTER (APC)

22. "PAST, PRESENT AND FUTURE PROBLEMS ON BOHOL AGRICULTURE" AGRICULTURAL PROMOTION CENTER, Tagbilaran City Bohol.
23. BOHOL APC TECHNICAL NEWS. VOLUME 1. OCTOBER-DECEMBER 1985.
24. do. VOL.1, NO.2.
25. do. No. 3.

收集図面一覧表

LIST OF THE COLLECTED DRAWINGS

CAVITE

1. CAVITE FIAR LANDS IRRIGATION SYSTEM showing location of the proposed farm sites and the office.
2. SITE DEVELOPMENT PLAN - PROJECT FACILITIES - showing area of the proposed farm site 1.
3. ADMISISTRATION BUILDING showing the projct office building.
4. DORMITORY one of whose rooms is proposed for the experts' overnight stay.
5. TRAINING CENTER one of whose roomes is proposed for the site office of our project.

SAN RAFAEL

1. OFFICE BUILDING - GROUND FLOOR PLAN - showing NIA office building floor plan.
2. OFFICE BUILDING - SECOND FLOOR PLAN - showing NIA office building foor plan.
3. SEMINAR BUILDING of the national training center, whose secretalist room being used as the library at present is proposed for the site office of our project, and one of the whose bed room is proposed for the experts' overnight stay.
4. WORKING STA.6 DIVISION-A showing are of the proposed test farm site 1.
5. COMPACT FARM LAYOUT showing details of the water intake for the proposed site 1.
6. LAYOUT OF SAN RAFAEL TUMANA showing layout of the proposed site 2.
7. AREA COVERED BY WORKING STATION NO.6 PINACPINACAN SN.RAFAEL.
8. LAYOUT OF SAN RAFAEL TUMANA WATER TURBINE PUMP IRRIG. PROJECT.

TARLAC

1. FLOOR PLAN OF ADMINISTRATIVE BUILDING of the former project office buliding, whose ENGINEERING DIV. room is proposed for the site office of our project.
2. TARRIS PILOT DEMONSTRATION FRAM showing area of the proposed test farm site.
3. TOPO-SURVEY FOR JICA.

REGION III TRAINING CENTER

1. PROPOSED DEVELOPMENT SITE .
2. PLAN AND DETAILS.
3. SCHED, OF DOORS & WDW. AND DETAILS.
4. PLANS, ELEVATIONS & DETAILS.

附属資料③

NIAの社会経済条件調査シート例

Form 2a (Farm Household Only)

AGLANAO, ZOLA
GABUYAN KAPALONG

*CONTROL PPM
M-0200*

Office for Operations
NATIONAL IRRIGATION ADMINISTRATION
Irrigators Assistance Department

PROJECT BENEFIT MONITORING SYSTEMS
Agro-Socio-Economic Survey

Davao - 3 Irrigation Project

Project Code _____ 1 _____

Schedule No. _____

Household Serial No. _____

Address GABUYAN KAPALONG
House No., Name of Street/Sitio

Sample Class _____

City Dist./Poblacion/Barangay GABUYAN

Province Davao del Norte

Raising Factor _____

C E R T I F I C A T I O N

I hereby certify that the data set forth hereon are obtained/reviewed by me personally and in accordance with instruction.

Nov 1981
Date Accomplished

[Signature]
Signature of Enumerator

Date Reviewed

Signature of Supervisor

*CONTRAL PAPA
M-COCO*

Office for Operations
NATIONAL IRRIGATION ADMINISTRATION
Irrigators Assistance Department

PROJECT BENEFIT MONITORING SYSTEMS
Agro-Socio-Economic Survey

Davao 3 Irrigation Project

Project Code	_____	1
Schedule No.	_____	<input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="0"/>
Household Serial No.	_____	<input type="text" value="2"/> <input type="text" value="0"/> <input type="text" value="7"/>
Address	<u>CABUYAN, KAPALONG</u>	<input type="text" value="7"/> <input type="text" value="0"/> <input type="text" value="6"/>
	House No., Name of Street/Sitio	
Sample Class	_____	<input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="1"/>
City Dist./Poblacion/Barangay	<u>CABUYAN</u>	<input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="0"/> <input type="text" value="5"/>
Province	<u>Davao del Norte</u>	<input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="1"/>
Raising Factor	_____	<input type="text" value=""/> <input type="text" value=""/> <input type="text" value=""/> <input type="text" value=""/> <input type="text" value=""/>

CERTIFICATION

I hereby certify that the data set forth hereon are obtained/reviewed by me personally and in accordance with instruction.

Nov 1981
Date Accomplished

[Signature]
Signature of Enumerator

Date Reviewed

Signature of Supervisor

I. DEMOGRAPHIC CHARACTERISTICS

A. The Household Head/ Farm Operator: 1. Name AGLAWAO DOLORA
 2. If farm operator, what is the tenure status? (Check box)
 a. Present - Since what year? 1966
 () Full owner () Part owner () Lessee () Amortizing owner
 () Share tenant () Others (Specify)
 b. Previous: () Full owner () Part owner () Lessee () Amortizing owner
 () Share tenant () Others (Specify)

3. Years in farming (17)
 4. Years operating present farm (15)
 5. Years in present residence (15)
 6. Previous residence (if any) (1)
 7. Ethnic group (2)

B. The Household

SN	Names of Household Member	Relationship to Head (enter code)	Sex M F	Marital Status (enter code)	Educational Attainment (enter code)	Occupation		Man-days during survey period devoted to Farming Activities			Non-farming Activities			Status of worker		
						Main	Secondary	Own farm	Other farm	Main occupation Do not fill in (12)	Secondary Occupation fill in (13)	Others (14)	Others of worker (15)		Status of worker (17)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(01)	AGLAWAO, DOLORA	(02)	(45)	(2)	(03)	(14)	(1)		(290)							(1)
(02)	" WELHELMIA	(04)	(25)	(2)	(01)	(24)	(9)									(1)
03																
04																
05																
06																
07																
08																
10																

Codes for relationship to head (column 3)	Codes for marital status (col. 6)	Codes for educational attainment (col. 7)	Codes for status of worker (col. 17)
01 - head 02 - wife/spouse 03 - son 04 - daughter 05 - mother-in-law 06 - daughter-in-law 07 - grandson 08 - granddaughter 09 - father 10 - mother 11 - other relatives 12 - boarder 13 - domestic help, etc.	01 - single 02 - married 03 - widow/ex 04 - Div./Sep. 05 - unknown	01 - No grade comp. Elementary 11 - grade 1 12 - grade 2 13 - grade 3 14 - grade 4 15 - grade 5 16 - grade 6 21 - 1st yr. 22 - 2nd yr. 23 - 3rd yr. 24 - 4th yr. College 31 - 1st year 32 - 2nd yr.	1 - Permanent 2 - Temporary 3 - Different employer 4 - day to day, week to week basis

II. FARM AND ITS PRODUCTION

A. Farm Area, Ownership, Location and Land Use.

Land Use (1)	Area and Ownership						Area & Location		
	Originally Owned (2)	Owned under LRP 1/ (3)	Amortized (4)	Leased Rented (5)	Share Tenant-ed (6)	Total (7)	Inside Service Area		Outside Service Area (10)
							Inside own Brgy. (8)	Outside own Brgy. (9)	
A. Cropland									
01. Temporary crops									
02. Permanent crops	2.00					2.00	2.00		
B. Area lying idle									
03. Temporary fallow									
04. Permanent pasture									
05. Permanent pasture									
06. Productive water area									
C. Forest Land									
07. Original forest									
08. Second growth forest									
D. All Other land									
09. Farmstead									
10. Roads, canals, etc.									
12 Total	2.00					2.00	2.00		

B. Irrigated area and Source of Water Supply

Source of water supply	Area Planted to								
	Rice		a		b		c		
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	
1. NIA									
a. Area irrigated(ha)	-								
b. % to total area	-								
2. Communal									
a. Area irrigated(ha)	-								
b. % to total area	-								
3. Private									
a. Area irrigated(ha)	-								
b. % to total area	-								
4. Total									
a. Area irrigated(ha)	-								
b. % to total area	-								

C. Crop Area and Production

Item	Rice					Other Crops			
	Irrigated		Rainfed		Up-land	Corn	a. (300) Coconut	b.	c.
	Wet Season	Dry Season	Wet Season	Dry Season					
1. Area planted							(2.00)		
2. Area harvested							(2.00)		
3. Reason if area not equal ^{1/}							(0)		
4. Total production (kgm)									
a. Actual							(500)		
b. Normal							(1000)		
5. Reason if prod. not equal ^{2/}							(16)		

1/ Codes for Item 3

(Change in area planted and area harvested)

- 1 - Tungro infestation
- 2 - Insect infestation
- 3 - Rat infestation
- 4 - Flood
- 5 - Plants still young
- 6 - Others (specify)

2/ Codes for Item 5

(Production increase from normal)

- 01 - Optimum & timely use of fertilizer
- 02 - Prevention and early control of pest & disease
- 03 - Adequate irrigation and drainage facilities
- 04 - Good weather
- 05 - Timely weeding practices
- 06 - Others (specify)

(Production decrease from normal)

- 11 - Lack of irrigation water
- 12 - Drainage problem
- 13 - tungro infestation
- 14 - Insect infestation
- 15 - Rat infestation
- 16 - Others (specify)

D. Disposal of Actual Production

Items	Rice					Other Crops			
	Irrigated		Rainfed		Up-land	Corn	a. (300) Coconut	b.	c.
	Wet	Dry	Wet	Dry					
1. Sold/to be sold (kgm)							(500)		
2. Value (P)							(350.00)		
3. Shared to landowner (kgm)									
4. Value (P)									
5. Household Use (kgm)									
6. Value (P)									
7. Paid to creditors (kgm)									
8. Value (P)									
9. Used for feeds (kgm)									
10. Value (P)									
11. Used for seeds (kgm)									
12. Value (P)									
13. Shared to Har. & Thres. (kgm)									
14. Value									
15. others (kgm)									
16. Value (P)									

E. Marketing of Products

Items	Product/Crops						
	Rice		a. Corn	b. <u>Wheat</u>	c.	d.	e.
	Wet	Dry					
1. Quantity sold (kgm)				(30)			
2. Price received per kilo (P)				(170)			
3. Month sold (01 to 12)				(10)			
4. Outlet ^{1/}				(5)			
5. Transportation cost (P)				-			
6. Mode of transportation ^{2/}				(3)			
7. Who pays transportation cost ^{3/}				(4)			
8. Mode of payment ^{4/}				-			
9. Price level in project area ^{5/}				(3)			
10. Give reason if price is lower than prevailing ^{6/}				(2)			
11. Market place ^{7/}				(3)			
12. Reason for choice of market ^{8/}				(4)			
13. Distance of market from farm				(1.00)			

1/ Outlet	2/ Mode of Transportation	3/ Who pays transportation cost	4/ Mode of payment	5/ Price Level
1. NGA	1. Man	1. farmer	1. cash	1. higher than prevailing
2. Cooperative	2. animal	2. wholesaler	2. installment	2. same as prevailing
3. Wholesaler	3. jeep/truck	3. retailer	3. others	3. lower than prevailing
4. Retailer	4. others	4. consumer		
5. consumer		5. NGA		
6. Others (specify)	6/ Reason for lower price	6. Others	7/ Market place	8/ Reason for choice of market
	1. High moisture content		1. farm	1. accessibility
	2. over supply		2. barrio	2. higher price
	3. others (specify)		3. town	3. cash payment
			4. others	4. regular buyer
				5. others

F. Acquisition and Use of Farm Credit

Items	Rural Bank	PNB	ACA	DBP	Land Bank	Cooperative	Landlord	Relatives/friends	Others
1. Purpose ^{1/}	-								
2. Amount applied (P)	-								
3. Date applied	-								
4. Amount granted (P)	-								
5. Date granted	-								
6. Amount repaid ^{2/} (P)	-								
7. Date repaid	-								
8. Outstanding balance	-								
9. When to pay	-								

- 1/ Codes for purpose
1. M-99
 2. M-17
 3. Farm improvement
 4. Purchase of farm power
 5. Home consumption
 6. Others (specify)

- 2/ Codes for reasons if not repaid
1. Low harvest
 2. No harvest
 3. No payment of sold palay
 4. Others (specify)

III. AVAILABLE EXTENSION SERVICES, PARTICIPATION IN GOVERNMENT PROGRAMS AND OTHER ORGANIZATIONS AND SOURCES OF INFORMATION

A. Are there Production Technicians available in the area?

Yes No If yes, accomplish the following:

I t e m	A g e n c y				
	BAEx	BPI	NIA	DAR	Others
No. of Representatives					
Frequency of visit ^{1/}					
Dry Season					
Wet Season					
Services rendered ^{2/}					
Receptiveness to advice ^{3/}					

1/ Frequency of visit

1. once per season
2. twice per season
3. 3 to 5 times
4. monthly
5. twice a week
6. weekly
7. daily
8. others _____

2/ Services Rendered

1. assist in the preparation of farm plan and budget
2. Teach improved cultural practices
3. conducts training
4. helps in controlling pests
5. distribute seeds to farmers
6. Teach proper water mgt. practices
7. Solve agrarian problems
8. Organize irrigators group
9. others _____

3/ Receptiveness to advice

1. Always follow: why _____
2. Sometimes follow: why _____
3. Never follow: why _____

B. What are your other sources of information on improved farming?

- 1 1. radio programs _____ 3. Agricultural Journal _____
 2. Newspapers _____ 4. Others (specify) _____

C. Do you buy publications? Yes No

If yes, check publication bought and indicate frequency of buying

1. Newspapers _____
2. Magazine _____
3. Komicks _____
4. Journal _____
5. Others (specify) _____

D. Participation in Government Program & Other Community Organization

Item	Program/Organization					
	Ms 99	Ms 55				
Date Joined						
Reason for joining ^{1/}						
Attendance in meeting ^{2/}						
Activities ^{3/}						

1/ Reasons for joining

1. Required
2. Benefit offered
3. CB Power group
4. Loaning advantages
5. Others

2/ Attendance in meeting

1. Regular
2. Irregular
3. Never
4. Others _____

3/ Activities

1. Seminar training
2. Farmer classes
3. Demo on farm practices
4. Others _____

IV. FAMILY INCOME FROM OTHER SOURCES

Sources	Gross Income	Expenses incurred	Annual Net Income
1. Income derived as farm laborers by the farmers and other family members			
2. Income from hiring out of work animals to other persons			
3. Income from hiring out of machinery, equipment, etc. to other persons			
4. Income from land and building rented to other persons			
5. Income from handicraft and other economic activities			
6. Earnings on money loaned to others and others investment			
7. Earnings from employment			
8. Gifts, pensions, etc. received from different sources.			

V. FAMILY LIVING EXPENSES AND SAVINGS

A. Expenses (in pesos)

Item (1)	Per Week (2)	Per Month (3)	Per Year (4)
1. Food			
a. cereals			1663.00
b. fruits			267.00
c. vegetables			1652.00
d. roots, bulbs, tubers			2187.00
e. meat			1056.00
f. eggs			277.00
g. seafoods			960.00
h. dairy products			147.00
i. other items			
j. food consumed outside the house			
2. Clothing, personal effects			500.00
3. Medical care			200.00
4. Education			
a. college			
b. high school			
c. elementary			
5. Personal Services ^{1/}			50.00
6. Household Operation ^{2/}			300.00
6. Rent and/or repairs of house and household fixture ^{3/}			
8. Tobacco/cigarette and alcoholic drinks			
9. Transportation & communication			300.00
10. Recreation			300.00
11. Miscellaneous ^{4/}			200.00
TOTAL			10057.00

1/ Includes haircut, manicure, etc.

2/ Includes detergent, toiletries, floor wax, gas, fire wood, water, etc.

3/ Includes rent, repair and operation and maintenance of house, furnitures and appliances.

4/ All other expenses not classified above.

B. Savings for the year (Not to be filled in by enumerators)

Items (1)	Value (P) (2)
1. Farm Total Production (Gross Farm Product)	1950
2. Farm Intermediate Consumption	123
3. Farm Gross Product at Market (Prices 1-2)	1827
4. Capital Consumption Allowance	
5. Farm Net Product at Market (Prices (3-4)	1827
6. Non-Farm Incomes	
7. Transfers Received	
8. Total Income (5 + 6 + 7)	1827
9. Income Tax Paid	
10. Transfers Paid	
11. Disposable Income (8 - 9 - 10)	1827
12. Household Final Consumption	10057
13. Net Savings (11 - 12)	-8230
14. Gross Savings (4 + 13)	

VI. INVENTORY OF ASSETS AND LIABILITIES

A.1 Land, building, and machinery and equipment

Items		Beginning of Year		End of Year		Year acquired built	Acquisition Value/ Cost	Year more to last	Annual R & M Cost	Days used per year
		No.	Value	No.	Value					
(1) Land Agricultural	(1)	(2)	5000.00	(2)	12000.00	1966	5000.00			
Residential										
(3) Building Residential	(1)	(1)	3000.00	(1)	2790.00	1966	3000.00			
Warehouse										
Drying grounds										
Machinery										
Tractor										
Power tillers										
Water pumps										
Equipment & tools										
(9) Plow	(1)	(1)	150.00	(1)	15.00	1976	150.00			75
Harrow										
Rotary weeder										
Sprayer										
Cart										
Sled										
Shovel										
(16) Bolo	(1)	(2)	100.00	(2)	10.00	1979	100.00			20
Harvest tools										
Others										

Codes for col. 2: O - owned, L - leased, R - Rented, S - Shared

A.2 Farm Animals

Animals	Ownership O - owned L - leased R - rented S - shared	Beginning of Year		Born and gift received during year		Bought during year		Sold during Year		Consumed & given away during year		Died/lost during year		End of Year
		No.	¥	No.	¥	No.	¥	No.	¥	No.	¥	No.	¥	No.
		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Livestock	(1)	(1)	1600.00											(1) 1600.00
Carabao														
Poultry														
Chicken														

B. Liabilities

1. Taxes
2. Loan/credit
3. a. Cooperative
- b. banks
- c. Private
4. Other account payable