# PROJECT PAPER

## VOLUME I

# BICOL INTEGRATED AREA DEVELOPMENT III
## (Rinconada/Buhi-Lalo)

USAID/PHILIPPINES

JUNE 1979

Bicol IAD III (Rinconada-Buhi/Lalo)

Outline of Project Paper


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## ABBREVIATIONS

| | | |
|---|---|---|
| ACA | - | Agricultural Credit Administration |
| AID | - | Agency for International Development |
| ADB | - | Asian Development Bank |
| ADT | - | Area Development Team |
| ADC | - | Area Development Council |
| AMC | - | Area Market Cooperative |
| BAEx | - | Bureau of Agricultural Extension |
| BAI | - | Bureau of Animal Industry |
| BAECON | - | Bureau of Agricultural Economics |
| BCLP | - | Barrio Committee on Land Production |
| BFAR | - | Bureau of Fisheries and Aquatic Resources |
| BFD | - | Bureau of Forest Development |
| BMG | - | Buhi Municipal Government |
| BMS | - | Bicol Multipurpose Survey |
| BPI | - | Bureau of Plant Industry |
| BPW | - | Bureau of Public Works |
| BRBCC | - | Bicol River Basin Coordinating Committee |
| BRBDP | - | Bicol River Basin Development Program |
| BRIS | - | Barit River Irrigation System |
| BS | - | Bureau of Soils |
| BWSP | - | Barangay Water Supply Project |
| COA | - | Commission on Audit |
| CMG | - | Composite Management Group |
| CMS | - | Cubic Meters Per Second |
| CRB | - | Cooperative Rural Bank |
| DA | - | Development Area |
| DBP | - | Development Bank of the Philippines |
| DRA | - | Direct Reimbursement Authority |
| FAR | - | Fixed Amount Reimbursement |
| FIA | - | Farmer Irrigators Association |
| FIG | - | Farmer Irrigators Group |
| FSDC | - | Farm Systems Development Corporation |
| GOP | - | Government of the Philippines |
| GSIS | - | Government Service Insurance System |
| IAD | - | Integrated Area Development |
| ICES | - | Inter-Agency Committee on Ecological Studies |
| IDA | - | Integrated Development Area |
| IFMSS | - | Intensified Farm Management Support Services |
| IPC | - | Institute of Philippine Culture |
| M99 | - | Masagana 99 |
| MA | - | Ministry of Agriculture |
| MAR | - | Ministry of Agrarian Reform |
| MCM | - | Million Cubic Meters |
| MFD | - | Main Farm Ditch |
| MHS | - | Ministry of Human Settlements |
| MLGCD | - | Ministry of Local Government and Community Development |
| MOE | - | Ministry of Energy |
| MPH | - | Ministry of Public Highways |
| MPWTC | - | Ministry of Public Works, Transportation & Communication |

| | | |
|---|---|---|
| NCIAD | - | National Council on Integrated Area Development |
| NEDA | - | National Economic and Development Authority |
| NEPA | - | National Economic Policy Act |
| NEPC | - | National Economic Protection Council |
| NGA | - | National Grains Authority |
| NIA | - | National Irrigation Administration |
| NPC | - | National Power Corporation |
| NWRC | - | National Water Resource Council |
| OAD | - | Office of Agricultural Development (USAID) |
| OCD | - | Office of Capital Development (USAID) |
| O&M | - | Operations and Maintenance |
| ORD | - | Office of Regional Development (USAID) |
| PCA | - | Philippine Coconut Authority |
| PAC | - | Private Advisory Committee (BRBDP) |
| PDAP | - | Provincial Development Assistance Project |
| PMIS | - | Project Management Information System (BRBDP) |
| PMO | - | Project Management Office |
| PRP | - | Project Review Paper |
| PP | - | Project Paper |
| RIDAP | - | Rinconada Integrated Development Area Project |
| RUG | - | Rotational Unit Group |
| SFD | - | Supplementary Farm Ditch |
| SN | - | Samahang Nayon (Barrio level cooperative) |
| SSIP | - | Small Scale Irrigation Project |
| SSRU | - | Social Survey Research Unit |
| TAMS/TAE | - | Tippetts-Abbett-McCarthy-Stratton and Trans-Asia Engineering Associates, Inc. |
| UHP | - | Upland Hydroecology Program |
| UNDP | - | United Nations Development Program |
| UPLB | - | University of the Philippines, Los Baños |
| USAID | - | United States Agency for International Development |

# I. FACESHEETS

AGENCY FOR INTERNATIONAL DEVELOPMENT

**PROJECT PAPER FACESHEET**

1. TRANSACTION CODE: A (A ADD, C CHANGE, D DELETE)

PP

2. DOCUMENT CODE: 3

3. COUNTRY ENTITY: Philippines

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 492-0289

6. BUREAU/OFFICE: A. SYMBOL: Asia; B. CODE: 04

7. PROJECT TITLE (Maximum 40 characters): Bicol Integrated Area Development III

8. ESTIMATED FY OF PROJECT COMPLETION: FY 85

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 79; B. QUARTER 3 (Enter 1, 2, 3 or 4); C. FINAL FY 80

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 - ₱7.5)

| A. FUNDING SOURCE | FIRST FY B. FX | FIRST FY C. L/C | FIRST FY D. TOTAL | LIFE OF PROJECT E. FX | LIFE OF PROJECT F. L/C | LIFE OF PROJECT G. TOTAL |
|---|---|---|---|---|---|---|
| AID APPROPRIATED TOTAL | 521 | 2,979 | 3,500 | 521 | 4,479 | 5,000 |
| (GRANT) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| (LOAN) | ( 521 ) | ( 2,979 ) | ( 3,500 ) | ( 521 ) | ( 4,479 ) | ( 5,000 ) |
| OTHER U.S. 1. | | | | | | |
| OTHER U.S. 2. | | | | | | |
| HOST COUNTRY | | 556 | 556 | | 3,495 | 3,495 |
| OTHER DONOR(S) | | | | | | |
| TOTALS | 521 | 3,535 | 4,056 | 521 | 7,974 | 8,495 |

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

| A. APPROPRIATION | B. PRIMARY PURPOSE CODE | PRIMARY TECH. CODE C. GRANT | PRIMARY TECH. CODE D. LOAN | E. 1ST FY 79 F. GRANT | E. 1ST FY 79 G. LOAN | H. 2ND FY 80 I. GRANT | H. 2ND FY 80 J. LOAN | K. 3RD FY ___ L. GRANT | K. 3RD FY ___ M. LOAN |
|---|---|---|---|---|---|---|---|---|---|
| (1) FN | B253 | | 210 | | 3,500 | | 1,500 | | |
| (2) | | | | | | | | | |
| (3) | | | | | | | | | |
| (4) | | | | | | | | | |
| TOTALS | | | | | 3,500 | | 1,500 | | |

| APPROPRIATION | N. 4TH FY ___ O. GRANT | N. 4TH FY ___ P. LOAN | Q. 5TH FY ___ R. GRANT | Q. 5TH FY ___ S. LOAN | LIFE OF PROJECT T. GRANT | LIFE OF PROJECT U. LOAN |
|---|---|---|---|---|---|---|
| (1) | | | | | | 5,000 |
| (2) | | | | | | |
| (3) | | | | | | |
| (4) | | | | | | |
| TOTALS | | | | | | 5,000 |

12. IN-DEPTH EVALUATION SCHEDULED: MM 05 YY 81

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

2 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Don F. Wadley

TITLE: Don F. Wadley, Chief
Office of Regional Development

DATE SIGNED: MM 02 DD 28 YY 79

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1330-4 (3-76) DAH, PCD, AKL, CSC

AGENCY FOR INTERNATIONAL DEVELOPMENT

# PROJECT IDENTIFICATION DOCUMENT FACESHEET

*To Be Completed By Originating Office*

1. TRANSACTION CODE: C (A = Add, C = Change, D = Delete)

PID

2. DOCUMENT CODE: 1

3. COUNTRY/ENTITY: Philippines

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER *(7 digits)*: 492-0289

6. BUREAU/OFFICE: A. Symbol: Asia; B. Code: 04

7. PROJECT TITLE *(maximum 40 characters)*: Bicol Integrated Area Development III

8. PROPOSED NEXT DOCUMENT: A. 2 = PRP, 3 = PP; B. DATE (MM YY)

9. ESTIMATED FY OF AUTHORIZATION/OBLIGATION: a. INITIAL FY 79; b. FINAL FY 80

10. ESTIMATED COSTS ($000 or equivalent, $1 = ₱7.5)

| FUNDING SOURCE | Life of Project |
|---|---|
| a. AID Appropriated | 5,000 |
| b. OTHER U.S. 1. | |
| b. OTHER U.S. 2. | |
| c. Host Country | 3,495 |
| d. Other Donor(s) | 8,495 |
| TOTAL | |

11. PROPOSED BUDGET AID APPROPRIATED FUNDS ($000)

| A. APPROPRIATION | B. PRIMARY PURPOSE CODE | PRIMARY TECH. CODE C. Grant | PRIMARY TECH. CODE D. Loan | E. FIRST FY 79 F. Grant | E. FIRST FY 79 G. Loan | LIFE OF PROJECT H. Grant | LIFE OF PROJECT I. Loan |
|---|---|---|---|---|---|---|---|
| (1) FN | B 253 | | 210 | | 3,500 | | 5,000 |
| (2) | | | | | | | |
| (3) | | | | | | | |
| (4) | | | | | | | |
| | | | TOTAL | | 3,500 | | 5,000 |

12. SECONDARY TECHNICAL CODES *(maximum six codes of three positions each)*

060 | 070 | 030 | 020 | 010

13. SPECIAL CONCERNS CODES *(maximum six codes of four positions each)*

BS | ENV | INTR | LAB | PART | TNG

14. SECONDARY PURPOSE CODE: 123

15. PROJECT GOAL *(maximum 240 characters)*

Improve the socio-economic situation and the quality of life of the rural poor residing in the project area.

16. PROJECT PURPOSE *(maximum 240 characters)*

1) GOP operating & maintaining new & improved water source, irrigation & drainage systems; 2) Farmer organizations operating & maintaining farm irrigation facilities; 3) Farmers practicing improved technology; 4) Upland farmers utilizing more productive and environmentally sound land-use practices; 5) GOP effectively managing public forest land in the Buhi Watershed.

17. PLANNING RESOURCE REQUIREMENTS *(staff/funds)*

18. ORIGINATING OFFICE CLEARANCE

Signature: Don F. Wadley

Title: Don F. Wadley, Chief
Office of Regional Development

Date Signed (MM DD YY): 02 28 79

19. Date Document Received in AID/W, or for AID/W Documents, Date of Distribution (MM DD YY)

AID 1330-2 (3-76)

## II. Project Description and Background[1/]

### A. Project Description

Goal and Purpose. This project component of the Bicol River Basin Development Program (BRBDP) pursues the program goal of improving the socio-economic situation and the quality of life of the rural poor residing in the project area. It focuses directly on the program sub-goals of (1) increasing agricultural production and productivity per hectare, (2) increasing productive employment opportunities, (3) increasing farmer participation in development activities affecting them, and (4) reversing the deterioration of upland watershed areas.

The specific purposes are to have, by the end of the 6-year project:[2/]

(1) the GOP operating and maintaining new and improved water source facilities, irrigation water distribution and drainage systems;

(2) farmer organizations operating and maintaining new and rehabilitated farm-level irrigation ditches and drainage systems;

(3) farmers utilizing improved technology;

(4) upland farmers utilizing more productive and environmentally sound land-use practices in the Lake Buhi watershed;

(5) GOP effectively managing existing and replanted public forest lands in the Lake Buhi watershed.

Project Inputs. The proposed financial inputs are summarized by source in Table 1. Total project cost is estimated to be $8.5 million, of which $5.0 million, or 59% is being requested as an AID loan, and the remainder will be GOP funded. See Part IV for further details on the financial plan.

Project Outputs. Outputs can be summarized in four related project components (See Table 2, Magnitude of Outputs):

(1) Lake Buhi Water Source Development. Lake Buhi will be developed to supply water for primary and supplementary dry season irrigation by constructing a control structure at the lake outlet (increasing the lake water height by approximately 85 cms.), deepening 3 kms. of the 6 km. outlet channel (increasing low-flow), and constructing a headworks structure through the forebay dam (See Map No. 1). The headworks will divert water via a new left bank connector canal to irrigate an additional 1,600 hectares of currently rainfed rice land in the extension area of the Lalo irrigation system.[3/]

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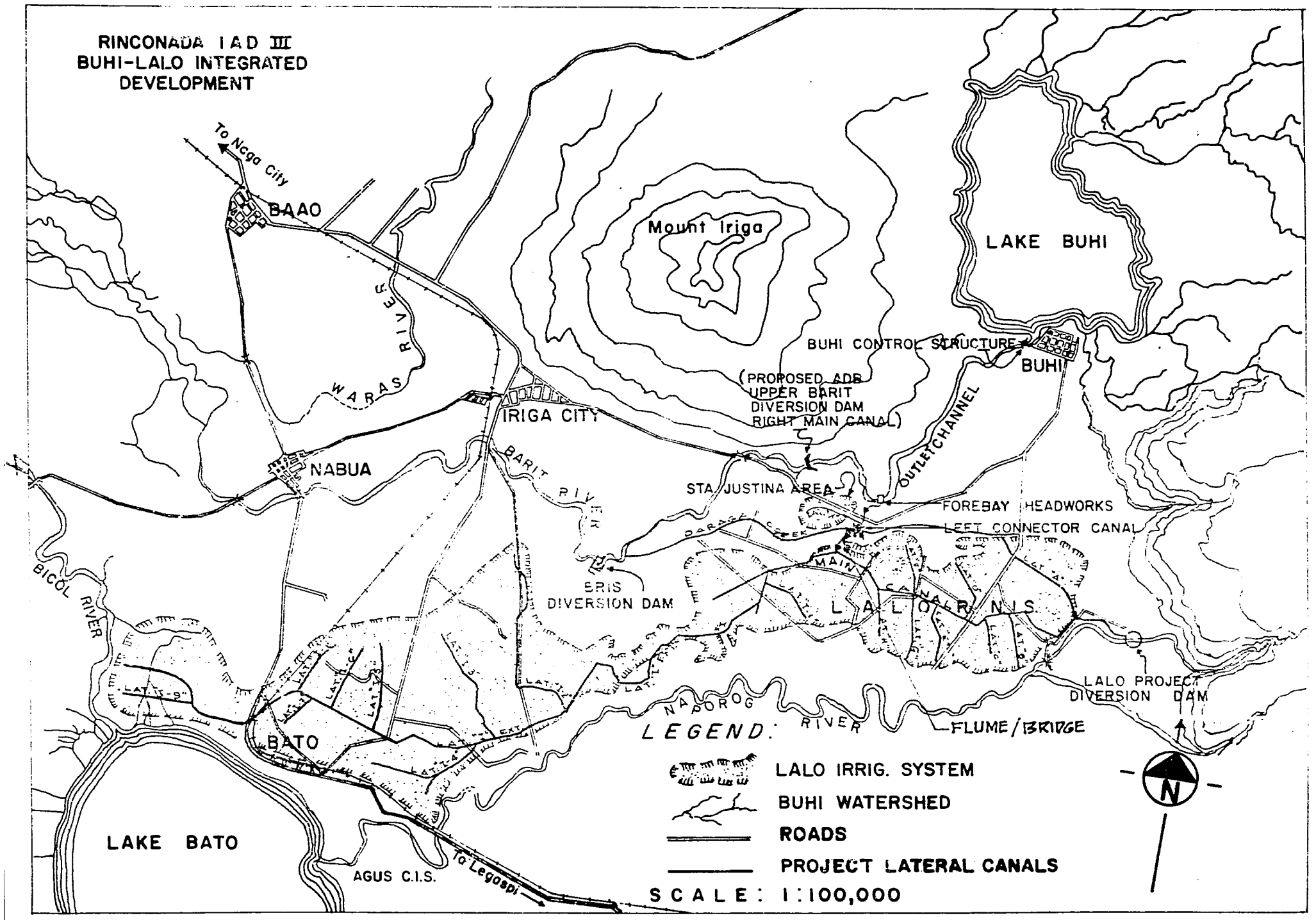
1/ AID obligations in FY 79 and 80; 5-year irrigation project funded in FY 79 is scheduled to begin in 1980 and 5-year watershed development program (Phase II) funded in FY 80 is scheduled to begin in 1981.

2/ Preparation of this Project Paper was undertaken jointly by the Government of the Philippines (GOP) Bicol River Basin Program Office (BRBDPO), National Irrigation Administration Region V, other GOP line agencies and USAID. There is substantive agreement by those involved on project design, analysis and the proposed implementation plan.

3/ In addition to irrigating an incremental 1600 hectares of existing riceland in the extension area, the system will have the capacity to irrigate an additional 300 hectares of low-lying coconut land which in the future may be converted to irrigated rice or the production of other diversified crops


RINCONADA IAD III
BUHI-LALO INTEGRATED
DEVELOPMENT
To Naga City
BAAO
Mount Iriga
LAKE BUHI
WARAS RIVER
BUHI CONTROL STRUCTURE
BUHI
(PROPOSED ADB
UPPER BARIT
DIVERSION DAM
RIGHT MAIN CANAL)
IRIGA CITY
OUTLET CHANNEL
NABUA
BARIT RIVER
STA. JUSTINA AREA
FOREBAY HEADWORKS
LEFT CONNECTOR CANAL
BICOL RIVER
ERIS
DIVERSION DAM
MAIN CANAL
LALO IRRIGATION
LALO PROJECT
DIVERSION DAM
NAPOROG RIVER
FLUME/BRIDGE
BATO
LAKE BATO
AGUS C.I.S.
To Legaspi
LEGEND:
LALO IRRIG. SYSTEM
BUHI WATERSHED
ROADS
PROJECT LATERAL CANALS
SCALE: 1:100,000
N

Map 1

Table 1. Summary Cost Estimates by Source of Funding (Financial Plan), U.S. Dollar Equivalents[1/]
Bicol IAD-III (Rinconada-Buhi/Lalo) Project ($1000)

| Project Component | Total Cost | AID Loan Total | AID Loan LC | AID Loan FX | GOP LC Total |
|---|---|---|---|---|---|
| I. Lake Buhi Water Source Development | 1872 | 1406 | 1406 | | 466 |
| II. Lalo Irrigation Construction | 1553 | 1166 | 1166 | | 387 |
| III. PMO for Irrigation & Agr. Support | 1783 | 470 | 125 | 345 | 1312 |
| Project Facilities | 156 | 38[2/] | 38 | | 118 |
| Agr. & Inst. Development Div. | 398 | 56[3/] | 56 | | 342 |
| O & M Equipment | 330 | 330 | | 330 | |
| Impact Evaluation | 46 | 46 | 31 | 15 | |
| Other PMO | 852 | | | | 852 |
| IV. Agro-Forestation/Watershed Devel. | 515 | 318 | 318 | | 197 |
| Land Dev./Tree Planting | 224 | 224 | 224 | | |
| Nurseries | 75 | 75 | 75 | | |
| All other | 216 | 19[4/] | 19 | | 197 |
| SUB-TOTAL | 5723 | 3360 | 3015 | 345 | 2363 |
| Cost Escalation[5/] | 1664 | 988 | 879 | 109 | 676 |
| 15% Contingency | 1108 | 652 | 584 | 68 | 456 |
| PROJECT TOTAL | 8495 | 5000 | 4479 | 521 | 3495 |

1/ Converted from peso figures in Annex Table H-1 at ₱7.50/$1.00.
2/ Partial funding of training center, gatekeepers quarters, work stations.
3/ Partial funding of line agency field technician allowances and farmer training.
4/ UPLB technical services for training and guidance.
5/ From 1978 base year prices, local currency costs were escalated 7%/yr. and imported equipment costs were escalated at 15%/yr.

Note: Figures may not add exactly to totals due to rounding.

ORD:CSCallison,vbp 3/2/79

Table 2. Magnitude of Outputs
Bicol IAD-III (Rinconada-Buhi/Lalo) Project

| Project Outputs | Year: 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | TOTAL |
|---|---|---|---|---|---|---|---|
| **I. Lake Buhi Water Source Development** | | | | | | | |
| Lake Buhi Control Structure & Bridge | | 0.4 | 0.6 | | | | 1 |
| Barit River Channel | | 0.3 | 0.7 | | | | 1 |
| Forebay Headworks | | 0.35 | 0.65 | | | | 1 |
| **II. Lalo Irrigation Construction** | | | | | | | |
| a. Distribution facilities & structures | | | | | | | |
| Existing main canal rehabilitated (km) | | 6 | 4 | | | | 10 |
| Service roads on existing laterals (km) | | 18 | 9 | | | | 27 |
| Drainage structures in Upper Lalo | | 4 | 2 | | | | 6 |
| Left connector canal, service road & structures (km) | | 1 | 1 | | | | 2 |
| Lateral I Extension & Service road (km) | | 4 | 3 | | | | 7 |
| Extension area lateral, service road & structures (km) | | 7 | 14 | | | | 21 |
| Main & supplementary farm ditches (km) | | | 125 | | | | 125 |
| On-farm drains (km) | | 10 | 29 | | | | 39 |
| Main & secondary drains & structures (km) | | 14 | 8 | | | | 22 |
| Parshal Flumes | | 9 | 12 | | | | 21 |
| Turnouts & division boxes | | 61 | 340 | | | | 401 |
| Gates installed | | 82 | 319 | | | | 401 |
| Vehicle & pedestrian crossings | | 20 | 36 | | | | 56 |
| Daraga river flume/bridge crossings | | 0.45 | 0.55 | | | | 1 |
| b. Project Facilities | | | | | | | |
| Administration building | 1 | | | | | | 1 |
| Equipment building | 1 | | | | | | 1 |
| Laboratory building | 1 | | | | | | 1 |
| Compound & improvements | 1 | | | | | | 1 |
| Improvement of NIA Regional Trng. Center | | 1 | | | | | 1 |
| Gatekeepers quarters | | 3 | | | | | 3 |
| Watermaster working stations | 6 | | | | | | 6 |
| Communication system | 1 | | | | | | 1 |
| **III. Agricultural & Institutional Development** | | | | | | | |
| a. Organizations formed and/or supported | | | | | | | |
| Rotational unit groups (8-10 farmers @) | 30 | 70 | 90 | 90 | | | 280 |
| Farmer Irrigators groups (40-80 " ") | 6 | 14 | 20 | 20 | | | 60 |
| Farmer Irrigators assoc. (500 " ") | | | | 3 | 2 | | 5 |
| Rural Improvement Clubs | | 5 | 5 | 5 | 5 | | 20 |
| b. People trained | | | | | | | |
| Water management trainors | 5 | | | | | | 5 |
| Watermasters (6)/Gatekeepers (3) 1/ | | 3 | | 9 | | | 12 |
| Ditchtenders | | | | 26 | | | 26 |
| Rotational unit group leaders | | 55 | 55 | 85 | 85 | | 280 |
| Farmers: water-management/production | | 500 | 550 | 700 | 700 | | 2450 |
| Farmers: cooperative/credit/mkt | | 500 | 550 | 700 | 700 | | 2450 |
| Homemakers | | 500 | 550 | 700 | 700 | | 2450 |
| c. Applied agricultural research | | | | | | | |
| Trials/demonstrations | | 2 | 3 | 3 | 2 | | 10 |
| **IV. Agro-forestation/Watershed Development** | | | | | | | |
| Project staff trained | | 6 | | | | | 6 |
| In-service seminars for technicians | | 3 | 3 | 3 | 3 | 3 | 15 |
| Assemblies for farmer organization & training | | 6 | 6 | 6 | 6 | 6 | 30 |
| New area terraced for rice/corn production (ha) | | 67 | 68 | 67 | 68 | | 270 |
| New mixed agro-forestry orchards (ha) | | 225 | 225 | 225 | 225 | | 900 |
| Firewood lots established (ha) | | 45 | 45 | 45 | 45 | | 180 |
| Denuded areas reforested (ha) | | | 200 | 200 | 200 | 200 | 800 |
| Upland access trails constructed (km) | | 8 | 8 | 8 | 8 | 8 | 40 |

1/ 3 are trained twice.

An existing diversion dam on the Lalo River and project-funded rehabilitation activities will provide adequate water for the 1,100 hectares currently in the system. The National Irrigation Administration (NIA), as the implementing agency, will design and contract for construction. It will be responsible for post-project operation and maintenance (O&M) of the regulation facilities including the controlled diversion of water for existing and planned irrigation systems. The total incremental area that will be assured of primary and supplemental irrigation water and better regulation is 8,000 hectares.

(2) Lalo Irrigation Construction. This includes: contract construction of a 2 km. left bank connector canal including a major flume over the Daraga River; construction or rehabilitation of physical facilities including irrigation canals and laterals and drainage and terminal facilities; construction of 67 km. of service roads along lateral canals linked to other secondary and feeder roads in the project area; and construction of project management facilities that will be converted to irrigation system management facilities (operation and maintenance) after project completion. The project will also upgrade the regional water management training facility in the vicinity. NIA will be the lead agency responsible for construction and for system operation and maintenance down to farmer irrigators group turnouts.

(3) Institutional and Agricultural Development. To assure adequate water management, the organizational structure, proposed by NIA will be fully applied in the project area: Rotational Unit Groups (RUG's) of 8-10 farmers at the supplementary farm ditch level, Farmer Irrigator Groups (FIG's) of 50 farmers at the main farm ditch level, Farmer Irrigators' Associations (FIA's) for about 500 hectares, and a federation of FIA's on a system basis. An estimated 2,800 farmers, farm leaders, and system O&M technicians will be trained in various courses. Farm families will be trained in their home barangays by appropriate project and line agency personnel in: water management (NIA), improved production methods (MA), and cooperative development (MLGCD) (including access to credit, post-production handling and marketing). Additional training will be given to women within existing or newly organized Rural Improvement Clubs by the Bureau of Agricultural Extension (BAEx). The project shall provide inputs for intensive agricultural extension (est. 130 farmers per technician, a target basin-wide ratio of BAEx) and for 10 farm-level production demonstrations and fertilizer trials (BPI and BS). A key covenant will also assure the completion of targeted land reform activities in the area by 1980. Successful farmer management of portions of the irrigation system is expected to demonstrate the utility of cooperative ventures and encourage expanded farmer cooperative behavior in general.

(4) Agro-forestation/Watershed Development. The principal outputs over five years are direct land improvements on 1,350 hectares farmed by 900 small-scale upland farmers and reforestation of 800 hectares of denuded public forest lands. The program area is the 10,100-hectare Lake Buhi watershed. Lake Buhi, in turn, is the main source of irrigation and other water for over 10,000 families downstream. To meet family rice and corn requirements, up to 270 hectares will be bench-terraced or contour farmed. Approximately 900 hectares of family orchard lots and 180 hectares of firewood lots will be established. Seedlings of orchard and forestry tree species will be raised in project nurseries on site and/or secured from GOP agencies if transportation is feasible. Graded mountain trails will also be improved to

facilitate access for production inputs, marketing of produce and forestry protection personnel. Farmer groups will be organized and training provided on production and on soil conservation. Project and interagency implementation staff will be oriented and trained. This component will be initiated in 1981 based on the outcome of 1979-80 pre-project activities being funded from other GOP/USAID sources.

End-of-Project Status. The successful accomplishment of these project outputs, together with certain conditions assumed to be favorable, should lead to achievement of the project purposes. The four most important of these assumptions are that:

(1) surface water supplies are sufficient, as studies indicate, to meet project crop irrigation requirements for double-crop intensity;

(2) sufficient agricultural credit will be made available through ongoing GOP-supported programs (e.g. M99) to finance required production inputs;

(3) modern production inputs such as fertilizer and insecticides will be available to project area farmers at reasonable prices and in the quantities required to achieve projected yields; and

(4) market conditions will motivate intensive production.

Over 90% of the project area's farmers use high-yielding varieties (see Table VIII-3 of the TAMS/TAE Special Study: "Financial & Economic Analysis"), and most are aware of the complementary nature of water and nitrogen in securing increased yield from fertilizer-responsive seed. However, the percentage of farmers using fertilizer is only 45-50% on irrigated land and about 15-20% on rainfed land. While these percentages are low, they do demonstrate that irrigation encourages fertilizer use. Additionally, those farmers using fertilizer on irrigated land use more than those on rainfed land.

The primary sources of fertilizer in the project area are presently retail agricultural chemical stores usually located in the market centers--the poblacions--of Buhi, Bato, and Nabua municipalities and Iriga City. The necessary chemicals are normally available in the poblacions, but the difficulty and cost of transport to and within the project area presently limits their use. The ease of transporting large and heavy loads into and out of the area will be greatly facilitated by the service roads to be constructed under this project. In conjunction with two new secondary and feeder road links, these service roads will tie the area to the greater Canada road network and the market centers.

The price farmers receive for their palay varies primarily with its moisture content and the ease of getting it to market. The National Grains Authority (NGA) will pay up to ₱57.50 for a 50-kilogram cavan of palay (95% purity) dried to 14% moisture capacity. When NGA buys wetter palay, the price is adjusted downwards to compensate for the excess moisture. Construction is nearing completion of two large NGA warehouse and drying facilities in the project's vicinity. NGA is also enlarging its truck fleet

to improve its ability to buy palay in the field and help ensure farmers a fair price. The construction of service and feeder roads should also improve the marketability (price) of palay within the project area.

A covenant to the loan agreement is being recommended to support GOP commitments to upgrade the collection and quality of hydrometrical data related to the project. The Mission has no reason to believe that these and the other conditions listed as assumptions in the logframe (Annex A) will be unfavorable to purpose and goal achievement.

Conditions that, if present by 1985, will indicate project purpose achievement are:

(1) Total regulated water source adequate for supplemental irrigation of an incremental 8,000 hectares during normal dry seasons.

(2) Hectarage receiving adequate irrigation water delivery in the Lalo system for two rice crops annually increased from 1,100 or less to 2,700.

(3) GOP implementing regular maintenance service on 67 km. of new and improved main and lateral canals, 22 km. of main and secondary drainage canals, and 67 km. of associated service roads.

(4) Regular maintenance programs for 125 km. of main and supplementary farm ditches and 39 km. of farm drains effectively conducted by local irrigators' associations.

(5) Farmers on project-irrigated riceland using high-yield varieties and other modern technology increased from 85 or less to 100%.

(6) 900 project upland farmers changed to more permanent and improved land use (agro-forestation).

(7) Currently non-forested hectarage on 10-30% slopes planted to agro-forestry crops increased from 370 to 1450.

(8) Currently non-forested hectarage on 3-10% slopes either terraced or planted on contour increased from 10 to 280.

(9) Currently non-forested hectarage on 10-30% slopes <u>not</u> planted to agro-forestry crops decreased from 3230 to 2150.

(10) Currently non-forested hectarage on 3-10% slopes <u>neither</u> terraced <u>nor</u> planted on contour decreased from 290 to 20.

(11) The denuded portion of areas classified as public forest or timberland on slopes above 30% decreased to near zero (5 ha. patches).

<u>Measures of Sub-Goal Achievement</u>. The achievement of the project purpose listed above, given certain favorable conditions outside the control of the project management, is expected to lead to successful sub-goal achievement. This can be measured in 1988 as:

(1) Total rice production in 2,700 ha. of project irrigated land increased from 9,000 metric tons to 20,000 metric tons per year.

(2) Project area rice farmers utilizing at least 30% more farm workdays per year in the 2700-hectare project area than the present annual average of 480,000.

(3) Non-forested percentage of Buhi watershed above 30% slope decreased from 73% to 40%.

(4) Percentage of Buhi watershed between 10-30% slope neither forested nor planted to agro-forestry crops decreased from 89% to 61%.

(5) Percentage of project area between 3-10% slope neither forested, planted to agro-forestry crops, terraced, nor planted on contour decreased from 97% to 7%.

(6) There is evidence that farmers are actively supporting and benefitting from participation in the Irrigators' Associations, Samahang Nayon, and/or other farmer organizations and that they perform other than their intended functions, and further that they are beginning to influence the timing, kind and manner of social and economic service delivery to the project area.

Measures of Goal Achievement. Sub-goal achievement, in turn, should result in a significantly favorable movement toward achievement of the program goals in the project area. Indications of goal achievement expected by 1988 are:

(1) Per capita income and/or consumption expenditure within the project area raised by 150% from ₱ in 1978 to ₱ (in 1978 prices, peso amounts to be determined by analysis of 1978 BMS in late 1979).

(2) Productive labor employment rate increased significantly (to be determined by analysis of 1978 BMS in late 1979).

(3) Perceived quality of life index on 0-10 point scale raised from 3.62 in 1974 to at least 4.00.

## B. Program Background

Bicol Region and Bicol River Basin Program. The Buhi-Lalo Integrated Development Project area is in the heart of the Bicol River Basin and Bicol Region. Recent studies indicate the Bicol River Basin has immediate and high growth potential, particularly for irrigation and upland agriculture, agri-business and basic infrastructure investments. The Bicol Program of which this Project is a component, represents an integrated area development (IAD) approach to developing this potential. It is based on three basic precepts:

- that development efforts targeted on the rural sector should focus on delimited geographic areas of high growth potential and recognized socio-economic need.

- that such development planning should be integrated, cross-sectoral and interagency in nature.

- that project planning and management should be decentralized to maximize participation from all sectors, especially from the intended beneficiaries.

The Region consists of 6 provinces (2 of them separate islands) at the south-eastern tip of Luzon. It comprises 8% (3.5 million) of the total Philippine population and 6% of its total land mass. It is characterized by:

- a declining per capita income, already at $172 (in 1974) one of the lowest among the 12 Philippine regions and only 49% of the national average

- a serious maldistribution of income, with the poorer half of the people surviving on $45 per capita (1974)

- the lowest share among regions of employment and production in large, modern manufacturing establishments, in proportion to population

- a lack of employment opportunities, resulting in high rates of under-employment and outmigration (1.1%) primarily to Manila

- high rates of malnutrition, morbidity and mortality (78% of pre-schoolers malnourished, of which 5.5% are serious 3rd degree cases)

The chief constraints to more rapid development are:

- physical isolation due to neglected transportation infrastructure

- poor communication facilities

- hostile physical environment (particularly typhoon and flooding)

- inefficient production, storage and marketing technology

- capital scarcity

- inequitable land tenure arrangements

- rapid rate of crude population growth (3.3% annually before migration)

- ineffective government institutions and low revenue collection

Pursuant to a national strategy of rural mobilization and development, the Bicol River Basin Development Program is an innovative effort to prioritize and reduce these constraints in a phased, coordinated, decentralized manner:

- <u>The BRBDP institution</u> is itself designed to improve the effectiveness of government entities to plan and implement development programs and projects. The Integrated Area Development approach focuses on a delineated area of recognized socio-economic need with high growth potential to maximize benefits. It directs an integrated, cross-sectoral, interagency planning process to ensure coordination. It decentralizes project planning and management and attempts to maximize local government and popular participation.

- <u>Basic infrastructure development</u> demands high priority to reduce costs of other activities and to best utilize natural resources: drainage and flood

control, irrigation facilities, watershed protection, roads, bridges, port facilities, the railroad, geothermal power and rural electrification, intra-regional telecommunications.

Land reform is designed to reduce income inequality.

Agricultural development in IAD component projects focuses on full development of water resources and provides supporting programs to increase the productivity of small-scale farmers; upland watershed development expands the focus to include conservation of natural resources.

Integrated health, nutrition and population which a component BRBDP project will train and help rural residents to improve environmental sanitation, reduce morbidity, malnutrition and population growth.

The promotion of private sector investment is designed to expand productive and employment-generating capital assets and to stimulate technological improvements.

The objectives of the Bicol Program and of this project component are in direct response to the Philippine development strategy outlined and recommended by the Government of the Philippines (GOP), USAID, World Bank and an International Labor Office team of the United Nations (the "Ranis Report"). The Bicol development strategy is the result of a long history of development planning within and for the Bicol Region itself, dating back to 1967.

An overview of USAID assistance in support of the broader Bicol Program is summarized in Annex L to this Project Paper. It provides a summary description and current status of the various Bicol projects supported by AID loans and grants.

C. Project Background

Irrigation. A basin-wide water resources pre-feasibility study conducted in 1975-1976,[1/] identified 86,000 hectares suited for two-crop irrigated rice production. Of this total, only 44,000 hectares are presently irrigated in the wet season and 37,000 in the dry season because of inadequate water supply.

The consultants recommended that a full feasibility study be conducted for the larger Rinconada IAD III area since it had the capacity for water storage and a potential irrigable area of 14,000 hectares. Because of the inter-related nature of the Basin's water resources, watersheds, flooding problems, roads access, and the like, it recommended that further planning continue to be comprehensive, that projects be packaged into inter-related components and be time-phased (e.g.) that development of Lake Buhi and Lake Bato storage should be undertaken first to provide supplemental water for proposed irrigation projects downstream).

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1/ TAMS/TAE; Bicol River Basin Comprehensive Water Resources Study (August 1976), Vol. I-V plus 24 technical working papers. Study was funded in part by USAID Feasibility Study Loan (492-T-030) Contract by the GOP/BRBDP. Multiple copies are available at AID/W.

A feasibility study for multi-project components was conducted in 1977-78 for the Rinconada area.1/ It confirmed the feasibility of developing lake water supplies and the potential irrigable areas. It also recommended attention be given to the watershed area of Lake Buhi and upland farmers.

For purpose of the proposed Buhi-Lalo Integrated Development Project, the Rinconada feasibility study investigated various alternatives to augment the Lalo orrigation system water supply and considered the rehabilitation and extension of irrigation facilities. For Lake Buhi water source development and Lalo system improvements, the study provided preliminary engineering design and cost estimates.2/

Since September 1978, when the TAMS/TAE foreign consultants departed Bicol, their counterpart GOP/BRBDP staff and USAID consultants have carried out additional technical analysis of the water supply and some re-design work in potential irrigable areas to be served from the Buhi water source. A summary description and updated technical analysis is presented in Section III.C. below, and in Annex G(1).

Additional analysis was conducted by the BRBDPO staff and participating line agencies to request financing from the Asian Development Bank for a combination of the other feasible components identified in Rinconada Development Area (DA III) and in Naga-Calabanga (DA IV) in the lower basin. A GOP contracted feasibility study is currently underway in Baliwag-San Vicente (DA V) in the lower basin. It should receive priority for funding from another donor since DA V should be developed concurrently with DA IV. Quinali (DA VI) is proposed for other donor support in 1980-81. (See Map 2.)

The proposed GOP/AID Buhi-Lalo Project, which includes development of Lake Buhi as an expanded source of irrigation water, is an economically attractive component of the larger Rinconada IAD III Project. Compared to existing and proposed Bicol River Basin IAD projects (now termed IDA's by the BRBDPO), the development of Lake Buhi is highly desirable because it will serve as a gravity water source, whereas IAD I (Libmanan), IAD II (Bula),4/ and the larger portion of IAD IV (Naga-Calabanga) will be irrigated by comparatively more expensive pump schemes.

The increased water supply developed by the construction of the Lake Buhi control structure and improvement of the outlet channel will provide additional water for existing communal and national systems which are currently underutilized, particularly during the potentially more productive dry season months. In addition to water required for approximately 1,600 hectares in the expanded Lalo irrigation system5/ it will provide an assured supplemental

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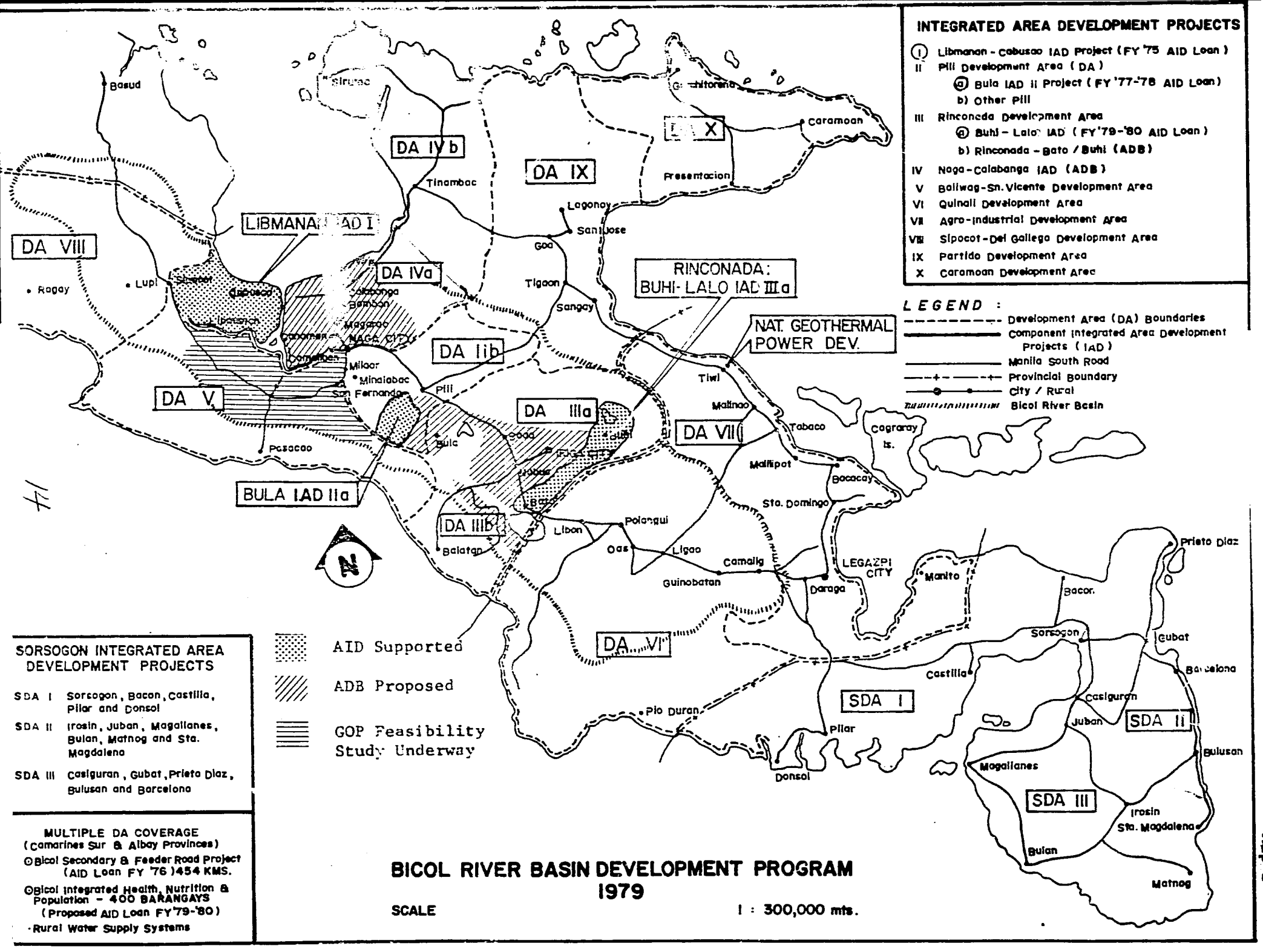
1/ TAMS/TAE; Bicol River Basin Rinconada Integrated Development Area Project Feasibility Study (January 1979) Vol. I-VI plus 4 special studies. Because of the complexity of the study, the contractor was required to further edit and include additional technical detail in the reports. This delayed final printing. Multiple copies to be pouched to AID/W when received. Recommend review Summary Vol. I; see p. 141 and 177 for feasibility of Lake Buhi source and irrigation feasibility.

2/ TAMS/TAE (January 1979) specifically see Vol. IIIA, pp. 93-131.

3/ TAMS/TAE (January 1979) specifically see Vol. I and Vol. III.

4/ A.I.D. loan assistance projects; Libmanan IAD, $3.5M FY 75; Bicol IAD II (Bula), $3.0M FY 77 & 78. Also see Annex L for project summaries.

5/ The Lalo main canal and lateral system will have the capacity to handle an additional 300 or more hectares of potential rice/diversified crop land that may be converted from coconut land.


INTEGRATED AREA DEVELOPMENT PROJECTS
I Libmanan - Cabusao IAD Project (FY '75 AID Loan)
II Pili Development Area (DA)
a) Bula IAD II Project (FY '77-'78 AID Loan)
b) Other Pili
III Rinconada Development Area
a) Buhi - Lalo IAD (FY '79-'80 AID Loan)
b) Rinconada - Bato / Buhi (ADB)
IV Naga - Calabanga IAD (ADB)
V Baliwag - Sn. Vicente Development Area
VI Quinali Development Area
VII Agro-industrial Development Area
VIII Sipocot - Del Gallego Development Area
IX Partido Development Area
X Caramoan Development Area
LEGEND :
Development Area (DA) Boundaries
Component Integrated Area Development Projects (IAD)
Manila South Road
Provincial Boundary
City / Rural
Bicol River Basin
DA VIII
DA IVb
DA IX
DA X
LIBMANAN IAD I
DA IVa
RINCONADA: BUHI-LALO IAD IIIa
NAT. GEOTHERMAL POWER DEV.
DA IIb
DA V
DA IIIa
DA VII
BULA IAD IIa
DA IIIb
DA VI
SDA I
SDA II
SDA III
Basud
Siruma
Caramoan
Presentacion
Tinambac
Lagonoy
San Jose
Goa
Tigaon
Sangay
Ragay
Lupi
Sipocot
Cabusao
Libmanan
Calabanga
Bombon
Magarao
NAGA CITY
Canaman
Milaor
Minalabac
San Fernando
Pili
Tiwi
Malinao
Tabaco
Cagraray Is.
Pasacao
Buhi
Bula
Iriga CITY
Malilipot
Bacacay
Sta. Domingo
Polangui
Libon
Oas
Ligao
Balatan
Camalig
Guinobatan
LEGAZPI CITY
Daraga
Manito
Prieto Diaz
Bacon
Sorsogon
Gubat
Castilla
Barcelona
Casiguran
Juban
Pio Duran
Pilar
Bulusan
Donsol
Magallanes
Irosin
Sta. Magdalena
Bulan
Matnog
AID Supported
ADB Proposed
GOP Feasibility Study Underway
SORSOGON INTEGRATED AREA DEVELOPMENT PROJECTS
SDA I Sorsogon, Bacon, Castilla, Pilar and Donsol
SDA II Irosin, Juban, Magallanes, Bulan, Matnog and Sta. Magdalena
SDA III Casiguran, Gubat, Prieto Diaz, Bulusan and Barcelona
MULTIPLE DA COVERAGE (Camarines Sur & Albay Provinces)
Bicol Secondary & Feeder Road Project (AID Loan FY '76) 454 KMS.
Bicol Integrated Health, Nutrition & Population - 400 BARANGAYS (Proposed AID Loan FY '79-'80)
Rural Water Supply Systems
BICOL RIVER BASIN DEVELOPMENT PROGRAM
1979
SCALE 1 : 300,000 mts.

Map 2

dry-season water supply for 2,200 hectares in the Barit River National Irrigation System where the dry season harvest area presently averages only 1,600 hectares. This is possible without further improvements in irrigation and drainage facilities in the Barit system. However, Barit system rehabilitation, improved drainage and better water management is proposed under the combined Naga-Calabanga and Rinconada IDA Project package for ADB loan assistance (for general locations, see Bicol River Basin Map No. 2 above and the Rinconada Vicinity Map and Figure G(1)-1 in Annex G(1). The improvements would assure dry season service to an additional 1,000 hectares of riceland in the present Barit system, bringing the total to 3,200 hectares. The proposed GOP/ADB project also includes a new right-main canal (approx. 30 kms) along the base of Mt. Iriga to provide supplemental water to an estimated 4,800 hectares in the Baao and Pili areas. Because the Lake Buhi water supply developed under the proposed GOP/AID project will serve as the water source for the Barit and Baao/Pili irrigation systems covered by the proposed GOP/ADB project, it is imperative that USAID cooperates closely with ADB as well as the GOP in scheduling construction activities, sharing technical data and preparing post-construction operation arrangements.

Watershed Development. One of the features of the proposed Buhi-Lalo Integrated Development Project not included in prior IAD projects is the simultaneous involvement of both lowland and upland farmers. The lowland farmer will benefit from assured water and other inputs on irrigated riceland; for the upland farmer, the program is designed to provide incentives which encourage the adoption of more productive, profitable and environmentally sound land-use practices.

The integrated area development approach addresses the primary constraints to increased productivity and welfare within a geographically delimited area. The project's irrigation and watershed activities are functionally related and will take place in contiguous areas within the larger Rinconada area. The improvement of the Lake Buhi watershed and Lalo River drainage can provide increased dry season flow for the rehabilitated and expanded downstream irrigation systems. Watershed protection is also essential for the long term water supply for irrigation and domestic water.

Both activities address high priority concerns identified at the national, regional and local levels. Rising domestic and foreign donor financing throughout the country attest to the high economic and social returns accruing to investments in irrigation development. Initially, much of the present interest in agro-forestation and watershed management grew out of the threat posed to certain irrigation investments by deteriorating watersheds. Concurrently, there has been growing interest in the situation of subsistence upland farmers. In the Lake Buhi area, as elsewhere, improper land-use practices threaten the long-run productivity of upland soils and, hence, the long-run welfare of upland households. The municipality of Buhi and the

1/ Estimated initial ADB assistance of $25-30M also includes development of the Lake Bato water supply for downstream projects, particularly Naga-Calabanga and Baliwag-San Vicente (DA IV & V). It also assures water for Bula IAD II supported by AID and helps control salinity intrusion from San Miguel Bay that affect Libmanan IAD I supported by AID.

Bicol Program Office have expressed a growing concern over the course of events in the Lake Buhi and other Bicol River Basin watersheds. In September 1978, a special Bicol seminar/workshop was held on watershed management and recommended technical approaches for Buhi as a test case. At the regional level, the Bicol River Basin Coordinating Committee proposed a set of policy recommendations in October 1978 to address watershed problems and specifically urged agro-forestation and watershed development activities be initiated as soon as possible.

The inclusion of the watershed activity, then, is based on the IAD approach, beneficiary needs, potential productivity and production, plus protection of the watershed and the water source. (See Annex G(3), Vol. II for detailed presentation.)

## III. Project Specific Analyses

### A. Economic Analysis

Benefit-Cost Analysis. An economic benefit-cost analysis was conducted for project activities related to the development of the Lake Buhi water source and the rehabilitation and extension of the Lalo irrigation system.

Those items identified as project costs and the underlying benefit assumptions are detailed in the tables and notes of Annex I. Briefly, project costs included all pre-construction, construction and future operation and maintenance expenditures, project administration, agricultural and institutional development costs. Additionally, a proportion of the cost of developing the Lake Buhi water source was attributed to the Lalo system, and an adjustment was made to reflect losses in electrical generation caused by diverting water from the power station forebay at Sta. Justina.

Project benefits result from increases in cropping intensity and dry and wet season per hectare yields.1/ The eventual annual per hectare yield assumed under with-project conditions is a modest 160 cavans (8.0 metric tons) divided roughly between the wet (78 cavans) and dry (82 cavans) season crops.

In one scenario, it was assumed that the GOP and another foreign donor (e.g. ADB) will develop irrigation facilities in the existing Barit River Irrigation System and vicinities of Baao, Bula and Pili. In this case, 25% of the cost of developing the Lake Buhi water source was attributed to the Lalo system. The resulting analysis derived an internal rate of return of 35% and a benefit/cost ratio of 1.7 when project costs and benefits were discounted at 20%. To test the sensitivity of the basic analysis to possible changes in the cost and benefit estimates, all incremental costs were increased by 20% and all incremental benefits decreased by 20%. The recalculated internal rate of return was 23%. When these adjusted streams were discounted at 20%, a new benefit/cost ratio of 1.1 was derived.

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1/ In the economic analysis, no benefits are assumed to grow from approximately 300 hectares of low-lying coconut land in the Lalo area which in the future may convert to irrigated palay or other crops and receive water from the proposed facilities.

2/ A total of some 8000 additional irrigable hectares will benefit from the development of the Lake Buhi source of which somewhat less than 25% (1600 ha.) are included within the Lalo extension area.

A second scenario assumed no further improvements in the Barit, Baao, Bula and Pili areas. In this case, all of the cost of developing the Lake Buhi water source was attributed to the Lalo system and an increment of 600 hectares in the Barit system which would realize an irrigated dry season crop without any additional irrigation or drainage system improvements. The Buhi-Lalo project was still found economically feasible. Even with incremental costs increased by 20% and incremental benefits decreased by 20%, a benefit/cost ratio of 1.0 was derived at a discount rate of 20%.

Cost Effectiveness Analysis. The Agro-Forestry/Watershed Development Program was subjected to cost-effectiveness analysis (see Annex G(3), Volume II). Briefly, the program is designed to (1) rehabilitate the watershed by reestablishing vegetative cover that will conserve the soil, prevent landslides and reduce erosion and downstream siltation, (2) improve the productivity and income of upland watershed farmers by helping them implement positive land use methods, and (3) alter the socio-economic attitudes of upland watershed farmers to sustain the economic and environmental improvement in the future. The proposed program is expected to achieve these objectives at an approximate cost, in 1978 prices, of $515 (₱3859) per family for agro-forestation (900 families) and $162 (₱1213) per hectare for reforestation (800 hectares). Under agro-forestry activities, about 270 hectares of land will be terraced for rice and corn production. Productive but environmentally appropriate vegetative cover will be planted on another 1080 hectares, for a total of 1350 at a cost of $343 (₱2573) per hectare.

The costs of this program compare very favorably with the alternative of resettlement, i.e., moving the upland watershed farmers to some other area to live where the slopes are less steep. It was recently announced that the 25-year program of the National Resettlement and Rehabilitation Administration has resettled a total of 53,051 families between 1953 and 1978 at a total cost of ₱710 million. This amounts to ₱13,380 per family. Most of these expenditures occurred in the early years of the program--the mid- to late-1950's--and the Philippine Consumer Price Index rose by 338% (from 100 to 438) between 1960 and 1978. This implies that the current cost of resettlement would be in the neighborhood of $8,000 (₱60,000), almost 16 times higher than the proposed agro-forestry program.

Maintenance of the status quo is another alternative. The present land use methods exhaust soil fertility and in time farmers will have to leave the area of their own accord when the land can no longer provide subsistence production. At that time, reforestation could be instituted and the cost of resettlement avoided. This alternative would not address one of the principal objectives of the program, which is to improve the living standards of the farmers. Since most of the soil fertility would be lost and some areas permanently denuded, later rehabilitation would be more difficult and costly.

A third approach would be to initiate a soil conservation program that would financially and technically assist farmers to modify their land use. At the present time, kaingin (slash-and-burn) is the prevailing farming method. Farmers practicing kaingin agriculture in Buhi live at the subsistence level, with average monthly incomes of $25 (₱186) per farm family. Appropriate soil conservation measures, such as terracing, planting orchards (agro-forestry) and covercropping would raise farm income, reduce erosion and help

prevent landslides. For the lower slopes, this is feasible. However, as slopes become steeper, the cost of implementing these soil conservation methods becomes greater, and more economical methods must be considered.

In this project, terracing and orchard planting (agro-forestation) is proposed on slopes up to 30% gradient. Where slopes exceed 30%, orchards generally will not provide ground cover thick enough to prevent soil erosion. Bench terracing could be resumed on these higher slopes; however, riser (retaining walls) may require artificial reinforcement with stones to stand the additional stress. Depending on the site, this could increase cost per hectare to as much as $2133 (₱16,000) and was not considered.1/

In sum, the cost and adequacy of agro-forestry methods are sensitive to slope conditions, and a combination of approaches is required to meet the varying degrees of slope on the watershed.

B. Social Soundness Analysis

The reader is referred to: (1) the 109-page Social Soundness Analysis of the TAMS-TAE Rinconada Integrated Development Area Project Feasibility Study, completed for the BRBDP in January 1979, (2) the Social Soundness Analysis in Annex I of the Bicol IAD-III Project Review Paper (PRP), (3) the full Social Soundness Analysis of this Project Paper in Annex J, and (4) the Social Soundness section (II.B) of Annex G(3) of this PP Vol. II, Technical Details of the Agro-Forestation/Watershed Development Component of this Project. The following is a brief summary of the conclusions of these four analytical treatments as they relate to proposed AID-supported project components described in this Project Paper.

Socio-Cultural Feasibility: The social and cultural patterns of the Bicolano indicate receptivity to change. The class system and social alliances, the social organizations by which values such as social acceptance and security are attained and reinforced, appear to be compatible with the project.

The project components recommended are in consonance with and focus on the development needs of Rinconada. Various survey findings reveal that farmers aspire for a better life and perceive the importance of activities such as cooperative efforts in water management and obtaining credit. Traditional values would therefore enhance agricultural programs through group farming, Samahang Nayon cooperatives and irrigators' associations. Neither are modern agricultural practices unfamiliar to project-area farmers, a high percentage of whom presently utilize high-yielding varieties, fertilizer and other modern inputs, albeit inefficiently and combined with inadequate water control. Lack of adequate irrigation has been identified by farmers, through dialogues and surveys, as a constraint to agricultural production. Further, local labor can be utilized to involve the beneficiaries in project implementation and to ensure their support, as well as provide them employment in construction activities.

While a few uncertainties have been identified with regards to the institutional aspect of irrigation and assurance of a broader based technology delivery system, remedial measures with room for flexibility have been included in the project design to increase the rate of adaptability to project demands. (See

1/ UNDP reports more than 2,000 mandays/ha. required to build terraces with stone wall reinforcement in Baguio, Philippines, where slopes are steep. At ₱8.00/manday, costs would be a minimum of ₱16,000.

Social Soundness Analysis, Annex J). With respect to the social soundness questions raised by the Agro-forestry/Watershed Development Program, an integrated effort of line agencies involved in the Phase I start-up effort during the next two years is expected to provide sufficient experience to refine the methods and strategies to be employed in replicating the program, not only within the project area, but in other Bicol watershed areas as well. Some 46% of upland survey respondents classified themselves as owners of the land they cultivate. A large, but as yet undetermined, proportion of the remainder occupy land owned by the government, and the security of their tenure will be improved in conjunction with this project. Upland farmers with secure land tenure can normally be expected to participate more actively in organizational and extension activities encouraging investments in long-term land improvements.

Social indicators do not portray a marked difference between upland and lowland farmers, aside from the greater relative poverty of the former. The socio-cultural patterns, values and associations of upland farmers are generally not different from those of lowland farmers, since most of them moved from the lowlands over the past two generations.

Benefit Incidence and Social Consequences. The project aims to improve the quality of life of the Rinconada rural poor. Particularly, farm households are expected to benefit from increased agricultural productivity on irrigated lowland and better managed upland areas. Landless households who are without access to resources are expected to benefit from improved employment opportunities as a consequence of increased agriculture production and a higher farmer demand for labor and other locally produced goods and services. (See Beneficiary Profile, Annex J.)

The project covenants relate to the implementation of the Ministry of Agrarian Reform's Operation Leasehold and Operation Land Transfer that will assure a greater magnitude of project benefits will accrue to tenants or actual tillers than to the landlords. Effective agricultural extension services, irrigators' associations, cooperatives and small farmer groups and the provision of irrigation itself can help motivate farmers to participate in these programs.

The benefits derived from cooperative water management are expected to stimulate cooperative behavior in other farming activities such as obtaining expanded group credit and other production inputs, managing equipment pools and providing marketing services.

Spread Effects. The expected rise in rural incomes from both irrigated and upland and farm facilities will enhance the purchasing power of farmers, who will in turn demand more goods and services in rural market and urban centers in and around the project area. Expected spread effects of the project include the stimulation of marketing and processing activities in rural and urban market centers near the project area. The success of cooperative efforts to be encouraged by this project is expected to provide examples for other farmer groups.

Success of the agro-forestation/watershed development component will encourage its replication into other areas to improve upland farming productivity and to protect the fertility and vegetative cover of vital watershed areas.

Role of Women. Participation by women in the project includes greater involvement in production labor as a consequence of more intensive agriculture. Increased income will permit improved housing and household appliances and other possessions that are among the primary concerns of Bicol women. Rural Improvement Club training is expected to stimulate the integration of rural women into the community and provide opportunities for social leadership and organizational activities. Cottage industry activities to be encouraged can also provide women with an additional source of income and expand their activities outside the home.

C. Technical Feasibility

General. This project provides the unique opportunity to capitalize on the existing natural reservoir of Lake Buhi, presently operating primarily as retention basin for power production by the National Power Corporation (NPC). The construction of a control structure at the outlet of the lake will convert it into a potential storage reservoir and regulation system for about 10,000 hectares (8,000 ha. incremental) of irrigated land, 1600 hectares of which is in the Buhi-Lalo Project area. It will also enhance power generation at the Buhi power plant, increase the usable water supply along the Bicol River downstream, hydraulically suppress salinity intrusion from San Miguel Bay up the Bicol River, and provide incidental flood control benefits near Lake Buhi and along the Barit River. No major engineering problems are expected in this project, since it proposes to follow accepted practices of gravity irrigation. A more detailed description, discussion and analysis is included in Annex G(1).

Technical Capability. The National Irrigation Administration (NIA) will be the lead agency in the construction and operation of this project. In its early history, NIA's role was mostly limited to the design and construction of diversion dams and irrigation systems. In recent years, NIA has been responsible for the design and construction of major multipurpose water resource development projects. Training sessions, additional practical experience, consultative inputs, recruitment, etc., have increased the institutional and technical capability of both national and regional-level staffs over the past few years to implement construction projects.

Design Standards. The design criteria used for this project is based on a revised set of standards prepared by NIA (see Annex G(1)). These design standards, when implemented properly, have been acceptable to USAID for the on-going Libmanan-Cabusao IAD Project. They have also been acceptable to the World Bank and the Asian Development Bank for on-going and completed assistance projects.

In addition to design standards developed from Philippine experience, NIA design personnel have utilized publications, specifications, instructions, etc., published by the U.S. Bureau of Reclamation as technical reference material in the design of irrigation facilities.

Technical and Engineering Data. The availability of technical and engineering data varies considerably. Much data have been generated as the result of previous feasibility reports and studies completed by TAMS/TAE, Asian Institute of Technology, University of Hawaii and others (see Bibliography).

Additional data was generated during the past several months in direct support of this project. Recent hydrologic data, especially streamflow data, is of questionable accuracy due to the lack of funds and personnel, the poor physical condition of the gaging stations and equipment, and the place and methods of runoff computation. This program needs extensive reorganization, upgrading and support. Fortunately, the streamflow data for 1956-1967 used in the water supply study upon which this project is based (see Annex G(1)) covered the driest consecutive years on record. Additionally, these data were generated during late 1950 and early 1960 when the USAID program was assisting the government in upgrading and expanding the stream gaging program. It included new facilities and equipment, personnel training in the U.S. and the Philippines, and counterpart training with professional employees from the U.S. Geological Survey Surface Water Division. The program concluded in the early 1960's and the newly developed inertia continued for several years before the quality of the stream gaging program dropped.

Additional vertical control, topograhic, center line, cross-sectional and other surveys will be required for final design purposes. The available data and engineering judgments are adequate for the preliminary design of the project. The cost estimates reflect the best available unit cost data and design quantities and are adequate for feasibility purposes.

Maintenance Capability and Practices. The Lalo irrigation system is a national system operated and maintained by NIA. National class systems are generally maintained better than other irrigation systems. The common constraints of effective operation and maintenance activities on irrigation systems in the Philippines are the lack of complete project facilities and lack of funds from project fees to finance adequate maintenance. The major reason farmers have not paid irrigation fees is inequitable distribution or non-delivery of water to sustain normal crop production. These two complaints relate back to incomplete facilities necessary to attain good water use efficiencies throughout the project. The rehabilitation and upgrading of the existing irrigation system and a well-designed system in the project extension area should eliminate these two constraints. Training of operating personnel and farmers regarding on-farm water management should also facilitate effective water use and adequate maintenance of the project facilities. Operation and maintenance personnel and procurement of basic maintenance equipment are also included as part of the project to enhance the maintenance capability of the project organization.

## Administrative Feasibility

Host Country. The Government of the Philippines (GOP) as the borrower will be represented by the National Economic Development Authority (NEDA). The National Irrigation Administration (NIA) will be the lead implementing agency responsible for implementing the project and for its subsequent operation and maintenance, working through NIA Region V. The Bicol River Basin Development Program Office (BRBDPO) will be responsible for interagency coordination. The Bicol River Basin Coordinating Committee (BRBCC) which is composed of the regional directors of key technical line agencies and the governors of the provinces of Albay, Camarines Sur and Sorsogon, will provide operating policies and guidelines for project planning and implementation. Programming functions are executed through interagency planning groups or sub-committees (see Figure 3). These bodies are fully functioning and are capable of providing necessary policy and coordinative functions. In this regard, the Bicol Program is the

# BRBDP COORDINATION STRUCTURE

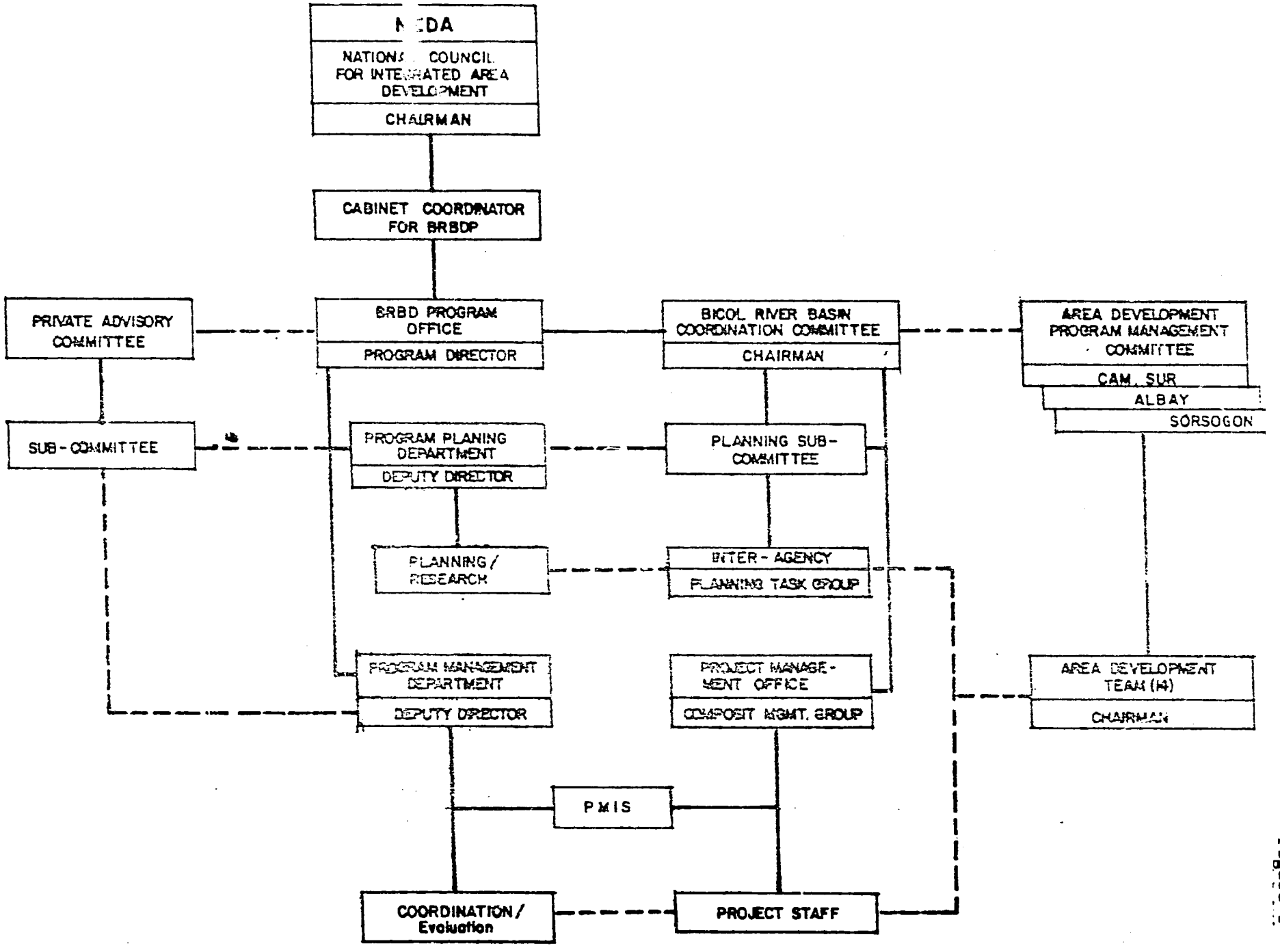


Figure 1

most advanced of the various nationally supported integrated rural development programs in the Philippines (see 1977 joint GOP-AID evaluation on the Bicol Program).

The policy making body of this Project will be the BRBCC sub-committee called the "Composite Management Group" and is composed of the regional directors of the NIA, NEDA, MLGCD, MAR, BAEx, MPWTC, MPH, BPI, BS, BAI, BL, FSDC, the Governor of Camarines Sur, the Mayor of Iriga City as Area Development Team (ADT) Chairman, and the BRBDP Program Director.

The Director of NIA Region V, as Chairman of the Composite Management Group (CMG) and concurrently the Project Director, shall be the presiding officer. He shall provide coordinative leadership, call meetings as required, prepare the agenda, and shall keep continuing official records.

The functions of the Sub-committee or Composite Management Group are:

- to serve as forum to resolve problems of the interagency coordination and institute remedial measures

- to establish basic policies and guidelines for the operation of the Project Management Office (PMO)

- to assure that plans and programs of the Project are carried out to achieve the objectives in a judicious and timely manner.

To facilitate implementation of the various integrated component projects, the physical Bicol River basin and watershed area is divided into eight (8) Development Areas (DA) each composed of from 5 to 6 municipalities and managed by an Area Development Team (ADT). The larger three-province Bicol Program area is divided into 13 Development Areas and into sub-DA's as required. The area development team is made up of the respective mayors of the member municipalities and local line agency field supervisors. The Rinconada ADT oversees implementation of the component projects within their area and ensures field level interagency coordination.

Local currency funds for the Project will be budgeted by the GOP through the Ministry of Budget to NIA and released through the regional NIA Office/PMO for project expenditures. NIA will maintain a separate account(s) for this Project.

An interagency Project Management Office (PMO) will be established by the NIA and BRBDP and staffed with full-time contract hire personnel and technicians detailed from the line agencies concerned with project implementation. The PMO shall [illegible] project manager and three deputy managers overseeing three divisions: Physical Development, Institutional and Agricultural Development, and Agro-forestation/Watershed Development.1/ The PMO, drawing on technical teams from NIA Manila, is responsible for engineering design, contract management of major facilities, and construction of some facilities on a force account basis.

The NIA central office in Manila will designate the full time project manager with the concurrence of the BRBCC and BRBDP Coordinator. NIA/Manila shall delegate authority to the NIA Region V/PMO to enter into and administer

1/ See Project Organization Chart p. 33 and detailed charts for the three divisions in Annex G(1) p. 72, G(2) p. 9 and G(3) p. 26.

contracts, make financial payments for work accomplished and hire additional PMO contract personnel as may be required, subject to existing GOP/NIA regulations. NIA/Manila will also detail additional qualified NIA personnel to the NIA Regional Office and/or the PMO as required to assure timely and effective implementation. The project manager will have adequate authority to administer and manage the project under the direction of the NIA Regional Director. Overall project direction will be provided by the project director who will have adequate delegated authorities discussed above. The project manager will have the delegated authority to exercise control and supervisory functions over all activities related to the field implementation and operation of the project.

The three deputy project managers shall be appointed by the project director. The deputy manager for Physical Development shall be an engineer from NIA. He will be responsible for all the construction components. The deputy manager for Institutional/Agricultural Development, will supervise the non-physical water resources components of the project including the detailed line agency extension personnel assigned to the project. The deputy manager for Agro-forestation/Watershed Development shall supervise all direct hire and line agency personnel detailed to that Program (see details under Administrative Feasibility in Annex G(3), Volume II).

Each agency or organization represented on the PMO staff will assign qualified representatives from their current staffing pattern or will hire additional staff as necessary. The project will provide funds for reimburseable representation allowances, honoraria, travel and per diems, etc. of key personnel from other agencies, but their basic salaries will be funded as part of their parent agencies' normal operating budget. The BRBDPO will negotiate with the agencies involved and will prepare a memorandum of agreement for the PMO staffing and logistic support.

GOP administrative arrangements and authorities to administer funds and manage the project, as outlined above, will be detailed in the GOP project implementation plan to be submitted as a condition precedent. In the opinion of the Mission, the agencies and organizations involved have the capability and commitment to implement their respective components of this project as proposed. The BRBDPO has developed its capability to coordinate effectively the several line agencies and provincial offices operating in the area, and the Presidential Decree 926 of April 1976 gives it clear authority to perform this function.

The NIA is responsible for constructing and managing the nation's larger irrigation systems, many of which are much larger than those proposed for the Bicol. In the Bicol Region, NIA has gained considerable experience over the last three years in the design and construction of the 4000-hectare irrigation system in Libmanan-Cabusao, under an AID-supported IAD Project, and of the pilot 100-hectare pump irrigation system in the Bula IAD II Project. In the latter case, NIA is assisting the Ministry of Agrarian Reform (MAR), the lead agency, to supervise the final design and construction of the remainder of the 2300-hectare irrigation system also supported by AID (see Annex L).

The administrative environment in the Bicol is presently one of increased awareness of how much more can be accomplished with well-planned and coordinated

efforts. The expected interagency problems still arise, but there is a coordinative organizational mechanism in place to deal with them. Nationally, GOP leadership continues to give high priority to intensified, integrated, and decentralized development projects in the Bicol Region. This is a favorable climate in which to implement this Project.

Many project area farmers have already been involved in plenary meetings and discussions about the proposed Project. They will become increasingly involved as it is implemented, as wage labor and trainees and as members of irrigators' associations responsible for operating and maintaining the on-farm portions of the irrigation and drainage canals constructed under the project. The project will also encourage greater farmer activism in cooperative ventures working through their Samahang Nayons. As discussed in Parts V and VI below, farmer households and organization representatives will participate in project monitoring and evaluation efforts, the households as survey respondents and the organizations through periodic reports on project progress and problems.

USAID. USAID monitoring of project implementation and management will be provided by the Mission utilizing on-board direct-hire personnel assigned to on-going Bicol grant and loan projects. Other required technical consultancy needed to address implementation problems and carry out evaluations will be provided under the approved Bicol grant project.

The Office of Regional Development (ORD) will coordinate various USAID supporting inputs at the field level and will be the principal liaison with the BRBDPO, the GOP coordinating agency. A USAID direct-hire engineer technically backstopped by the Office of Capital Development (OCD) and administratively supported by ORD is assigned as the USAID project officer to monitor this and two other on-going Bicol loan assistance projects. He also provides engineering/planning technical assistance to the BRBDPO and other appropriate regional GOP agencies as a member of the USAID Bicol core team.

The Office of Capital Development (OCD) will represent the Mission in loan negotiations and loan administration, and in all engineering matters. The Mission, through various support staff, will take appropriate action to meet all AID legal requirements for loan administration. Long term U.S. and Filipino consultants are programmed under the Bicol grant project beginning in 1979 to support irrigation water management and farmers' organizations development through NIA Region V. The Office of Agricultural Development (OAD) will also provide assistance in the fields of improved agricultural technology, credit, cooperatives, extension and marketing from on-board and consultant staff as requirements are identified and as time permits.

USAID will have access to all pertinent project reports and other documents issued by the implementing agency, the Project Management Office, and project contractors that relate to project progress and problems. USAID will monitor all activities, including quality control measures, that relate to reimbursement of local currency costs, and will conduct field inspections as required. USAID will participate in joint annual implementation assessments and the final impact evaluation.

## E. Environmental Concerns

The goal of the Rinconada/Buhi-Lalo Integrated Development Project, as well as the overall Bicol River Basin Development Program, is to improve the socio-economic situation and quality of life of the rural poor through increased agricultural production and productivity. These goals will be attained through such things as improvements in irrigation and drainage facilities, reduced flooding, agro-forestation in the uplands, the construction of additional secondary and feeder roads and the rehabilitation of existing roads.

Impacts on the natural environment which will result from the various Bicol Program activities are discussed in the two volume "Environmental Assessment of Bicol River Basin Development Projects" prepared by the Philippines Interagency Committee on Ecological Studies, with the assistance of an AID-financed consultant in 1978.1/ This study is Annex N of this project paper. Copies of this two-volume document are available for review in AID/W (Asia /PD and Asia/TR). Environmental concerns regarding components of the proposed Rinconada/Buhi-Lalo Project are also described in appropriate sections of the TAMS-TAE Rinconada Feasibility Study completed in January 1979.2/ Measures which will be taken to mitigate adverse effects are also discussed.

The conclusion of these documents is that the environmental and socio-economic benefits to be derived from the proposed project will far outweigh any unavoidable adverse effects.

# IV. Financial Analysis and Plan

## A. Financial Plan and Project Budget

Tabular summaries of the project budget and its proposed sources of funding are presented in Tables 1 and 3. More detailed cost estimates are included in Annex H.

Of the $8.5 million total project cost, the $5.0 million AID loan will provide 59%. About 10% of the AID funds will be used to cover the direct foreign exchange costs of maintenance equipment, and AID funding is proposed for final compilation of baseline data to be used in later impact evaluation. Some 3.8 million, or about 75% of the AID loan, will be applied toward water source development and irrigation construction, $2.1 million for the former and $1.7 million for the latter (including cost escalation and contingencies). Some $516,000 is earmarked for the Agro-Forestation/Watershed Development component of the project, or 10% of the AID loan, focusing mostly on the nurseries and the permanent improvements to be achieved through land development and tree planting activities. Small amounts are also designated to support critical elements of planned training and extension activities, field irrigation management facilities, and contract technical services in the Philippines.

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1/ Interagency Committee on Ecological Studies, Man and the Biosphere, Environmental Assessment and Bicol River Basin Development Projects, Volumes I & II, (December 1978). Financial support provided by AID/W, Asia Bureau.

2/ Printed copies of the five-volume report are expected to be provided by the contractor in March 1979. Copies will be provided to AID/W.

Table 3. Projected Expenditure Schedule by Major Component and by Source of Funds, Annual U.S. Dollar Equivalents Bicol IAD-III (Rinconada-Buhi/Lalo) Project ($1000)[1/]

| Project Component and Source of Funds | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | Sub-Total | Cost Escalation | 15% Contingency[2/] | Project Total |
|---|---|---|---|---|---|---|---|---|---|---|
| I. Lake Buhi Water Source Development | | 656 | 1216 | | | | 1872 | 525 | 360 | 2757 |
| II. Lalo Irrigation Construction | 67 | 701 | 785 | | | | 1553 | 411 | 295 | 2259 |
| III. PMO for Irrigation & Agr. Support | 759 | 345 | 253 | 247 | 148 | 31 | 1783 | 517 | 345 | 2645 |
| IV. Agro-Forestation/Watershed Devel. | | 97 | 101 | 110 | 119 | 88 | 515 | 211 | 109 | 835 |
| SUB-TOTAL | 826 | 1798 | 2355 | 357 | 267 | 119 | 5723 | | | |
| Cost-Escalation[2/] | 178 | 405 | 732 | 144 | 134 | 72 | | 1664 | | |
| 15% Contingency | 151 | 330 | 463 | 75 | 60 | 29 | | | 1108 | |
| PROJECT TOTAL | 1154 | 2533 | 3550 | 576 | 461 | 221 | | | | 8495 |
| AID Loan Total | 404 | 1120 | 1581 | 85 | 92 | 79 | 3360 | 988 | 652 | 5000 |
| Local Currency | 59 | 1120 | 1581 | 85 | 92 | 79 | 3015 | 879 | 584 | 4479 |
| Foreign Exchange | 345 | | | | | | 345 | 109 | 68 | 521 |
| GOP Contribution (LC) | 422 | 678 | 775 | 272 | 175 | 41 | 2363 | 676 | 456 | 3495 |

Note: Figures may not add exactly to totals due to rounding.

1/ Converted from peso figures in Annex Tables H-2, H-3 and H-4 at ₱7.50/$1.00.
2/ From 1978 base year prices, local currency costs are escalated by 7%/yr. and imported equipment by 15%/yr.

ORD:CSCallison,vbp 3/2/79

**Table 4.** Cost of Project Outputs by Source of Funding
Bicol IAD-III (Rinconada-Buhi/Lalo) Project ($1000)[1/]

| | Project Outputs | Total Magnitude of Output | Total Cost | AID Loan | GOP |
|---|---|---|---|---|---|
| I. | Lake Buhi Water Source Development (water for 8000 ha.) | | 1872 | 1406 | 466 |
| | Lake Buhi control structure & bridge | 1 | 883 | 663 | 220 |
| | Barit River Channel | 1 | 883 | 663 | 220 |
| | Forebay headworks | 1 | 106 | 79 | 26 |
| II. | Lalo Irrigation Construction (2700 ha. irrigated) | | | | |
| | a. Distribution facilities & structures | | 1553 | 1166 | 387 |
| | Existing main canal rehabilitated | 10 km | 3 | 2 | 1 |
| | Service roads on existing laterals | 27 km | 235 | 177 | 59 |
| | Drainage structures in upper Lalo | 6 | 10 | 7 | 3 |
| | Left connector canal, service road & structures | 2 km | 154 | 116 | 38 |
| | Lateral I extension & service road | 7 km | 370 | 278 | 92 |
| | Extension area lateral, service road & structures | 21 km | 293 | 220 | 73 |
| | Main & supplementary farm ditches | 125 km | 30 | 22 | 7 |
| | On-farm drains | 39 km | 11 | 8 | 3 |
| | Main & secondary drains & structures | 22 km | 86 | 65 | 21 |
| | Parshall Flumes | 21 | 8 | 6 | 2 |
| | Turnouts & division boxes | 401 | 35 | 26 | 9 |
| | Gates installed | 401 | 22 | 16 | 5 |
| | Vehicle & pedestrian crossings | 56 | 91 | 69 | 23 |
| | Daraga River flume/bridge crossing | 1 | 205 | 154 | 51 |
| | b. Project facilities | | 163 | 38 | 125 |
| | Administration building | 1 | 27 | | 27 |
| | Equipment building | 1 | 10 | | 10 |
| | Laboratory building | 1 | 10 | | 10 |
| | Compound & improvements | 1 | 33 | | 33 |
| | Improvements of NIA Regional Training Center | 1 | 56 | 28 | 28 |
| | Gatekeepers quarters | 3 | 12 | 6 | 6 |
| | Water management technician working stations | 6 | 8 | 4 | 4 |
| | Communication system | 1 | 7 | | 7 |
| III. | Agricultural & Institutional Development | | 398 | 56 | 342 |
| | a. Organizations formed and/or supported | | | | |
| | Rotational Unit Groups (8-10 farmers @) | 280 | | | |
| | Farmer Irrigators Groups (40-50 farmers @) | 60 | | | |
| | Farmer Irrigators Associations (500 farmers @) | 5 | | | |
| | Rural Improvement Clubs | 20 | | | |
| | b. People trained | | | | |
| | Water management trainors | 5 | | | |
| | Watermasters/Gatekeepers | 12 | | | |
| | Ditchtenders | 26 | | | |
| | Rotational unit group leaders | 280 | | | |
| | Farmers: water mgt./production | 2450 | | | |
| | Farmers: cooperatives/credit/mkt. | 2450 | | | |
| | Homemakers | 2450 | | | |

Table 4 cont.

| Project Output | Total Magnitude Of Output | Total Cost | AID Loan | GOP |
|---|---|---|---|---|
| c. Applied agricultural research | | | | |
| Trails/demonstrations | 10 | | | |
| IV. Agro-Forestation/Watershed Development | | 333 | 305 | 28 |
| Project Staff trained | 6 | 6 | | 6 |
| In-service seminars for technicians | 15 | 18 | 5 | 13 |
| Assemblies for farmer organization & training | 30 | 9 | | 9 |
| New area terraced for rice/corn production | 270 ha. | 72 | 72 | |
| New mixed agro-forestry orchards planted | 900 ha. | 84 | 84 | |
| Firewood lots established | 180 ha. | 4 | 4 | |
| Denuded areas reforested | 800 ha. | 113 | 113 | |
| Upland access trails constructed | 40 km. | 27 | 27 | |
| Project Management (not included above) | | 1404 | 389 | 1015 |
| Irrigation | | 1222 | 376 2/ | 846 |
| Agro-forestation/watershed development | | 182 | 13 | 169 |
| SUB-TOTAL | | 5723 | 3360 | 2363 |
| Cost Escalation | | 1664 | 988 | 676 |
| 15% Contingency | | 1108 | 652 | 456 |
| TOTAL | | 8495 | 5000 | 3495 |

Note: Items may not add exactly to totals due to rounding.

1/ Converted from peso figures in Annex Table H-5 at ₱7.50/$1.00.
2/ $330,000 for maintenance equipment, the remainder for impact evaluation.

ORD:CSCallison,vbp 3/2/79

The GOP contribution will amount to $3.5 million, or 41% of total project cost, fully satisfying the requirements of Section 110(A) of the FAA. Besides covering about 25% of the water source development and irrigation construction costs, GOP unreimbursable funds will cover most (74%) of the Project Management Office expenditures, including Agricultural and Institutional Development activities, and 38% of the Agro-Forestation/ Watershed Management component.

A contingency fund of 15% and compounded cost escalation factors of 15% annually for imported equipment and 7% annually for all local currency costs have been applied and added to the basic cost estimates, which were made in pesos and converted to dollars at an exchange rate of ₱7.50/$1.00.

Of the total project budget, the Lake Buhi water source development component will require around $2.8 million, or 32%; the Lalo irrigation construction will cost $2.3 million, or 27%; the Project Management Office for irrigation and agricultural support is budgeted at $2.6 million, or 31%; and the agro-forestation/watershed development effort is funded at $835,000 or 10%. (See Table 3).

The AID loan funds for this project are expected to be authorized in two tranches, $3.5 million in FY 1979 and $1.5 million in FY 1980. The Agro-Forestation/Watershed Development component will be funded wholly from the second tranche, and its budget will run for five years beginning in late 1980 or early 1981, one year later than the irrigation components, which will begin in early 1980 and also run for five years. This results in a total project lifespan of six years. It will be necessary for the GOP to continue key Agro-forestation/Watershed Development support expenditures for two additional years (1986 and 1987). A project covenant to the loan agreement relates to this required support. The AID-funded final impact evaluation of the entire project is also scheduled for the sixth year ($31,000).

Fixed Amount Reimbursement (FAR). The GOP, through the NIA lead agency, will make annual budget releases specifically for this project in sufficient amounts to cover all projected local currency costs. Upon completion of a useable segment of construction in conformity with previously agreed upon plans and specifications, or upon the completion of a specified activity designated for AID support, AID will reimburse the fixed amount agreed upon utilizing standard Mission FAR procedures. These will be spelled out in detail in an implementation letter(s). The GOP will be responsible for all costs overruns. AID reimbursement will be made in pesos under the direct reimbursement authority (DRA) mechanism.

The costs that are eligible for reimbursement will be reviewed and approved by AID and detailed in the formal FAR agreement. Costs will be calculated in Philippine pesos and dollar reimbursement will be based on the selling rate for U.S. dollars set by the Central Bank of the Philippines on the date USAID/Manila officially receives an application for reimbursement from the GOP. AID reserves the right to inspect completed facilities and to monitor non-construction activities eligible for reimbursement prior to approving reimbursement requests.

Equipment. The proposed $502,000 (including contingency and cost escalation) in imported maintenance equipment shall be procured by the Project Management Office (PMO) in accordance with provisions of AID Handbook 1, Chapter 3, following normal AID Letter of Commitment procedures. (See List, Annex H, p. 23).

Interest Rate and Terms of Payment. The cooperating country shall repay the AID loan in U.S. dollars within forty (40) years from the date of first disbursement of the loan, including a grace period of not to exceed ten years. The cooperating country shall pay interest to AID in U.S. dollars from the date of first disbursement of the loan, at the rate of (a) two percent per annum during the first ten years and (b) three percent per annum thereafter, on the outstanding disbursed balance of the loan and on any due and unpaid interest accrued thereon.

B. Budget Analysis of the Lead Implementing Agency

The project will be managed by the NIA Regional Office based in Naga City, supported by the NIA Office in Manila. NIA is a government corporation. Annual local currency budget counterpart requirements are presented in Table H-2, Annex H, and peak at $2.6 (₱19.7) million in 1981 and $3.5 (₱26.6) million in 1982, year 2 and 3 of the project. The actual 1978 capital budget handled by NIA nationwide came to a total of $258.9 (₱1,942.0) million. NIA budget projections for CY 1981 total $356.2 (₱2,671.3) million and for CY 1982 $391.8 (₱2,938.7) million, and the proposed project budget represents an increment of only 0.8% of the regular funds expected to be controlled and disbursed by NIA. NIA follows GOP fiscal procedures and is subject to national regulations and audit. The Mission believes NIA has adequate procedures and sufficient capability for handling the project flow of funds.

C. Financial Viability of the Proposed Irrigation Component

The annual per hectare water fee charged in the existing Lalo system (1,100 hectares) is 5 cavans. Collection rates on current account during the last two years have been 50 to 60 percent, higher than most national systems. The financial viability of the proposed irrigation rehabilitation and expansion was investigated by determining the size of the water fee NIA would need to charge farmer beneficiaries to amortize the cost of construction over a 40-year period and meet operation and maintenance costs. This fee was then examined at the farm level to see how easily farm households can meet it from anticipated increases in production (see Financial impact on Target Beneficiaries below).

Assuming a 100 percent rate of collection, the new annual water fee is in the neighborhood of 12 cavans (see Determination of Water Fee discussion in Annex H, Table H-27). At the farm level, this represents about 10 percent of the increment in per hectare productivity. The quality of the service the farmer receives is the primary determinant of his willingness and ability to pay. The extent to which the Philippine government and society must subsidize the proposed Lalo system will depend on the system's ability to provide full and timely service and by so doing increase the farmer's willingness to pay his fees. While the improvements proposed in this project have been explicitly designed with an eye towards high quality water management, it may be realistic to anticipate a collection rate of

less than 100 percent. At 12 cavans per year, a 50 percent rate of collection would yield about ₱850,000--enough to meet system operation and maintenance requirements, but the annual amount available for amortization would be reduced.

D. Financial Impact on Project Beneficiaries

The proposed irrigation component will benefit approximately 1,000 farm households cultivating land in the unrehabilitated Lalo system service area and another 1,450 households farming in the system's extension area. The financial impact on both groups is three-fold and differs primarily in magnitude (refer to Annex Table H-28).

First, realization of the full benefits made possible by new or improved irrigation service requires the complementary use of fertilizer. This means an increase in per hectare cash expenses from approximately ₱790 and ₱850 each crop on rainfed and irrigated land, respectively, to a little over ₱1,100 per crop under with-project conditions. On-going government-sponsored farm credit programs in the area are considered capable of satisfying this incremental demand for farm financing.

Secondly, NIA seems intent on having farmer beneficiaries pay a fee which will amortize the system as well as covering operation and maintenance expenses. Such a fee would be in the neighborhood of 12 cavans per year (see discussion of Water Fee Determination, Annex H Table H-27), which is much steeper than the 3 cavans and 2 cavans presently charged for dry season and wet season service. However, it would still be within the ability of farmers to pay out of the anticipated increases in their productivity. The new fee represents 11 percent of the yearly increase in production envisioned for those farmers in the extension area already attempting two crops a year. The 7 cavan increment over the present 5 cavan fee is also 11 percent of the 71 cavan increase envisioned for farmers in the rehabilitated portions of the system.

Finally, a comparison of the typical net returns to farm households under without-project and with-project conditions clearly demonstrates the financial benefits to the targeted beneficiaries. Annual returns to rice-producing farm families will increase from about ₱550 to over ₱4,400 in the Lalo extension area. In the rehabilitated area an average increase in annual household returns from ₱2,650 to over ₱4,400 is expected. Valued at ₱8.00 per manday, the typical farm-budget summaries presented in Annex I indicate the 2700-hectare project will increae annual farm labor requirements from 481,700 mandays to 646,650, or from an average of 178 mandays per hectare to 240. This represents an increase in productive employment of 34%, which will be shared by both farm and landless labor families.

The technical assistance provided by the project's agro-forestation/watershed management component will enable each upland family to develop 1.5 hectares into a mixed-crop production unit. After 8-10 years, when all orchard crops have reached full production, the unit will provide an annual net return of $1000 (₱7500) per family, increasing gradually from $250 (₱1900) the second year and $330 (₱2500) the third. (See Annex G(3), Attachment C).

## V. Implementation Plan

### A. Proposed Schedule

Preliminary Activities. The responsibilities of each participating agency for PMO staffing and logistic support will be specified in an initial memorandum of agreement among NIA, BRBDP and the other agencies involved. This will be accomplished within the first month after the loan agreement is signed and personnel assignments to the PMO will occur by not later than the third month.

NIA and the PMO, once it is constituted with the assistance of the BRBDPO, will be responsible for completing or securing and submitting all documentation to satisfy the conditions precedent to first disbursement in accordance with the loan agreement.

Final Design and Construction - Water Resources. Final engineering survey, design, cost estimates, and preparation of construction specifications and other tender documents shall be accomplished for the PMO by the NIA Regional Design Division, to which NIA/Manila has agreed to assign sufficiently qualified staff for this task, and is targeted for completion by December 1981. The PMO shall prequalify construction bidders, advertise for, open and evaluate bids and shall award contracts for actual construction. It shall also be responsible for day-to-day supervision, inspection and materials quality control of contract construction work. Plans, specifications, cost estimates, and bid packages will be subject to the review and approval of Regional NIA, BRBDPO and USAID.

The proposed construction schedule appears in Annex G(1), Figure G(1)-22. Although the total project lifespan is 6 years, all major construction activities are scheduled to be completed by the end of the third year of the project, with any delays carried into the fourth year.

Construction of all major physical components shall be contracted by the PMO to two or more private engineering construction firms. To develop the contracting capabilities of local contractors, local sub-contracting will be encouraged and smaller components will be allocated to local contractors (or carried out by NIA force account if more feasible). Construction equipment will be procured or leased for force account work and operation and maintenance of the irrigation system. Day-to-day construction supervision will be under the Construction Management Staff (CMS). The CMS will be organized as a separate unit composed of Senior Engineers and will be directly under the Project Manager (see Organization Chart, Figure 2).

A Committee on Bidding and Award will be created by the PMO to evaluate the qualifications of construction contractors and award contracts to successful bidders. Bidding will be conducted in accordance with existing laws and pertinent rules and regulations of NIA.

A Force Account Unit will be organized to administer the construction of terminal facilities and farm ditches through labor intensive methods. It will give priority to farmers and landless residents from the project area in the recruitment and hiring of required unskilled manual labor.

# PROPOSED ORGANIZATIONAL CHART
## PROJECT MANAGEMENT OFFICE
## RINCONADA IAD III
## BUHI-LALO INTEGRATED DEVELOPMENT PROJECT

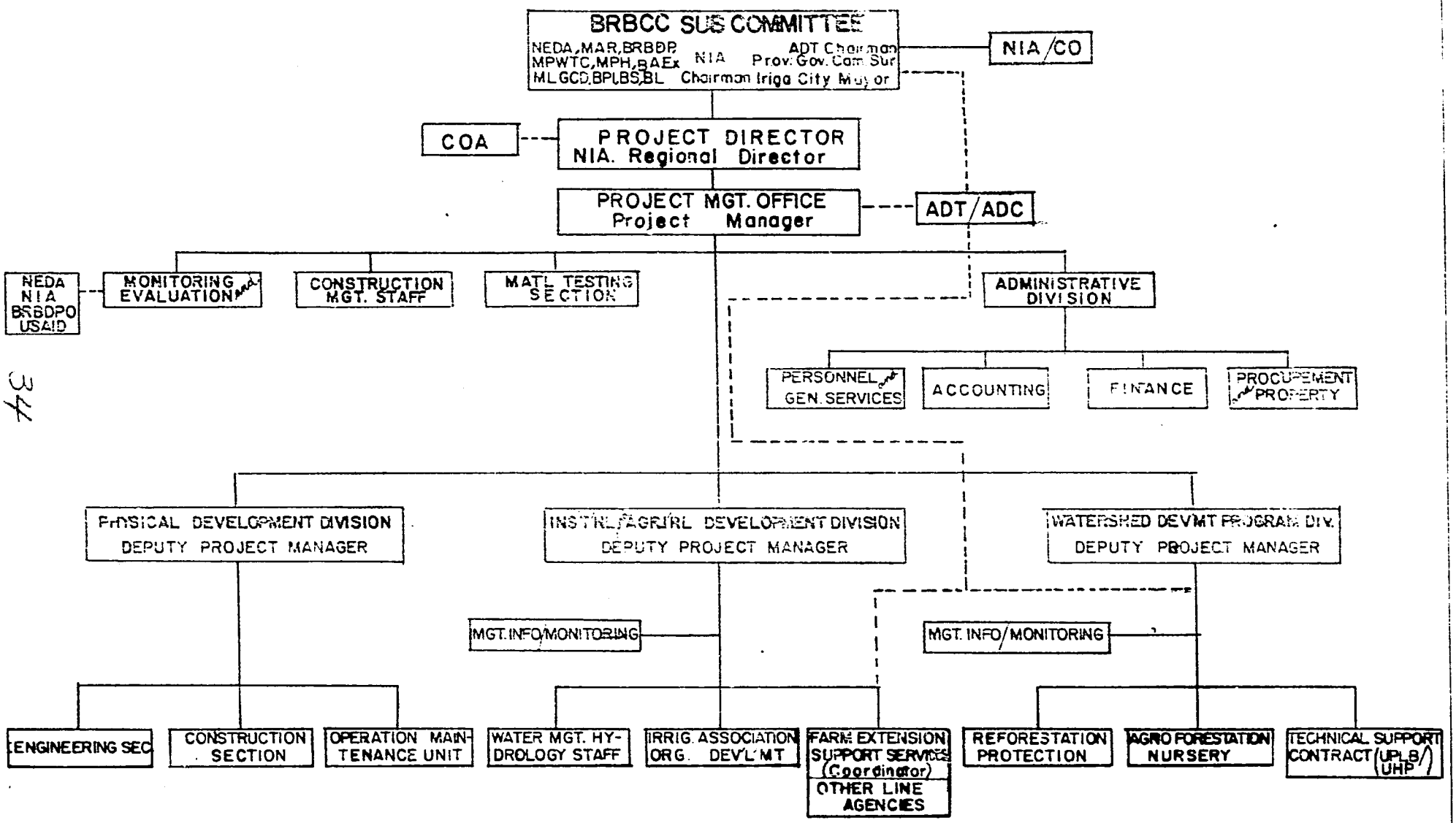


Figure 2

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Operation and Maintenance. The control and operation of the Lake Buhi outlet structure, main headgates, lateral headgates and turnout gates will be placed under the supervision of the O&M Office of NIA Region V. A water permit and the related resolution issued by the National Water Resources Council (NWRC) will cover all diversions of Lake Buhi water for multipurpose use proposed in this project.

The entire 10,000-hectare area irrigated from Lake Buhi (8,000 incremental area) will be placed under the supervision of a NIA Region V Irriation Superintendent for operations and maintenance. It will be subdivided into approximately four irrigation divisions, of which the entire USAID supported project area will be one. A Water Management Technologist will be directly responsible for the operations and maintenance of each division and will supervise a staff including one Water Management Technician for every 500 hectares hectares and a ditchtender for each rotation area of approximately 50 hectares, or one ditchtender for every 3 to 5 km. of lateral canal. The Water Management Technologist must have had wide experience in irrigated rice cultivation and water management. The technicians will be agricultural or vocational college graduates. All ditchtenders, technicians and the technologist will undergo training by the PMO in water management, crop production and farmer organization development prior to completion of construction.

NIA and the Farm System Development Corporation (FSDC) will provide on-going supervision and technical assistance to the irrigators' associations both during and after the project. Field extension will be provided by responsible line agencies in coordination with O&M personnel and as agreed in the initial Memorandum of Agreement.

NIA will set water fees on a per hectare basis sufficiently high to cover annual O&M costs and to amortize the initial investment of the system over a 40-year period. The average rate of real interest presently charged by NIA on such amortization is 1.3%, since the fees are set in cavans of rice paddy. This is equivalent to a nominal rate of interest of 1.3% plus the annual rate of inflation, which has lately been averaging about 7-9% annually.

Equipment Purchase. All activities in the purchasing and delivery of equipment purchased with AID funds will be handled in accordance with AID Handbook 11 and subject to final review by AID for compliance. All equipment is scheduled for procurement within the first two years after the signing of the loan agreement.

Agricultural and Institutional Development. A separate division within the PMO headed by an assistant project manager will oversee the project's agricultural and institutional development activities. The division will be staffed with personnel directly hired by the project and with line-agency personnel detailed to the project by the regional offices of NIA, the Ministry of Local Government and Community Development (MLGCD), the Ministry of Agrarian Reform (MAR), and the Ministry of Agriculture (MA). The BRBDPO will provide for overall interagency coordination during implementation and for project monitoring and evaluation.

Five trainors responsible for the project water management training activities will be newly hired or detailed from other line agencies involved in farmer training and organization of irrigators groups. In early 1980, these trainors will attend a 30-day session in water management and related aspects of irrigated agriculture at the Upper Pampanga River Irrigation System Water Management Training Center. Upon their return, these trainors and additional NIA and MLGCD personnel will begin preparations for the organization of farmers into rotational unit groups and farmer irrigators groups. Before mid-1980, in-field organizational efforts will begin in the existing Lalo service area.

One of the first steps in organizing such groups will be barangay level farmer sessions conducted by an interagency team of field technicians from MLGCD, NIA, MA and MAR. Initial meetings will serve to inform farmers of the proposed project's activities and begin eliciting their involvement in the detailed design, construction and operation/maintenance phases of the project. The proposed fertilizer and production trial/demonstrations to be undertaken by MA technicians will be explained and potential cooperators identified. Later meetings will include discussions on the structure and function of the irrigators organizations. Rotational unit groups will be formed and group leaders will be elected. NIA technicians will work closely with the members of each rotational unit group to derive a mutually satisfactory water distribution schedule. Technicians from all of the identified agencies will take part in sessions related to farm-level water management and associated production, post-harvest handling, and marketing practices. By taking part in these sessions, MLGCD technicians responsible for Samahang Nayon organization and training will be able to coordinate their activities more closely with the formation of project irrigators' groups.

During the first two years, these detailed organizational and training efforts will be concentrated in the existing Lalo service area where irrigation service is already operational on some 1,100 hectares. By the end of 1981, approximately 100 rotational unit groups and 20 farmer irrigators groups will be operational. In the Lalo extension area, initial project information sessions will be held in 1980. The organization of irrigators groups, farm-level trials/demonstrations, and improved water and farm management training efforts will proceed with project construction activities. As rotational unit groups are formed, the water management trainors will initiate one-week courses in water management, leadership and the organization and responsibilities of irrigators for rotational unit group leaders who will coordinate the distribution of water from supplementary farm ditches. This will be an on-going training activity during the second through fifth years of the project.

Additionally, all of the NIA operation and management personnel working in the existing Lalo service area will receive some water management training during the first year of the project. This training will primarily relate to the use of the new water management devices--primarily steel headgates and measurement flumes--installed by the project as part of its rehabilitation program. The completion of construction in the extension area will mark the beginning of a year-long debugging period to be undertaken by NIA staff. During this period, all of the technicians to be employed in the rehabilitated and extended portions of the Lalo system will receive intensive training in the operation and maintenance of the entire system.

Technicians from the Bureau of Agricultural Extension (BAEx) will intensify their efforts in the organization and training of the project area's women. It is estimated that five new Rural Improvement Clubs for women will be organized each year during 1981 through 1984. One of the first concerns will be to identify the perceived needs of the project area's women so relevant and popular programs may be planned. Club activities may include training in home management, improved literacy, family health and nutrition, the operation of small-scale livestock enterprises, cottage industry skills, management and marketing, or simply ways of gaining access to government-sponsored social service programs (additional details are presented in Annex G(3).

Agro-forestation/Watershed Development. The Agro-forestation/Watershed Development Program component (Phase II) is scheduled to be initiated approximately one year after the start of the overall Buhi-Lalo Development Project--late 1980 with upland physical work to start at the beginning of the 1981 dry season. Approval and implementation are conditioned, in part, on the success of Phase I activities over the 1979-1980 period which is being funded from other GOP/USAID sources. Based on joint agreement by the GOP and USAID to proceed, the Agro-forestation/Watershed Development Annex shall be revised, if required, by January 1980. It shall be submitted to USAID/Manila and NEDA for subsequent review and approval. Once approved, the AID contribution for both the watershed development portion (est. $518,000) and the second tranche for irrigation development would be included in the FY 1980 obligation and amendment to the basic loan agreement. GOP funding for watershed activities may be provided earlier, however.

AID funding for watershed development shall be made available for disbursement after fulfillment of subsequent conditions precedent, most importantly, submission of a detailed implementation plan, including a hard schedule and quarterly budget for watershed activities.

It is proposed that the full complement of program staff be hired in late 1980 and physical work begin in January 1981 at the advent of the dry season. The best estimate of scheduling of other proposed watershed activities is outlined in "Proposed Implementation Schedule, 1980-81" (Figure G(3)-3).

Technical and other concerns relating to implementation are spelled out in Annex G(3): particularly Part I.B.3 (Program Site, Problems and Approaches) and Attachment 1, (Implementation Letter No. 5 Bicol Grant Project 492-0303), which outlines the Phase I Start-up effort.

B. Funding and Payment

For Philippine currency funding, NIA will include sufficient funds in its budget request for each year to cover planned expenditures on this project. Such budget requests will be earmarked "KBC Code 4" to assure their priority for approval and budgetary releases as required counterpart for a foreign donor-assisted project. The Project Manager will withdraw funds from the Project Account for contract construction services and other expenditures, with the concurrence of the Project Director, and will make payments accordingly. (See Part IV above for a discussion of the use of AID loan funds).

C. Monitoring

Representatives from NIA Region V and the BRBDPO shall be designated to monitor and inspect the project both independently and through the PMO to assure acceptable performance work by contractors and in PMO force account activities, training, field extension, and applied research. Monthly and annual reports covering all project components will be prepared by the PMO and transmitted to NIA, BRBDPO and USAID. In addition, the three monitoring agencies may invite independent quarterly progress reports from the Samahang Nayon organizations in the project area and newly formed irrigators' associations.

USAID will work closely with the PMO during project implementation and will conduct both joint and independent monitoring of construction work as required to assure compliance with agreed plans and specifications for reimbursement purposes. An AID direct-hire planning-engineer, presently on-board, will be assigned professional local-hire staff as required to assist in the inspection and monitoring of the project in accordance with AID procedures and audit regulations.

Following the completion of the AID-funded portion of the project, NIA and BRBDPO will continue monitoring the remaining training and field extension activities and the operations and maintenance of the facilities constructed. Any problems identified will be brought to the attention of appropriate NIA authorities and, if necessary, the BRBCC for resolution and remedial action.

The monitoring agencies will expect the PMO to work closely with project beneficiaries to obtain feedback and suggested solutions to any problems that might arise during implementation. The monitoring agencies will carefully consider any issues and problems brought to their attention by the irrigators' associations and Samahang Nayons. NIA and the BRBDPO will continue to invite periodic reports from farmers organizations after project construction.

VI. Evaluation Plan

Operational progress reports and socio-economic household surveys will generate the information necessary for evaluating: (1) the operational efficiency and relevance of the organization and management adopted for the project, (2) the accomplishment of physical output targets, (3) socio-economic impact and (4) the effects on the general quality of life, attitudes and social awareness of the beneficiaries. Formal implementation project assessments (evaluations) will be undertaken in May of each year beginning in 1981 through 1985 by a joint evaluation team composed of representatives from NEDA, BRBDP, NIA and USAID. The final impact evaluation is scheduled in late 1985. Details of the evaluation schedule are presented in Annex L.

Operational Progress Reports. The PMO/NIA, shall submit monthly and annual progress reports, including a terminal report at the end of the sixth year of the project. These reports will include the rate of progress and accomplishment of the objectively verifiable inputs and outputs of the project, including comments on problems encountered and actions taken in the course of project implementation.

The above reports shall be supplemented by summary monthly reports prepared by the BRBDPO for the Project Management Information System (PMIS). BRBDPO reports will indicate the status of construction, problems encountered, management efficiency and corresponding recommendations designed to improve project organization and management.

Socio-Economic Household Surveys. The Bicol Multipurpose Survey (BMS), a randomly sampled socio-economic household survey shall be conducted every three years (beginning in 1978) by a competent research group contracted by the BRBDPO. Funding for the 1978 and 1981 surveys and selected analysis is programmed in the Bicol grant project supported by AID. Details of the 3-province, 1900-household 1978 BMS and proposed analysis appear in Annex K. Additional sub-samples of 100 households are programmed for the Buhi watershed and Lalo irrigation system in 1981 or earlier. The BMS analytical reports will include measures of the socio-economic impact of the Rinconada IAD component activities and will enable evaluators to determine whether the various projects and their components are achieving desired objectives. The analysts will be able to compare socio-economic indicators and their trends within the project area with similar data from other Bicol project areas. The key indicators of social and economic change to be evaluated are discussed in Annex K.

A special Rinconada household survey and a barangay institutional inventory was conducted by TAMS-TAE for the Rinconada Feasibility Study social soundness analysis. Together with the BMS, they will provide baseline data for the Buhi/Lalo project area and for the other Rinconada projects proposed for ADB funding. The TAMS-TAE Rinconada household survey was completed in 1978, but due to coding and computerization problems, only a small portion of the data was utilized by TAMS-TAE analysts. Budget is allocated ($15,000) to complete the data files and tapes and perform some preliminary analysis to establish baseline benchmarks, or carry out special BMS sub-samples. If funded from other sources, this budget shall be allocated to the final impact evaluation. The TAMS-TAE sample, randomly selected from the whole Rinconada IAD, includes a total of 783 households composed of 465 from irrigated areas, 245 in upland watershed areas, 454 in proposed road influence areas and 295 in frequently flooded areas (some households fall within more than one category). In addition to the areas of concern to the BMS, it will also support impact evaluation on (1) rural energy demand and utilization, (2) fishing and non-agricultural occupation, (3) rural youth, and (4) different cropping systems. The barangay institutional inventory, patterned after the SSRU Municipal Inventories and based on approaches developed at Cornell University and the East-West Center, will support impact analysis on (1) patterns of local institutional development, (2) availability of basic educational and health services, and (3) characteristics of economic infrastructure (marketing, processing, storage, etc.).

## VII. Conditions, Covenants and Negotiating Status

### A. Conditions Precedent

In addition to the standard terms and conditions precedent (CP's) to the release of loan funds, the loan agreement should provide that:

a. "Prior to the first disbursement under the Loan, or the issuance by A.I.D. of documentation pursuant to which disbursement will be made, the Borrower will, except as the Parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

"(1) An opinion of counsel acceptable to A.I.D. that the Project Loan Agreement has been duly authorized and/or ratified by, and executed on behalf of, the Borrower, and that it constitutes a valid and legally binding obligation of the Borrower in accordance with all of its terms;

"(2) A statement of the name of the person holding or acting in the office of the Borrower, and of any additional representatives, together with a specimen signature of each person specified in such statement;

"(3) A plan for the evaluation of the project during and after implementation;

"(4) A copy of the Philippine Government order designating the National Irrigation Administration (NIA) as the lead implementing agency ("implementing agency"), and the Bicol River Basin Development Program Office (BRBDPO) as the Bicol level coordinating agency ("coordinating agency") for the effective and timely implementation of this Project;

"(5) A copy of the Philippine Government order establishing a Composite Management Group (CMG) composed of the NIA Regional Director, as Chairman and Project Director, and the Regional Directors or heads of appropriate national and local Government agencies. The CMG shall be given sufficient authority and responsibility to enable it to effectively manage and carry out its functions, including the necessary delegations of authority from the NIA to (a) enter into contracts regardless of amounts of the components; (b) make financial payments for work accomplished regardless of amount; and (c) hire additional personnel required by the Project. The order shall include authority for the CMG to redelegate sufficient and appropriate authority to the Project Manager and his staff to implement the Project on a daily basis;

"(6) A plan for the implementation of the Project prepared by the PMO, including a quarterly projection of funds available to finance the various elements of the Project; and

"(7) A copy of the appropriate water permit and related resolution issued by the National Water Resources Council (NWRC) covering all diversions of Lake Buhi water for multipurpose use as proposed in the Project."

b. "Prior to disbursement under the Loan, or the issuance by A.I.D. of documentation pursuant to which disbursement will be made, to finance the agro-forestation/watershed development component under the second increment of the Loan, the Borrower shall, except as the Parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D. an updated plan for the implementation of these activities incorporating the experience and evaluation recommendations arising out of Phase I of the ongoing Bicol Agro-forestation/Watershed Development Program, including an updated quarterly projection of funds available to finance the various elements of this component."

## B. Covenants

The Loan Agreement should contain the following special covenants by the Borrower:

"(1) The Borrower, through the BRBDPO, in coordination with the National Water Resources Council (NWRC) and the Bureau of Public Works (BPW), shall establish or rehabilitate (by January 1980), operate and maintain sufficient hydrometeorological stations in the Rinconada-Buhi area of the Bicol River Basin, according to acceptable engineering standards, to collect the basic data required to properly design and operate existing and proposed irrigation systems. Operational staff shall receive in-service training at least once each year. Data collection, computation, and tabulation shall be kept current for use by all interested agencies. The overall Bicol River Basin hydrometeorological program, of which the above stations are a part, shall be evaluated semi-annually by a BRBDPO inter-agency team, to include an analysis of data validity and reliability.

"(2) The Borrower, through the Ministry of Agrarian Reform, will assure that Barrio Committees on Land Production (BCLP) determine, based on values set as of October 21, 1972, and that MAR approve at the regional level, land production levels for all land to be affected by Operation Land Transfer within the Project area, and further that the land production levels so determined will serve as the basis for calculating farmer amortization and leasehold rent levels on 60% of the land area by December 31, 1979, and 100% by September 30, 1980.

"(3) The Borrower, through the Ministry of Agrarian Reform (MAR) will, by the target dates stated below, issue 100% of the Certificates of Land Transfer, and secure written leasehold instruments for 90% of the farmers eligible in the Rinconada-Buhi area (portions of 7 rural municipalities and 1 city) under Republic Act 3844, Presidential Decree 27 and subsequent implementing instructions (rice and corn land only). Minimum MAR performance for issuance of Certificates of Land Transfer is 70% and 100% and for securing leasehold instruments in 60% and 90%, respectively, by December 31, 1979, and December 31, 1980.

"(4) The Borrower shall budget and allocate adequate funding to assure effective implementation of protective measures on existing and newly reforested plantings in the Lake Buhi watershed and Lalo River drainage area.

"(5) The Borrower, through the regional offices of the Ministry of Agrarian Reform (MAR) and Bureau of Lands (BL), shall develop and implement adequate procedures to allow permanent farmers, or groups of permanent farmers, to secure title to the uplands that they till, particularly rice and corn land, if not otherwise prohibited by public law or regulations.

"(6) The Borrower will issue the appropriate forest occupancy permits, if required, to qualified watershed farmers or groups of farmers occupying land within the Project area by December 1984.

"(7) The Borrower, through the Bureau of Forestry Development (BFD) shall supply, without cost at the nursery site, seeds and/or seedlings for reforestation, and covercrop seeds and cuttings.

"(8) In addition to assured and timely release of local currency funding for the first few years of the Project, the Borrower shall budget and allocate adequate funding for implementation of the farmer extension and support for the sixth and seventh year of the planned Agro-forestation/ Watershed Development component."

C. Negotiating Status

This project paper is based on a feasibility study and preliminary engineering design for costing purposes prepared by a U.S. firm (TAMS/TAE) and a GOP interagency team of Bicol Region planners organized and chaired by the BRBDPO and NIA. USAID input was intermittent and technical in nature until the final documentation and review. At the completion of the contract of the Rinconada feasibility study (January 1979), it became apparent that the costs of various major components were higher than anticipated. Based on the proposed level of assistance by AID and possible level of assistance by the Asian Development Bank (ADB), together with technical considerations, there is informal agreement among the GOP, USAID, and ADB at the technical level on those discrete components which will be designed, appraised and proposed for loan assistance from the two donors. There is substantive agreement among the regional GOP agencies involved, the BRBDPO, and USAID on the project design, analyses, implementation and evaluation plans, and on the desirability of the conditions precedent and covenants listed above.

The letter of request for assistance from NEDA at Annex D indicates substantive approval by NEDA of the Project Paper and tentative commitment by the GOP to perform its part of the agreed upon plan. In arriving at such approval, NEDA subjects the project paper to careful scrutiny by its own staff, focusing primarily on economic and overall development policy questions, and obtains the advice and approval of the key ministries involved, particularly those involved in implementation and those to be responsible for meeting the proposed conditions precedent and covenants of the loan agreement.

Annex H

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**Life of Project:** 6 Years
**From FY** 1979 **To FY** 1985
**Total U.S. Funding:** $5,000,000
**Date Prepared:** February 1979

**Project title & Number:** Bicol IAD III (Rinconada) Project 492-0289

| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | MEANS OF VERIFICATION | IMPORTANT ASSUMPTIONS |
|---|---|---|---|
| **Program or Sector Goal: The broader objective to which this project contributes:** (A-1)<br><br>Program Goal: Improve the socio-economic situation and the quality of life of the rural poor residing in the project area.<br><br>Program Sub-Goals:<br>1) Increase agricultural production and productivity per hectare.<br>2) Increase productive employment opportunities.<br>3) Increase farmer participation in development activities affecting them.<br>4) Reverse deterioration of upland watershed areas. | **Measures of Goal Achievement:** (A-2)<br>1) Per capita income and/or consumption expenditure within the project area raised by 150% from ₱ in 1978 to ₱ in 1988 (in 1978 prices, peso amounts to be determined by analysis of 1978 EMS in late 1979).<br>2) Productive labor employment rate increased significantly by 1988 (to be determined by analysis of 1978 EMS in late 1979).<br>3) Perceived quality of life index on 0-10 point scale raised from 3.62 in 1974 to at least 4.00 by 1988.<br><br>Measures of Sub-Goal Achievement:<br>1) Total rice production in 2700 ha. of project irrigated land increased from 9000 metric tons to 20,000 tons per year by 1988.<br>2) Project area rice farmers utilizing at least 30% more farm workdays per year in the 2700-hectare project area by 1988 than the present annual average of 480,000.<br>3) Non-forested percentage of project area above 30% slope decreased from 73% to 40% by 1988.<br>4) Percentage of project area between 10-30% slope neither forested nor planted to agro-forestry crops decreased from 89% to 61 by 1988.<br>5) Percentage of project area between 3-10% slope neither forested, planted to agro-forestry crops, terraced, nor planted on contour decreased from 97% to 7% by 1988.<br>6) By 1988 there is evidence that farmers are actively supporting and benefitting from participation in the Irrigators' Associations, Samahang Nayon, and/or other farmer organizations and that they perform other than their intended functions, and further that they are beginning to influence the timing, kind and manner of social and economic service delivery to the project area. | Goal: (A-3)<br>1) Bicol Multipurpose (socio-economic) Surveys (EMS's) in the project area by contract institutions in 1978, 1981, 1984 and 1987.<br>2) Other household and barangay surveys in the project area.<br><br>Sub-Goals:<br>1) National Grains Authority Records.<br>2) Records and surveys of GOP and private rural banks, National Irrigation Administration, Irrigation Associations and Samahang Nayon Cooperatives.<br>3) EMS of project area in 1978, 1981, 1984 and 1987.<br>4) Other household and barangay surveys in the project area. | **Assumptions for achieving Goal Targets:** (A-4)<br>1) The farmgate price of rice relative to all other goods does not significantly decline.<br>2) Major weather patterns will continue as in the past and no major disasters will occur in the project area.<br>3) Stable economic and political conditions.<br>4) Social-cultural systems of target area can absorb proposed changes in organization and economic activities without undue stress and disintegration.<br><br>Sub-Goals:<br>1) Available HY rice technology is suited to project-area soil, water, weather and environmental conditions without introducing intolerable risks of loss.<br>2) Plant diseases and pests can be controlled without undue expense or loss of crops.<br>3) Effective capital/labor price ratios encourage labor-intensive agricultural production techniques rather than premature mechanization.<br>4) Bicol Basin social and economic milieu accommodates changed status of target area population in positive ways. |
| **Project Purpose:** (B-1)<br>1) GOP operating and maintaining new and improved water source facilities, primary and secondary water distribution and drainage systems.<br>2) Farmer organizations operating and | **Conditions that will indicate purpose has been achieved. End-of-Project Status.** (B-2)<br>1) Total regulated water source adequate for supplemental irrigation of an incremental 8000 hectares during normal dry seasons.<br>2) Hectarage receiving adequate irrigation water delivery in the Lalo system for two rice crops annually increased from 1100 or | Purpose EOPS: (B-3)<br>1) Farm technician reports<br>2) Rural bank credit records<br>3) On-site inspection | **Assumptions for achieving Purpose:** (B-4)<br>1) Surface water supplies are sufficient, as studies indicate, to meet projected crop irrigation requirements for double-crop intensity.<br>2) Sufficient agricultural credit will be made available to finance required production inputs.<br>3) Modern production inputs such as fertilizer and insecticides will be available to project area |

6) By 1988 there is evidence that farmers are actively supporting and benefitting from participation in the Irrigators' Associations, Samahang Nayon, and/or other farmer organizations and that they perform other than their intended functions, and further that they are beginning to influence the timing, kind and manner of social and economic service delivery to the project area.

accommodates changed status of target area population in positive ways.

**Project Purpose: (B-1)**

1) GOP operating and maintaining new and improved water source facilities, primary and secondary water distribution and drainage systems.

2) Farmer organizations operating and maintaining new and rehabilitated farm level farm irrigation ditches and drainage systems.

3) Farmers utilizing improved technology.

4) Upland farmers utilizing more productive and environmentally sound land-use practices in Lake Buhi watershed.

5) GOP effectively managing existing and replanted public forest lands in the Lake Buhi watershed.

**Conditions that will indicate purpose has been achieved. End-of-Project Status. (B-2)**

1) Total regulated water source adequate for supplemental irrigation of an incremental 8000 hectares during normal dry seasons.
2) Hectarage receiving adequate irrigation water delivery in the Lalo system for two rice crops annually increased from 1100 or less to 2700 by 1985.
3) GOP implementing regular maintenance service on 67 km. of new and improved main and lateral canals, 22 km. of main and secondary drainage canals, and 67 km. of associated service roads by 1985.
4) Regular maintenance programs for 125 km. of main and supplementary farm ditches and 39 km. of farm drains effectively conducted by local irrigators associations by 1985.
5) Farmers on project-irrigated riceland using high-yield varieties and other modern technology increased from 85 or less to 100% by 1984.
6) 900 project upland farmers changed to more permanent and improved land use (agro-forestation) by 1985.
7) Non-forested hectarage on 10-30% slopes planted to agro-forestry crops increased from 370 to 1,450 by 1985.
8) Non-forested hectarage on 3-10% slopes either terraced or planted on contour increased from 10 to 280 by 1985.
9) Non-forested hectarage on 10-30% slopes <u>not</u> planted to agro-forestry crops decreased from 3,230 to 2,150 by 1985.
10) Non-forested hectarage on 3-10% slopes <u>neither</u> terraced <u>nor</u> planted on contour decreased from 290 to 20 by 1985.
11) The denuded portion of areas classified as public forest or timberland on slopes above 30% decreased to near zero (5-ha. patches).

**Purpose EOPS: (B-3)**

1) Farm technician reports

2) Rural bank credit records

3) On-site inspection

4) BMS and other household surveys

5) Irrigation Association and Samahang Nayon records

6) Agricultural extension agent reports

**Assumptions for achieving Purpose: (B-4)**

1) Surface water supplies are sufficient, as studies indicate, to meet projected crop irrigation requirements for double-crop intensity.
2) Sufficient agricultural credit will be made available to finance required production inputs.
3) Modern production inputs such as fertilizer and insecticides will be available to project area farmers at reasonable prices and in the quantities required to achieve projected yields.
4) The National Grains Authority (NGA) and Area Marketing Cooperatives will help assure a satisfactory floor price for rice at farmgate by providing a ready, if residual, market for project area production.
5) Economic, financial and consumption incentives will be sufficient to encourage the use of irrigation systems and modern production technology to increase production.
6) Training and extension programs are or can be redesigned to make modern rice production technology acceptable and desireable to project area farmers.
7) Rice farmers will support cooperative irrigation activities.
8) Upland farmers will support appropriate watershed management practices and will be willing to change their land-use patterns accordingly.
9) Sufficient market demand will exist to make proposed agro-forestry crops economically viable replacements for present crops grown on 10-30% slopes.
10) Land tenure arrangements will not deter lowland or upland farmers from making investments in land and production improvements.

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**Project Outputs: Stage II**

**Magnitude of Outputs: Stage II (C-2a)**

| Year: | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | TOTAL |
|---|---|---|---|---|---|---|---|
| I. <u>Lake Buhi Water Source Development</u> | | | | | | | |
| Lake Buhi Control Structure & Bridge | | 0.4 | 0.6 | | | | 1 |
| Barit River Channel | | 0.3 | 0.7 | | | | 1 |
| Forebay Headworks | | 0.35 | 0.65 | | | | 1 |
| II. <u>Lalo Irrigation Construction</u> | | | | | | | |
| a. <u>Distribution facilities & structures</u> | | | | | | | |
| Existing main canal rehabilitated (km) | | 6 | 4 | | | | 10 |
| Service roads on existing laterals (km) | | 18 | 9 | | | | 27 |
| Drainage structures in Upper Lalo | | 4 | 2 | | | | 6 |
| Left connector canal, service road & structures (km) | | 1 | 1 | | | | 2 |
| Lateral I Extension & Service road (km) | | 4 | 3 | | | | 7 |
| Extension area lateral, service road & structures (km) | | 7 | 14 | | | | 21 |
| Main & supplementary farm ditches (km) | | | 125 | | | | 125 |
| On-farm drains (km) | | 10 | 29 | | | | 39 |
| Main & secondary drains & structures (km) | | 14 | 8 | | | | 22 |
| Parshal Flumes | | 9 | 12 | | | | 21 |
| Turnouts & division boxes | | 61 | 340 | | | | 401 |
| Gates installed | | 82 | 319 | | | | 401 |
| Vehicle & pedestrian crossings | | 20 | 36 | | | | 56 |
| Daraga river flume/bridge crossings | | 0.45 | 0.55 | | | | 1 |
| b. <u>Project Facilities</u> | | | | | | | |
| Administration building | 1 | | | | | | 1 |
| Equipment building | 1 | | | | | | 1 |
| Laboratory building | 1 | | | | | | 1 |

**Stage II (C-3a)**

1) Physical verification, end of project reports, and BRBDPO Management Information System reports

2) Special surveys undertaken by BRBDPO

3) Training reports and other PMO records

4) Records of BPI, NIA, BFD, MLGCD, BAEx

**Assumptions for achieving Outputs: Stage II (C-4a)**

1) The weather will not depart from normal patterns and no seriously destructive typhoons will occur to disrupt physical construction activities.

2) Capable contractors are available to do the A&E and construction work required.

3) Training programs and farmers institutions are or can be designed to be acceptable to project area farmers.

4) GOP budgetary releases are made as planned to forward-fund each year of project design, construction, training and other activities as scheduled and do not delay scheduled activities.

## Project Outputs: Stage II

## Magnitude of Outputs: Stage II (C-2a)

| Year: | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | TOTAL |
|---|---|---|---|---|---|---|---|
| **I. Lake Buhi Water Source Development** | | | | | | | |
| Lake Buhi Control Structure & Bridge | | 0.4 | 0.6 | | | | 1 |
| Barit River Channel | | 0.3 | 0.7 | | | | 1 |
| Forebay Headworks | | 0.35 | 0.65 | | | | 1 |
| **II. Lalo Irrigation Construction** | | | | | | | |
| a. Distribution facilities & structures | | | | | | | |
| Existing main canal rehabilitated (km) | | 6 | 4 | | | | 10 |
| Service roads on existing laterals (km) | | 18 | 9 | | | | 27 |
| Drainage structures in Upper Lalo | | 4 | 2 | | | | 6 |
| Left connector canal, service road & structures (km) | | 1 | 1 | | | | 2 |
| Lateral I Extension & Service road (km) | | 4 | 3 | | | | 7 |
| Extension area lateral, service road & structures (km) | | 7 | 14 | | | | 21 |
| Main & supplementary farm ditches (km) | | | 125 | | | | 125 |
| On-farm drains (km) | | 10 | 29 | | | | 39 |
| Main & secondary drains & structures (km) | | 14 | 8 | | | | 22 |
| Parshal Flumes | | 9 | 12 | | | | 21 |
| Turnouts & division boxes | | 61 | 340 | | | | 401 |
| Gates installed | | 82 | 319 | | | | 401 |
| Vehicle & pedestrian crossings | | 20 | 36 | | | | 56 |
| Daraga river flume/bridge crossings | | 0.45 | 0.55 | | | | 1 |
| b. Project Facilities | | | | | | | |
| Administration building | 1 | | | | | | 1 |
| Equipment building | 1 | | | | | | 1 |
| Laboratory building | 1 | | | | | | 1 |
| Compound & improvements | 1 | | | | | | 1 |
| Improvement of NIA Regional Trng. Center | | 1 | | | | | 1 |
| Gatekeepers quarters | | 3 | | | | | 3 |
| Watermaster working stations | 6 | | | | | | 6 |
| Communication system | 1 | | | | | | 1 |
| **III. Agricultural & Institutional Development** | | | | | | | |
| a. Organizations formed and/or supported | | | | | | | |
| Rotational unit groups (8-10 farmers @) | 30 | 70 | 90 | 90 | | | 280 |
| Farmer Irrigators groups (40-80 " ") | 6 | 14 | 20 | 20 | | | 60 |
| Farmer Irrigators assoc. (500 " ") | | | | 3 | 2 | | 5 |
| Rural Improvement Clubs | | 5 | 5 | 5 | 5 | | 20 |
| b. People trained | | | | | | | |
| Water management trainers | 5 | | | | | | 5 |
| Watermasters (6)/Gatekeepers (3)1/ | | 3 | | 9 | | | 12 |
| Ditchtenders | | | | 26 | | | 26 |
| Rotational unit group leaders | | 55 | 55 | 85 | 85 | | 280 |
| Farmers: water-management/production | | 500 | 550 | 700 | 700 | | 2450 |
| Farmers: cooperative/credit/mkt | | 500 | 550 | 700 | 700 | | 2450 |
| Homemakers | | 500 | 550 | 700 | 700 | | 2450 |
| c. Applied agricultural research | | | | | | | |
| Trials/demonstrations | | 2 | 3 | 3 | 2 | | 10 |
| **IV. Agro-forestation/Watershed Development** | | | | | | | |
| Project staff trained | | 6 | | | | | 6 |
| In-service seminars for technicians | | 3 | 3 | 3 | 3 | 3 | 15 |
| Assemblies for farmer organization & training | | 6 | 6 | 6 | 6 | 6 | 30 |
| New area terraced for rice/corn production (ha) | | 67 | 68 | 67 | 68 | | 270 |
| New mixed agro-forestry orchards (ha) | | 225 | 225 | 225 | 225 | | 900 |
| Firewoods lots established (ha) | | 45 | 45 | 45 | 45 | | 180 |
| Denuded areas reforested (ha) | | | 200 | 200 | 200 | 200 | 800 |
| Upland access trails constructed (km) | | 8 | 8 | 8 | 8 | 8 | 40 |

1/ 3 are trained twice.

## Stage II (C-3a)

1) Physical verification, end of project reports, and BRBDPO Management Information System reports

2) Special surveys undertaken by BRBDPO

3) Training reports and other PMO records

4) Records of BPI, NIA, BFD, MLGCD, BAEx

## Assumptions for achieving Outputs: Stage II (C-4a)

1) The weather will not depart from normal patterns and no seriously destructive typhoons will occur to disrupt physical construction activities.

2) Capable contractors are available to do the A&E and construction work required.

3) Training programs and farmers institutions are or can be designed to be acceptable to project area farmers.

4) GOP budgetary releases are made as planned to forward-fund each year of project design, construction, training and other activities as scheduled and do not delay scheduled activities.

45

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Compound & improvements | 1 | | | | | | |
| Improvement of NIA Regional Trng. Center | | 1 | | | | | 1 |
| Gatekeepers quarters | | 3 | | | | | 3 |
| Watermaster working stations | 6 | | | | | | 6 |
| Communication system | 1 | | | | | | 1 |
| **III. Agricultural & Institutional Development** | | | | | | | |
| a. Organizations formed and/or supported | | | | | | | |
| Rotational unit groups (8-10 farmers @) | 30 | 70 | 90 | 90 | | | 280 |
| Farmer Irrigators groups (40-80 " ") | 6 | 14 | 20 | 20 | | | 60 |
| Farmer Irrigators assoc. (500 " ") | | | | 3 | 2 | | 5 |
| Rural Improvement Clubs | | 5 | 5 | 5 | 5 | | 20 |
| b. People trained | | | | | | | |
| Water management trainers | 5 | | | | | | 5 |
| Watermasters (6)/Gatekeepers (3)1/ | | 3 | | 9 | | | 12 |
| Ditchtenders | | | | 26 | | | 26 |
| Rotational unit group leaders | | 55 | 55 | 85 | 85 | | 280 |
| Farmers: water-management/production | | 500 | 550 | 700 | 700 | | 2450 |
| Farmers: cooperative/credit/mkt | | 500 | 550 | 700 | 700 | | 2450 |
| Homemakers | | 500 | 550 | 700 | 700 | | 2450 |
| c. Applied agricultural research | | | | | | | |
| Trials/demonstrations | | 2 | 3 | 3 | 2 | | 10 |
| **IV. Agro-forestation/Watershed Development** | | | | | | | |
| Project staff trained | | 6 | | | | | 6 |
| In-service seminars for technicians | | 3 | 3 | 3 | 3 | 3 | 15 |
| Assemblies for farmer organization & training | | 6 | 6 | 6 | 6 | 6 | 30 |
| New area terraced for rice/corn production (ha) | | 67 | 68 | 67 | 58 | | 270 |
| New mixed agro-forestry orchards (ha) | | 225 | 225 | 225 | 225 | | 900 |
| Firewoods lots established (ha) | | 45 | 45 | 45 | 45 | | 180 |
| Denuded areas reforested (ha) | | | 200 | 200 | 200 | 200 | 800 |
| Upland access trails constructed (km) | | 8 | 8 | 8 | 8 | 8 | 40 |

1/ 3 are trained twice.

**Project Inputs:** ($1,000)1/ **(D-1)** **Implementation Target: (Type and Quantity) (D-2)**

| Project Component | AID LOAN FX | AID LOAN LC | AID LOAN Total | GOP LC | Proj. Total | Year: 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I. Lake Buhi Water Source Dev. | | 1406 | 1406 | 466 | 1872 | | 656 | 1216 | | | |
| II. Lalo Irrigation Construction | | 1166 | 1166 | 387 | 1553 | 67 | 701 | 785 | | | |
| III. PMO for Irrigation & Agr. Support | 345 | 125 | 470 | 1312 | 1783 | 759 | 345 | 253 | 247 | 148 | 31 |
| O&M Equipment | 330 | | 330 | | 330 | 330 | | | | | |
| Other PMO | 15 | 125 | 140 | 1312 | 1453 | 429 | 345 | 253 | 247 | 148 | 31 |
| IV. Agro-Forestation/Watershed Dev. | | 318 | 318 | 197 | 515 | | 97 | 101 | 110 | 119 | 88 |
| Land Dev./Tree Planting | | 224 | 224 | | 224 | | 34 | 47 | 53 | 60 | 31 |
| Nurseries | | 75 | 75 | | 75 | | 13 | 16 | 16 | 17 | 13 |
| All Other | | 19 | 19 | 197 | 216 | | 50 | 39 | 41 | 42 | 45 |
| SUB-TOTAL | 345 | 3015 | 3360 | 2363 | 5723 | 826 | 1798 | 2355 | 357 | 267 | 119 |
| Cost Escalation | 109 | 879 | 988 | 676 | 1664 | 178 | 405 | 732 | 144 | 134 | 72 |
| 15% Contingency | 68 | 584 | 652 | 456 | 1108 | 151 | 330 | 463 | 75 | 60 | 29 |
| PROJECT TOTAL | 521 | 4479 | 5000 | 3495 | 8495 | 1154 | 2533 | 3550 | 576 | 461 | 221 |

NOTE: Items may not add exactly to totals due to rounding.

1/Converted from peso figures in Annex Table H-1 and 2 at ₱7.50/$1.00.

**(D-3)**

1) PMO budget reports

**Assumptions for providing inputs: (D-4)**

## 5C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Security Supporting Assistance funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? IDENTIFY. HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT? --Yes.

—Yes, see Project Paper for ...

A. GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(b); Sec. 671

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure

A.1.(a) A description of the project was included in the A.I.D. Congressional Presentations for FY 1979 and FY 1980.

(b) Yes.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

2.(a) Yes. Preliminary engineering designs and financial, implementation and evaluation plans are complete. Final A&E design of the irrigation and diversion systems and other necessary structures will be completed under the project; and final financial, implementation and evaluation plans will be required as conditions precedent to first disbursement under the loan.

(b) Yes. Construction and other cost estimates are reasonably firm for all components. The U.S. loan share of these costs will be stated as a fixed amount for each useable component of the project, and cost overruns, if any occur, will be borne entirely by the GOP.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

3. N.A. All legislative authority needed already exists.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per *the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?*

4. Yes.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

5. Yes. See Annex C.

6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate?

6. No. N.A.

7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?

11. *ISA 14. Are any FAA funds for FY 78 being used in this Project to construct, operate, maintain, or supply fuel for, any nuclear powerplant under an agreement for cooperation between the United States and any other country?*

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?

A.7.(a) Yes. It will help the Philippines become and remain self-sufficient in rice production, thus saving foreign exchange which can be used to import other items, and it will hasten the day when they could export rice or more of other agricultural products (by permitting crop diversification and encouraging upland agroforestry crops), thus earning more foreign exchange for international trade purposes.

(b) Yes. Both the upland and lowland farms to be benefitted under the project are privately owned. The project will encourage private initiative among farmers through cooperative organizations. Private contractors will perform the construction.

(c) Yes. The project will train farmers to organize and manage their own cooperatives and encourage them to utilize agricultural credit provided through the rural banking system.

(d) Yes. The farmer cooperatives will enable the farmers to avoid and thereby reduce the monopsonistic control over the rice paddy trade exerted by some middlemen and millers in certain localities. The cooperatives themselves will be selling rice in a competitive market.

(e) Yes, of agriculture.

(f) No.

8. The project will utilize 10% of the loan for procurement of operations and maintenance equipment.

9. The host country will contribute unreimbursable local currency to meet 41% of total project costs, or 44% of local currency costs.

10. The Philippines is not an excess currency country.

11. No.

B.1.a.(a) This project directly involves poor farmers in the construction and management of an irrigation system and trains them in modern farm and agroforestry technology. It increases market access with forest trails, service roads and cooperatives. It utilizes labor-intensive construction methods as much as possible and promotes labor-intensive use of land for production. All of its investment will be made in a very poor rural area.

B1

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [include only applicable paragraph -- e.g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

(2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(b) to help alleviate energy problem;

(c) research into, and evaluation of, economic development processes and techniques;

(d) reconstruction after natural or manmade disaster,

(e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

(b) The project will strengthen cooperative farmer organizations and will provide training in cooperative activities and management. The project is specifically designed to assist the rural poor of the project area increase their production, real income and quality of life.

B.1.b.(1) Yes, for agriculture and rural development. The lowland irrigation portion of the project, involving 90% of its total cost, is totally designed to increase the productivity and real income of rural poor. The upland watershed management and agro-forestry component seeks to provide economically viable alternative agroforest crops to those poor farmers currently denuding the steeper slopes with ecologically damaging agricultural practices, while protecting the long-run productivity of the whole watershed, including the downstream irrigation areas.

(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

B.1.c. Yes (no waiver). The loan agreement will so provide and the planned administrative arrangements will assure it.

d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, *or is the recipient country "relatively least developed"?*

d. No. All A.I.D. funding is to be loaned.

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

e.(1) Project will organize and train leadership for irrigators associations and farmer co-operatives. Project is result of successful interagency and local planning meetings conducted by BRBDP on a sub-regional basis.

(2) Project will increase rice and agroforestry food crop production.

(3) Project will train technicians and farmers in irrigation system management, modern rice farm technology and upland agroforestry production.

(4) Increased food production and rural income will help improve nutrition and health status.

(5) Project will strengthen and organize farmer cooperatives. It will construct service roads and upland paths to improve farm access and transportation. It is a direct result of an important experiment in decentralized, integrated planning, and its implementation will be likewise decentralized and integrated, thus strengthening regional and local development organizations.

(6) By permitting labor-intensive development of irrigated farms, the project will result in more wage-labor for both men and women.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

B.1.f. Project is a component of sub-regional Bicol River Basin development strategy devised by indigenous regional planners specifically to meet local needs, desires and potential. All project-related training will be conducted by locally or regionally assigned personnel. Organizational management and civic leadership are important elements of planned training program.

BI

g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). Does the activity give reasonable promise of contributing to the development: of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?

B.1.g. The project directly increases the productive capacities of land and labor by providing water for controlled irrigation. Agricultural production in the project area will be lifted to a permanently higher level; and increased farmer income will provide a higher level of effective demand for both food and non-agricultural products, thus helping to stimulate economic growth elsewhere, as well. Project is an integral part of overall regional and national development strategy to invest in decentralized, rural, agricultural, food-producing, irrigation activities and to improve the income and quality of life of rural poor. It will contribute to the long-range goal of national self-sufficiency in food production. The economic and technical soundness of the project are discussed in Part III, Sections A and C.

AID financial inputs will provide for procurement of some commodities (equipment) from the U.S. Long-term effect will increase U.S. exports of spare parts, decrease need for concessional PL480 exports of rice.

h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.

2. Development Assistance Project Criteria (Loans only)

a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.

B.2.a. Financing is not available for this project from other sources on terms comparable to this proposed plan. Irrigation and institutional development are exceedingly lumpy, long-term investments.

b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.

b.(1) A.I.D. and other international institutions, especially IBRD, closely watch GOP foreign exchange earnings and debt service requirements. It appears that currently and for the forseeable future, the GOP will be able to repay this loan.

(2) The rate of interest is considered reasonable and repayment of the loan with interest is within the financial capability of the borrower. Interest will accrue at 2% per annum through the grace period, 3% thereafter. These rates are well within the legal limits of both countries.

c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds $100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?

c. An application has been received. Expected economic and technical soundness was analyzed by GOP and contract (TAMS-TAE) technicians and is discussed in Part III of this PP.

d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?

d. Yes, See Part II and Annex L of PP.

e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?

B.2.e. The total amount of loan money used to finance procurement from private sources, including imported equipment and other supplies and contracts for construction and other services from the private sector, is estimated to total $3.9 million, or 79% of the total loan.

f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

f. No. It is not likely that Philippine rice could ever be exported to the U.S. on a competitive basis with U.S.-produced rice in a free trade situation. The proposed subtropical agroforestry crops are not produced in the U.S.

3. Project Criteria Solely for Security Supporting Assistance

3. N.A.

a. FAA Sec. 531. How will this assistance support promote economic or political stability?

b. FAA Sec. 533(c)(1). *Will assistance under the Southern African Special Requirements Fund be used for military, guerrilla, or paramilitary activities?*

4. Additional Criteria for Alliance for Progress

4. N.A.

[Note: Alliance for Progress projects should add the following two items to a project checklist.]

a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?

b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CIPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?

CERTIFICATION PURSUANT TO SECTION 611(e)
OF THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, DENNIS P. BARRETT, the acting principal officer of the Agency for International Development in the Philippines, having taken into account, among other things, the maintenance and utilization of projects in the Philippines previously financed or assisted by the United States, do hereby certify that, in my judgement, the Philippines has both the financial capability and the human resources capability to effectively implement, utilize and maintain the proposed Bicol Integrated Area Development III (Rinconada-Buhi/Lalo) Project.

This judgement is based upon the project analysis as detailed in the Bicol Integrated Development Area III Project Paper and is subject to the conditions imposed therein.

Dennis P. Barrett

Dennis P. Barrett, Acting Director
USAID/Philippines

March 8, 1979

Date

Republic of the Philippines
NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY
P.O. Box 1111 Manila

May 2, 1979

Mr. Peter M. Cody
Director, USAID Mission
M a n i l a

Dear Mr. Cody,

I refer to Project Paper on the Bicol Integrated Area Development III, Rinconada/Buhi, forwarded in your letter of 9 March 1979.

I wish to advise you that this Office endorses said Project Paper, except that, in lieu of condition requiring Government to give priority in the use of Lake Buhi Water for irrigation over power requirements, it is proposed that the proper scheduling on the use of Lake Buhi Water be determined by the National Irrigation Administration and the National Power Corporation, which could be embodied in a Memorandum of Understanding between the two agencies and the National Water Resources Council.

Sincerely yours,

GERARDO P. SICAT
Minister of Economic Planning
(Director-General)

ANNEX D

Republic of the Philippines
NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY
P.O. Box 1110 Manila

May 9, 1979

Mr. Peter M. Cody
Director, USAID Mission
M a n i l a

Dear Mr. Cody,

Further to my letter of 2 May 1979 endorsing with certain modification the Project Paper on the Bicol Integrated Area Development III, Rinconada/Buhi, I wish to advise you that it included the endorsement of the proposed loan of $5 M from USAID and by this letter, I am formally requesting for such $5 M loan for said project.

Sincerely yours,

GERARDO P. SICAT
Minister of Economic Planning
(Director-General)

# PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

Name of Country: Republic of the Philippines

Name of Project: Rinconada IAD III
Number of Project: 492-0289

Pursuant to Part I, Chapter I, Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a Loan to the Government of the Philippines (the "Cooperating Country") of not to exceed Three Million Five Hundred Thousand United States Dollars ($3,500,000) the ("Authorized Amount") to help in financing certain foreign exchange and local currency costs of goods and services required for the Project as described hereafter. The Project consists of : (1) the development and regulation of water from Lake Buhi, to provide dependable dry season gravity water to irrigate an additional 8,000 hectares, by constructing a lake control structure and forebay regulation facilities and excavating the outlet channel; (2) the rehabilitation of existing and construction of new irrigation and drainage facilities, plus farm access roads, serving approximately 3,000 hectares in the Lalo system, and procurement of equipment necessary for adequate system maintenance; (3) the support of applied research, small-scale farmer organizational development, farm family and technician training in water management and improved production technology; and (4) an agro-forestation and watershed development program to achieve a more productive and environmentally sound use of cultivated uplands and the protection of forested watershed areas (hereinafter referred to as the "Project").

I approve the total level of A.I.D. appropriated funding planned for this Project of not to exceed Five Million United States Dollars ($5,000,000.00) Loan, including the amount authorized above, during the period of Fiscal Year 1979 and Fiscal Year 1980. Of the total level of A.I.D. funding approved above, the increment of up to One Million Five Hundred Thousand Dollars ($1,500,000) not hereby authorized, will be loan funded subject to the availability of funds and shall be processed in accordance with A.I.D. allotment procedures.

I hereby authorize the initiation of negotiation and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority subject ot the following essential terms and covenants and major conditions; together with such other terms and conditions as A.I.D. may deem appropriate:

a. Interest Rate and Terms of Repayment

The Cooperating Country shall repay the Loan to A.I.D. in United States Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Cooperating Country shall pay to A.I.D. in United States Dollars interest from the date of first disbursement of the Loan at the rate of (a) two

percent (2%) per annum during the first ten (10) years, and (b) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods and Services

Goods and services, except for ocean shipping, financed by A.I.D. under the Project shall have their source and origin in the Cooperating Country or in countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise agree in writing. Ocean shipping financed under the Loan shall be procured in the U.S. or the Cooperating Country, except as A.I.D. may otherwise agree in writing.

c. Conditions Precedent to Initial Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, the Borrower shall, except as A.I.D. may otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

1. A copy of the Philippine Government order designating the National Irrigation Administration (NIA) as the lead implementing agency, and the Bicol River Basin Development Program Office (BRBDPO) as the Bicol level coordinating agency, responsible for the effective and timely implementation of the Project.

2. A copy of the Philippine Government order establishing a Composite Management Group (CMG) composed of the NIA Regional Director, as Chairman and Project Director, and the Regional Directors or heads of appropriate national and local Government agencies concerned, with authorities and responsibilities to enable the CMG to carry out assigned functions effectvely.

3. A detailed plan for the implementation of the Project prepared by the Project Management Office (PMO), including an evaluation program.

4. A copy of the appropriate water permit and related resolution issued by the National Water Resources Council (NWRC) covering all diversions of Lake Buhi water for multipurpose use as proposed in the Project.

d. Conditions Precedent to Disbursement for Agro-forestation/Watershed Development Under the Second Loan Tranche

Prior to disbursement, or the issuance of any commitment documents under the Project Agreement to finance the Agro-forestation/Watershed development component under the second increment of the Loan, the Borrower shall, except as the A.I.D. may otherwise agree in writing, furnish

in form and substance satisfactory to A.I.D., an updated plan for the implementation of these activities, incorporating the experience and evaluation recommendations arising out of the on-going Phase I Bicol Agro-forestation/Watershed Development Program.

e. Special Covenants

A.I.D. shall incorporate within the Project Agreement appropriate Covenants to insure that in carrying out the Project, the A.I.D. approved Implementation Plan, Section C.3, is followed and that local currency funding is made available on a timely basis.

Clearance:

| | | Date | Initial |
|---|---|---|---|
| W.F. McDonald | OCD | 5/17/79 | |
| D.F. Wadley | ORD | 5-17-79 | |
| L.E. Vaughn | CO | 5/17/79 | |
| D.L. Leaty | PO | 5/17/79 | |
| D.P. Barrett | OD | 5/18/79 | |

Signature: _____
Peter M. Cody
Director, USAID/Manila

Date: 5-21-79

OCD:TRishoi:cdp 5/16/79

P 230005Z DEC 76
FM SECSTATE WASHDC
TO AMEMBASSY MANILA PRIORITY 2109
BT
UNCLAS STATE 309628/1/2

AIDAC

E.O. 11652: N/A

TAGS:

SUBJECT: APPROVAL AND CONDITIONS FOR BICOL INTEGRATED RURAL DEVELOPMENT PP AND ADDITIONAL ISSUES FOR BICOL IAD III PRP

1. CONDITIONAL APPROVAL OF THE IRD PROJECT PAPER ALONG WITH APPROVAL OF THE IAD III PROJECT REVIEW PAPER AND DISCUSSION OF SUBSTANTIVE ISSUE CONTAINED THEREIN WERE THE SUBJECTS OF A PREVIOUS CABLE.1/ THIS CABLE WILL ADDRESS CONDITIONS AND ADDITIONAL ISSUES PERTAINING TO THE SUBJECT PROJECTS.

2. BICOL INTEGRATED RURAL DEVELOPMENT:
(A) APAC ACCEPTED THE DOCUMENT AS A PROJECT PAPER ON THE CONDITION THAT APAC'S RECOMMENDATION FOR FY 1978 AUTHORIZATION BE CONTINGENT ON ACTION BY THE GOP TO BEGIN NEGOTIATIONS FOR MAJOR CAPITAL INVESTMENT FOR THE BICOL BY INTERNATIONAL LENDING INSTITUTIONS (IBRD, ADB) AND OTHER BILATERAL DONORS (GERMANS, JAPANESE, ETC).
(B) ATTENTION WAS DRAWN TO THE FACT THAT A RECENT AID POLICY DIRECTIVE, AIDTO-564, REQUIRES MISSIONS TO ASSIGN CONTRACTING RESPONSIBILITIES TO THE HOST COUNTRY TO THE EXTENT OF THE HOST COUNTRIES CAPABILITIES (AND APPROPRIATENESS SINCE IOC'S AND SOME UNIVERSITIES AND PASA PROCUREMENT WOULD REMAIN UNDER AID). THIS DIRECTIVE WILL HAVE TO BE TAKEN INTO ACCOUNT IN IMPLEMENTING THIS PROJECT.
(C) IT WAS NOTED THAT THE PP DOES NOT CONTAIN A DRAFT PROJECT AUTHORIZATION OR A STATUTORY CHECKLIST BOTH OF WHICH ARE REQUIRED BY HANDBOOK III CHAPTER 6. THE MISSION SHOULD SUBMIT COPIES OF THESE DOCUMENTS TO AID/W ASAP.

3. BICOL IAD III - THE FOLLOWING QUESTIONS AND ISSUES WERE RAISED BY THE APAC AND SHOULD BE CONSIDERED IN PREPARATION OF THE PROJECT PAPER:

(A) THE PREFEASIBILITY STUDY PRELIMINARY ANALYSIS OF THE LAKE BATO-PANTAO BAY DIVERSION CHANNEL BY TAMS/TAE CONSULTING ENGINEERS INDICATES THAT IT IS NOT ECONOMICALLY FEASIBLE WHEN CONSIDERED BY ITSELF. PRELIMINARY ENGINEERING, COST BENEFIT ANALYSIS AND INTERNAL-RATE OF RETURN ANALYSIS OF THE CHANNEL AND ALL COMPONENTS IN THE RINCONADA PROJECT (INCLUDING LAKE BATO) SHOULD BE PERFORMED TO DETERMINE WHETHER THE CHANNEL AND THE PROJECT TAKEN AS A WHOLE ARE ECONOMICALLY FEASIBLE AS EARLY IN THE FULL FEASIBILITY STUDY AS POSSIBLE. ADDITIONAL STUDIES SHOULD BE PERFORMED ON SUCH ALTERNATIVES TO THE DIVERSION CHANNEL AS DIKING. SER/ENGR PERSONNEL SHOULD WORK CLOSELY WITH THE MISSION AND THE FIRM SELECTED TO IMPLEMENT THE FULL-SCALE FEASIBILITY STUDY FOR THE AREA.

---

1/ The approval cable was actually received one month after this cable.

Ans: Preliminary engineering analysis by TAMS-TAE confirmed technical feasibility of Lake Bato-Pantao Bay Diversion Channel, but also determined that the desired regulation of Lake Bato without the Channel would not increase frequency, duration or risk of flooding in adjacent upstream areas. Therefore, the Channel is not required as part of Lake Bato control structures. Since, in the opinion of the Mission, the Diversion Channel cannot be considered economically feasible by itself, and since it is not required to obtain the positive benefits of proposed Lake Bato regulation, it is no longer being proposed for USAID funding. (For detailed discussion, see TAMS/TAE Rinconada feasibility study reports).

(B) THE SCOPE OF WORK AND PLANS FOR A FEASIBILITY STUDY OF THE SCOPE AND COMPLEXITY OF THE ONE REQUIRED FOR THIS PROJECT SHOULD BE APPROVED JOINTLY BY AID/W AND USAID AS SHOULD THE EXPERIENCE AND QUALIFICATIONS OF THE FIRM CHOSEN TO DO THE STUDY.

Ans: Because (1) of the Bicol experience of the firm (TAMS-TAE) selected for the prior River Basin level pre-feasibility study which included the Rinconada area and (2) a time constraint, the GOP selected the same firms for the Rinconada Feasibility Study. This was concurred in by the Mission and AID/W. AID/W engineering staff also reviewed the proposed scope.

(C) PROJECT PURPOSE: EOPS SHOULD CONFORM TO LIFE OF PROJECT - 1983 NOT 1990. THE GOAL/PURPOSE LEVELS SHOULD BE ADJUSTED IN THE PROJECT PAPER. THE FOLLOWING IS SUGGESTED:
...GOAL: INCREASE INCOME, EMPLOYMENT AND QUALITY OF LIFE FOR POOR MAJORITY IN THE RINCONADA PROJECT AREA.
...SUBGOAL: INCREASED AGRICULTURAL AND FISHERY PRODUCTION AND PRODUCTIVITY IN 1990.
...PURPOSE: (1) DEVELOP OPERATIONAL FLOOD CONTROL, IRRIGATION, STORAGE AND DISTRIBUTION SYSTEMS WITHIN THE RINCONADA PROJECT AREA AND TARGETED AREAS AFFECTED DOWNSTREAM. (2) INCREASE GOP AGRICULTURAL AND FISHERIES EXTENSION ACTIVITIES, FARMERS' ORGANIZATIONS AND POPULAR PARTICIPATION IN THE DEVELOPMENT PROCESS BY 1983.

Ans: In preparing for the Project Paper, both the Logframe and the project itself have been revised.

(D) (1) WILL ANY PEOPLE BE FORCED TO RESETTLE AS A RESULT OF PROJECT ACTIVITIES? IF SO, HOW WILL RESETTLEMENT BE MANAGED? POSSIBLE RESETTLEMENT MIGHT BE ON RECLAIMED LAND.

Ans: Flood protection activities which may have involved resettlement was included for other donor support. For possible minimal relocation in the uplands, see Section 4 of the agro-forestation/watershed development social soundness analysis in Annex G(3) and the answer to question 3(F) below.

(2) HOW WILL ADDITIONAL WATER BE DISTRIBUTED?

Ans: See Part II and Annex G(1) of PP for a detailed description of the irrigation system.

(3) WHAT OTHER BRBDP AND NATIONALLY SPONSORED SOCIAL DEVELOPMENT ACTIVITIES ARE BEING CARRIED OUT AND WILL BE INTEGRATED IN THE RINCONADA AREA? THE PP SHOULD DESCRIBE THESE OTHER AID AND GOP EFFORTS SUCH AS AGRICULTURAL SUPPORT PROGRAMS AND THE PROPOSED BICOL INTEGRATED HEALTH PROJECT THAT WILL IMPACT IN THE RINCONADA AREA.

Ans: See Part II and Annex L of PP for this background information.

(4) THE WOMEN IN DEVELOPMENT SECTION OF SOCIAL SOUNDNESS SHOULD INCLUDE BASELINE DATA WITH RESPECT TO THEIR CURRENT POSITION IN THE COMMUNITY. THIS IS BELIEVED AS ESSENTIAL FOR COMPARISON PURPOSES WHEN PROJECT EVALUATION TAKES PLACE IN DETERMINING THE IMPACT ON THE SOCIAL STATUS OF WOMEN.

Ans: See Section III.B. and Annex J of PP. Most currently available baseline data on women in the Bicol can be found in Jeanne Frances I. Illo, Involvement by Choice, The Role of Women in Development, Social Survey Research Unit (SSRU) (Naga City), Institute of Philippine Culture (IPC), Quezon City, 1977. Additional data on women will become available when the analytical results of the 1978 Bicol Multipurpose Survey are published in late 1979.

(5) THE SOCIAL SOUNDNESS IN THE PROJECT PAPER SHOULD COMMENT ON THE PROGRESS TO DATE OF COMPACT FARMS AND PRE-COOPS (SAMAHANG NAYONGS). THE OPERATIONAL EXPERIENCE FROM LIBMANAN IAD I SHOULD BE INCLUDED.

Ans: See Annex G(2) for a brief discussion of Samahang Nayon activities. Recent experience in Libmanan related to compact farm development is related in Annex J.

(6) PLANS FOR ORGANIZATION AND THE OPERATIONS OF IRRIGATOR ASSOCIATIONS SHOULD BE COVERED.

Ans: See Annex G(2) of PP.

(7) THE PP SHOULD DETAIL HOW SOCIAL SOUNDNESS STUDIES WILL BE DESIGNED AND CONDUCTED.

Ans: See Annex J for a description of the social soundness studies conducted by TAMS-TAE as part of the Rinconada feasibility study. See Part VI for future studies proposed as part of the project evaluation plan.

(E) HOW WILL RECLAIMED LAND BE DISTRIBUTED FOR USE?

Ans. As presently designed the project support by AID does not involve any reclaimed land.

(F) THE PRP INDICATES THAT THERE ARE ABOUT 47,500 HA. OF NON-ARABLE LAND IN THE PROJECT AREA. HOWEVER, THE GOP HAS ONLY IDENTIFIED 6,500 FOR REFORESTATION. ARE THERE ANY ADDITIONAL AREAS IN RINCONADA WHICH SHOULD BE REFORESTED? HOW WILL THE REFORESTATION IMPACT ON PEOPLE LIVING IN AREAS DESIGNATED FOR PLANTING?

Ans: Considering the high rainfall and soil types in the Rinconada, all slopes above 30% should either be reforested or land use improved on cultivated areas to prevent soil erosion. Approximately 50%, or 23,750 has. of the 47,500 has. identified in Rinconada IAD as non-arable land, is composed of upland areas with slopes exceeding 30% gradient. Of these 23,750 an estimated 1,625 has. is forested. The balance (22,125 has.) should be reforested and/or protected against fire/poaching so that natural regeneration of forests will occur.

On the Buhi-Lalo watershed 5,580 has. have slopes exceeding 30% gradient of which 1500 are forested, leaving a balance of 4080 has. that should be reforested. 800

has. (20% of 4080 has.) will be reforested, and protection should enable natural regeneration to begin to take place on the balance.

On the Buhi-Lalo watershed an estimated 50 families may have to be relocated onto more favorable sites within the watershed so that they will be cultivating slopes of 30% or less - see Sec. II, Part B, Paragraph 4 of Annex G(3). These families would be assited in developing farms on the lower slopes with a resultant favorable impact on their economic conditions.

(G) THE PP SHOULD DISCUSS THE POSSIBILITY OF USING LABOR INTENSIVE METHODS OF CONSTRUCTION (USE OF WHEELBARROWS, ETC.) IN ADDRESSING THE SUBJECT OF CONSTRUCTION CONTRACTING THIS MAY BE ESPECIALLY RELEVANT FOR EARTH-MOVING OPERATIONS FOR CHANNEL OR DIKE CONSTRUCTION. THE PP SHOULD ALSO INDICATE CONTRACTING PROCEDURES TO BE EMPLOYED IN SELECTION OF CONTRACTORS AND WHAT KINDS OF EQUIPMENT WILL BE REQUIRED FOR THE PROJECT.

Ans: See Annex J for a discussion of proposed labor-intensive construction activities, Part V of the PP for contracting procedures, and Annex Table H-22 for the equipment list.

(H) THE ENVIRONMENTAL ASSESSMENT SHOULD BE STARTED AS SOON AS POSSIBLE, PERHAPS IN CONJUNCTION WITH THE FEASIBILITY STUDY. WORK SHOULD BE COORDINATED WITH ALAN JACOBS OF ASIA/TR. THE STATEMENT SHOULD INCLUDE A DISCUSSION OF POTENTIAL HEALTH IMPACTS FROM EXPANDED IRRIGATION SUCH AS MALARIA, SCHISTOSOMIASIS, ETC., AS WELL AS CHANGES IN THE RIVER'S REGIME AND ITS EROSION CHARACTERISTICS.

Ans: Environmental concerns of the overall Bicol Program are discussed in the "Environmental Assessment of the Bicol River Basin Development Projects" prepared by ICES, with the assistance of an AID-financed consultant, in 1978 (designated Annex N of this PP). Copies of this document are available for review in ASIA/PD. Environmental impacts of each element of the proposed Rinconada IAD are described in appropriate volumes of the TAMS-TAE feasibility study completed in January 1979.

(I) ANNEX A INDICATES SOME DESIGN ACTIVITIES WILL HAVE BEEN COMPLETED BEFORE THE PP IS RECEIVED. THESE APPEAR TO BE INCONSISTENCIES.

Ans: Some preliminary engineering design activities have been completed by TAMS-TAE, NIA and BRBDP engineers for feasibility analysis and cost estimation purposes. Some early construction surveys are proposed in NIA to accelerate final design before the loan CP's are met. All final A & E design is to be funded by the Project itself. Consideration was initially given to including some final design work in the TAMS-TAE feasibility study contract, but this proposal was later dropped. It was also proposed to "piggy-back" some Rinconada final design money in the Bicol IAD-II (Bula) Project loan in order to reduce the long project start-up period normally required to accomplish such tasks, but NEDA did not agree.

4. AID/W APPRECIATED DON WADLEY'S HELP IN REVIEWING BICOL DOCUMENTS.

ROBINSON

P 191802Z JAN 77
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BT
UNCLAS STATE 012522

AIDAC

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TAGS:

SUBJECT: BICOL INTEGRATED AREA DEVELOPMENT III
REF: (A) STATE 309628
1. AN ASIA PROJECT ADVISORY COMMITTEE MET ON DECEMBER 1, 1976 TO CONSIDER THE SUBJECT PAPERS.

2. THE APAC CONDITIONALLY APPROVED THE PROJECT PAPER FOR BICOL INTEGRATED RURAL DEVELOPMENT GRANT PROJECT FOR FY 1978 (FUNDING FOR FY 77 WILL BE HANDLED BY PROP AMENDMENT) AND APPROVED THE PROJECT REVIEW PAPER FOR BICOL IAD III LOAN PROJECT. CONDITIONS FOR AUTHORIZATION OF THE GRANT PROJECT AND ISSUES TO BE CONSIDERED IN PREPARATION OF THE PROJECT PAPER FOR THE LOAN PROJECT WERE DISCUSSED IN AN EARLIER SEPTEL (SEE REF).

3. WITH REGARD TO IAD III, AID/W IS BUDGETING DOLS. 3.0 MILLION FOR FY 78. GIVEN THE SUBSTANTIAL SIZE OF THE TOTAL REQUEST AND THE SMALL PORTION WHICH IS LIKELY TO BE EXPENDED IN FY 78, PRIMARILY FOR DESIGN WORK, AID/W FEELS IT IS MORE REASONABLE TO HANDLE TOTAL FUNDING IN TWO PHASES. THE DOLS 3.0 MILLION IS EXPECTED TO COVER THE FIRST PHASE (DESIGN WORK) AND THE REMAINING APPROXIMATELY DOLS. 20 MILLION WOULD BE AUTHORIZED FOR FY 79 TO COVER THE SECOND PHASE (CONSTRUCTION).

4. HOWEVER, IF PROJECT MATURES FASTER THAN ANTICIPATED, AID/W HAS NO OBJECTION TO FUNDING THIS PROJECT EARLIER, ASSUMING AVAILABILITY OF FUNDS.

5. GIVEN THIS APPROACH, AID/W SUGGESTS USAID CONSIDER SEVERAL ALTERNATIVE MEANS OF FINANCING THE TOTAL PROJECT. THE FEASIBILITY STUDY WILL STILL BE FINANCED THROUGH THE CONSULTING SERVICES LOAN BEGINNING IN THE SECOND QUARTER OF FY 77. THE DESIGN PHASE, WHICH SHOULD BEGIN SOMETIME IN THE SECOND OR THIRD QUARTER OF FY 78, COULD BE HANDLED SEPARATELY AND APART FROM CONSTRUCTION WORK IN ONE OF THE FOLLOWING WAYS: (A) AS THE INITIAL AUTHORIZATION IN FY 78 OF TOTAL PROJECT FUNDING (AUTHORIZATION OF FUNDING FOR CONSTRUCTION WOULD BE DEFERRED UNTIL FY 79): (B) BY MEANS OF AN ADDITIONAL DRAWDOWN ON A CONSULTING SERVICES LOAN OR (C) BY USING FUNDS FROM THE INTEGRATED AREA DEVELOPMENT II LOAN ON THE PIGGYBACK PRINCIPLE AND REQUESTING GREATER GOP PARTICIPATION IN IAD II FUNDING. UNDER OPTION (B) OR (C) THE CONSTRUCTION PHASE WOULD BE FINANCED AS A SEPARATE PROJECT IN FY 79 FOLLOWING COMPLETION OF ESSENTIAL ELEMENTS DESIGN PHASE.

6. IN CONJUNCTION WITH THE PHASING OF PROJECT SEGMENTS, PERIODIC CHECKS SHOULD BE MADE ON THE FEASIBILITY STUDIES AND DESIGN WORK TO ENSURE THAT THE PROJECT IS ON TRACK AND THAT IT IS TECHNICALLY AND ECONOMICALLY FEASIBLE. CRITICAL CHECKPOINTS (TO BE JOINTLY REVIEWED BY USAID AND AID/W) WOULD BE IN (APPROXIMATELY):

....AUGUST, 1977 - THE CONSULTANT MAKING THE FEASIBILITY STUDY SHOULD KNOW WHETHER THE LAKE BATO-PANTAO BAY DIVERSION CHANNEL IS ECONOMICALLY FEASIBLE.
....MARCH, 1978 - FEASIBILITY STUDY COMPLETED. RESULTS WILL DETERMINE HOW PROJECT SHOULD PROCEED IN MAIN DESIGN PHASE.
....MARCH, 1979 - DESIGN WORK COMPLETED, FINAL COST ESTIMATES ESTABLISHED, ECONOMIC FEASIBILITY RECONFIRMED, AND BID DOCUMENTS PREPARED.

7. USE OF PHASED SYSTEM ALLOWS (A) USAID AND AID/W FLEXIBILITY IN TERMS OF BUDGETING FOR FY 78, I.E., AID WOULD BE ABLE TO CHOOSE AMONG A GREATER RANGE OF PROJECTS: (B) MORE TIMELY USE OF DEVELOPMENT ASSISTANCE FUNDS IN THAT CONSTRUCTION FUNDS WOULD BE USED IN FY 1979 WHEN CONSTRUCTION BEGINS: AND (C) MORE TIMELY DECISIONS ON THE PROGRESS AND DIRECTION OF THE PROJECT.

8. BASED ON THE FOREGOING DISCUSSIONS, AID/W REQUESTS USAID TO SUBMIT ITS VIEWS ON MEANS OF FINANCING ALONG WITH AN INTERIM IMPLEMENTATION SCHEDULE DETAILING TIMING OF (A) FEASIBILITY STUDY, (B) DESIGN AND (C) CONSTRUCTION WORK AND STATING ESTIMATED COSTS OF EACH PHASE.

KISSINGER

# Technical Details
## Water Resources & Engineering

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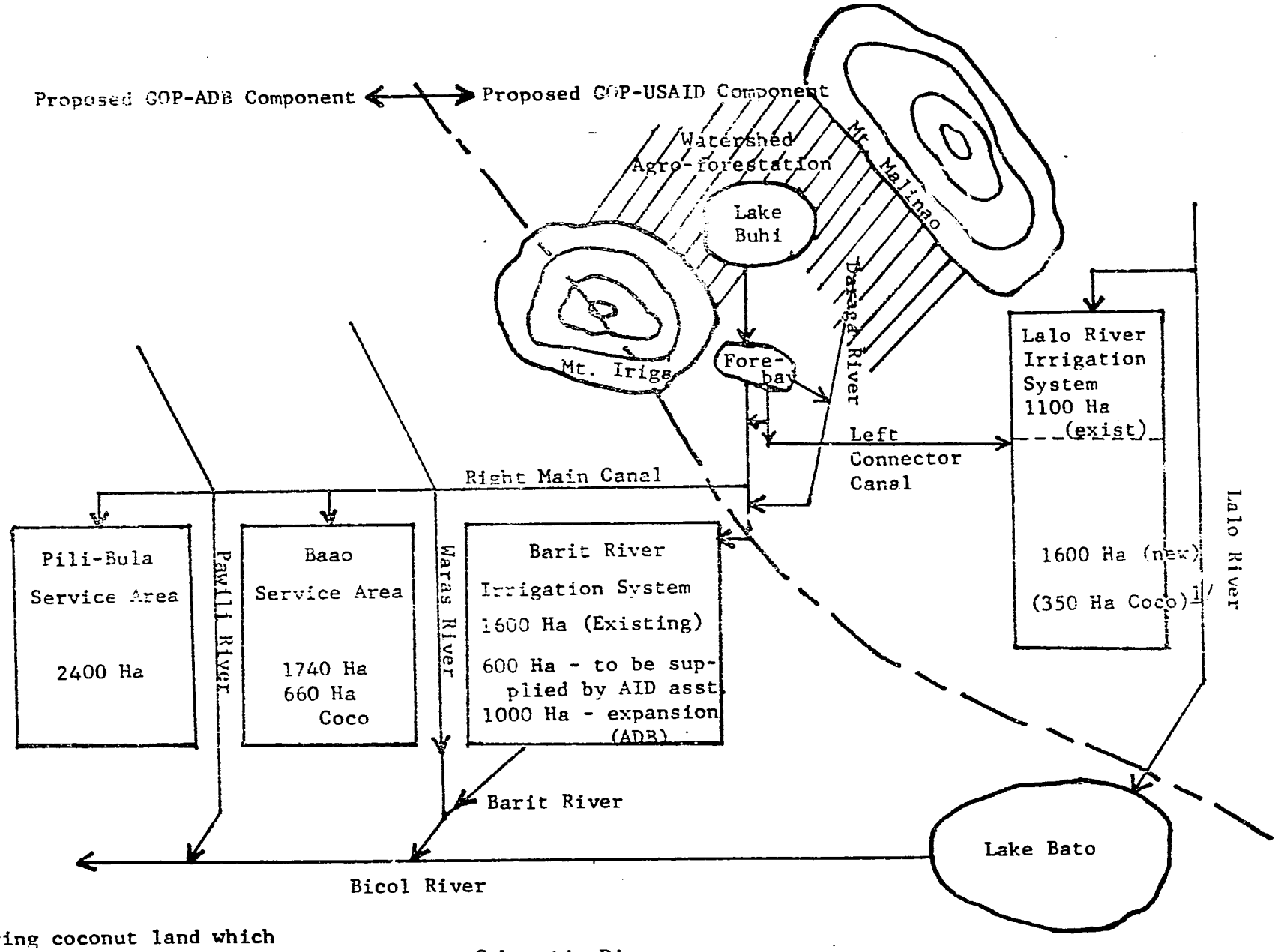
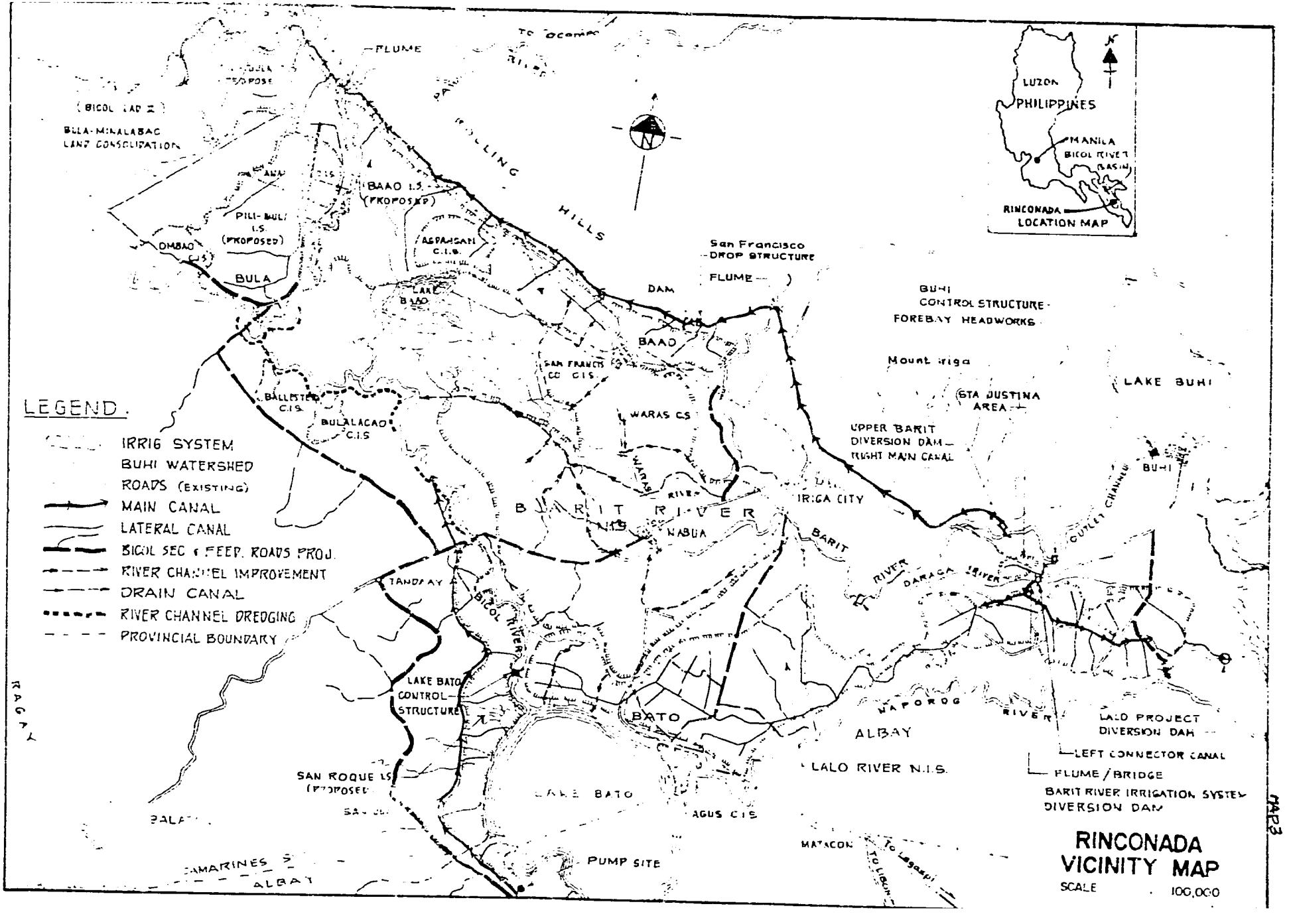



1/ Low-lying coconut land which may be converted to irrigated rice production.

Schematic Diagram
LAKE BUHI WATER DISTRIBUTION
Fig. No. G(1)1

Figure 1


RINCONADA VICINITY MAP
SCALE 100,000
LEGEND.
IRRIG SYSTEM
BUHI WATERSHED
ROADS (EXISTING)
MAIN CANAL
LATERAL CANAL
BICOL SEC & FEEP. ROADS PROJ.
RIVER CHANNEL IMPROVEMENT
DRAIN CANAL
RIVER CHANNEL DREDGING
PROVINCIAL BOUNDARY
LUZON
PHILIPPINES
MANILA
BICOL RIVER BASIN
RINCONADA LOCATION MAP
BULA-MINALABAC LAND CONSOLIDATION
BULA
BAAO I.S. (PROPOSED)
PILI-BULI I.S. (PROPOSED)
OMBAO C.I.S.
ASPAMSAN C.I.S.
LAKE BAAO
BALLESTER C.I.S.
BULALACAO C.I.S.
SAN FRANCIS CO C.I.S.
WARAS C.S.
BARIT RIVER
NABUA
TANDAY
BICOL RIVER
LAKE BATO CONTROL STRUCTURE
SAN ROQUE I.S. (PROPOSED)
LAKE BATO
PUMP SITE
AGUS C.I.S.
BATO
MATACON
ALBAY
LALO RIVER N.I.S.
NAPOROG RIVER
DARAGA RIVER
IRIGA CITY
UPPER BARIT DIVERSION DAM
RIGHT MAIN CANAL
STA JUSTINA AREA
Mount Iriga
LAKE BUHI
BUHI
OUTLET CHANNEL
BUHI CONTROL STRUCTURE
FOREBAY HEADWORKS
San Francisco DROP STRUCTURE
FLUME
DAM
HILLS
FLUME
LALO PROJECT DIVERSION DAM
LEFT CONNECTOR CANAL
FLUME / BRIDGE
BARIT RIVER IRRIGATION SYSTEM DIVERSION DAM
RAGAY
CAMARINES S.
ALBAY
MAP 3

## A. Pre-Project Conditions

The Buhi-Lalo Integrated Development Project area is part of the larger Rinconada Development Area (see Map 2, p. 14 of PP) located in the Province of Camarines Sur, in the vicinity of the townships of Buhi, Bato and Iriga City.[1/] It involves the further development of the water resources of Lake Buhi and the Lalo River through the construction of regulatory facilities at Lake Buhi and the improvement and expansion of the existing Lalo irrigation system facilities.

Currently, there is no positive control work at the outlet of Lake Buhi. The Barit River channel downstream from the lake outlet is also constricted by sediment and dikes of boulders, gravel, etc. The lake elevation and outflow is somewhat regulated by the power plant forebay of the Sta. Justina hydro-electric power plant located about 6 km. downstream from the lake. Under present day conditions, the water surface elevation has fluctuated from lows of around 82.30 to a recorded high of 84.95 in December 1956. The surface area of Lake Buhi is about 18 $Km^2$ (18,000,000 $M^2$) and stays about constant within the range of its normal fluctuation which historically ranges from 0.50 m. to 1.50 m. annually. Concurrently, the water is discharged as much as possible, through the Sta. Justina Power Plant and on down the Barit River to be partially diverted to irrigate the Barit River Irrigation System (aver. 1600 harvested in dry season) and the remainder flows into the Bicol River, near the town of Bula, Camarines Sur.

The current Lalo River irrigation system (1100 ha. or less) is situated southwesterly of Lake Buhi and currently derives its water supply from the Lalo River (synonymous with Naporog or Agos River). The Lalo River watershed is only about 22.5 $Km^2$ and does not produce enough stream flow to irrigate the existing system. This was started as a communal irrigation system in 1969 and upgraded to a national system in 1975 with the completion of a reinforced concrete canal headworks. Since that time, the main canal has been improved, laterals have been constructed along with main and supplemental farm ditches in part of the project area. In 1978, a rock masonry overflow weir, with sluiceway was constructed across the Lalo River. Due to the limited water supply originating in the Lalo River, approximately 700 ha. within the Lateral I-2 and I-3 service areas have never received any water, even though the laterals were completed in 1977.

Water use efficiency in the current Lalo system is low. This is due to the lack of regulatory gates on most lateral check structures and turnouts. In addition, there are no water measurement devices to determine the amount of water that is within or being delivered by the irrigation system. Without these facilities together with an adequate density of main and supplementary farm ditches, it is impossible to utilize even the available water supply efficiently. This situation will be remedied under the proposed project.

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1/ TAMS/TAE, Bicol River Basin Rinconada Integrated Development Area Project Feasibility Study (January 1979) Vol. I-VI plus 4 special studies. Because of the complexity of the study, the contractor was required to further edit and include additional technical detail in the reports. This has delayed final printing to March 1979. Multiple copies to be pouched to AID/W when received.

Currently, there are no roadways along the main canal or existing laterals. This situation is a deterrent to adequate operation and maintenance activities as well as the daily movement of the residents of the project in carrying out their normal farming and marketing activities. Under the project, roadways will be provided along [illegible] canal or lateral that is farther than about 100 to 200 meters from an existing roadway. Presently, there are very few access roads within the project area, so these canal berm roadways will be of significant value to the residents of the area.

Fortunately, the project area is situated on a plateau area between the Barit and Naporog Rivers and drainage problems that normally accompany typhoon rains are not very prevalent. Natural drainage channels, some of which need to be improved, are adequate to prevent extensive inundation of the project lands.

Farm plots or lots are small, ranging from as small as 0.25 ha. up to 15.0 ha. and only average about 0.5 ha. The larger plots are farmed by several tenant farmers. Farmers often operate two or more plots in their family operations.

B. Project Description - Water Resources

General. The major components of the water source and irrigation phases of this project consist of the construction of a water regulatory-bridge structure at the outlet of Lake Buhi; the deepening and improvement of about 2.75 km. of the Barit River channel downstream from the lake outlet; construction of a canal headworks at the power plant forebay near Sta. Justina; construction of 2.02 km. of left connector canal including an 80 m. combination flume/bridge over the Daraga River; rehabilitation of the existing Lalo irrigation system and the extension of this system to include an additional 1600 ha. of land with project service facilities consisting of 26.7 km. of main canal and laterals, 125 km. of main and supplementary farm ditches, 21.8 km. of main and secondary drains, 39 km. of on-farm drains, and 56.7 km. of service roads along canals and laterals. Necessary vehicle and pedestrian crossings over the irrigation and drainage system and appurtenant, checks, drops, culverts, turnouts, measuring devices, gates, and division boxes will also be provided.

Lake Buhi, an existing lake with a surface area of 1800 hectares is presently serving as a retention reservoir with no artificial control facilities at the outlet, although the National Power Corporation Sta. Justina power plant forebay (located 6 km. downstream) does have some effect on the natural outflow. The lake is said to have been formed several hundred years ago when the southeasterly side of the Mt. Iriga volcanic cone collapsed and slid across the Barit River channel, blocking its flow and forming the existing lake. The rock, gravel and boulders that exist in the restrictive portions of the Barit River located 2-3 km. downstream from the outlet of the lake, together with the fine sediments that have accumulated in the first 2 km. of the river downstream from the lake, attest to this event.

The main control structure at the outlet of Lake Buhi will be constructed of reinforced concrete and will consist of a concrete overflow ogee section approximately 40 meters in length abutted by a sluiceway containing 4-2.5 meter wide steel gated openings. The super-structure would carry a vehicular bridge to replace the existing timber bridge. This bridge is part of a critical road network serving the area that is to be upgraded in the near future. This outlet structure will facilitate the regulation of Lake Buhi between elevations 79.3 and 83.0 MSL providing an active storage capacity of 66.6 million cubic meters of water.

Foundation explorations for the Lake Buhi outlet control structure were made by TAMS/TAE in the Rinconada feasibility study. The details of this investigation can be found in their Special Study on Foundation and Soil, dated August 1978. The results of the testing indicate that both the control structure site and the highway embankment were pervious, but based on the permeability tests, seepage can be controlled to minimize losses (see Figure No. G(1)19, page G-72).

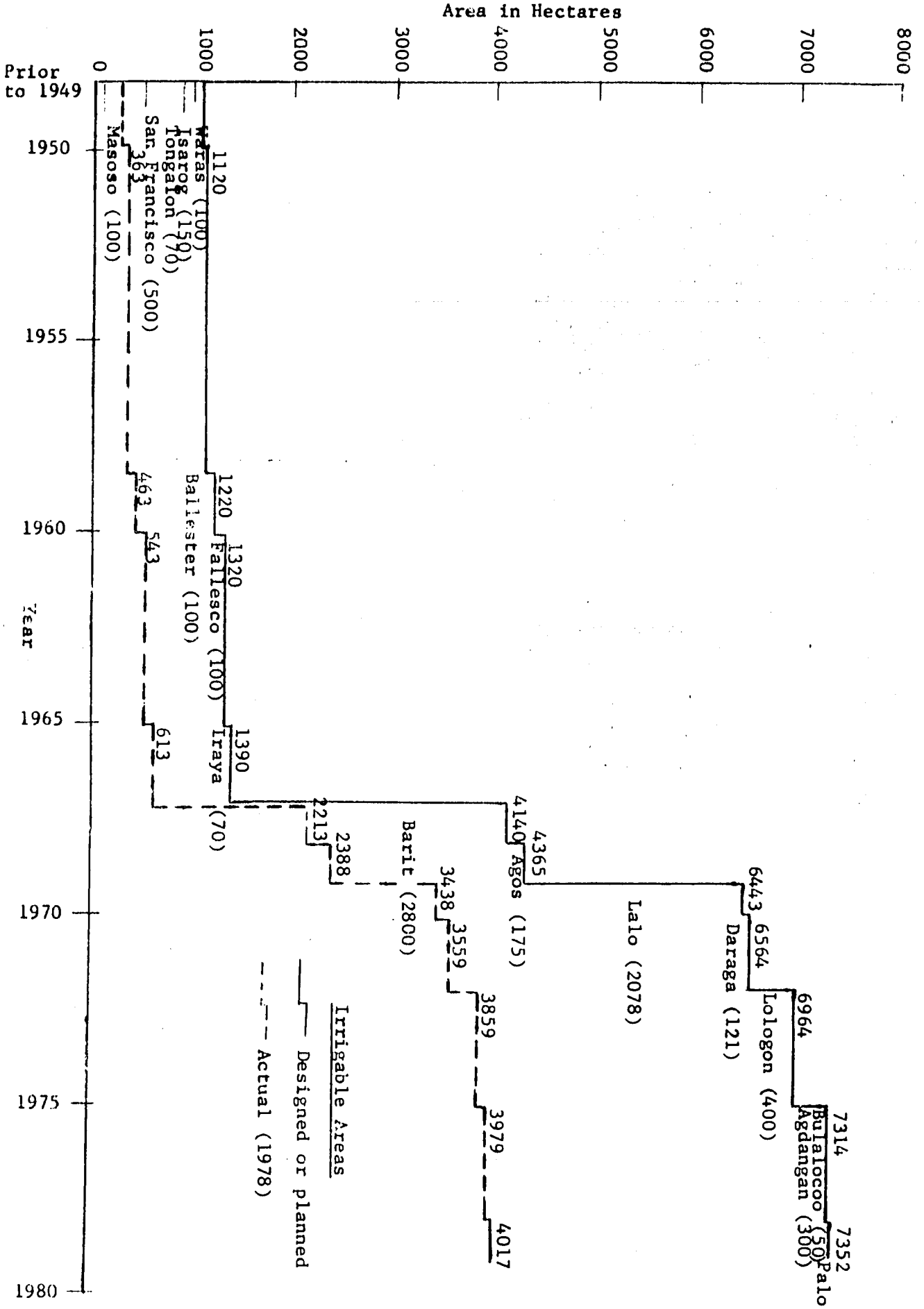
The forebay headworks structure would be constructed through the left abutment of the National Power Corporation's earth dike which was constructed in 1[illegible] across the Barit River. It would be a reinforced concrete box, conduit-type, steel-gated structure. The discharge capacity would be approximately 11.5 cubic meters per second. It will permit the release of about 3 cms of water into the left connector canal to meet the irrigation requirement of 1600 ha. or more in the Lalo project extension and about 7 cms to meet the irrigation requirements of land to be served by the proposed right main canal (4800 ha.) under a separate project. The 3 cms. diversion capacity is slightly larger than required for 1600 ha. of land in the Lalo Project extension because there are an additional 350 ha. of coconut land in this area that could be converted to irrigated rice land. Some of the owners of this land indicated interest in converting their land to irrigated rice if the project is implemented. The water would be released through this headworks and bifurcated, about 140 meters downstream, where 3 cms. would be diverted into the left connector canal and the remaining 8.5 cms. discharged into the Barit River through the baffled chute-drop structure. About 2 kms. downstream, up to 7 cms. could be diverted into a right main canal with the balance of the flow augmenting the leakage from the NPC forebay reservoir, the natural flow of the Barit River below this point and the flow of the Daraga River to service the existing Barit River Irrigation System,which has a future potential of 3200 has. of irrigated land. The only time that water will be released through this headworks specifically for use on the Barit River Irrigation System is when there is insufficient water to operate the Sta. Justina power plant,which has a minimum operable hydraulic capacity of 6 cms. Generally, there will be sufficient water to operate the power plant and all available flow, up to the maximum of 12.7 cms, will be run through the power plant to generate power. When the power plant is operating, the flow of water available to the Barit River Irrigation System exceeds the irrigation requirement.

At about Sta. 0+900 along the left main canal, the water will cross the Daraga River channel and discharge into the Lalo system main canal at Sta. 8+080. This Daraga River crossing will consist of a reinforced concrete combination flume/bridge structure about 80 meters in length. A bridge at this point will enhance maintenance activities, provide easier access into the central portion of the Lalo Project, thereby reducing travel distances between Iriga and this part of the project.

The balance of work included in the project would consist of the rehabilitation and upgrading of the existing Lalo irrigation system. It involves raising of the banks of the main canal to facilitate the diversion and utilization of greater quantities of water from the Lalo River when it is available and required in the project area. Some sections of the main canal, lateral I, lateral I-2, and I-3 will be enlarged and improved to facilitate the conveyance and delivery of water to expanded irrigable areas and the extension of the project down into the Bato area. The Lalo irrigation system area will be increased from 1100 ha. to 2700 ha. (with a possible extension later to 3000 ha., if 300 ha. of coconut land is converted to irrigated land). This will require the construction of about 30.9 km. of new canals and laterals. Approximately, 47.5 km. of service roads will be built along the main canals and laterals of the system, along with 25 vehicular and 31 pedestrian crossings to provide easy access to adjacent land. Approximately 125 km. of main and supplementary farm ditches, 16.8 km. of main and secondary drains and 39 km. of farm drains will be constructed to service this new land. The existing and new project distribution system will be provided with adequate water measurement devices, checks, head gates, etc., to facilitate the adoption of efficient water management practices.

Figure G(1)-2

Irrigation Development in Rinconada Area



# PROCEDURE USED FOR DETERMINING THE ESTIMATED DISCHARGE FOR VARIOUS STREAMS IN THE RINCONADA AREA

## LAKE BUHI

Records are available for water surface elevations of Lake Buhi and the outflow from Lake Buhi at the NPC Sta. Justina Power Plant. The surface area of Lake Buhi is about 18 $km^2$ or 18,000,000 $M^2$. The banks and shore line of the lake are relatively steep; therefore, it has been assumed that there is no change in the water surface area of Lake Buhi for the 4-meter range between water surface elevations 79.0 to 83.0 meter above MSL. The storage capacity or lake content has been assumed to be a constant 18,000,000 cubic meters per meter of depth. With these data, i.e., unit storage, outflow and change in water surface elevation, it was possible to compute the net inflow into the lake for each month of the period of record. Evaporation data are also available within the Bicol River Basin so it was possible to compute the estimated evaporation loss from the water surface of the lake, thereby facilitating the determination of the total inflow into the lake. This total inflow was then correlated with adjacent watershed areas to estimate the runoff of pertinent streams for which there are no available runoff data. The outflow from Lake Buhi, together with the discharge records for the Barit River at Sto. Nino, Iriga, was also used to estimate local inflows to the Barit River and Daraga River system between Lake Buhi and the Barit River Irrigation System Diversion dam (see Rinconada Vicinity Map No. 3, p. ii of Annex G(1)).

## LALO RIVER

The Lalo River watershed is adjacent to the Lake Buhi watershed and both drain the westerly slopes of Mt. Malinao. Watershed conditions, with respect to topography, vegetative cover, etc., are also comparable; therefore, it was assumed that a direct precipitation-runoff relationship existed between these two watershed areas. The total drainage area above the outlet of Lake Buhi is about 105 $km^2$. The total drainage area above the Lalo River Irrigation System diversion dam, near Antipolo, Buhi, is about 22.5 $km^2$. Both watershed areas fall within the 2,600 to 2,800 mm. range of precipitation per year; therefore, the runoff of the Lalo River, at Antipolo, was assumed to be the same as the ratio of the size of these two drainage areas. The discharge of the Lalo River was computed to be 21.4% of the total inflow into Lake Buhi. The monthly distribution of this runoff was assumed to be the same as the inflow into Lake Buhi.

Local inflow to the Barit River, between Lake Buhi and the proposed Upper Barit River diversion site and the local inflow between this proposed dam and the Barit River Irrigation System (BRIS) diversion dam, at Sto. Nino, plus the natural flow of the Daraga River, above St. Nino, Iriga. The total drainage area bove the diversion dam of the Barit River Irrigation System is 142 $km^2$. With the drainage area above the outlet of Lake Buhi at 105 $km^2$, this leaves an area of 37 $km^2$, which contributes local inflow to the Barit and Daraga Rivers, between the two above-mentioned stations. About 21 $km^2$ of watershed area generates the local inflow to the Barit

River above the proposed Upper Barit River diversion site. The remaining 16 $km^2$ generates the local inflow runoff to the Barit River below the proposed Upper Barit River diversion site and the flow of the Daraga River between its headwaters and the Barit River Irrigation System diversion dam and this local inflow is divertible to the Barit River Irrigation System (see Schematic, Figure 1, p. v).

These local inflow areas are located between the 2,200 mm and 2,500 mm annual precipitation zones (see Figure G(1)-10). Therefore, the runoff is lower, per unit area, than that of the Lake Buhi watershed area. The estimated runoff from these areas was modified or weighted to adjust for this reduced unit runoff. The resultant value was used, in conjunction with the inflow into Lake Buhi to determine the monthly distribution of the local inflow for these two sub-areas. The local inflow for the area on the Barit River, above the proposed Upper Barit River diversion dam, was computed to be about 14.8% of the inflow into Lake Buhi. The local inflow of the Daraga River and the Barit River below the proposed diversion dam and above the Barit River Irrigation System (BRIS) diversion dam was computed to be 11.3% of the inflow to Lake Buhi.

9/22/78

## Analysis of Lake Buhi-Barit River Drainage Area

Barit River at Sto. Niño Watershed Area = 142 $km^2$
Lake Buhi Watershed Area = 105 $km^2$

Lake Buhi Area = $\frac{105}{142}$ = 73.9% of Drainage Area

Local Inflow Barit and Daraga Rivers = $\frac{37}{142}$ = 26.1% of Drainage Area

Precipitation: Lake Buhi Outlet to Watershed Divide
(Form Isohyet Map) = 2600 to 2800 mm/yr Ave: 2700 mm

Lake Buhi to Barit Div. Dam & Daraga River
= 2200 to 2500 mm/yr Ave: 2350 mm

Therefore 105 $km^2$ @ 2700 mm/yr
37 $km^2$ @ 2350 mm/yr Ratio of Precip. = $\frac{2350}{2700}$ = 87%

Jan. 1956 Discharge at Sto. Niño = 25,870,000 $m^3$ *

$$= \frac{25,870,000\ m^3}{142\ km^2} = 182,183\ m^3/km^2$$

Trial & Error

(1) Therefore 190,000 $m^3$ x 105 $km^2$ = 19,950,000 $m^3$
(190,000 x .87)=165,300 x 37 = 6,116,100 $m^3$
26,066,100 $m^3$

(2) 189,500 $m^3$ x105 $km^2$ = 19,897,500 $m^3$
(189,500 x .87)=164,865 x 37 = 6,100,005 $m^3$
25,997,505 $m^3$

(3) 188,600 $m^3$ x105 $km^2$ = 19,803,000 $m^3$
(188,600 x .87)=164,082 x 37 = 6,071,034 $m^3$
* 25,874,034 $m^3$ Checks

$$\frac{188,600}{182,183} = 1.035$$

Weighted Discharge of Buhi Outflow

$$\frac{105}{142} = .739 \times \frac{188,600}{182,183} = 0.765$$ = 76.5% of Sto. Nino is from Buhi and 23.5% is local inflow

9/18/78

## Stream Flow Analysis

### Barit River at Sto. Niño, Iriga City

Drainage Area at Sto. Nino = 142 $km^2$

Drainage Area at Upper Barit River Diversion Site = 126 $km^2$

Drainage Area at Outlet of Lake Buhi = 105 $km^2$

Therefore Local inflow area from Lake Buhi to Upper Barit River Diversion Site = 126 - 105 = 21 $km^2$

" Local inflow on Daraga River between Sto. Nino and Headwaters is 142 - 126 = 16 $km^2$

" Total local inflow area between Lake Buhi and Sto. Nino = 142 - 105 = 37 $km^2$

Lake Buhi Watershed = 105 $km^2$ = $\frac{105}{142}$ = 73.9% of total area

Local Inflow Watershed = 37 $km^2$ = $\frac{37}{142}$ = 26.1% of total area

Local Inflow Watershed, Buhi to Upper Barit River Diversion Damsite = $\frac{21}{142}$ = 14.8% of total area

= $\frac{21}{37}$ = 56.8% of local inflow area

Local Inflow Watershed, Daraga River and Barit River Flow Upper Damsite and above Sto. Niño = $\frac{16}{142}$ = 11.3% of total area

= $\frac{16}{37}$ = 43.2% of local inflow area

9/23/78

## Analysis of Estimated Discharges of Waras River, San Francisco Creek and Agdangan Creek, Based upon Relative Average Annual Precipitation, Watershed Areas and Monthly Distribution of Lake Buhi Inflows.

12 year average annual discharge of Lalo River = 72.75 m.c.m.
Drainage area = 22.5 $km^2$ ∴ Discharge = 3,233,333 $m^3/km^2/yr$
Average annual precipitation (Isohyet Chart) 2700 mm/yr
= 3.23 $mcm/km^2/yr$

Estimated Discharge of San Francisco Creek and Agdangan Creek

San Francisco Creek: Precipitation = 2100 mm/yr Drainage Area = 8.6 $km^2$

Proportionate Runoff = $\frac{2100 \text{ mm}}{2700 \text{ mm}} \times 3{,}233{,}333 = 2{,}514{,}800 \ m^3/km^2/yr$

S.F. Cr. Discharge = 8.6 $km^2$ x 2,514,800 = 21,627,280 $m^3/yr$ = 2.51 $mcm/km^2/yr$

Agdangan Creek = 7.0 $km^2$ x 2,514,800 = 17,603,600 $m^3/yr$ = 2.51 $mcm/km^2/yr$

Waras River Precipitation = 2200 mm/yr. Drainage Area = 54.5 $km^2$

Proportionate Runoff = $\frac{2200 \text{ mm}}{2700 \text{ mm}} \times 3{,}233{,}333 = 2{,}634{,}500 \ m^3/km^2/yr$

Waras River Discharge = 54.5 $km^2$ x 2,634,500 = 143,530,000 $m^3/yr$
= 2.63 $mcm/km^2/yr$

Inflow into Lake Buhi (12 yr Average 1956-67) = 323.021 mcm
+ Est. Evaporation 16.940 mcm
Ave. Total Inflow 339.961 mcm
= 3.23 $mcm/km^2/yr$

Drainage Area Runoff Ratios:

$$\frac{\text{San Francisco Creek}}{\text{Inflow to Lake Buhi}} = \frac{21.627 \text{ mcm}}{339.961 \text{ mcm}} = 0.0636$$

$$\frac{\text{Agdangan Creek}}{\text{Inflow to Lake Buhi}} = \frac{17.604 \text{ mcm}}{339.961} = 0.0518$$

$$\frac{\text{Waras River}}{\text{Inflow to Lake Buhi}} = \frac{143.580 \text{ mcm}}{339.961 \text{ mcm}} = 0.4223$$

Table G(1)-1

RINCONADA BUHI, IAD III
NET INFLOW INTO LAKE BUHI

| Year and Month | Lake Buhi Outflow | | Net Inflow into Lake Buhi | | | | |
|---|---|---|---|---|---|---|---|
| | | | US Gage Ht 1st of Mo. | Change in Storage | | Outflow | Net Inflow |
| | $m^3$/sec | M.C.M. | (m) | (m) | M.C.M. | M.C.M. | M.C.M. |
| **1955** | | | | | | | |
| Mar | 7.40 | 19.820 | 95.67 | -0.37 | - 6.660 | 19.820 | 13.160 |
| Apr | 5.34 | 13.841 | 95.30 | +0.02 | + 0.360 | 13.841 | 14.201 |
| May | 5.38 | 14.410 | 95.32 | +0.05 | + 0.900 | 14.410 | 15.310 |
| June | 5.94 | 15.396 | 95.37 | +0.05 | + 0.900 | 15.396 | 16.296 |
| July | 5.54 | 14.838 | 95.42 | 0 | 0 | 14.838 | 14.838 |
| Aug | 6.40 | 17.142 | 95.42 | +0.04 | + 0.720 | 17.142 | 17.862 |
| Sept | 5.01 | 12.986 | 95.46 | -0.15 | - 2.700 | 12.986 | 10.286 |
| Oct | 5.55 | 14,865 | 95.31 | +0.17 | + 3.060 | 14,865 | 17,925 |
| Nov | 19.76 | 51.218 | 95.48 | +1.98 | +35.640 | 51.218 | 86.858 |
| Dec | 26.05 | 69.772 | 97.46 | -1.87 | -33.660 | 69.772 | 36.112 |
| Total | - | 244.288 | - | -0.08 | - 1.440 | 244.288 | 242,848 |
| **1956** | | | | | | | |
| Jan | 7.14 | 19.124 | 95.59 | +0.01 | + 0.180 | 19.124 | 19.304 |
| Feb | 8.62 | 21.598 | 95.60 | -0.12 | - 2,160 | 21.598 | 19.438 |
| Mar | 9.18 | 24.588 | 95.48 | -0.04 | - 0.720 | 24.588 | 23,868 |
| Apr | 11.19 | 29.004 | 95.44 | +0.14 | + 2.520 | 29.004 | 31.524 |
| May | 6.74 | 18.052 | 95.58 | -0.10 | - 1.800 | 18.052 | 16.252 |
| June | 5.38 | 13.945 | 95.48 | -0.05 | - 0.900 | 13.945 | 13.045 |
| July | 6.69 | 17.918 | 95.43 | +0.05 | + 0.900 | 17.918 | 18.818 |
| Aug | 6.43 | 17.222 | 95.48 | +0.06 | + 1.080 | 17.222 | 18.302 |
| Sept | 14.57 | 37.765 | 95.54 | +0.34 | + 6.120 | 37.765 | 43.885 |
| Oct | 9.53 | 25.525 | 95.88 | -0.39 | - 7.020 | 25.525 | 18.505 |
| Nov | 10.59 | 27.449 | 95.49 | +0.75 | +13.500 | 27.449 | 40.949 |
| Dec | 61.73 | 165.338 | 96.24 | +0.50 | + 9.000 | 165.338 | 174.338 |
| Total | - | 417.528 | - | +1.15 | +20.700 | 417.528 | 438.228 |
| **1957** | | | | | | | |
| Jan | 27.12 | 72.638 | 96.74 | -1.01 | -18.180 | 72.638 | 54.458 |
| Feb | 9.89 | 23.926 | 95.73 | -0.36 | - 6.480 | 23.926 | 17.446 |
| Mar | 6.23 | 16.686 | 95.37 | -0.08 | - 1.440 | 16.686 | 15.246 |
| Apr | 4.69 | 12.156 | 95.29 | -0.03 | - 0.540 | 12.156 | 11.616 |
| May | 3.54 | 9.482 | 95.26 | -0.10 | - 1.800 | 9.482 | 7.682 |
| June | 3.50 | 9.072 | 95.16 | +0.23 | + 4.140 | 9.072 | 13.212 |
| July | 7.36 | 19.713 | 95.39 | +0.04 | + 0.720 | 19.713 | 20.433 |
| Aug | 5.97 | 15.990 | 95.43 | -0.08 | - 1.440 | 15.990 | 14.550 |
| Sept | 5.41 | 14.023 | 95.35 | +0.05 | + 0.900 | 14.023 | 14.923 |
| Oct | 8.57 | 22.954 | 95.40 | +0.19 | + 3.420 | 22.954 | 26.374 |
| Nov | 16.05 | 41.602 | 95.59 | +0.14 | + 2.520 | 41.602 | 44.122 |
| Dec | 8.65 | 23.168 | 95.73 | -0.28 | - 5.040 | 23.168 | 18.128 |
| Total | - | 281.410 | - | -1.29 | -23.220 | 218.410 | 258.190 |

AKLong,vbp 1/28/79

Table G(1)-1 Continued

| Year and Month | Lake Buhi Outflow | | Net Inflow into Lake Buhi | | | | |
|---|---|---|---|---|---|---|---|
| | | | WS Gage Ht 1st of Mo. | Change in Storage | | Outflow | Net Inflow |
| | $m^3$/sec | M.C.M. | (m) | (m) | M.C.M. | M.C.M. | M.C.M. |
| **1958** | | | | | | | |
| Jan | 7.65 | 20.490 | 95.45 | +0.24 | + 4.320 | 20.490 | 24.810 |
| Feb | 7.64 | 18.483 | 95.69 | -0.06 | - 1.080 | 18.483 | 17.403 |
| Mar | 8.84 | 23.677 | 95.63 | -0.14 | - 2.520 | 23.677 | 21.157 |
| Apr | 5.20 | 13.478 | 95.49 | +0.29 | + 5.220 | 13.478 | 18.698 |
| May | 6.50 | 17.410 | 95.78 | -0.50 | - 9.000 | 17.410 | 8.410 |
| June | 4.75 | 12.312 | 95.28 | +0.04 | + 0.720 | 12.312 | 13.032 |
| July | 4.84 | 12.963 | 95.32 | -0.04 | - 0.720 | 12.963 | 12.243 |
| Aug | 4.56 | 12.214 | 95.28 | +0.12 | + 2.160 | 12.214 | 14.374 |
| Sept | 6.41 | 16.615 | 95.40 | -0.05 | - 0.900 | 16.615 | 15.715 |
| Oct | 18.94 | 50.729 | 95.35 | +1.36 | +24.480 | 50.729 | 75.209 |
| Nov | 18.00 | 46.656 | 96.71 | -0.91 | -16.380 | 46.656 | 30.276 |
| Dec | 9.12 | 24.427 | 95.80 | -0.37 | - 6.660 | 24.427 | 17.767 |
| Total | - | 269.454 | - | -0.02 | - 0.360 | 269.454 | 269.094 |
| **1959** | | | | | | | |
| Jan | 8.20 | 21.963 | 95.43 | +0.36 | + 6.480 | 21.963 | 28.443 |
| Feb | 10.48 | 25.353 | 95.79 | -0.33 | - 5.940 | 25.353 | 19.413 |
| Mar | 10.82 | 28.980 | 95.46 | +0.04 | + 0.720 | 28.980 | 29.700 |
| Apr | 5.80 | 15.034 | 95.50 | -0.19 | - 3.420 | 15.034 | 11.614 |
| May | 6.55 | 17.544 | 95.31 | +0.10 | + 1.800 | 17.544 | 19.344 |
| June | 4.79 | 12.416 | 95.41 | -0.12 | - 2.160 | 12.416 | 10.256 |
| July | 4.54 | 12.160 | 95.29 | +0.14 | + 2.520 | 12.160 | 14.680 |
| Aug | 5.72 | 15.320 | 95.43 | 0 | 0 | 15.320 | 15.320 |
| Sept | 5.83 | 15.111 | 95.43 | -0.10 | - 1.800 | 15.111 | 13.311 |
| Oct | 5.29 | 14.169 | 95.33 | -0.01 | - 0.180 | 14.169 | 13.989 |
| Nov | 19.70 | 51.062 | 95.32 | +0.18 | + 3.240 | 51.062 | 54.302 |
| Dec | 22.09 | 59.166 | 95.50 | +0.06 | + 1.080 | 59.166 | 60.246 |
| Total | - | 288.278 | - | +0.13 | + 2.340 | 288.278 | 290.618 |
| **1960** | | | | | | | |
| Jan | 18.55 | 49.684 | 95.56 | +0.01 | + 0.180 | 49.684 | 49.864 |
| Feb | 9.32 | 23.352 | 95.57 | -0.17 | - 3.060 | 23.352 | 20.292 |
| Mar | 7.48 | 20.034 | [illegible]40 | -0.10 | - 1.800 | 20.034 | 18.234 |
| Apr | 6.94 | 17.988 | 95.30 | +0.17 | + 3.060 | 17.988 | 21.048 |
| May | 9.04 | 24.213 | 95.47 | +0.33 | + 5.940 | 24.213 | 30.153 |
| June | 12.02 | 31.156 | 95.80 | +0.03 | + 0.540 | 31.156 | 31.696 |
| July | 8.43 | 22.579 | 95.83 | -0.37 | - 6.660 | 22.579 | 15.919 |
| Aug | 7.41 | 19.847 | 95.46 | -0.03 | - 0.540 | 19.847 | 19.307 |
| Sept | 5.78 | 14.982 | 95.43 | +0.02 | + 0.360 | 14.982 | 15,342 |
| Oct | 21.67 | 58.041 | 95.45 | +0.21 | + 3.780 | 58.041 | 61.821 |
| Nov | 12.49 | 32.374 | 95.66 | +0.07 | + 1.260 | 32.374 | 33.634 |
| Dec | 9.90 | 26.516 | 95.73 | -0.02 | - 0.360 | 26.516 | 26.156 |
| Total | - | 340.766 | - | +0.15 | + 2.700 | 340.766 | 343.466 |

AKLong,vbp 1/28/79

Table G(1)-1 Continued

| Year and Month | Lake Buhi Outflow $m^3$/sec | Lake Buhi Outflow M.C.M. | WS Gage Ht. 1st of Mo. (m) | Net Inflow into Lake Buhi: Change in Storage (m) | Net Inflow into Lake Buhi: Change in Storage M.C.M. | Net Inflow into Lake Buhi: Outflow M.C.M. | Net Inflow into Lake Buhi: Net Inflow M.C.M. |
|---|---|---|---|---|---|---|---|
| **1961** | | | | | | | |
| Jan | 8.90 | 23.838 | 95.71 | -0.14 | - 2.520 | 23.838 | 21.318 |
| Feb | 6.44 | 15.580 | 95.57 | -0.16 | - 2.880 | 15.580 | 12.700 |
| Mar | 4.75 | 12.722 | 95.41 | -0.11 | - 1.980 | 12.722 | 10.742 |
| Apr | 2.76 | 7.154 | 95.30 | -0.04 | - 0.720 | 7.154 | 6.434 |
| May | 2.51 | 6.723 | 95.26 | +0.03 | + 0.540 | 6.723 | 7.263 |
| June | 3.15 | 8.165 | 95.29 | +0.03 | + 0.540 | 8.165 | 8.705 |
| July | 5.75 | 15.401 | 95.32 | +0.26 | + 4.680 | 15.401 | 20.081 |
| Aug | 6.09 | 16.311 | 95.58 | -0.01 | - 0.180 | 16.311 | 16.131 |
| Sept | 7.92 | 20.529 | 95.57 | +0.02 | + 0.360 | 20.529 | 20.889 |
| Oct | 9.95 | 26.650 | 95.59 | +0.03 | + 0.540 | 26.650 | 27.190 |
| Nov | 8.13 | 21.073 | 95.62 | +0.15 | + 2.700 | 21.073 | 23.773 |
| Dec | 14.24 | 38.140 | 95.77 | -0.06 | - 1.080 | 38.140 | 37.060 |
| Total | - | 212.286 | - | 0 | 0 | 212.286 | 212.286 |
| **1962** | | | | | | | |
| Jan | 11.98 | 32.087 | 95.71 | -0.04 | - 0.720 | 32.087 | 31.367 |
| Feb | 8.53 | 20.636 | 95.67 | +0.04 | + 0.720 | 20.636 | 21.356 |
| Mar | 8.45 | 22.632 | 95.71 | -0.17 | - 3.060 | 22.632 | 19.572 |
| Apr | 3.49 | 9.046 | 95.54 | -0.16 | - 2.880 | 9.046 | 6.166 |
| May | 7.19 | 19.258 | 95.38 | +0.37 | + 6.660 | 19.258 | 25.918 |
| June | 9.03 | 23.406 | 95.75 | -0.33 | - 5.940 | 23.406 | 17.466 |
| July | 8.75 | 23.436 | 95.42 | +0.35 | + 6.300 | 23.436 | 29.736 |
| Aug | 5.13 | 13.740 | 95.77 | -0.16 | - 2.880 | 13.740 | 10.860 |
| Sept | 4.98 | 12.908 | 95.61 | +0.11 | + 1.980 | 12.908 | 14.888 |
| Oct | 3.99 | 10.687 | 95.72 | -0.27 | - 4.860 | 10.687 | 5.827 |
| Nov | 13.46 | 34.888 | 95.45 | +0.35 | + 6.300 | 34.888 | 41.188 |
| Dec | 16.85 | 45.131 | 95.80 | -0.15 | - 2.700 | 45.131 | 42.431 |
| Total | - | 267.855 | - | -0.06 | - 1.080 | 267.855 | 266.775 |
| **1963** | | | | | | | |
| Jan | 11.65 | 31.203 | 95.65 | +0.07 | + 1.260 | 31.203 | 32.463 |
| Feb | 12.02 | 29.079 | 95.72 | -0.02 | - 0.360 | 29.079 | 28.719 |
| Mar | 6.32 | 16.927 | 95.70 | -0.31 | - 5.580 | 16.927 | 11.347 |
| Apr | 3.48 | 9.020 | 95.39 | -0.11 | - 1.980 | 9.020 | 7.040 |
| May | 1.27 | 3.402 | 95.28 | -0.10 | - 1.800 | 3.402 | 1.602 |
| June | 2.85 | 7.387 | 95.18 | +0.28 | + 5.040 | 7.387 | 12.427 |
| July | 4.04 | 10.821 | 95.46 | -0.16 | - 2.880 | 10.821 | 7.941 |
| Aug | 14.64 | 39.212 | 95.30 | +0.30 | + 5.400 | 39.212 | 44.612 |
| Sept | 5.24 | 13.582 | 95.60 | -0.01 | - 0.180 | 13.582 | 13.402 |
| Oct | 6.82 | 18.267 | 95.59 | -0.21 | - 3.780 | 18.267 | 14.487 |
| Nov | 5.72 | 14.826 | 95.38 | +0.09 | + 1.620 | 14.826 | 16.446 |
| Dec | 7.34 | 19.659 | 95.47 | +0.12 | + 2.160 | 19.659 | 21.819 |
| Total | - | 213.385 | - | -0.06 | - 1.080 | 213.385 | 212.305 |

AKLong:lep 1/28/79

Table G(1)-1 Continued

| Year and Month | Lake Buhi Outflow $m^3$/sec | Lake Buhi Outflow M.C.M. | WS Gage Ht. 1st of Mo. (m) | Net Inflow into Lake Buhi: Change in Storage (m) | Change in Storage M.C.M. | Outflow M.C.M. | Net Inflow M.C.M. |
|---|---|---|---|---|---|---|---|
| **1964** | | | | | | | |
| Jan | 8.04 | 21.534 | 95.59 | -0.11 | - 1.980 | 21.534 | 19.554 |
| Feb | 5.37 | 13.455 | 95.48 | +0.14 | + 2.520 | 13.455 | 15.975 |
| Mar | 4.24 | 11.356 | 95.62 | -0.23 | - 4.140 | 11.356 | 7.216 |
| Apr | 2.85 | 7.387 | 95.39 | -0.03 | - 0.540 | 7.387 | 6.847 |
| May | 2.85 | 7.633 | 95.36 | -0.11 | - 1.980 | 7.633 | 5.653 |
| June | 5.05 | 13.090 | 95.25 | +0.52 | + 9.360 | 13.090 | 22.450 |
| July | 14.30 | 38.301 | 95.77 | -0.51 | - 9.180 | 38.301 | 29.121 |
| Aug | 6.37 | 17.061 | 95.26 | 0 | 0 | 17.061 | 17.061 |
| Sept | 9.68 | 25.091 | 95.26 | +0.92 | +16.560 | 25.091 | 41.651 |
| Oct | 13.43 | 35.971 | 96.18 | -0.82 | -14.760 | 35.971 | 21.211 |
| Nov | 19.62 | 50.855 | 95.36 | +0.51 | + 9.180 | 50.855 | 60.035 |
| Dec | 37.64 | 100.815 | 95.87 | +0.01 | + 0.180 | 100.815 | 100.995 |
| Total | - | 342.539 | - | +0.29 | + 5.220 | 342.549 | 347.769 |
| **1965** | | | | | | | |
| Jan | 23.62 | 63.264 | 95.88 | -0.13 | - 2.340 | 63.264 | 60.924 |
| Feb | 14.57 | 35.248 | 95.75 | -0.24 | - 4.320 | 35.248 | 30.928 |
| Mar | 12.56 | 33.641 | 95.51 | +0.02 | + 0.360 | 33.641 | 34.001 |
| Apr | 7.63 | 19.777 | 95.53 | -0.15 | - 2.700 | 19.777 | 17.077 |
| May | 4.52 | 12.106 | 95.38 | +0.04 | + 0.720 | 12.106 | 12.826 |
| June | 16.61 | 43.053 | 95.42 | +0.48 | + 8.640 | 43.053 | 51.693 |
| July | 34.14 | 91.441 | 95.90 | -0.18 | - 3.240 | 91.441 | 88.201 |
| Aug | 9.57 | 25.632 | 95.72 | -0.17 | - 3.060 | 25.632 | 22.572 |
| Sept | 17.31 | 44.868 | 95.55 | +0.09 | + 1.620 | 44.868 | 46.488 |
| Oct | 15.69 | 42.024 | 95.64 | -0.05 | - 0.900 | 42.024 | 41.124 |
| Nov | 12.32 | 31.933 | 95.59 | +0.12 | + 2.160 | 31.933 | 34.093 |
| Dec | 12.38 | 33.159 | 95.71 | -0.06 | - 1.080 | 33.159 | 32.079 |
| Total | - | 476.146 | - | -0.23 | - 4.140 | 476.146 | 472.006 |
| **1966** | | | | | | | |
| Jan | 18.87 | 50.541 | 95.65 | -0.06 | - 1.080 | 50.541 | 49.461 |
| Feb | 6.06 | 14.660 | 95.59 | -0.20 | - 3.600 | 14.660 | 11.060 |
| Mar | 2.75 | 7.366 | 95.39 | -0.04 | - 0.720 | 7.366 | 6.646 |
| Apr | 1.77 | 4.588 | 95.35 | -0.12 | - 2.160 | 4.588 | 2.428 |
| May | 3.30 | 8.839 | 95.23 | +0.12 | + 2.160 | 8.839 | 10.999 |
| June | 1.82 | 4.717 | 95.35 | -0.04 | - 0.720 | 4.717 | 3.997 |
| July | 5.38 | 14.410 | 95.31 | +0.40 | + 7.200 | 14.410 | 21.610 |
| Aug | 12.22 | 32.730 | 95.71 | -0.18 | - 3.240 | 32.730 | 29.490 |
| Sept | 7.82 | 20.269 | 95.53 | -0.03 | - 0.540 | 20.269 | 19.729 |
| Oct | 3.54 | 9.482 | 95.50 | -0.06 | - 1.080 | 9.482 | 8.402 |
| Nov | 20.82 | 53.965 | 95.44 | +0.34 | + 6.120 | 53.965 | 60.085 |
| Dec | 34.82 | 93.262 | 95.78 | +0.84 | +15.120 | 93.262 | 108.382 |
| Total | - | 314.829 | - | +0.97 | +17.460 | 314.829 | 332.289 |

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Table G(1)-1 Continued

| Year and Month | Lake Buhi Outflow $m^3$/sec | M.C.M. | WS Gage Ht. 1st of Mo. (m) | Net Inflow into Lake Buhi: Change in Storage (m) | M.C.M. | Outflow M.C.M. | Net Inflow M.C.M. |
|---|---|---|---|---|---|---|---|
| **1967** | | | | | | | |
| Jan | 52.50 | 140.616 | 96.62 | -0.66 | -11.880 | 140.616 | 128.736 |
| Feb | 14.14 | 34.207 | 95.96 | -0.23 | - 4.140 | 34.207 | 30.067 |
| Mar | 10.88* | 29.140* | 95.73 | -0.17 | - 3.060 | 29.140* | 26.080* |
| Apr | 7.44* | 19.280* | 95.56 | -0.09 | - 1.620 | 19.280* | 17.660* |
| May | 7.02* | 18.810* | 95.47 | -0.10 | - 1.800 | 18.810* | 17.1[illegible]* |
| June | 2.06 | 5.340 | 95.37 | +0.02 | + 0.360 | 5.340 | 5.700 |
| July | 4.02 | 10.767 | 95.39 | +0.15 | + 2.700 | 10.767 | 13.467 |
| Aug | 11.02 | 29.516 | 95.54 | +0.19 | + 3.420 | 29.516 | 32.936 |
| Sept | 14.63 | 37.921 | 95.73 | -0.14 | - 2.520 | 37.921 | 35.401 |
| Oct | 7.79 | 20.865 | 95.59 | -0.03 | - 0.540 | 20.865 | 20.325 |
| Nov | 33.57 | 87.013 | 95.56 | -0.09 | - 1.620 | 87.013 | 85.393 |
| Dec | 5.82 | 15.588 | 95.47 | +0.27 | + 4.860 | 15.588 | 20.448 |
| Total | - | 449.063 | - | -0.88 | -15.840 | 449.063 | 433.223 |
| **1968** | | | | | | | |
| Jan | 7.18 | 19.231 | 95.74 | +0.02 | + 0.360 | 19.231 | 19.591 |
| Feb | 5.49 | 13.756 | 95.76 | -0.33 | - 5.940 | 13.756 | 7.816 |
| Mar | 4.05 | 10.848 | 95.43 | -0.17 | - 3.060 | 10.848 | 7.788 |
| Apr | 2.14 | 5.547 | 95.26 | +0.07 | + 1.260 | 5.547 | 6.807 |
| May | 2.04 | 5.464 | 95.33 | -0.09 | - 1.620 | 5.464 | 3.844 |
| June | 1.59 | 4.121 | 95.24 | | | 4.121 | |
| July | 2.39 | 6.401 | | | | 6.401 | |
| Aug | 5.86 | 15.695 | | | | 15.695 | |
| Sept | 12.31 | 31.908 | | | | 31.908 | |
| Oct | 10.40 | 27.855 | | | | 27.855 | |
| Nov | 5.16 | 13.375 | | | | 13.375 | |
| Dec | 6.77 | 18.133 | | | | 18.133 | |
| Total | - | | - | | | | |
| **1969** | | | | | | | |
| Jan | | | | | | | |
| Feb | | | | | | | |
| Mar | | | | | | | |
| Apr | | | | | | | |
| May | | | | | | | |
| June | | | | | | | |
| July | | | | | | | |
| Aug | | | | | | | |
| Sept | | | | | | | |
| Oct | | | | | | | |
| Nov | | | | | | | |
| Dec | | | | | | | |
| Total | | | | | | | |

* Est. by correlation J.V.S.
AKLong:lep 1/28/79

Table G(1)-2

## Lake Buhi Reservoir
## Elevation-Capacity Table

| Elev. | Storage - $M^3$ | MCM | Elev. | Storage - $M^3$ | MCM |
|---|---|---|---|---|---|
| 79.3 | 0 | 0 | 81.7 | 43,200,200 | 43.2 |
| .4 | 1,800,000 | 1.8 | .8 | 45,000,000 | 45.0 |
| 79.5 | 3,600,000 | 3.6 | .9 | 46,800,000 | 46.8 |
| .6 | 5,400,000 | 5.4 | 82.0 | 48,600,000 | 48.6 |
| .7 | 7,200,000 | 7.2 | .1 | 50,400,000 | 50.4 |
| .8 | 9,000,000 | 9.0 | .2 | 52,200,000 | 52.2 |
| .9 | 10,800,000 | 10.8 | .3 | 54,000,000 | 54.0 |
| 80.0 | 12,600,000 | 12.6 | .4 | 55,800,000 | 55.8 |
| .1 | 14,400,000 | 14.4 | 82.5 | 57,600,000 | 57.6 |
| .2 | 16,200,000 | 16.2 | .6 | 59,400,000 | 59.4 |
| .3 | 18,000,000 | 18.0 | .7 | 61,200,000 | 61.2 |
| .4 | 19,800,000 | 19.8 | .8 | 63,000,000 | 63.0 |
| 80.5 | 21,600,000 | 21.6 | .9 | 64,800,000 | 64.8 |
| .6 | 23,400,000 | 23.4 | 83.0 | 66,600,000 | 66.6 * |
| .7 | 25,200,000 | 25.2 | .1 | 68,400,000 | 68.4 |
| .8 | 27,000,000 | 27.0 | .2 | 70,200,000 | 70.2 |
| .9 | 28,800,000 | 28.8 | .3 | 72,000,000 | 72.0 |
| 81.0 | 30,600,000 | 30.6 | .4 | 73,800,000 | 73.8 |
| .1 | 32,400,000 | 32.4 | 83.5 | 75,600,000 | 75.6 |
| .2 | 34,200,000 | 34.2 | .6 | 77,400,000 | 77.4 |
| .3 | 36,000,000 | 36.0 | .7 | 79,200,000 | 79.2 |
| .4 | 37,800,000 | 37.8 | .8 | 81,000,000 | 81.0 |
| 81.5 | 39,600,000 | 39.6 | .9 | 82,800,000 | 82.8 |
| .6 | 41,400,000 | 41.4 | 84.0 | 84,600,000 | 34.6 |

* Maximum storage.

Table G(1)-3

## Discharge Rating of Lake Buhi Outlet
## (Cubic Meters per Second)

| Elev. (Meters) MSL | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 1.0* | 1.8* | 2.6* | 3.4 | 4.0 | 5.1 | 6.2 | 7.9* | 9.5 | 11.6 |
| 83 | 14.6 | 17.9 | 21.5 | 25.6 | 31.0 | 37.1 | 44.0 | 51.5 | 60.0 | 69.0 |
| 84 | 80.0 | 97.5 | 100.0 | 130.0 | 150.0 | 176.0 | 203.0 | 239.0 | 274.0 | 319.0 |
| 85 | 360.0 | 410.0 | 470.0 | | | | | | | |

* Extrapolated from curve

Table G(1)-4

Total Inflow Into Lake Buhi
(Million Cubic Meters - mcm) Drainage Area = 105 $km^2$

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 20.68 | 20.74 | 25.47 | 33.26 | 17.88 | 14.54 | 20.17 | 19.69 | 45.19 | 19.73 | 42.17 | 175.65 | 455.17 |
| 1957 | 55.84 | 18.75 | 16.85 | 13.36 | 9.31 | 14.70 | 21.78 | 15.94 | 16.23 | 27.59 | 45.34 | 19.44 | 275.13 |
| 1958 | 26.19 | 18.70 | 22.76 | 20.44 | 10.04 | 14.52 | 13.59 | 15.76 | 17.02 | 76.43 | 31.50 | 19.08 | 286.03 |
| 1959 | 29.82 | 20.71 | 31.30 | 13.36 | 20.97 | 11.75 | 16.03 | 16.71 | 14.62 | 15.21 | 55.52 | 61.56 | 307.56 |
| 1960 | 51.24 | 21.59 | 19.84 | 22.79 | 31.78 | 33.19 | 17.27 | 20.70 | 16.65 | 63.04 | 34.85 | 27.47 | 360.41 |
| 1961 | 22.70 | 14.00 | 12.34 | 8.18 | 8.89 | 10.20 | 21.43 | 17.52 | 22.20 | 28.41 | 24.99 | 38.37 | 229.23 |
| 1962 | 32.75 | 22.66 | 21.17 | 7.91 | 27.55 | 18.95 | 31.08 | 12.25 | 16.20 | 7.05 | 42.41 | 43.74 | 283.72 |
| 1963 | 33.84 | 30.02 | 12.95 | 8.78 | 3.23 | 13.92 | 9.29 | 46.00 | 14.71 | 15.71 | 17.67 | 23.13 | 229.25 |
| 1964 | 20.93 | 17.28 | 8.82 | 8.59 | 7.28 | 23.94 | 30.47 | 18.45 | 42.96 | 22.43 | 61.26 | 102.30 | 364.71 |
| 1965 | 62.30 | 32.23 | 35.60 | 18.82 | 14.46 | 53.18 | 89.55 | 23.96 | 47.80 | 42.34 | 35.32 | 33.49 | 488.95 |
| 1966 | 50.84 | 12.36 | 8.25 | 4.17 | 12.63 | 5.49 | 22.96 | 30.88 | 21.04 | 9.62 | 61.30 | 109.69 | 342.23 |
| 1967 | 130.11 | 31.37 | 27.68 | 19.40 | 18.64 | 7.19 | 14.82 | 34.33 | 36.71 | 21.54 | 86.61 | 21.76 | 450.16 |
| TOTAL | 537.24 | 260.41 | 243.03 | 179.06 | 182.66 | 221.57 | 308.44 | 271.69 | 311.33 | 349.10 | 538.94 | 675.58 | 4079.55 |
| AVERAGE | 44.77 | 21.70 | 20.26 | 14.93 | 15.22 | 18.47 | 25.71 | 22.64 | 25.95 | 29.10 | 44.91 | 56.30 | 339.96 |

Table G(1)-5

Net Inflow Into Lake Buhi
(Million Cubic Meters - mcm) Drainage Area = 105 $km^2$

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 19.30 | 19.44 | 23.87 | 31.52 | 16.25 | 13.05 | 18.82 | 18.30 | 43.88 | 18.51 | 40.95 | 174.34 | 438.23 |
| 1957 | 54.46 | 17.45 | 15.25 | 11.62 | 7.68 | 13.21 | 20.43 | 14.55 | 14.92 | 26.37 | 44.12 | 18.13 | 258.19 |
| 1958 | 24.81 | 17.40 | 21.16 | 18.70 | 8.41 | 13.03 | 12.24 | 14.37 | 15.71 | 75.21 | 30.28 | 17.77 | 269.09 |
| 1959 | 28.44 | 19.41 | 29.70 | 11.62 | 19.34 | 10.26 | 14.68 | 15.32 | 13.31 | 13.99 | 54.30 | 60.25 | 290.62 |
| 1960 | 49.86 | 20.29 | 18.24 | 21.05 | 30.15 | 31.70 | 15.92 | 19.31 | 15.34 | 61.82 | 33.63 | 26.16 | 343.47 |
| 1961 | 21.32 | 12.70 | 10.74 | 6.44 | 7.26 | 8.71 | 20.08 | 16.13 | 20.89 | 27.19 | 23.77 | 37.06 | 212.29 |
| 1962 | 31.37 | 21.36 | 19.57 | 6.17 | 25.92 | 17.46 | 29.73 | 10.86 | 14.89 | 5.83 | 41.19 | 42.43 | 266.78 |
| 1963 | 32.46 | 28.72 | 11.35 | 7.04 | 1.60 | 12.43 | 7.94 | 44.61 | 13.40 | 14.49 | 16.45 | 21.82 | 212.31 |
| 1964 | 19.55 | 15.98 | 7.22 | 6.85 | 5.65 | 22.45 | 29.12 | 17.06 | 41.65 | 21.21 | 60.04 | 100.99 | 347.77 |
| 1965 | 60.92 | 30.93 | 34.00 | 17.08 | 12.83 | 51.69 | 88.20 | 22.57 | 46.49 | 41.12 | 34.10 | 32.08 | 472.01 |
| 1966 | 49.46 | 11.06 | 6.65 | 2.43 | 11.00 | 4.00 | 21.61 | 29.49 | 19.73 | 8.40 | 60.08 | 108.38 | 332.29 |
| 1967 | 128.73 | 30.07 | 26.08 | 17.66 | 17.01 | 5.70 | 13.47 | 32.94 | 35.40 | 20.32 | 85.39 | 20.45 | 433.22 |
| TOTAL | 520.68 | 244.81 | 223.83 | 158.18 | 163.10 | 203.69 | 292.24 | 255.51 | 295.61 | 334.46 | 524.30 | 659.86 | 3876.27 |
| AVERAGE | 43.39 | 20.40 | 18.65 | 13.18 | 13.59 | 16.98 | 24.35 | 21.29 | 24.64 | 27.87 | 43.69 | 54.99 | 323.02 |

Table G(1)-6

Estimated Local Inflow to Barit and Daraga Rivers
Below Lake Buhi and Above Barit River Irrigation System Diversion Dam, Sto. Niño, Iriga *
(Million Cubic Meters) Drainage Area = 37 $km^2$

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 6.08 | 6.87 | 7.82 | 9.22 | 5.73 | 4.43 | 5.70 | 5.47 | 12.00 | 8.11 | 8.72 | 52.54 | 132.69 |
| 1957 | 23.09 | 7.60 | 5.31 | 3.86 | 3.02 | 2.89 | 6.26 | 5.08 | 4.45 | 7.29 | 13.22 | 7.36 | 89.43 |
| 1958 | 6.51 | 5.87 | 7.52 | 4.28 | 5.53 | 3.91 | 4.12 | 3.88 | 5.28 | 16.12 | 14.83 | 7.76 | 85.61 |
| 1959 | 6.98 | 8.06 | 9.21 | 4.78 | 5.58 | 3.95 | 3.87 | 4.87 | 4.80 | 4.50 | 16.23 | 18.80 | 91.63 |
| 1960 | 15.79 | 7.42 | 6.37 | 5.72 | 7.70 | 9.91 | 7.17 | 6.31 | 4.76 | 18.45 | 10.29 | 8.43 | 108.32 |
| 1961 | 7.57 | 4.95 | 4.05 | 2.27 | 2.14 | 2.59 | 4.90 | 5.19 | 6.52 | 8.46 | 6.70 | 12.12 | 67.46 |
| 1962 | 10.20 | 6.56 | 7.19 | 2.87 | 6.12 | 7.44 | 7.45 | 4.37 | 4.10 | 3.40 | 11.08 | 14.34 | 85.12 |
| 1963 | 9.92 | 9.24 | 5.38 | 2.86 | 1.08 | 2.35 | 3.44 | 12.46 | 4.31 | 5.81 | 4.71 | 6.25 | 67.81 |
| 1964 | 6.84 | 4.27 | 3.61 | 2.35 | 2.42 | 4.16 | 12.17 | 5.43 | 7.97 | 11.43 | 16.17 | 32.04 | 108.86 |
| 1965 | 20.11 | 11.20 | 10.69 | 6.29 | 3.85 | 13.68 | 29.06 | 8.15 | 14.26 | 13.36 | 10.15 | 10.54 | 151.34 |
| 166 | 16.06 | 4.66 | 2.34 | 1.45 | 2.81 | 1.50 | 4.58 | 10.40 | 6.44 | 3.02 | 17.15 | 29.64 | 100.05 |
| 1967 | 44.69 | 10.87 | 6.13 1/ | 4.15 1/ | 4.00 1/ | 1.70 | 3.42 | 9.38 | 12.05 | 6.63 | 27.65 | 4.95 | 135.62 |

* Estimated using proportionate drainage areas and weighted to recognize the variation in precipitation from higher to lower elevations. Equal to 23.5% of Barit River at Sto. Niño, Iriga.

1/ Estimated as 23.5% of net inflow into Lake Buhi.

Table G(1)-7

Local Inflow to Barit River
Between Lake Buhi Outlet and Upper Barit River Diversion Damsite *
(Million Cubic Meters) Drainage Area = 21 $km^2$

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 3.56 | 4.03 | 4.58 | 5.40 | 3.36 | 2.60 | 3.34 | 3.21 | 7.03 | 4.75 | 5.11 | 30.79 | 77.76 |
| 1957 | 13.53 | 4.45 | 3.11 | 2.26 | 1.77 | 1.69 | 3.67 | 2.98 | 2.61 | 4.27 | 7.75 | 4.31 | 52.40 |
| 1958 | 3.81 | 3.44 | 4.41 | 2.51 | 3.24 | 2.29 | 2.41 | 2.27 | 3.09 | 9.45 | 8.69 | 4.55 | 50.16 |
| 1959 | 4.09 | 4.72 | 5.40 | 2.80 | 3.27 | 2.31 | 2.27 | 2.85 | 2.81 | 2.64 | 9.51 | 11.02 | 53.69 |
| 1960 | 9.25 | 4.35 | 3.73 | 3.35 | 4.51 | 5.81 | 4.20 | 3.70 | 2.79 | 10.81 | 6.03 | 4.94 | 63.47 |
| 1961 | 4.44 | 2.90 | 2.37 | 1.33 | 1.25 | 1.52 | 2.87 | 3.04 | 3.82 | 4.96 | 3.93 | 7.10 | 39.53 |
| 1962 | 5.98 | 3.84 | 4.21 | 1.68 | 3.59 | 4.36 | 4.37 | 2.56 | 2.40 | 1.99 | 6.49 | 8.40 | 49.87 |
| 1963 | 5.81 | 5.41 | 3.15 | 1.68 | 0.63 | 1.38 | 2.02 | 7.30 | 2.53 | 3.40 | 2.76 | 3.66 | 39.73 |
| 1964 | 4.01 | 2.50 | 2.12 | 1.38 | 1.42 | 2.44 | 7.13 | 3.18 | 4.67 | 8.70 | 9.48 | 18.78 | 63.81 |
| 1965 | 11.78 | 6.56 | 6.26 | 3.69 | 2.26 | 8.02 | 17.03 | 4.78 | 8.36 | 7.83 | 5.95 | 6.18 | 88.70 |
| 1966 | 9.41 | 2.73 | 1.37 | 0.85 | 1.65 | 0.88 | 2.68 | 6.09 | 3.77 | 1.77 | 10.05 | 17.37 | 58.62 |
| 1967 | 26.19 | 6.37 | 3.53 | 2.43 | 2.34 | 1.00 | 2.00 | 5.50 | 7.06 | 3.89 | 16.20 | 2.90 | 79.47 |
| TOTAL | 101.86 | 51.30 | 44.30 | 29.36 | 29.29 | 34.30 | 53.99 | 47.46 | 50.94 | 62.46 | 91.95 | 120.00 | 717.21 |
| AVERAGE | 8.49 | 4.28 | 3.69 | 2.45 | 2.44 | 2.86 | 4.50 | 3.96 | 4.24 | 5.20 | 7.66 | 10.00 | 59.77 |

* Estimated using proportionate drainage areas and weighted to recognize the variation in precipitation from higher to lower elevations. Equal to 58.6% of total local inflow above Barit Diversin Dam, Sto. Niño, Iriga.

Table G(1)-8

Local Inflow to Barit River from the Daraga River
and the Barit River below the Upper Barit River Diversion Damsite *
(Million Cubic Meters) Drainage Area = 16 $km^2$

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 2.52 | 2.84 | 3.24 | 3.82 | 2.37 | 1.83 | 2.36 | 2.26 | 4.97 | 3.36 | 3.61 | 21.75 | 54.93 |
| 1957 | 9.56 | 3.15 | 2.20 | 1.60 | 1.25 | 1.20 | 2.59 | 2.10 | 1.84 | 3.02 | 5.47 | 3.05 | 37.03 |
| 1958 | 2.70 | 2.43 | 3.11 | 1.77 | 2.29 | 1.62 | 1.71 | 1.61 | 2.19 | 6.67 | 6.14 | 3.21 | 35.45 |
| 1959 | 2.89 | 3.34 | 3.81 | 1.98 | 2.31 | 1.64 | 1.60 | 2.02 | 1.99 | 1.86 | 6.72 | 7.78 | 37.94 |
| 1960 | 6.54 | 3.07 | 2.64 | 2.37 | 3.19 | 4.10 | 2.97 | 2.61 | 1.97 | 7.64 | 4.26 | 3.49 | 44.85 |
| 1961 | 3.13 | 2.05 | 1.68 | 0.94 | 0.89 | 1.07 | 2.03 | 2.15 | 2.70 | 3.50 | 2.77 | 5.02 | 27.93 |
| 1962 | 4.22 | 2.72 | 2.98 | 1.19 | 2.53 | 3.08 | 3.08 | 1.81 | 1.70 | 1.41 | 4.59 | 5.94 | 35.25 |
| 1963 | 4.11 | 3.83 | 2.23 | 1.18 | 0.45 | 0.97 | 1.42 | 5.16 | 1.78 | 2.41 | 1.95 | 2.59 | 28.08 |
| 1964 | 2.83 | 1.77 | 1.49 | 0.97 | 1.00 | 1.72 | 5.04 | 2.25 | 3.30 | 4.73 | 6.69 | 13.26 | 45.05 |
| 1965 | 8.33 | 4.64 | 4.43 | 2.60 | 1.59 | 5.66 | 12.03 | 3.37 | 5.90 | 5.53 | 4.20 | 4.36 | 62.64 |
| 1966 | 6.65 | 1.93 | 0.97 | 0.60 | 1.16 | 0.62 | 1.90 | 4.31 | 2.67 | 1.25 | 7.10 | 12.27 | 41.43 |
| 1967 | 18.50 | 4.50 | 2.54 | 1.72 | 1.66 | 0.70 | 1.42 | 3.88 | 4.99 | 2.74 | 11.45 | 2.05 | 56.15 |
| TOTAL | 71.98 | 36.27 | 31.32 | 20.74 | 20.69 | 24.21 | 38.15 | 33.53 | 36.00 | 44.12 | 64.95 | 84.77 | 506.73 |
| AVERAGE | 6.00 | 3.02 | 2.61 | 1.73 | 1.72 | 2.02 | 3.18 | 2.80 | 3.00 | 3.68 | 5.41 | 7.06 | 42.23 |

* Estimated using proportionate drainage areas and weighted to recognize the variation in precipitation from higher to lower elevations. Equal to 43.2% of the total local inflow above Barit Diversion Dam, Sto. Niño, Iriga.

## RINCONADA IAD WATER SUPPLY - EASTERLY SECTOR

The revised water supply study data for the easterly sector of the Rinconada area was derived primarily from the Lalo or Naporog, Barit and Waras rivers. The remainder of the supply comes from the San Francisco and Agdangan creeks and smaller contributary streams. Stream flow data on these streams are limited to fragmentary records for the Barit River, Lalo River, recent NIA records of diversions from the Lalo River to the Lalo River Irrigation System and water levels of Lake Buhi. There is not a first-class stream gaging station on any of these streams. In the absence of available runoff data, the simulation studies conducted by TAMS/TAE were based on the assumption that only water from Lake Buhi would be used to determine the hectarage to be irrigated under existing proposed projects. This assumption appears to ignore 25 to 30 percent of actual runoff available for use in this area.

Estimated runoff data were developed through the correlation of precipitation data and watershed area comparisons and fragmentary records for the major tributary streams listed previously. Utilizing these data, a detailed water supply study was carried out assuming an irrigated area of 10,000 ha., with irrigation having priority of water use over power production. The study covered the same period of time as the feasibility simulation studies, i.e., 1956-1967. The results showed no irrigation shortages occurred during that period. This indicates that an area in excess of 10,000 hectares could be irrigated under accepted water supply study operation criteria. Only the channelization improvement of the Barit River (synonymous with Tabao River), downstream from the Lake Buhi outlet, was considered, resulting in an active storage capacity of 51.3 MCM, in Lake Buhi. (It is recomended that an additional study be undertaken using an active storage capacity of 66.3 MCM, in Lake Buhi.)

The detailed revised study also assume that the proposed right main canal (part of a proposed GOP-ADB package) would be enlarged and extended across the Pawili River to provide supplemental water to the Bula project area with 470 hectares and an additional 1,100 ha. in the Anayan-Pili-Bula area, for a total of 1,570 ha. in the area. This would more fully utilize the water supply that could be made available by fully developing Lake Buhi and other sources. Revised area determinations completed in December 1978 indicate that the potential Anayan-Pili-Bula service area could be increased to 2680 hectares.

Although the results of this water study indicated there is adequate water to irrigate in excess of 10,000 ha., utilizing a Lake Buhi storage capacity of 51.3 MCM, it would be advisable to fully exploit the storage potential of Lake Buhi and construct the outlet control structure to increase the active storage capacity of the lake to 66.6 MCM or an additional 15.3 MCM of regulated water supply. This structure would provide positive control of the outflow from Lake Buhi which would be necessary as the result of the channel deepening in the Barit River (Tabao River) downstream from the lake outlet. The additional storage capacity would also provide a small amount of flood protection for localized areas downstream.

This additional regulated water supply could be utilized to (1) augment irrigation releases during extremely dry years or hot periods during dry seasons; released through the Sta. Justina Power Plant to increase power generation; used to augment the flow of the Bicol River for irrigation use downstream from the Rinconada area or also to hydraulically suppress salinity intrusion up the river from San Miguel Bay, which is a potential hazard to the Naga-Calabanga and Libmanan project areas.

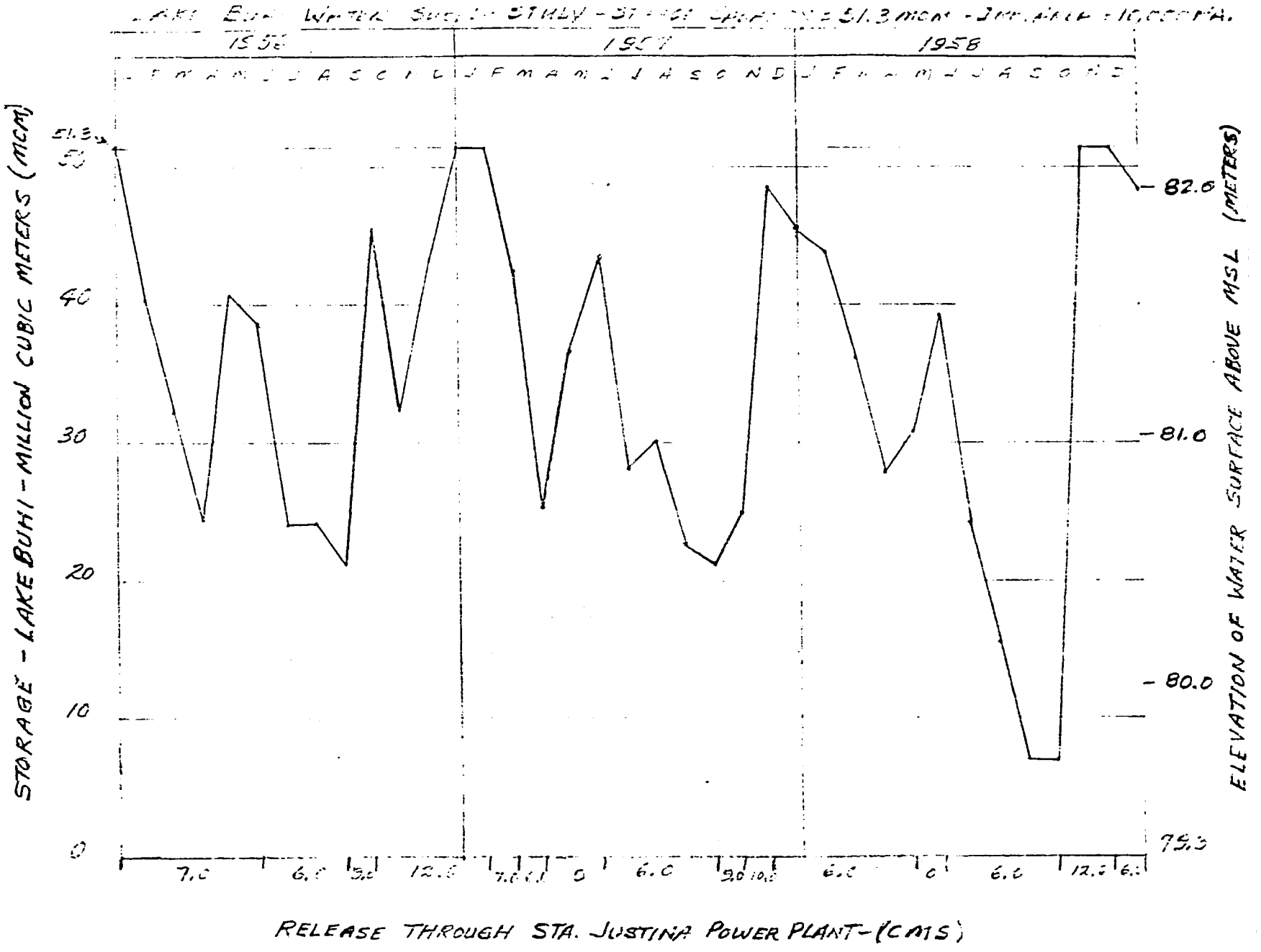

1956
1957
1958
STORAGE - LAKE BUHI - MILLION CUBIC METERS (MCM)
51.3
50
40
30
20
10
0
ELEVATION OF WATER SURFACE ABOVE MSL (METERS)
82.0
81.0
80.0
79.3
RELEASE THROUGH STA. JUSTINA POWER PLANT - (CMS)

Fig. No. G(1)3

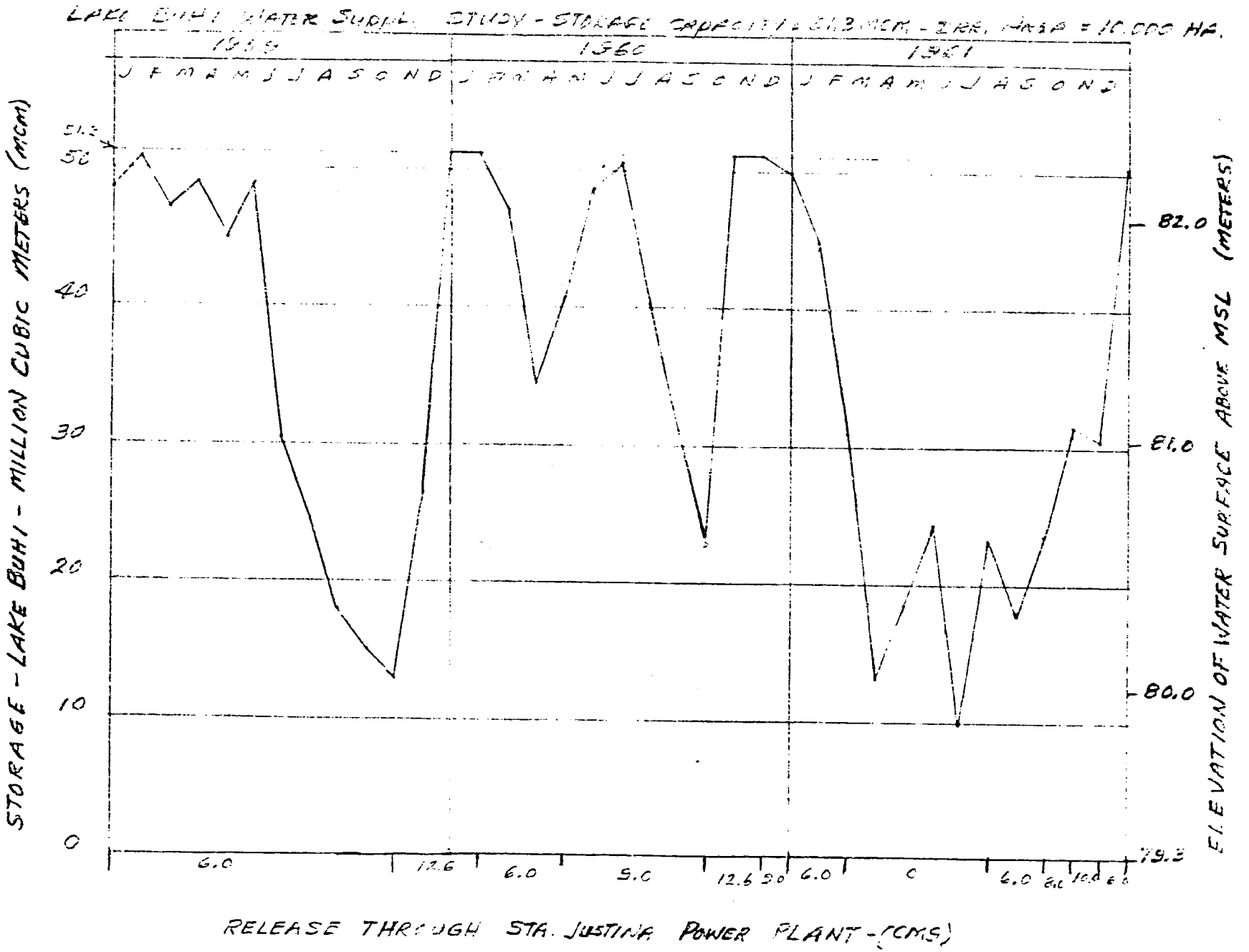

LAKE BUHI WATER SUPPLY STUDY - STORAGE CAPACITY
1959
1960
1961
J F M A M J J A S O N D
STORAGE - LAKE BUHI - MILLION CUBIC METERS (MCM)
51.3
50
40
30
20
10
0
ELEVATION OF WATER SURFACE ABOVE MSL (METERS)
82.0
81.0
80.0
79.3
6.0
12.6
6.0
9.0
12.6
9.0
6.0
0
6.0
6.0
10.0
6.0
RELEASE THROUGH STA. JUSTINA POWER PLANT - (CMS)

Figure G(1)-3

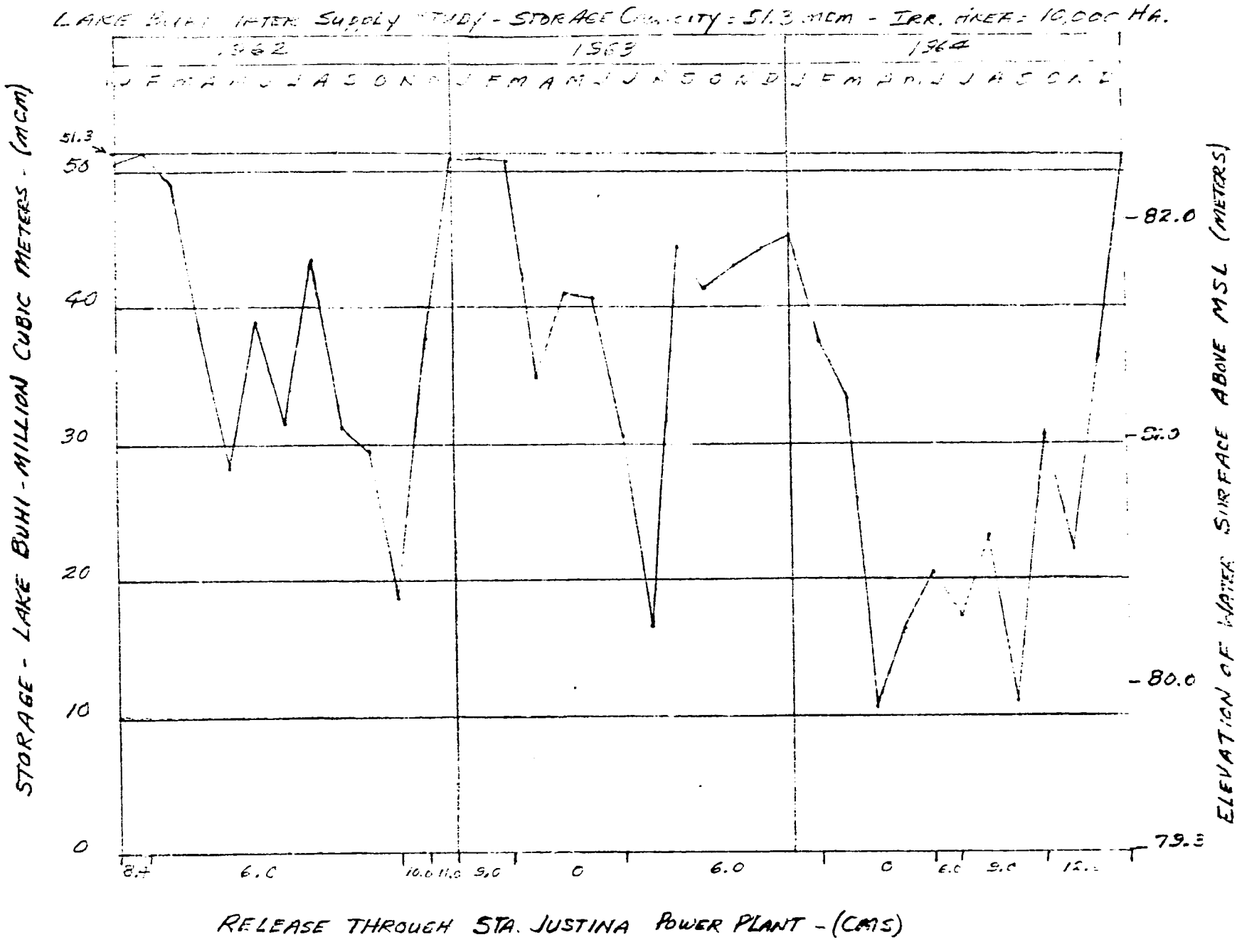

LAKE BUHI WATER SUPPLY STUDY - STORAGE CAPACITY = 51.3 MCM - IRR. AREA = 10,000 HA.
1962
1963
1964
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
51.3
50
40
30
20
10
0
STORAGE - LAKE BUHI - MILLION CUBIC METERS - (MCM)
82.0
81.0
80.0
79.3
ELEVATION OF WATER SURFACE ABOVE MSL (METERS)
8.4
6.0
10.0
11.0
9.0
0
6.0
0
6.0
9.0
RELEASE THROUGH STA. JUSTINA POWER PLANT - (CMS)

Figure G(1)-3

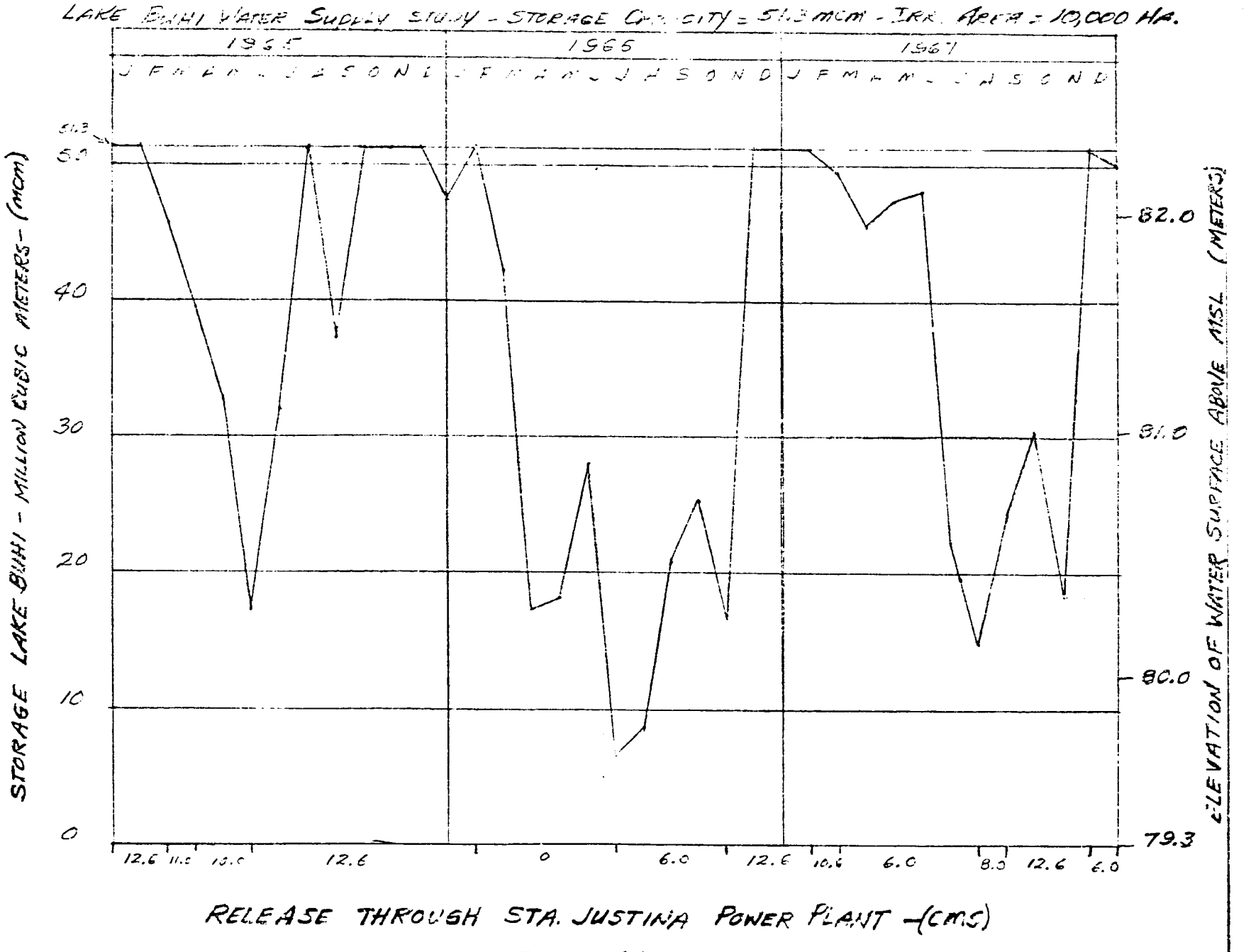

LAKE BUHI WATER SUPPLY STUDY - STORAGE CAPACITY = 51.3 MCM - IRR. AREA = 10,000 HA.
1965
1966
1967
J F M A M J J A S O N D
STORAGE LAKE BUHI - MILLION CUBIC METERS - (MCM)
51.3
50
40
30
20
10
0
ELEVATION OF WATER SURFACE ABOVE MSL (METERS)
82.0
81.0
80.0
79.3
12.6
11.0
10.0
12.6
0
6.0
12.6
10.6
6.0
8.0
12.6
6.0
RELEASE THROUGH STA. JUSTINA POWER PLANT -(CMS)

Figure G(1)-3

Table G(1)-9

Estimated Flow of Barit River at Sto. Niño, Iriga
(Million Cubic Meters - mcm) Drainage Area = 142 $km^2$

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 25.87 | 29.22 | [illegible] | 39.22 | 24.40 | 18.87 | 24.24 | [illegible] | 51.06 | 34.52 | 37.12 | 223.59 | 564.66 |
| 1957 | 98.24 | 32.34 | [illegible] | 16.43 | 12.83 | 12.29 | 26.65 | 21.61 | 18.95 | 31.04 | 56.25 | 31.34 | 380.55 |
| 1958 | 27.72 | 24.99 | [illegible] | 18.22 | 23.54 | 16.64 | 17.54 | 16.53 | 22.47 | 68.59 | 63.09 | 33.02 | 364.36 |
| 1959 | 29.70 | 34.28 | 39.18 | 20.32 | 23.73 | 16.80 | 16.45 | 20.73 | 20.42 | 19.15 | 69.05 | 80.00 | 389.81 |
| 1960 | 67.20 | 31.57 | 27.11 | 24.34 | 32.76 | 42.15 | 30.53 | 26.84 | 20.27 | 78.50 | 43.78 | 35.86 | 460.91 |
| 1961 | 32.22 | 21.07 | 17.22 | 9.67 | 9.11 | 11.04 | 20.84 | 22.07 | 27.76 | 36.02 | 28.49 | 51.59 | 287.10 |
| 1962 | 43.39 | 27.92 | 30.61 | 12.23 | 26.03 | 31.65 | 31.69 | 18.59 | 17.44 | 14.46 | 47.17 | 61.04 | 362.22 |
| 1963 | 42.21 | 39.31 | 22.90 | 12.18 | 4.61 | 9.98 | 14.65 | 53.03 | 18.35 | 24.72 | 20.06 | 26.60 | 288.60 |
| 1964 | 29.11 | 18.19 | 15.35 | 9.98 | 10.31 | 17.70 | 51.80 | 23.09 | 33.93 | 48.64 | 68.79 | 136.33 | 463.22 |
| 1965 | 85.57 | 47.68 | 45.51 | 26.75 | 16.37 | 58.22 | 123.66 | 34.66 | 60.68 | 56.84 | 43.18 | 44.84 | 643.96 |
| 1966 | 68.35 | 19.81 | 9.96 | 6.19 | 11.95 | 6.38 | 19.47 | 44.25 | 27.42 | 12.83 | 72.96 | 126.13 | 425.70 |
| 1967 | 190.17 | 46.26 | | | | 7.23 | 14.57 | 39.93 | 51.27 | 28.20 | 117.68 | 21.08 | |

C. Lalo Irrigation System 9/22/78

Estimated Runoff From Lalo River Watershed
Above the Lalo River Irrigation System Diversion Dam.
Drainage Area Above Diversion Dam = 22.5 $km^2$

The Lake Buhi watershed and the Lalo River watershed area adjacent to each other and both drain the slopes of Mt. Malinao. The unit discharge should be about the same; therefore it is assumed that the discharge of the Lalo River above the Diversion Dam is proportionate to the respective drainage area of Lake Buhi (105 $km^2$) and the Lalo River drainage area (22.5 $km^2$) times the net inflow into Lake Buhi.

Therefore $\frac{22.5}{105}$ x net inflow into Lake Buhi

= 21.4% of the net inflow into Lake Buhi.

9/23/78

Revision:

The estimated runoff of the Lalo River at Antipolo, Buhi should be 21.4% of the total inflow into Lake Buhi which would amount to the net inflow plus an estimated evaporation loss. The estimated evaporation loss from Lake Buhi as determined by J.V. Sinogba is as follows: (mcm)

| | | | |
|---|---|---|---|
| Jan. | 1.38 | July | 1.35 |
| Feb. | 1.30 | Aug. | 1.39 |
| Mar. | 1.60 | Sept. | 1.31 |
| Apr. | 1.74 | Oct. | 1.22 |
| May | 1.63 | Nov. | 1.22 |
| June | 1.49 | Dec. | 1.31 |
| | | Total=16.94 mcm | |

Addatives net inflow derivation of Lalo River Flows are as follows: (mcm)

| | | | |
|---|---|---|---|
| Jan. | 0.30 | July | 0.29 |
| Feb. | 0.28 | Aug. | 0.30 |
| Mar. | 0.34 | Sept. | 0.28 |
| Apr. | 0.37 | Oct. | 0.26 |
| May | 0.35 | Nov. | 0.26 |
| June | 0.32 | Dec. | 0.28 |
| | | Total= | 3.63 mcm |

Table G(1)-10

Estimated Discharge of Lalo River above the Lalo River Irrigation System Diversion Dam, Antipolo, Buhi *
(Million Cubic Meters - mcm) Drainage Area = 22.5 $km^2$

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 4.43 | 4.44 | 5.[illegible]5 | 7.12 | 3.83 | 3.11 | 4.32 | 4.22 | 9.67 | 4.22 | 9.02 | 37.59 | 97.42 |
| 1957 | 11.95 | 4.01 | 3.60 | 2.86 | 1.99 | 3.15 | 4.66 | 3.41 | 3.47 | 5.90 | 9.70 | 4.16 | 5[illegible].86 |
| 1958 | 5.61 | 4.00 | 4.87 | 4.37 | 2.13 | 3.11 | 2.91 | 3.38 | 3.64 | 16.35 | 6.74 | 4.08 | 61.19 |
| 1959 | 6.39 | 4.43 | 6.70 | 2.86 | 4.49 | 2.51 | 3.43 | 3.58 | 3.13 | 3.25 | 11.88 | 13.17 | 65.82 |
| 1960 | 10.97 | 4.62 | 4.24 | 4.87 | 6.80 | 7.10 | 3.70 | 4.43 | 3.56 | 13.49 | 7.46 | 5.88 | 77.12 |
| 1961 | 4.86 | 3.00 | 2.64 | 1.75 | 1.90 | 2.18 | 4.59 | 3.75 | 4.75 | 6.08 | 5.35 | 8.21 | 49.06 |
| 1962 | 7.01 | 4.85 | 4.53 | 1.69 | 5.00 | 4.06 | 6.65 | 2.62 | 3.47 | 1.51 | 9.07 | 9.3[illegible] | 60.72 |
| 1963 | 7.25 | 6.43 | 2.77 | 1.88 | 0.69 | 2.98 | 1.99 | 9.85 | 3.15 | 3.36 | 3.78 | 4.9[illegible] | 49.08 |
| 1964 | 4.48 | 3.70 | 1.88 | 1.84 | 1.56 | 5.12 | 6.52 | 3.95 | 9.19 | 4.80 | 13.11 | 21.89 | 78.04 |
| 1965 | 13.34 | 6.90 | 7.62 | 4.01 | 3.09 | 11.38 | 19.17 | 5.13 | 10.23 | 9.06 | 7.56 | 7.14 | 104.63 |
| 1966 | 10.88 | 2.65 | 1.76 | 0.89 | 2.70 | 1.18 | 4.91 | 6.61 | 4.50 | 2.06 | 13.12 | 23.47 | 74.73 |
| 1967 | 27.85 | 6.71 | 5.92 | 4.15 | 3.99 | 1.54 | 3.17 | 7.35 | 7.86 | 4.61 | 18.53 | 4.66 | 96.34 |
| TOTAL | 115.02 | 55.74 | 51.98 | 38.29 | 39.07 | 47.42 | 66.02 | 58.28 | 66.62 | 74.69 | 115.32 | 144.56 | 873.01 |
| AVERAGE | 9.58 | 4.65 | 4.33 | 3.19 | 3.26 | 3.95 | 5.50 | 4.86 | 5.55 | 6.22 | 9.61 | 12.05 | 72.75 |

Drainage Area = 22.5 $km^2$

* Discharge is estimated to 21.4% of the net inflow into Lake Buhi + estimated lake evaporation losses, based upon the relationship of the size of the two watershed areas.
Lake Buhi = 105 $km^2$, Lalo River = 22.5 $km^2$ therefore $\frac{22.5}{105} = .214$

## Construction Computations[1/]
## Lalo Irrigation System - Right of Way (ROW)

| | | | |
|---|---|---|---|
| **Main Canal or Equivalent** | | | |
| Left Connector Canal | 2.02 km @ 20 m | = 40,400 $m^2$ (road) | |
| Existing main canal (enlarge) | 0.76 km @ 7 m | = 5,320 $m^2$ (road) | |
| Lateral I Ext. (enlarge) | 8.138 km @ 6 m | = 48,828 $m^2$ (road) | |
| New Lateral I Extension | 7.240 km @ 15 m | =108,600 $m^2$ (road) | |
| | Main canal - Total | =203,148$m^2$ | |
| **Laterals** | | | |
| Lateral I-2 (Existing)(enl) | 1.282 km @ 1.0 m | = 1,282 $m^2$ (no road) | |
| New Lat. I-2 Extension | 4,120 km @ 10.0 m | = 41, 200 $m^2$ (road) | |
| Sub-lateral I-2 | 3,080 km @ 6 m | = 18,480 $m^2$ (no road) | |
| | Sub-total | = 60,962 $m^2$ | 60,962 $m^2$ |
| Lateral I-3 Existing (road) | 3,346 km @ 3.0 m | = 10,038 $m^2$ (road) | |
| New Lat. I-3 Extension | 0.920 km @ 10.0 m | = 9,200 $m^2$ (road) | |
| | Sub-total | = 19,238 $m^2$ | 19,238 $m^2$ |
| Lateral I-4 (New) | 4,120 km @ 10.0 m | = 41,200 $m^2$ (road) | |
| Lateral I-4-1 (New) | 1,400 km @ 10.0 m | = 14,000 $m^2$ (road) | |
| | Sub-total | = 55,200 $m^2$ | 55,200 $m^2$ |
| Lateral I-5 (new) | 1.06 km @ 8.0 m | = 8,480 $m^2$ (no road) | |
| Lateral I-5 (new) | 1.10 km @ 10.0 m | = 11,000 $m^2$ (road) | |
| | Sub-total | 19,480 $m^2$ | 19,480 $m^2$ |
| Lateral I-6 (new) | 1.60 km @ 10.0 m | = 16,000 $m^2$ | 16,000 $m^2$ |
| Lateral I-7 (new) | 1.60 km @ 10.0 m | = 16,000 $m^2$ | 16,000 $m^2$ |
| Lateral I-8 (new) | 1.20 km @ 10.0 m | = 12,000 $m^2$ | 12,000 $m^2$ |
| Lateral I-9 (new) | 1.40 km @ 10.0 m | = 14,000 $m^2$ | 14,000 $m^2$ |
| | | | 212,880 $m^2$ |
| Lateral X (new) | 1.712 km @ 6 m | = 10,272 $m^2$ | 10,272 $m^2$ |
| | | | 223,152 $m^2$ |

1/ These relate to quantities for costing in Annex H.

Table G(1)-11

Upper Lalo Project Rehabilitation
Irrigation System Service Roads*

| Canal or Lateral & Station | | Width (m) | Length (m) | Base Course Selected/Common Borrow $M^3$ 1.84m³/m | Cost ₱34.00/m³ | Gravel $M^3$ 0.60m³/m | Surface ₱48.00/m³ |
|---|---|---|---|---|---|---|---|
| Main Canal | 0+000 to 1+140 (L) | 4.0 | 1,140 | 2,098 | 71,332 | 684 | 32,832 |
| | 1+140 to 1+580 (R) | 4.0 | 440 | 810 | 27,540 | 264 | 12,672 |
| | 3+200 to 10+120 (L) | 4.0 | 6,920 | 12,733 | 432,922 | 4,152 | 199,296 |
| | | | | 1.035m³/m | ₱12.50/m³ | 0.30m³/m | |
| Lateral A | 0+000 to 3+220 (R) | 3.0 | 3,220 | 2,333 | 41,663 | 966 | 46,368 |
| Lateral B | 0+000 to 1+080 (L) | 3.0 | 1,080 | 1,118 | 13,975 | 324 | 15,552 |
| Lateral C | 0+000 to 0+900 (L) | 3.0 | 900 | 932 | 11,650 | 270 | 12,960 |
| Lateral D | 0+000 to 1+500 (R) | 3.0 | 1,500 | 1,553 | 19,413 | 450 | 21,600 |
| Lateral E | 0+000 to 1+400 (L) | 3.0 | 1,400 | 1,449 | 18,113 | 420 | 20,160 |
| Lateral F | 0+000 to 1+240 (R) | 3.0 | [illegible] | 1,284 | 16,050 | 372 | 17,856 |
| Lateral G | 0+000 to 1+220 (L) | 3.0 | 1,220 | 1,263 | 15,788 | 366 | 17,568 |
| Lateral H | 0+000 to 0+820 (L) | 3.0 | 820 | 849 | 10,613 | 246 | 11,808 |
| | | | | 1.84m³/m | ₱34.00/m³ | 0.60m³/m | |
| Lateral I | 0+000 to 1+370 (R) | 4.0 | 1,370 | 2,521 | 85,714 | 822 | 39,456 |
| Lateral I Ext | (A) 0+000 to 1+878 (R) | 4.0 | 1,878 | 3,456 | 117,504 | 1,127 | 54,096 |
| | (B) 0+000 to 2+119 (R) | 4.0 | 2,119 | 3,899 | 132,566 | 1,272 | 61,056 |
| | | | | 1.035m³/m | ₱12.50/m³ | 0.30m³/m | |
| Lateral I-1 | 0+000 to 1+100 (L) | 3.0 | 1,100 | 1,139 | 14,238 | 330 | 15,840 |
| Antipolo Road to Intake | | 4.0 | 300 | - | - | 180 | 8,640 |
| Materials source cost @ ₱2/m³ | | - | - | 38,437 | 76,874 | 12,245 | 24,490 |
| TOTALS | | - | 26,647 | 38,437 | 1,105,952 | 12,245 | 612,250 |

*Note: Selected Borrow was used for the base course of the roads along the main canal, Lateral I and Lateral I Ext. and common borrow was used for the base course of the roads along the other laterals.

**Table G(1)-12** Left Connector Canal, Including Lateral I Extension and Lalo Extension Laterals Irrigation System Service Roads*

| Canal or Lateral and Station | Width (m) | Length (m) | Base Course Selected/Common Borrow $M^3$ 1.84$m^3$/m | Cost ₱34.00/$m^3$ | Gravel $M^3$ 0.30$m^3$/m | Surface ₱48.00/$m^3$ |
|---|---|---|---|---|---|---|
| Left Connector Canal 0+000 to 2+020 | 4.0 | 2,020 | 3,717 | 126,378 | 1,212 | 58,176 |
| New Lat. I Extension 0+000 to 7+240 | 4.0 | 7,240 | 13,322 | 452,948 | 4,344 | 208,512 |
| Sub-total | - | 9,260 | 17,039 | 579,326 | 5,556 | 266,688 |
| Materials Source Cost @ ₱2/$m^3$ | - | - | 17,039 | 34,078 | 5,556 | 11,112 |
| Total | - | 9,260 | 17,039 | 613,404 | 5,556 | 277,800 |
| | | | 1.035$m^3$/m | ₱12.50/$m^3$ | 0.30$m^3$/m | |
| Lateral I-2 Extension | 3.0 | 4,120 | 4,265 | 53,313 | 1,236 | 59,328 |
| Lateral I-3 (Existing) | 3.0 | 3,346 | 3,464 | 43,300 | 1,004 | 48,192 |
| Lateral I-3 (Extension) | 3.0 | 920 | 953 | 11,913 | 276 | 13,248 |
| Lateral I-4 | 3.0 | 4,120 | 4,265 | 53,313 | 1,236 | 59,328 |
| Lateral I-4-1 | 3.0 | 1,400 | 1,449 | 18,113 | 420 | 20,160 |
| Lateral I-5 | 3.0 | 1,100 | 1,139 | 14,238 | 330 | 15,840 |
| Lateral I-6 | 3.0 | 1,600 | 1,656 | 20,700 | 480 | 23,040 |
| Lateral I-7 | 3.0 | 1,600 | 1,656 | 20,700 | 480 | 23,040 |
| Lateral I-8 | 3.0 | 1,200 | 1,242 | 15,525 | 360 | 17,280 |
| Lateral I-9 | 3.0 | 1,400 | 1,449 | 18,113 | 420 | 20,160 |
| Sub-total | - | 20,806 | 21,538 | 269,228 | 6,242 | 299,616 |
| Materials Source Cost @ ₱2/$m^3$ | - | - | 21,538 | 43,076 | 6,242 | 12,484 |
| TOTAL | - | 20,806 | 21,538 | 312,304 | 6,242 | 312,100 |

* Note: Selected borrow was used for the base course of the roads along the main canals and Lateral I extension and common borrow was used for the base course of the roads alone other laterals.

Table G(1)-13 Left Connector Canal Including Lateral I Extension Vehicle and Pedestrian Crossings*

| Lateral | Length (m) | Vehicle No. | Vehicle Unit Cost ₱ | Pedestrian No | Pedestrian Unit Cost ₱ | COST ₱ |
|---|---|---|---|---|---|---|
| Left Connector Canal | 2,020 | 2 | 15,000 | - | - | 30,000 |
| | | - | - | 1 | 10,000 | 10,000 |
| Lateral X | 1,712 | 1 | 15,000 | - | - | 15,000 |
| | | - | | 2 | 10,000 | 20,000 |
| Lateral I Ext. | 7,241 | 3 | 15,000 | - | - | 45,000 |
| | | - | - | 4 | 10,000 | 40,000 |
| Lateral I-2 (Exist) | 1,282 | 1 | 15,000 | - | - | 15,000 |
| | | - | - | 1 | 10,000 | 10,000 |
| Lateral I-2 (Ext.) | 4,120 | 4 | 15,000 | - | - | 60,000 |
| | | - | - | 4 | 10,000 | 40,000 |
| Sub-Lateral I-2 | 3,080 | 0 | 0 | 5 | 10,000 | 50,000 |
| Lateral I-3 (Exist) | 3,346 | 3 | 15,000 | 0 | - | 45,000 |
| | | | | 3 | 10,000 | 30,000 |
| Lateral I-3 (Ext.) | 0,920 | 1 | 15,000 | - | - | 15,000 |
| TOTALS | 23,721 | 15 | 15,000 | 20 | 10,000 | 425,000 |

* Note: Turnout Structures, checks, drops and end structures reduce the requirement for bridge crossings.

Table G(1)-14

Lalo Project Extension Laterals
Vehicle and Pedestrian Crossings*

| | Length (m) | Vehicle No. | Vehicle Unit Cost ₱ | Pedestrian No. | Pedestrian Unit Cost ₱ | COST ₱ |
|---|---|---|---|---|---|---|
| Lateral I-4 | 4,120 | 4 | 15,000 | - | - | 60,000 |
| | | - | - | 4 | 10,000 | 40,000 |
| Lateral I-4-1 | 1,400 | 1 | 15,000 | - | - | 15,000 |
| | | - | - | - | 10,000 | 10,000 |
| Lateral I-5 | 1,100 | 1 | 15,000 | - | - | 15,000 |
| Lateral I-6 | 1,600 | 1 | 15,000 | - | - | 15,000 |
| | | - | - | 2 | 10,000 | 20,000 |
| Lateral I-7 | 1,600 | 1 | 15,000 | - | - | 15,000 |
| | | - | - | 2 | 10,000 | 20,000 |
| Lateral I-8 | 1,200 | 1 | 15,000 | - | - | 15,000 |
| | | - | - | 1 | 10,000 | 10,000 |
| Lateral I-9 | 1,400 | 1 | 15,000 | - | - | 15,000 |
| | | - | - | 1 | 10,000 | 10,000 |
| TOTALS | 12,420 | 10 | 15,000 | 11 | 10,000 | 260,000 |

* NOTE: Turn out structures, checks, drops and end structures reduce the requirement for bridge crossings.

Table G(1)-15 Upper Lalo Project Rehabilitation
Parshall Flumes

| Canal or Lateral & Station | | Throat width (m) | Cost ₱ |
|---|---|---|---|
| 1. Main Canal | 0+020 | 2.0 | 6,000 |
| 2. Lateral A | 0+010 | 0.60 | 3,000 |
| 3. Lateral B | 0+010 | 0.30 | 2,000 |
| 4. Lateral C | 0+010 | 0.30 | 2,000 |
| 5. Lateral D | 0+010 | 0.30 | 2,000 |
| 6. Lateral E | 0+010 | 0.30 | 2,000 |
| 7. Lateral F | 0+010 | 0.30 | 2,000 |
| 8. Lateral G | 0+010 | 0.30 | 2,000 |
| 9. Lateral H | 0+010 | 0.30 | 2,000 |
| 10. Lateral I | 0+020 | 2.0 M | 6,000 |
| 11. Lateral I-1 | 0+010 | 0.30 | 2,000 |
| | TOTAL | | ₱ 31,000 |

Table G(1)-16 Lalo Project Extension Laterals
Parshall Flumes

| Lateral and Station | | Throat width (m) | Cost ₱ |
|---|---|---|---|
| 1. Lateral I-2 | 0+010 | 0.60 | 3,000 |
| 2. Lateral I-3 | 0+010 | 0.60 | 3,000 |
| 3. Lateral I-4 | 0+010 | 0.60 | 3,000 |
| 4. Lateral I-5 | 0+010 | 0.30 | 2,000 |
| 5. Lateral I-6 | 0+010 | 0.30 | 2,000 |
| 6. Lateral I-7 | 0+010 | 0.30 | 2,000 |
| 7. Lateral I-8 | 0+010 | 0.30 | 2,000 |
| 8. Lateral I-9 | 0+010 | 0.30 | 2,000 |
| 9. Lateral X | 0+010 | 0.30 | 2,000 |
| | TOTAL | | ₱ 21,000 |

**Table G(1)-17** Upper Lalo Project Rehabilitation gates for Headgate structures

| Lateral and Check Structure | Check Struc. Gate | Lateral Gate |
|---|---|---|
| Lateral A | Existing gate | Existing gate |
| Lateral B | 1 | Existing gate |
| Lateral C | 1 | 1 |
| Lateral D | 1 | 1 |
| Lateral E | 1 | 1 |
| Lateral F | 1 | 1 |
| Lateral G | 1 | 1 |
| Lateral H | 1 | 1 |
| Lateral I | 1 | 1 |
| Lateral I-1 | 1 | 1 |
| Lateral I-2 | 1 | 1 |
| Lateral I-3 | 1 | 1 |
| | 11 | 10 |

Check gates estimated @ ₱2200 (Pro-rated Libmanan Gates & increase)

Lateral gates estimated @ ₱1000 (pro-rated Libmanan gates & increase)

| | | |
|---|---|---|
| Cost | Check gates @ ₱2200 pc | ₱ 24,200 |
| Cost | Lateral gates @ ₱1100 pc (+ 1 Extra) | ₱ 12,100 |

**Table G(1)-18** Lalo Extension Main and Secondary Drainage Right-of-Way Computation

| Drain | W(M) | L(M) | A($M^2$) | Unit Cost ₱ | Cost |
|---|---|---|---|---|---|
| MDA 13 | 5.90 | 3,300 | 19,470 | 0.80 | 15,580 |
| MDA 13 | 6.40 | 2,500 | 16,000 | 0.80 | 12,800 |
| TOTALS | | 5,800 | 35,470 | | ₱28,380 |
| MDA 15 | 4.90 | 1,000 | 4,900 | 0.80 | 3,920 |
| MDA 15 | 5.20 | 500 | 2,600 | 0.80 | 2,080 |
| MDA 15 | 5.60 | 600 | 3,360 | 0.80 | 2,690 |
| MDA 15 | 6.80 | 1,900 | 12,920 | 0.80 | 10,340 |
| TOTALS | | 4,000 | 23,780 | | ₱19,030 |
| DA 12 | 4.90 | 2,100 | 10,290 | 0.80 | 8,230 |
| DA 14 | 4.70 | 1,200 | 5,640 | 0.80 | 4,510 |
| DA 15 | 4.70 | 1,810 | 8,460 | 0.80 | 6,770 |
| DA 16 | 4.50 | 1,900 | 8,550 | 0.80 | 6,840 |
| TOTALS | | 7,010 | 32,940 | | ₱26,350 |
| GRAND TOTALS | | 16,810 | 92,190 | | ₱73,760 |

Table G(1)-19 Lalo Extension Main and Secondary Drainage Earthwork Computation

| Drain | A (HA) | Q (CMS) | B (M) | D (M) | A ($M^2$) | L (M) | Vol. ($M^3$) | Unit Cost ₱ | Cost ₱ |
|---|---|---|---|---|---|---|---|---|---|
| MDA 13 | 255 | 1.30 | 1.50 | 1.50 | 3.24 | 3,300 | 10,692 | 6.45 | 68,970 |
| MDA 13 | 455 | 2.32 | 1.60 | 1.40 | 4.20 | 2,500 | 10,500 | 6.45 | 67,730 |
| TOTALS | 710 | | | | | 5,800 | 21,192 | | ₱136,700 |
| MDA 15 | 110 | 0.56 | 0.90 | 1.00 | 1.90 | 1,000 | 1,900 | 6.45 | 12,260 |
| MDA 15 | 183 | 0.93 | 1.00 | 1.10 | 2.31 | 500 | 1,155 | 6.45 | 7,450 |
| MDA 15 | 292 | 1.49 | 1.20 | 1.20 | 2.88 | 600 | 1,728 | 6.45 | 11,150 |
| MDA 15 | 620 | 3.16 | 2.00 | 1.40 | 4.76 | 1,900 | 9,044 | 6.45 | 58,330 |
| TOTALS | 1,205 | | | | | 4,000 | 13,827 | | ₱89,190 |
| DA 12 | 182 | 0.69 | 0.90 | 1.00 | 1.90 | 2,100 | 3,990 | 6.45 | 25,740 |
| DA 14 | 74 | 0.28 | 0.90 | 0.90 | 1.62 | 1,200 | 1,944 | 6.45 | 12,540 |
| DA 15 | 108 | 0.41 | 0.90 | 0.90 | 1.62 | 1,800 | 2,916 | 6.45 | 18,810 |
| DA 16 | 92 | 0.35 | 0.90 | 0.80 | 1.36 | 1,900 | 2,584 | 6.45 | 16,670 |
| TOTALS | 456 | | | | | 7,910 | 11,434 | | ₱73,760 |
| GRAND TOTALS | 2,371 | | | | | 16,810 | 46,453 | | ₱299,650 |

Lalo Extension Main and Secondary Drainage
Structure, Additional Drains and Summary

Drain Crossing (near Bato) (Siphon)

| | | |
|---|---|---|
| 1.00 m Ø pipe 8.0 m long @ ₱429/lin.m. | = ₱ 3,432 | |
| 4 $m^3$ concrete @ ₱930 | = 3,720 | |
| 24 $m^3$ backfill @ ₱6.45 | = 154.80 | |
| TOTAL | ₱ 7,306.80 | |

Road Crossing

| | | |
|---|---|---|
| 1.00 m Ø pipe 10.0 m long @ ₱429/lin.m. | = ₱ 4,290 | |
| 4 $m^3$ concrete @ ₱930 | = 3,720 | |
| 30 $m^3$ backfill @ ₱6.45 | = 193.50 | ₱15,510.30 |

(Ave. cost 2 crossings = ₱7,755 each)

Estimate: 8 additional crossing may be required @ ₱7,755 = ₱62,040

15 km additional drains may be required @ ₱15,000 (Incl ROW) = ₱75,000

Summary

MDA 13 Excav. = ₱136,700; R.O.W.=₱28,380; L=5800 M. TOTAL COST = ₱165,080
COST PER KM = ₱ 28,462

MDA 15 Excav. = ₱89,190; R.O.W=₱19,700; L=4000 M, total cost = ₱108,890
COST PER KM. = ₱ 27,223

DA 12 Excav. = ₱25,740; R.O.W. = ₱8,230; L=2100 M, TOTAL COST = ₱ 33,970
COST PER KM. = ₱ 16,176

DA 14 Excav. = ₱12,540; ROW = ₱4,320; L = 1200 M TOTAL COST = ₱ 16,860
COST PER KM. = ₱ 14,050

DA 15 Excav. = ₱18,810; ROW = ₱6,520; L = 1810 M TOTAL COST = ₱ 25,330
COST PER KM. = ₱ 13,995

DA 16 Excava. = ₱16,670; ROW = ₱6,840; L = 1900 M TOTAL COST = ₱ 23,510
COST PER KM. = ₱ 12,374

TOTAL DRAINS Excav. = ₱299,630; ROW = ₱73,990; L=16,810 M
TOTAL COST = ₱ 373,620
COST PER KM. ₱ 22,226

## D. ENGINEERING DATA

### Irrigation Water Requirements

A. Estimating Consumptive Use:

The consumptive use or evapo-transpiration of crops was computed from climatological data since no measurements of consumptive use are available in the Rinconada Integrated Development Area. For this purpose, the Blaney and Criddle method was used with some modifications.

In this method, the amount of water consumptively used by crops during their normal growing season was closely correlated with mean monthly temperatures and daylight hours.

Numerous factors must be taken into consideration if the consumptive use of water is to be determined accurately. Of the climatic factors, the effect of the temperature and sunshine upon plant growth as measures of solar radiation is without doubt the most important. Disregarding many influencing factors, consumptive use varies with temperature, length of day, and available moisture regardless of its source (precipitation, irrigation water, or natural ground). Multiplying the mean monthly temperature by the possible monthly percentage of daytime hours of the year (p) gives a monthly consumptive-use factor F.

U = Consumptive use of the crop in inches for the growing season

F = Consumptive use factor (product of mean monthly temperature and monthly percentage of daylight hours of the year)

t = Mean monthly air temperature in degrees Fahrenheit

p = Monthly percentage of daylight hours in the year

$K_t$ = A climatic coefficient which is related to the mean air temperature (t)

$K_t$ = .0173 t - .314, values of $K_t$ for mean air temperature from 36 to 100 degrees are shown in Table 2.

B. Water Requirement:

Water requirement is the total quantity of water required to mature a crop under field conditions. It is the sum of consumptive use and percolation. The percolation used under this condition is 2 mm/day.

C. Effective Rainfall:

Effective rainfall is the net amount of rainfall available during cropping period to meet the consumptive water requirement of crops. It is greately influenced by the intensity and distribution of rainfall, depth of standing water in the paddy field, size and maintenance of farm dikes, irrigation method and water delivery interval, topography of land, and the drainage facilities.

There is no standard method for computing effective rainfall which can be applied to all conditions except those that were actually derived from specific localities. The following are the criteria adopted for estimating effective rainfall in this study.

1. During the period of land soaking and land preparation, and transplanting up to the maturity period, it is assumed that there is effective rainfall.

2. Rainfall less than 5 mm on an individual day distributed over the area is considered non-effective. ("Individual day" is the day preceded and followed by two rainless days).

3. The water holding capacity of paddy field is assumed to be 40 mm and the loss of soil moisture through natural causes is assumed at about 8 mm daily for all conditions. Therefore, a rainfall which is between 5 mm and 48 mm is considered effective rainfall. Any rainfall above 48 mm daily distributed over the area is considered non-effective.

4. Rsinfall is excess of 80 mm in a 10 day period is considered non-effective.

5. All calculations were done on a 10 day basis. This means rainfall was reckoned from the beginning of every 10 days to come up with a conservative estimate.

Tables (5) and (6) represent the average monthly rainfall and effective rainfall distributed over the project area, covering the period from 1971 to 1975. The rainfall station considered is the Sta. Cruz, Baao, Rainfall station.

D. Farm Water and Canal Conveyance Losses:

There are two major losses that were considered in the calculation of the diversion water requirement. They are the losses incurred at the distribution and conveyance systems.

The losses at the distribution system are those which are incurred during the delivery of water from the turnout down to the paddy. It includes farm water, leakages thru gates and farm ditches, etc. For purposes of estimating the farm-turnout water requirement, 20 percent of turnout water requirement on account of such losses has been assumed.

In the conveyance system, 25% of the losses from the canal intake down to the turnout was adopted. It includes seepage thru canals and leakage thru gates and canal dikes.

E. Diversion Water Requirement:

Diversion water requirement was computed, based on the estimates stated in the preceding four topics. This was computed to serve as an input on the effect of regulating Lake Buhi (the source of irrigation water).

Explanation in the calculation of diversion water requirement is as follows:

1. Water requirement = water requirement for seedling bed and water requirement for land soaking and land preparation and water requirement for main paddy field.

2. On-farm irrigation water requirement = water requirement less effective rainfall.

3. Turnout water requirement = on-farm irrigation water requirement $x = \frac{1}{1 - 20\%}$

4. Diversion water requirement = turnout water requirement $x = \frac{1}{1 - 25\%}$

TAMS/TAE 1/79

RINCONADA INTEGRATED DEVELOPMENT AREA

Planting Calendar
Area No. 1

| MONTH / 10-day Period / ITEM | JAN 1 | JAN 2 | JAN 3 1/ | FEB 1 | FEB 2 | FEB 3 2/ | MAR 1 | MAR 2 | MAR 3 3/ | | JUN 1 | JUN 2 | JUN 3 | JUL 1 | JUL 2 | JUL 3 1/ | AUG 1 | AUG 2 | AUG 3 1/ | SEP 1 | SEP 2 3/ | SEP 3 | DEC 1 | DEC 2 | DEC 3 1/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cropping Schedule | | | | | | | | | | | | | | | | | | | | | | | | | |
| Irrigation Requirement Period | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Requirement mm/10 day | 80 | 80 | 88 | 80 | 80 | 64 | 80 | 80 | 22 | | 157 | 90 | 90 | 90 | 90 | 99 | 90 | 90 | 99 | 90 | 36 | | 154 | 154 | 88 |
| Effective Rainfall mm/10 day | 38.08 | 2.18 | 26.56 | 10.72 | 26.68 | 3.76 | 7.16 | 14.88 | 1.78 | | 58.28 | 54.8 | 59.7 | 68.7 | 66.4 | 40.5 | 61.6 | 37.7 | 51.9 | 80 | 10.78 | | 65.3 | 58.7 | |
| On-Farm Water Requirement mm/10 day | 41.92 | 77.8 | 61.44 | 69.3 | 53.3 | 60.2 | 72.8 | 65.1 | 30.2 | | 98.7 | 35.16 | 30.34 | 21.28 | 23.6 | 58.5 | 28.4 | 52.3 | 47.14 | 10 | 25.2 | | 88.7 | 29.3 | |
| Turnout Water Requirement mm/10 day | 52.4 | 97.3 | 76.8 | 86.6 | 66.6 | 75.3 | 91.0 | 81.4 | 37.8 | | 123.4 | 43.95 | 37.9 | 26.6 | 29.5 | 73.1 | 35.5 | 65.4 | 58.9 | 12.5 | 31.52 | | 110.88 | 36.6 | |
| Diversion Requirement mm/10 day | 69.7 | 129.4 | 102.1 | 115.2 | 88.6 | 100.1 | 121.0 | 108.3 | 50.3 | | 164.5 | 58.5 | 50.4 | 35.3 | 39.2 | 97.3 | 47.2 | 86.98 | 78.3 | 16.6 | 41.9 | | 147.5 | 48.7 | |
| Liters/Sec./Ha. | 0.84 | 1.55 | 1.11 | 1.38 | 1.06 | 1.20 | 1.45 | 1.30 | 1.50 | | 1.97 | 0.70 | 0.61 | 0.42 | 0.47 | 1.06 | 0.57 | 1.04 | 0.85 | 0.20 | 1.25 | | 1.77 | 0.53 | |

1/ 11-day period
2/ 8-day period
3/ 4-day period

TAMS/TAE 2/79
CSC:lmr

Figure G(1)-4

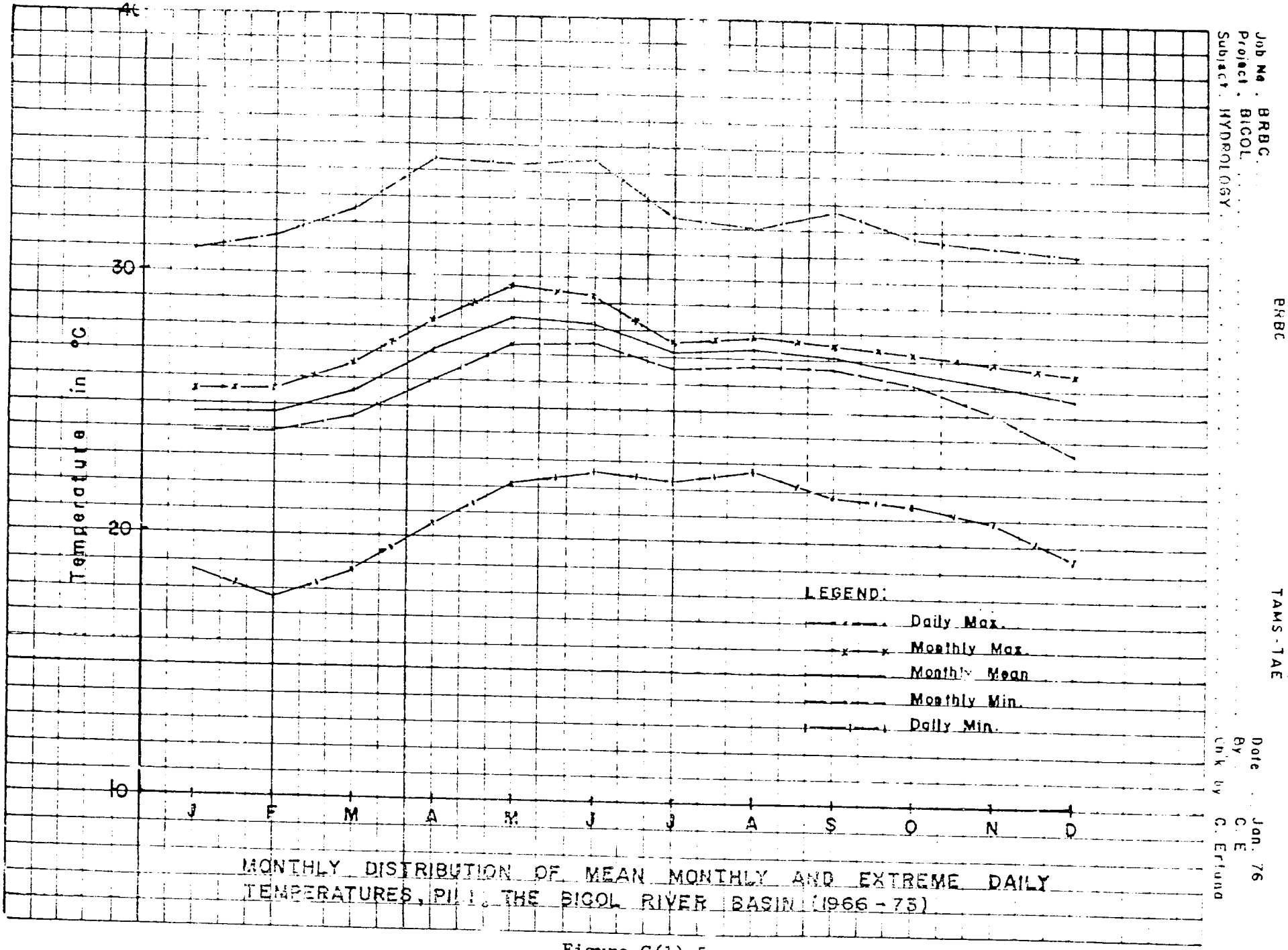
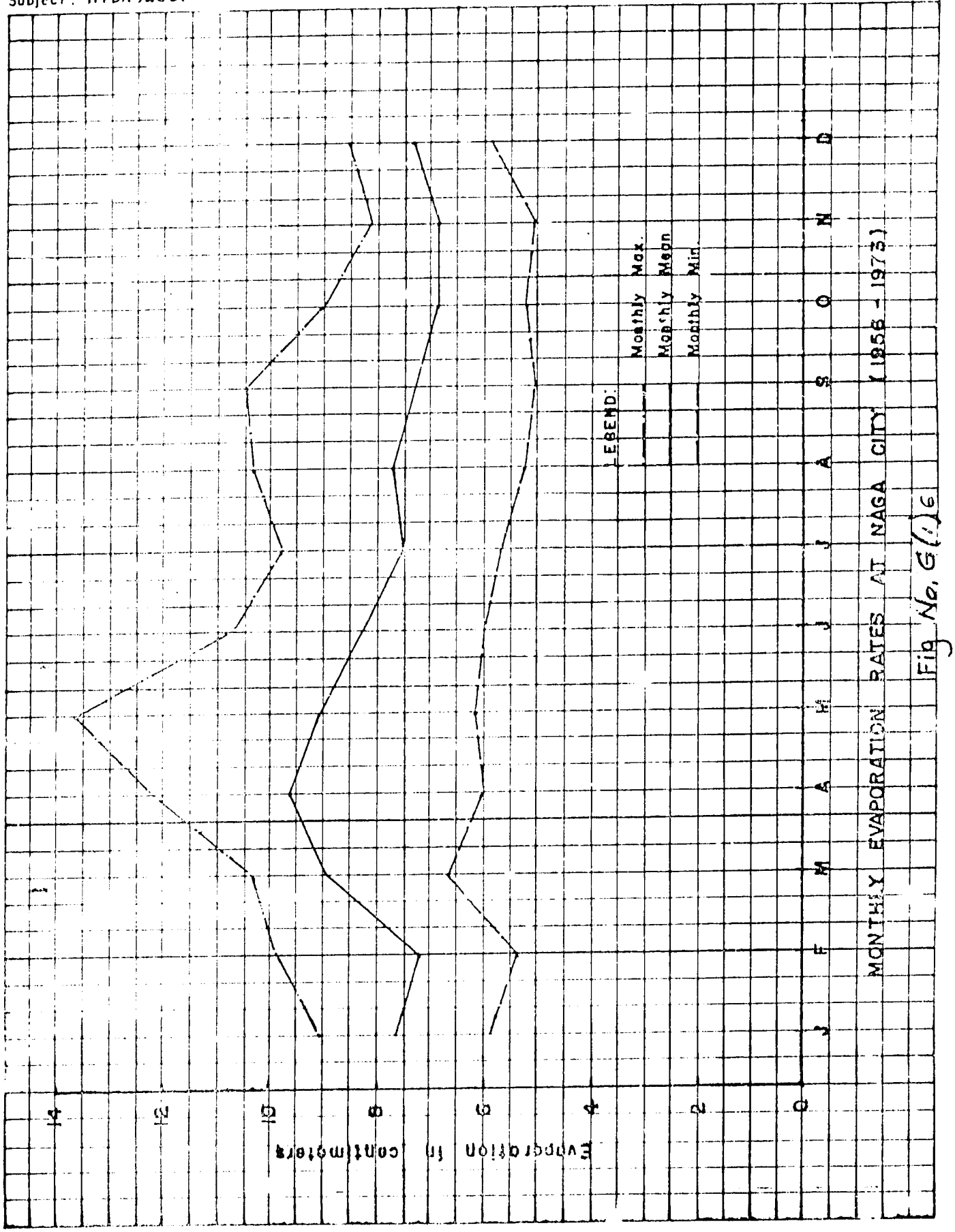

Job No. BRBC
Project. BICOL
Subject. HYDROLOGY
BICOL RIVER BASIN
COMPREHENSIVE WATER RESOURCES STUDY
BRBC
TAMS-TAE
Date Jan. 76
By C.E.
Chk by C. Erlana
Temperature in °C
40
30
20
10
J
F
M
A
M
J
J
A
S
O
N
D
LEGEND:
Daily Max.
Monthly Max.
Monthly Mean
Monthly Min.
Daily Min.
MONTHLY DISTRIBUTION OF MEAN MONTHLY AND EXTREME DAILY
TEMPERATURES, PILI, THE BICOL RIVER BASIN (1966-73)

Figure G(1)-5

BICOL RIVER BASIN
COMPREHENSIVE WATER RESOURCES STUDY
BRBC TAMS-TAE

Job No . BRBC
Project . BICOL
Subject . HYDROLOGY

Date Feb. '76
By C. E.
Ch'k by C. Ertuna

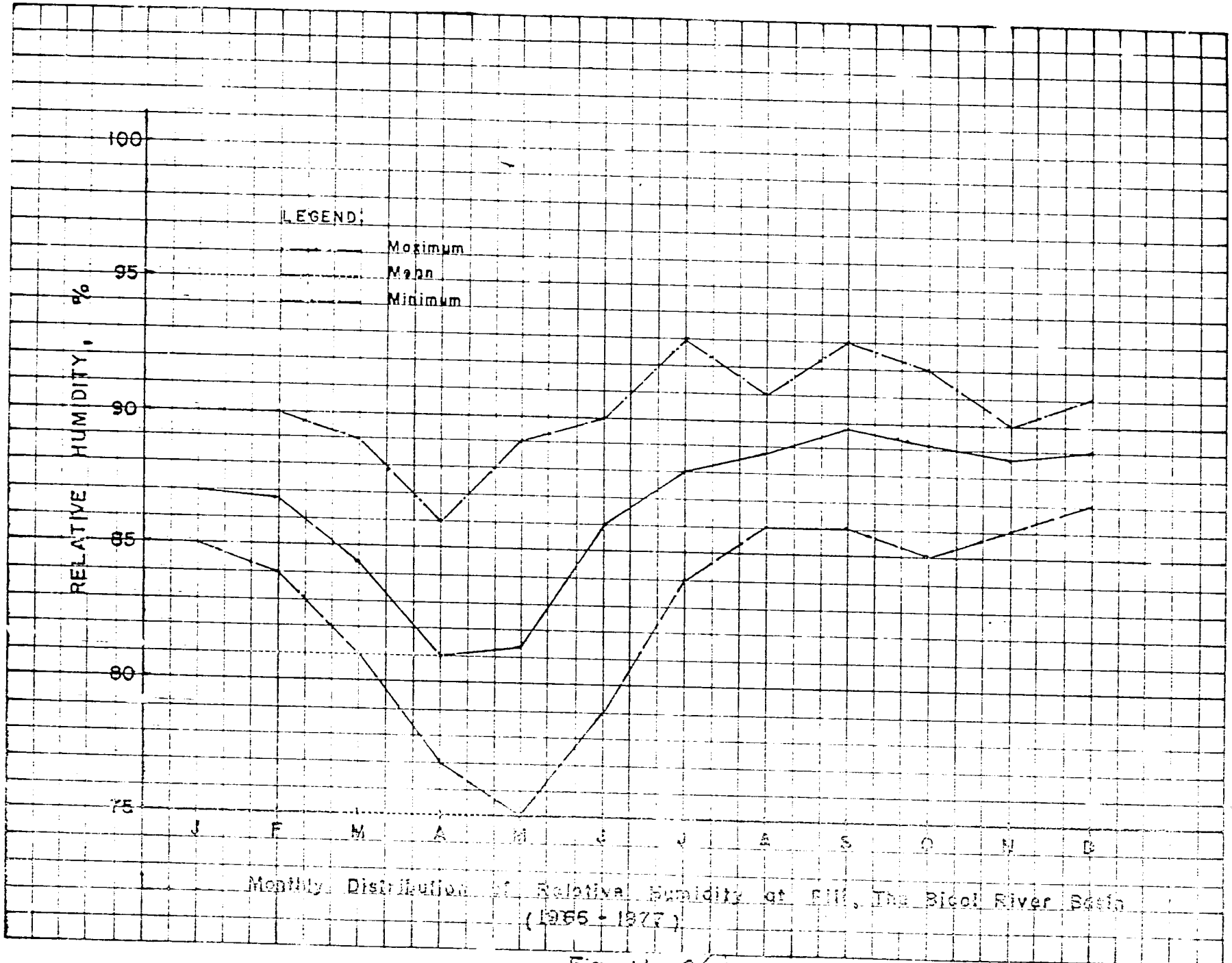



MONTHLY EVAPORATION RATES AT NAGA CITY (1956 - 1975)

Fig. No. G(1)6

Job No BRBC
Project BICOL
Subject HYDROLOGY

BICOL RIVER BASIN
COMPREHENSIVE WATER RESOURCES STUDY
BRBC TAMS-TAE




Monthly Distribution of Relative Humidity at Fill, The Bicol River Basin
(1965 - 1977)

Fig. No. 6(1)7

Date
By
Chk by C. E. Ertuna

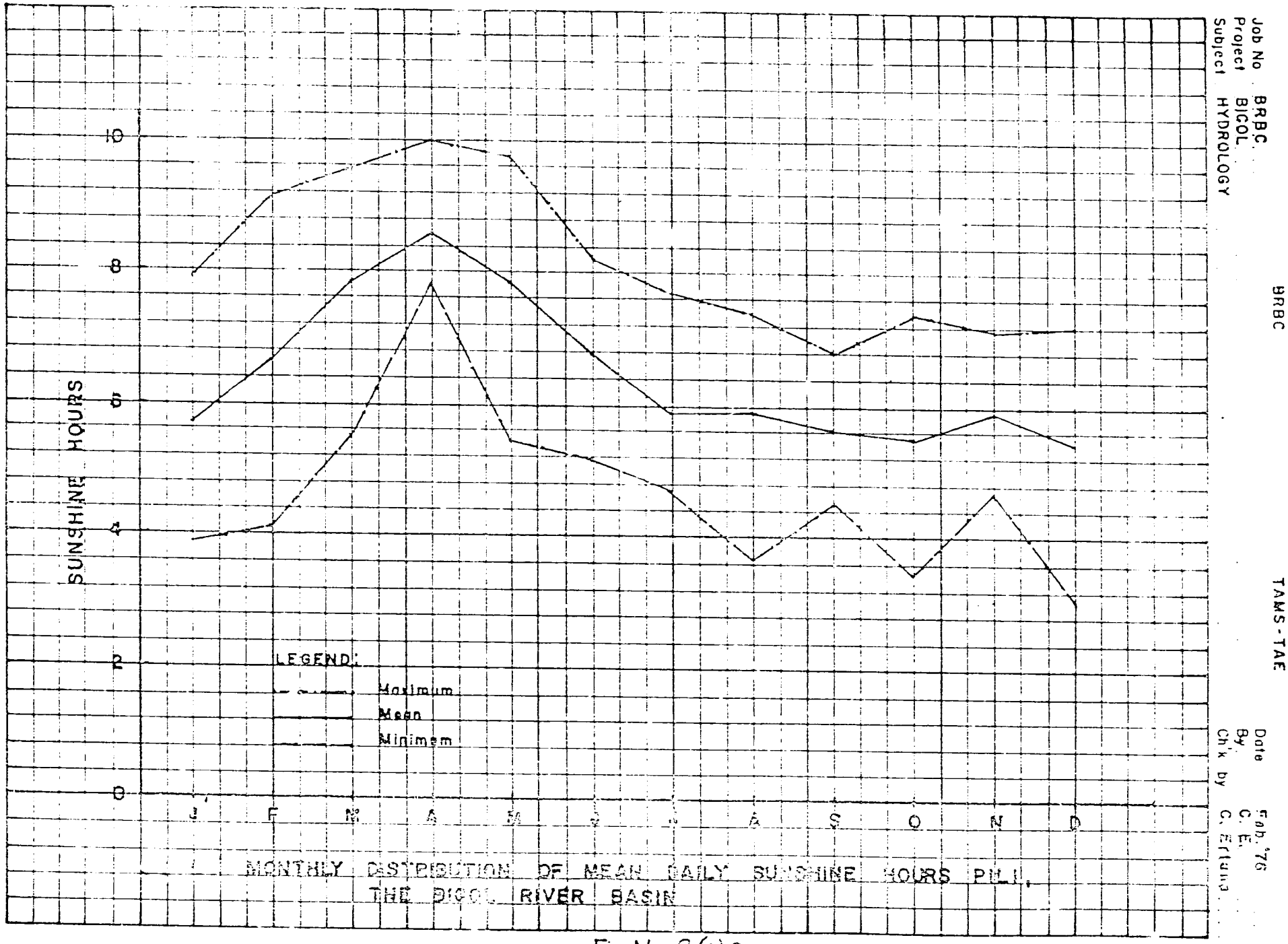
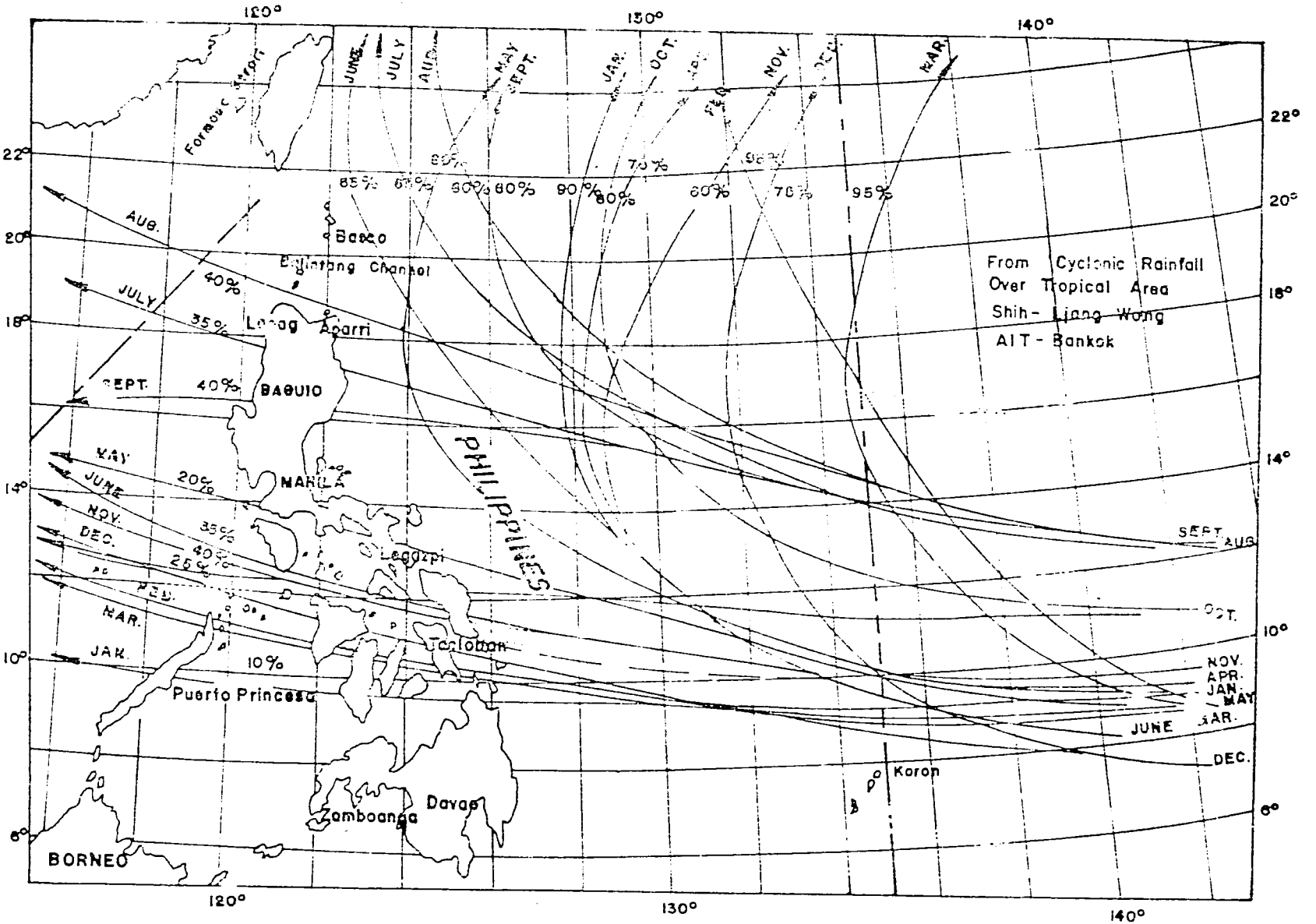

Job No BRBC
Project BICOL
Subject HYDROLOGY
BICOL RIVER BASIN
COMPREHENSIVE WATER RESOURCES STUDY
BRBC
TAMS-TAE
Date Feb. '76
By C. E.
Ch'k by C. Erlung
SUNSHINE HOURS
10
8
6
4
2
0
J F M A M J J A S O N D
LEGEND:
Maximum
Mean
Minimum
MONTHLY DISTRIBUTION OF MEAN DAILY SUNSHINE HOURS PILI,
THE BICOL RIVER BASIN

Fig. No. G(1)8

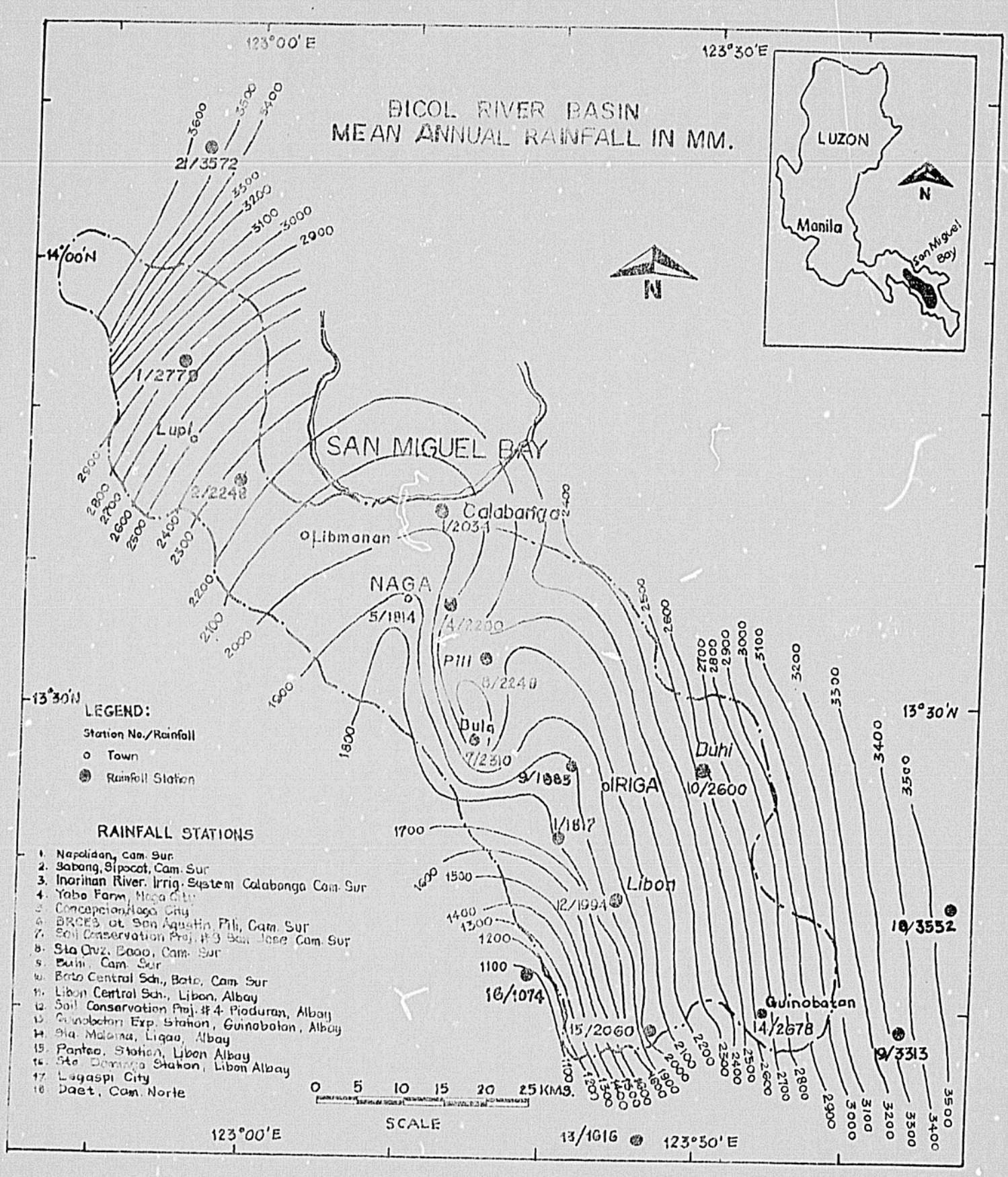



Mean Monthly Tracks Of Tropical Cyclones Affecting The Philippines

Fig. No. 6.1.5

Table G(1)-20 Incidence of Cyclonic Storms Affecting the Bicol Basin (1949-1975)

| Month | No. of Occurrences |
|---|---|
| May | 1 |
| June | 3 |
| July | 1 |
| August | 1 |
| September | 2 |
| October | 5 |
| November | 7 |
| December | 6 |




Isohyets for Mean Annual Rainfall, Bicol River Basin

Revised 2/79
A.K. Long

FIG. No. G(1) 10

## Precipitation Isohyetal Chart

The isohyetal chart that was prepared early in the planning stages of the Bicol River Basin Development Program has recently come under close scrutiny. The primary reason for this concern was the precipitation record of a rainfall station listed as "No. 13, Soil Conservation Project #4, Ligao, Albay," the data from which did not seem to conform to that of the general area. It appeared as a "desert island" within a "rain forest." It is very doubtful that the orographic effect on precipitation that Mt. Mayon causes in the area, where the above listed station is supposed to be located, could be this extensive or critical. Mt. Mayon is not that massive of a barrier to the movement of storms. This is borne out by the fact that other stations such at Libon, Albay, Sta. No. 12 and Bato, C.S., Sta. No. 11, located on the leeward side of Mt. Mayon and in the area where precipitation should be much lighter as the result of orographic effects, have more rainfall than Station No. 13. In fact, Station No. 13 has the next lowest precipitation of all of the 13 stations that were used to prepare the chart, with the lowest being Station No. 16 at Pantao Station, Libon, Albay, located on the Ragay Gulf.

It was determined that the particular station in question was actually located at the Bureau of Soils, Soil and Water Conservation Research Station located approximately 30 km. Southwest of Ligao, at Pio Duran, Albay, located on the southwesterly side of the Ragay Hills along the shoreline of the Burias Pass. Until 1969, this was known as Malabanan, Ligao, Albay, at which time it was changed to a separate municipality and renamed Pio Duran.

The collection of precipitation was initiated in 1957 at the request and with the support of the Weather Bureau (PAGASA). The data was collected using a manually operated rain gage until September 1976 when an automatic, tipping bucket type recorder was installed at the site. This new recorder operated until May 1977 when it malfunctioned and it has been inoperable with no data being collected since that date. This station was visited again in February 1979, at which time the Sta. No. 13 listed on the original Isohyetal Chart was confirmed to be located at Pio Duran and not in the vicinity of Ligao, Albay.

To further verify the inconsistency of the precipitation pattern depicted on the original Isohyetal Chart, caused by the mislocation of Sta. No. 13, the data from several precipitation stations operated by NIA in the vicinity of Ligao, Albay, were reviewed and tabulated. These stations are the Nasisi Damsite located southeast of Ligao, Manamba Damsite which is located northeast of Ligao, and the Hibiga River I.S., located north of Ligao. All three of these stations have fragmentary records; however there are some years during which a complete record is available. These complete years of record indicate that average annual precipitation in these areas is between 2400 mm

and 3100 mm. These data further substantiate the invalidity of the location of Sta. No. 13 as originally plotted and strongly supports the need to revise the original Isohyetal Chart for the Bicol River Basin.

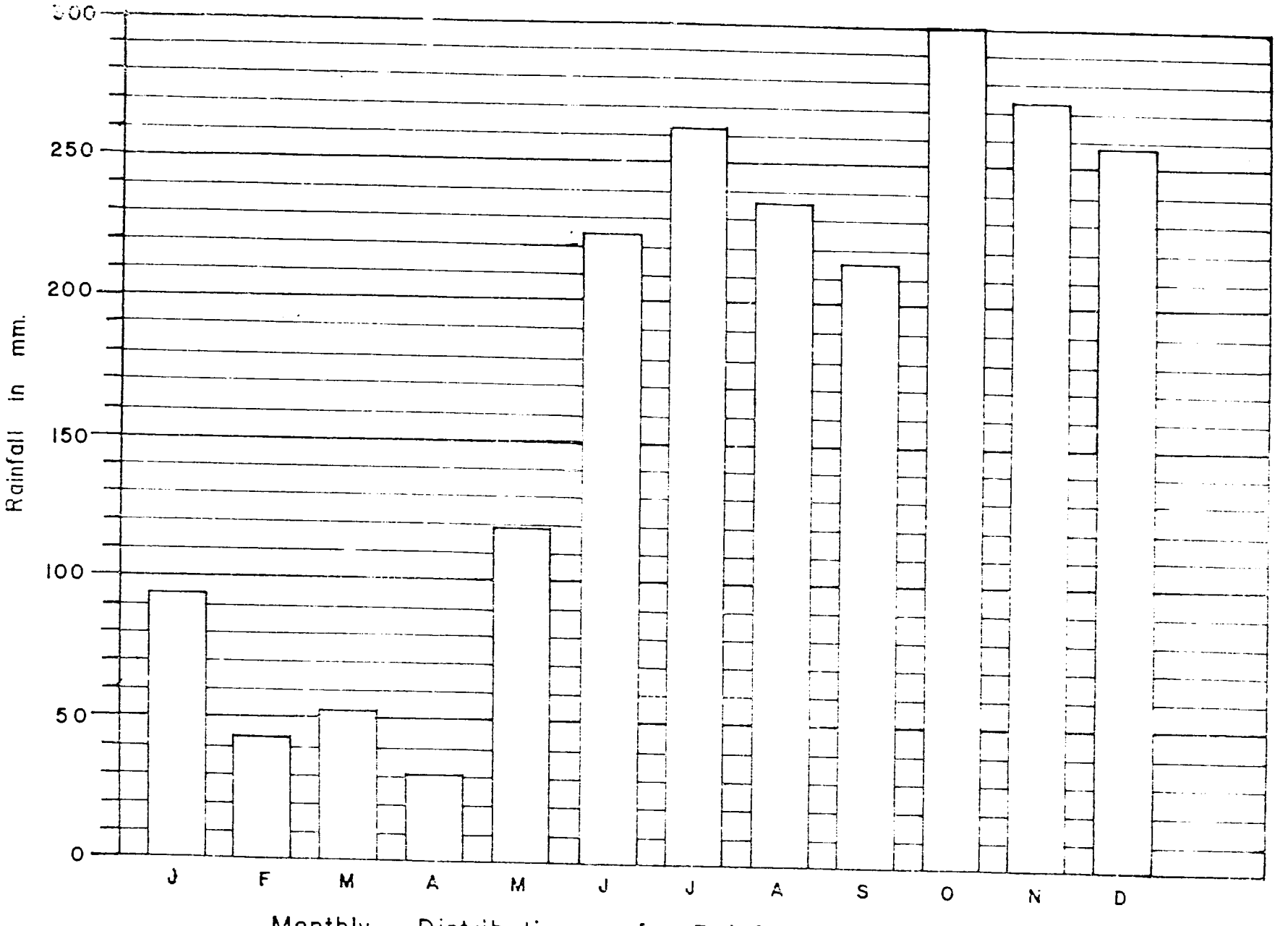
On the above basis, a revised Isohyetal Chart has been prepared. The estimated discharges of streams originating along the easterly border of the Upper Bicol River Basin determined by the Asian Institute of Technology, Bangkok, Thailand, and possibly others may have been adversely affected by the utilization of the original Isohyetal Chart. To substantiate this observation, the estimated annual discharge of the streams located in the Lake Buhi-Tinobatan area of the eastern Bicol River Basin area, which is situated in a precipitation range of 2600-3000 mm per year, amounts to about 1.70 million cubic meters per square kilometer, while the estimated runoff of the northwestern region of the Bicol River Basin, the Sipocot River area with the same general range of precipitation, is reported to be between 2.3 and 3.04 million cubic meters per square kilometer. Under such similar precipitation and watershed conditions, it appears that the average annual unit discharge from these two areas should be very comparable.

2/13/79

Table G(1)-21 Monthly and Annual Rainfall at Buhi, Camarines Sur
(Millimeters)

| YEAR | J | F | M | A | M | J | J | A | S | O | N | D | CALENDAR YEAR | WATER YEAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1950 | | | | | | | | | | | | | | |
| 1951 | | | | | | | | | | | | | | |
| 1952 | 246.5 | 145.5 | 108.7 | 11.7 | 114.80 | 206.50 | 290.8 | 669.0 | 185.7 | 899.4 | 375.1 | 509.0 | 3762.8 | |
| 1953 | 146.5 | 200.4 | 80.5 | 29.9 | 168.6 | 181.3 | 175.5 | 257.0 | 231.9 | 169.1 | 282.4 | 351.8 | 2272.9 | |
| 1954 | 73.9 | 74.4 | 205.2 | 18.0 | 82.3 | 186.9 | 139.2 | 320.8 | 223.5 | 218.2 | 623.8 | 546.3 | 2711.5 | |
| 1955 | | | | | | | | | | | | | | |
| 1956 | 131.1 | 75.9 | 153.7 | 313.7 | 142.7 | 124.7 | 288.3 | 199.1 | 579.3 | 161.7 | 451.6 | 1231.1 | 3859.9 | |
| 1957 | 315.4 | 65.5 | 100.0 | 135.8 | 35.8 | 197.6 | 303.7 | 159.5 | 161.0 | 395.2 | 402.3 | 98.2 | 2350.0 | |
| 1958 | 211.1 | 7[illegible].5 | 121.4 | 190.8 | 52.6 | 253.2 | 183.4 | 279.4 | 187.2 | 746.3 | 244.3 | 43.2 | 2583.4 | |
| 1959 | 228.8 | 63.0 | 255.7 | 38.6 | 210.8 | 102.6 | 253.4 | 241.5 | 82.5 | 152.4 | 445.5 | 575.5 | 2653.7 | |
| 1960 | 83.9 | 105.4 | 48.0 | 142.7 | 353.8 | | 164.1 | 185.9 | 173.2 | 597.7 | 236.5 | 172.7 | | |
| 1961 | 129.5 | 12.2 | 42.7 | 38.4 | 124.9 | 129.5 | 256.3 | 290.1 | 333.8 | 246.4 | 222.8 | 356.4 | 218[illegible] | |
| 1962 | 175.3 | 106.7 | 128.0 | 42.4 | 339.3 | 105.7 | 364.2 | 148.6 | 203.5 | 74.7 | 299.2 | 291.8 | 2279.8 | |
| 1963 | 77.3 | 101.1 | 11.9 | 30.1 | 45.3 | 252.5 | 94.9 | 404.4 | 250.2 | 116.3 | 219.2 | 224.8 | 1832.7 | |
| 1964 | 130.3 | 156.8 | 20.6 | 85.1 | 62.7 | 244.9 | 90.2 | 151.1 | 388.4 | 131.3 | 293.4 | 320.3 | 2077.3 | |
| 1965 | 197.6 | 40.6 | | 20.6 | 1970.4 | 266.7 | 371.1 | 227.8 | 406.7 | 178.8 | 280.7 | 317.3 | | |
| 1966 | 257.1 | 16.0 | 61.0 | 41.2 | 208.3 | 210.3 | 381.2 | 353.4 | 235.9 | 191.6 | 437.6 | 602.1 | 2995.7 | |
| 1967 | 218.5 | 124.7 | 138.3 | 10[illegible].6 | 176.1 | 157.7 | 379.8 | 440.9 | 285.0 | 186.1 | 252.1 | 139.3 | 2679.1 | |
| 1968 | | | | | | 159.2 | 186.5 | 353.2 | 427.5 | 54.2 | 148.9 | 65.3 | 1608.4 | |
| 1969 | | | | | | 19[illegible].4 | 307.0 | 175.4 | 144.6 | | 309.03 | | | |
| 1970 | 98 | | 89 | 32.7 | 23.3 | 91.3 | 298.4 | 283.4 | | | | 313.4 | | |
| 1971 | 187.3 | 313.3 | 148.1 | 43.9 | 295.5 | | | 49.6 | 165.9 | 237.3 | 207.9 | 441.5 | | |
| 1972 | 355.4 | 33.1 | 58.9 | 31.6 | 173.9 | 350.8 | 197.4 | 524.4 | 204.5 | 154.18 | 359.31 | 221.9 | 2665.39 | |
| 1973 | 55.8 | 55.9 | 36.0 | 27.7 | 91.9 | 128.9 | 226.5 | 254.4 | 322.0 | 583.4 | 471.8 | 625.2 | 2879.53 | |
| 1974 | 65.4 | 117.4 | 54.3 | 29.5 | 102.0 | 730.2 | 357.7 | 181.1 | 174.9 | 465.7 | 492.7 | 545.2 | 3313.9 | |
| Mean | | | | | | | | | | | | | | |
| Max | | | | | | | | | | | | | | |
| Min | | | | | | | | | | | | | | |

SOURCE: ANNUAL CLIMATOLOGICAL REVIEW (1952-1968) and FILES, (1950-1, 1953, 1969-74) WEATHER BUREAU

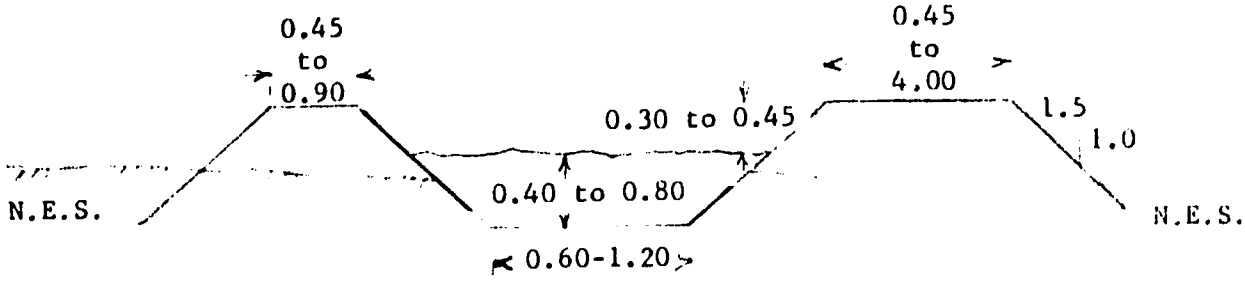



Monthly Distribution of Rainfall at Pili, Camarines Sur

Figure G(1)-11

Figure G(1)-12

TYPICAL CANAL SECTIONS
MAIN CANAL AND LATERALS




TYPICAL DITCH SECTIONS
MAIN AND SUPPLEMENTARY FARM DITCHES

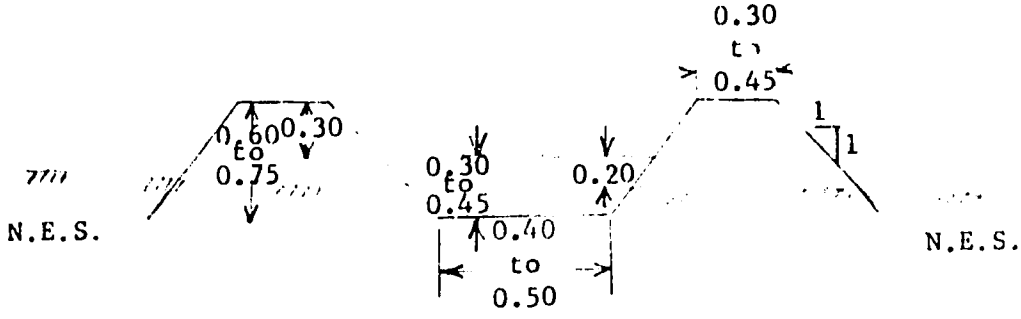
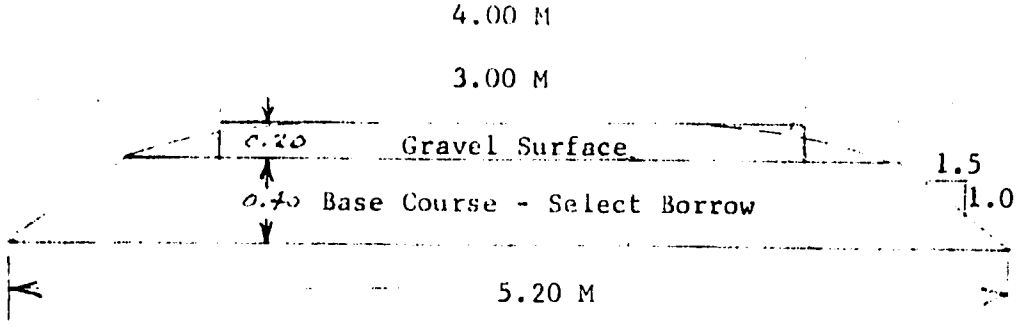


Figure G(1)-13

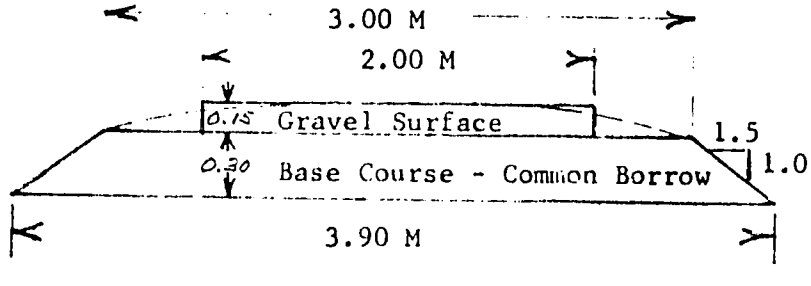
TYPICAL ROAD SECTION
MAIN CANAL OR EQUIVALENT




$$\underline{\text{Base Course}} = \frac{4.0 + 5.2}{2} \times 0.40 = 1.84 \text{ m}^3/\text{L.M.}$$

$$\underline{\text{Gravel Surface}} = 3.0 \times 0.20 = 0.60 \text{ m}^3/\text{L.M.}$$

TYPICAL ROAD SECTION
LATERAL




$$\text{Base Course} = \frac{3.0 + 3.9}{2} \times 0.30 = 1.035 \text{ m}^3/\text{L.M.}$$

$$\text{Gravel Surface} = 2.0 \times 0.15 = 0.30 \text{ m}^3/\text{L.M.}$$

## DESIGN CRITERIA*

### I. Canals, Laterals and Sub-Laterals

(a) Diversion works, main canals and laterals will be designed according to the following water duty:

1. Bicol ----- 1.4 liters/sec./ha.

(b) Cross-section-Earth canals will be constructed trapeziodal in shape with side slopes determined from stability of bank materials. Usually a side slope 1½:1 is used. This side slope may be flattened or steepened as soil condition warrants. For rock or hard soil, slope of 1:1 is used. In calculating the canal cross-section, Manning's formula will be used. A roughness coefficient "n" of 0.025 is generally used for main canals, laterals, sub-laterals and main drains, "n" of .03 for farm ditches and secondary drains and "n" of 0.04 for farm drains. For unlined canals, the ratio of bottom width to depth ranges from 2:1 to 2½:1.

(c) Freeboard - An adequate freeboard should be provided to furnish a factor of safety against a rise of water surface above the computed normal flow. Freeboard, Fd = 40 percent of design depth of water "d" with a minimum value of 30 cms.

(d) Top Berm Width - The top berm width of canals are determined by either requirement of operating equipment or by minimum width required to minimize seepage. When needed as a roadway for mechanized equipment, the width shall be 4.00 meters for canals with cut less than 2.50 meters and 6.00 meters if cut is more than 2.50 meters. When not used as operation road, the top berm width should be approximately equal to the water depth "d" with a minimum value of 60 cms.

(e) Velocity - Permissible velocities for determining the size of the water section for earth canals will be dependent upon the materials through which the canal is to be constructed. Velocities in unlined canals ordinarily vary from 0.30 m./sec. to 1.0 m./sec.

### II. Canal Structure

(a) There should be at least one vehicle/equipment crossing for every 1.0 km. to 1.5 km. of canal in non-residential areas. For residential areas, additional light vehicle crossing or footwalks (pre-cast reinforced concrete T-beam) in between equipment crossing shall be provided.

(b) Adequate provisions will be made for check structures across the main and secondary canals, using steel gates if the flow exceeds 1.00 cu.m./sec. and step logs for lower flows. As much as possible,

*From National Irrigation Systems Improvement Project

canal structures such as road crossings, siphons, headgates, etc. will be utilized as check structures. For structures with two or more bays, only one bay will be provided with steel gates and the rest with stop logs.

(c) Measuring devices will be provided at the upstream end of each lateral and main farm ditch, which will be Parshall Flume for flows exceeding 1.0 cu.m./sec. and a C.H.O. turnout or a Parshall Flume for lower flows.

(d) To prevent wash-outs of canals, sufficient protective structures such as culverts, drainage siphons or paddy drains shall be provided across the canals depending on the topography of the area traversed by the canal. For canals with small discharge, canal siphons may be more economical.

## III. Operation and Maintenance Road

All weather gravel road is to be provided along the embankment of canals, laterals or sub-laterals at an intensity of about 20 meters of O & M road for each hectare of service area on the following criteria:

(a) When a small canal runs parallel to an existing road within a center to center distance of 200 meters, the road embankment may be omitted.

(b) Generally, the road embankment shall be placed on the service area side of the canal, except along canals where a road already exists paralleling the canal embankment the location of the existing road shall be maintained.

(c) When both sides of the canal are serviced, the road shall be placed at the wider embankment of the existing canal.

(d) If possible, maintain operation road along same side of the canal from headgate to the canal end to avoid vehicle/equipment switching from left to right embankment or vice versa.

(e) Generally, the canal service roads shall terminate at the farthest turnout on the canal. However, when a canal terminates near an existing road or another canal, a connecting road may be provided.

(f) Gravel Surfacing

Gravel surfacing for the different width of road will be as follows:

- For 2.50 M. cycle road-2.70 M. wide, 15 cms. thick.
- For 4.00 M. canal embankment-3.00 M. wide, 20 cm. thick.
- For 6.00 M. canal embankment-4.50 M. wide, 20 cms. thick.

(g) A non-gravel farm road of 2.5 M. width will be provided along these main farm ditches which lead to a village and where there is no access within a 200-meter distance.

## IV. Rehabilitation Works

Where existing irrigation facilities are to be incorporated in the proposed irrigation system, the following are to be considered:

(a) Study ways of using the present facilities before considering any change in the method or system layout that necessitate abandoning or relocating permanent structures.

(b) Check capacity of existing canal sections. Canal sections with capacities less than design requirement should be enlarged while canal sections with larger capacities should be maintained.

(c) Where additional head is required due to increased in design discharge, water surface at the upstream of the structure may be allowed to build up, provided the water surface back-up will not reach closer than 100 meters of the immediate upstream structure if the structure is not a drop. If the upstream structure is a drop, the water surface back-up can be allowed to reach the drop.

## V. Design Criteria for Drainage (Project Drains)

(a) General

The criteria given in this section apply to the improvement of existing waterways and the construction of additional drainage channels to provide sufficient outlet of the farm drains for the removal of surface waste and storm run-off. It may include the deepening and enlarging of the existing natural waterways. For existing waterways the section will be maintained if adequate.

(b) Design Consideration

1. Intensity

There should be about 20 meters of project drains for each hectare of service area, depending upon the topography and soil of the project area.

2. Capacities

In the determination of capacities of existing waterways, the following investigations are to be undertaken:

a) General conditions such as area topography, present development of the natural drainage system and condition of existing channels are to be observed. Depth

of existing drainage channels are to be measured at various locations. Observations of flood flows are to be taken during the rainy season to indicate the direction of surface flows in relatively flat areas and also to determine how well the existing drainage functions. Discharges will be determined from Manning's formula of:

$$V = \frac{R^{2/3} S^{\frac{1}{2}}}{n}$$ using applicable coefficient of roughness "n"

b) Drainage work will be designed for ten-year frequency flood for drainage channels allowing a retention of water in the rice fields not to exceed 30 cm. depth and 72 hours.

c) Farm drains will normally drain an area of 60-100 has. if draining two rotation blocks or 30-50 has. for a single block. These drains will be designed with two sections, an upper section for a capacity of 150 liters/sec. (single block) to 300 liters/sec. (two rotation blocks) and the lower section twice the capacity of the upper section.

d) All of the main and secondary drains will be designed for a minimum velocity of 0.4 m./sec. and the maximum velocity will not exceed 1.2 m/sec.

e) All drainage channels will have a side slope of 1½:1 or flatter depending on soil conditions.

f) All drainage structures will be designed for a 25-year return period.

## VI. Design Criteria for On-Farm Facilities

### (a) Design Concept

To irrigate the project area adequately, rotational irrigation will be used. The paddy field is to be sub-divided into sections of 50 hectares (average) called "Rotation Area." The rotation area is to be further sub-divided into smaller areas averaging 10 hectares each called "Rotation Units."

It would be preferable that the Main Farm ditch (starting from a turnout with discharge measuring device) should be running perpendicular to the lateral and be able to serve a Rotation Area on the right side and another Rotation Area on the left side. Under this scheme the two Rotation Areas will be served simultaneously and therefore both the Turnout and Main Farm Ditch (MFD) should be designed to be able to accommodate the flow for the peak requirement of the combined areas. The Main Farm Ditch should extend not more than one kilometer and the Supplementary

Farm Ditches (SFD) not more than 500 meters. On all the Supplementary Farm Ditches adequate number of 8 Ø off-take Pipes and an End Check should be installed. No off-take pipes shall be installed along the Main Farm Ditch. Both the MFD and SFD's shall be provided with a freeboard of at least 20 cms. and shall have a side slope of 1:1. At the intersection of MFD and SFD's an appropriate Division Box shall be designed.

Inasmuch as the respective service area of the various SFD's differ in size each SFD therefore should be designed independently.

Where it is not possible to serve two rotational areas by the same Turnout and MFD, the installation of an independent Turnout and corresponding SFD is also tolerable. Depending on the topographical conditions, a main Farm Ditch running perpendicular or parallel and side by side with the lateral can be adopted.

Whatever scheme is adopted, all SFD's should discharge into a Drainage Ditch which will in turn extend to existing drainage channels.

(b) Farm Level Facilities and Functions

1. Turnout - provided with a steel gate to control and regulate the flow of water to the farm ditches.

2. Measuring Device - orifice incorporated at the inlet of the turnout provided with direct reading gage.

3. Main Farm Ditch - conveys water from the turnout to the supplementary farm ditches.

4. Supplementary Farm Ditch - conveys water from the main farm ditch to the paddy in rotation unit.

5. Division Box - to check water from the main farm ditch and divert it to the supplementary farm ditch.

6. Off-Takes - to provide take-offs for irrigation water from supplementary farm ditch or main farm ditch to the paddy field.

7. End Check - to prevent escape of irrigation water in the supplementary farm ditch to the drainage ditch when it is needed in the paddies or to release irrigation water from same when not needed.

8. Farm Ditch Crossing - provide access of farm equipment from farm road to the paddies in a rotation area. This is to be installed only on main farm ditches.

9. Farm Ditch Check and Drop - in steep slopes, this is necessary to limit the flow of water in the farm ditch within the non-scouring velocity.

10. Drainage Ditch - located at the lowest portion of the rotation area to drain the paddy field when necessary and to pass on surface run-off during floods.

11. Internal Farm Ditch - to distribute water in a rotation unit from an off-take.

(c) Design Criteria

1. Intensities

i) About 60 meters of main and supplementary farm ditch for each hectare of service area.

ii) About 40 meters of farm drain for each hectare of service area.

2. Rotation Area and Rotation Units

i) The rotation area should not be too long because a long area needs long farm ditches and thus increases conveyance loss and opportunity for water disputes. As a guide therefore, a main farm ditch should not be longer than 1,000 meters and supplementary farm ditch not longer than 500 meters.

ii) As much as possible rotation units within one rotation area should be made equal or nearly equal in areas.

3. Farm Ditches

i) The average distance between supplementary farm ditches in a rotation area is 200 meters.

ii) Main and supplementary farm ditches should be located along tenant or lot boundaries and such location should be selected so that it can irrigate the highest natural ground level in the service area.

iii) There should be one supplementary farm ditch for each rotation unit. However, a common supplementary farm ditch for the two adjacent rotation units, may be constructed depending upon the topography.

iv) To have a permanent visual boundary between rotation units, the supplementary farm ditches should be located along sides of rotation units except when following a ridge line.

v) Main and supplementary farm ditch serving the biggest areas in the rotational area should be designed with

equal capacities and should be with sufficient freeboard to convey water during land soaking and preparation. Other supplementary farm ditches should be designed independently.

vi) For both main and supplementary farm ditches, adopt a base width of either 60 centimeters or 40 cms.

vii) Main Farm Ditch (MFD), wherever practicable will be designed to irrigate on both sides thus serving two rotation blocks of 30-50 has. each with one turnout at the secondary lateral.

viii) Supplementary farm ditches will normally be designed with a variation of two sections, upper half for 60 liters/sec. (5-6 ha.) or 100 liters/sec. (10 has.) and lower half for 30 liters/sec. or 50 liters/sec. capacity. Main farm ditches will have a uniform section for the entire length with designed capacity of 50-100 liters/sec, if serving one block and 120-200 liters/sec if serving two rotation blocks. Berm width will be 0.45 M. for main farm ditch and 0.35 M. for supplementary farm ditch. Outside and inside slopes will be 1:1 for main farm ditch and supplementary farm ditch.

4. Turnouts

i) The location of a turnout is at the inlet of a check structure, although in certain instances, when there is sufficient head and irrigable area is at the downstream side of the structure, it will be more economical to place the turnout at the outlet of a road crossing provided with a check.

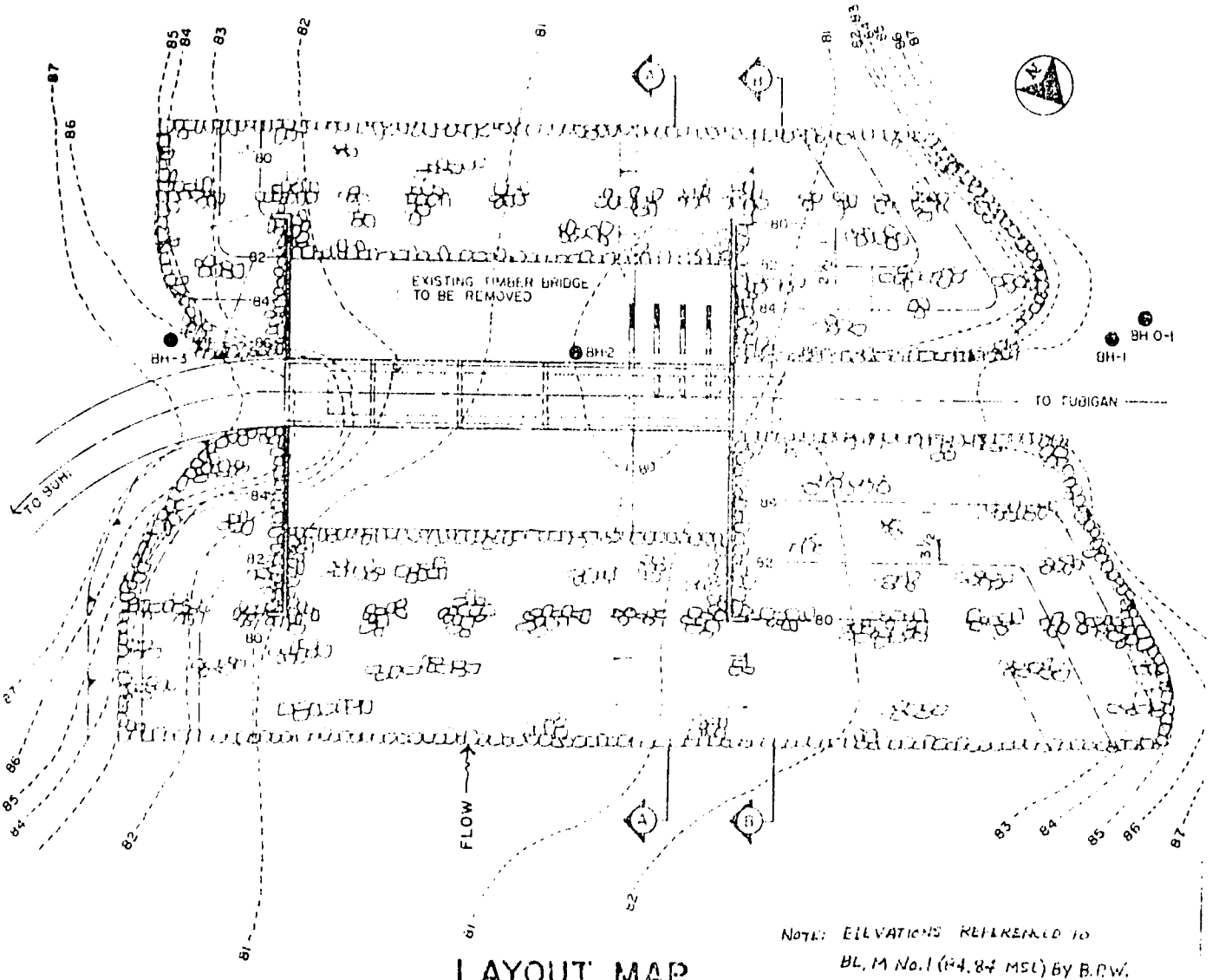
ii) When a turnout is necessary further upstream of a check structure, its operating head is to be based from a water surface elevation equal to the checking height at the structure downstream.

iii) The turnout is to be designed twice the designed discharge of its main farm ditch at normal irrigation to take care of increased flow during peak demand. The size of turnout pipes should depend on available head. The minimum size of turnout pipes for a rotation area not less than 30 hectares is 18 inches in diameter.

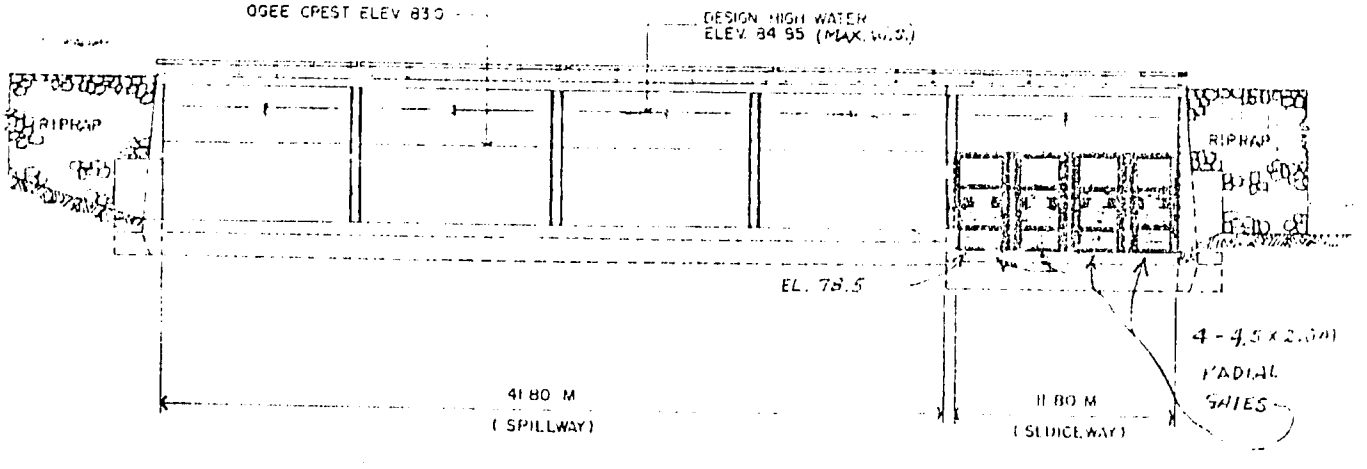
5. Off-Take

The off-take along supplementary farm ditches should be installed at a distance equal to one off-take to every 3 to 3.5 hectares.

# LAKE BUHI REGULATION
# OUTLET CONTROL STRUCTURE
Figure C(1)-14



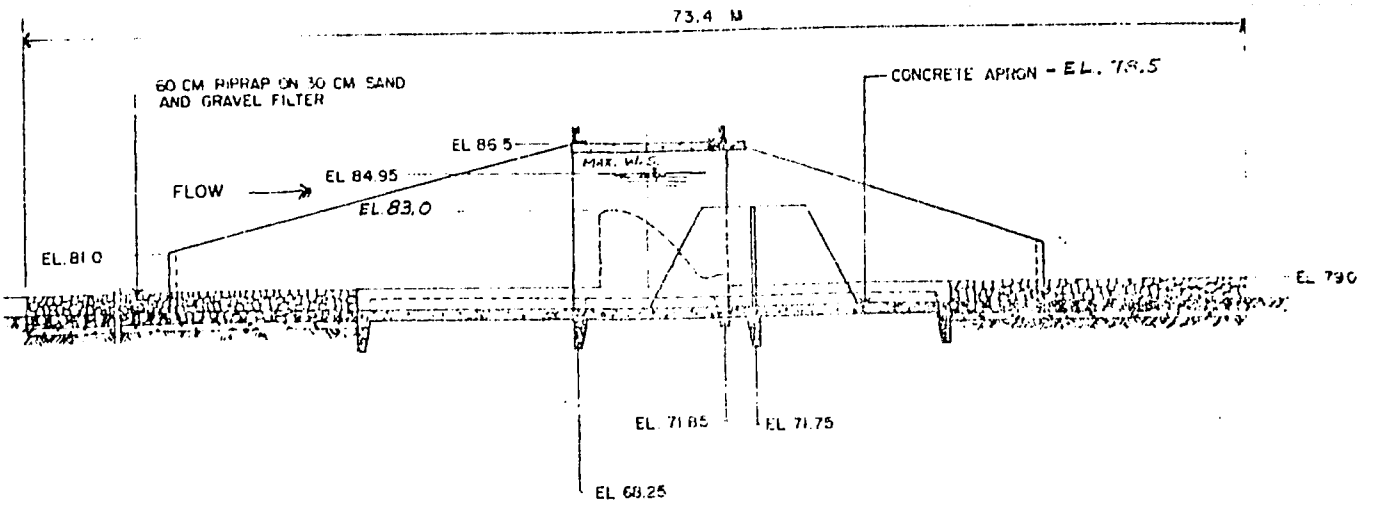

LAYOUT MAP



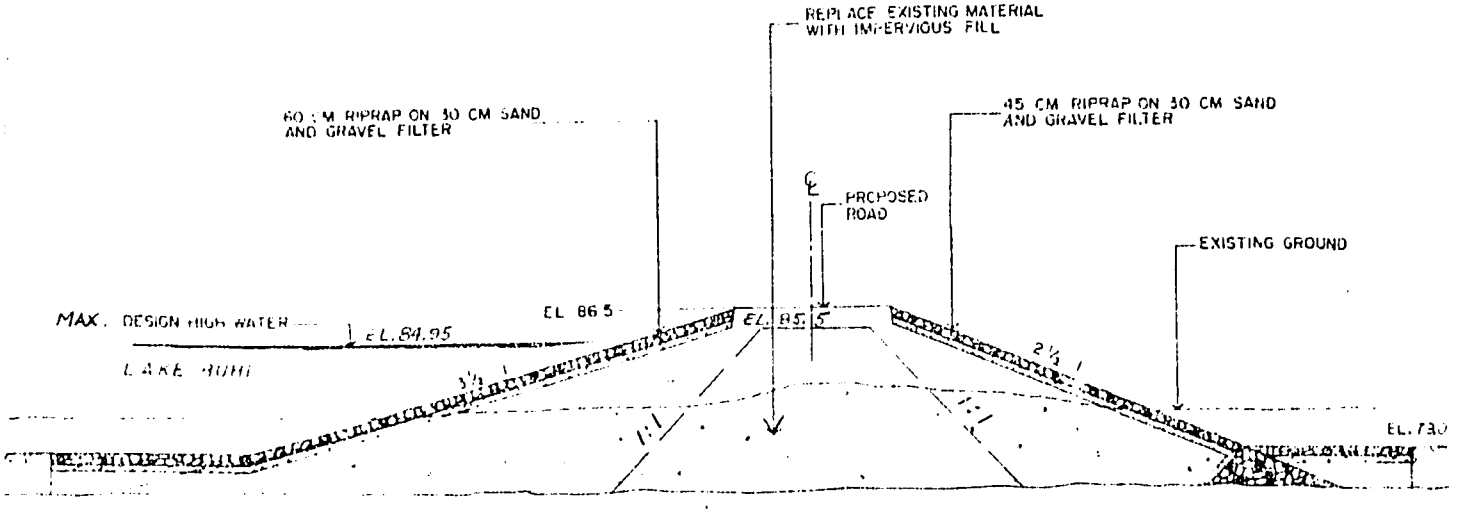

ELEVATION LOOKING DOWNSTREAM

LAKE BUHI REGULATION
OUTLET CONTROL STRUCTURE

Figure G(1)-1

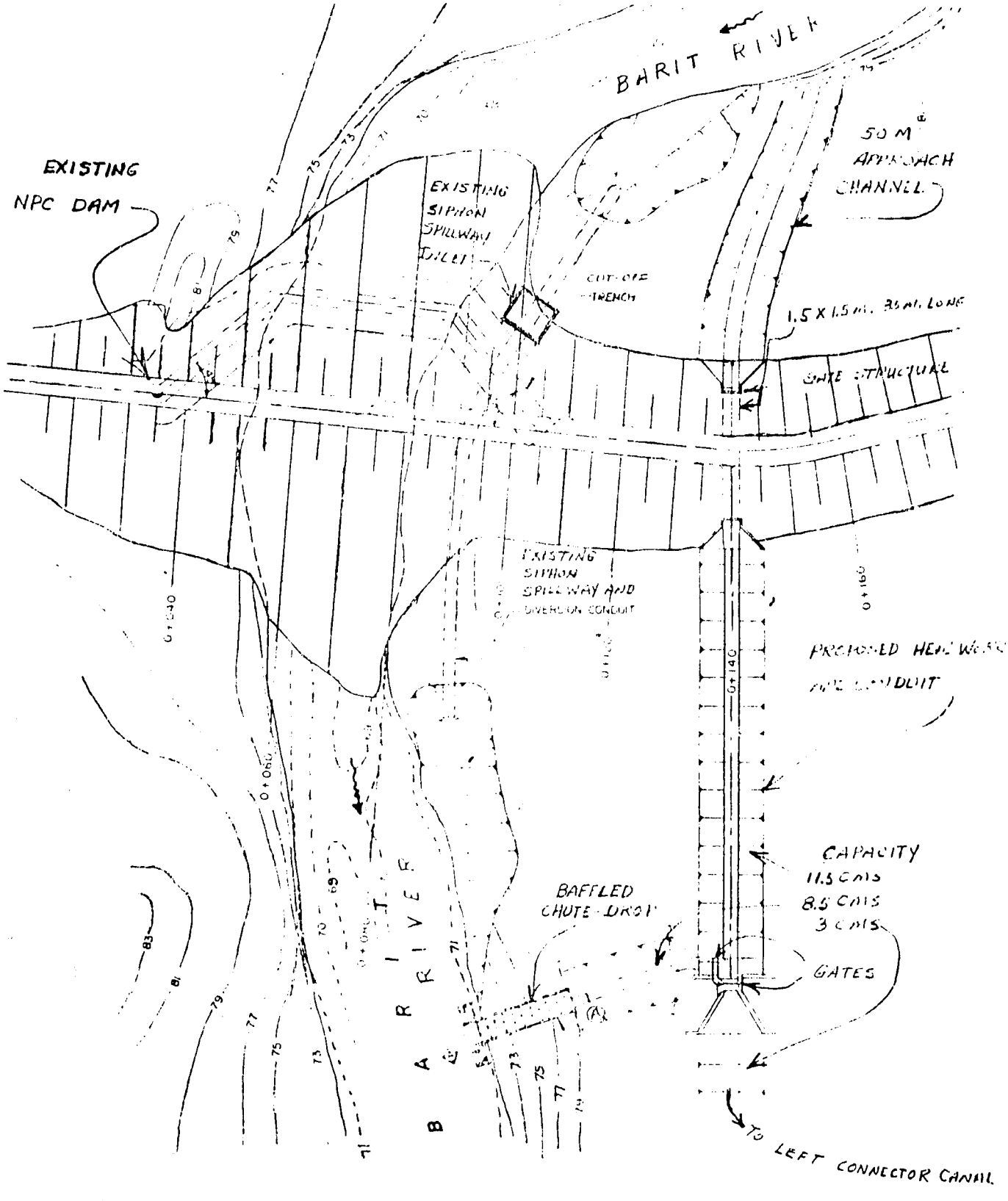



SECTION A-A




SECTION B-B

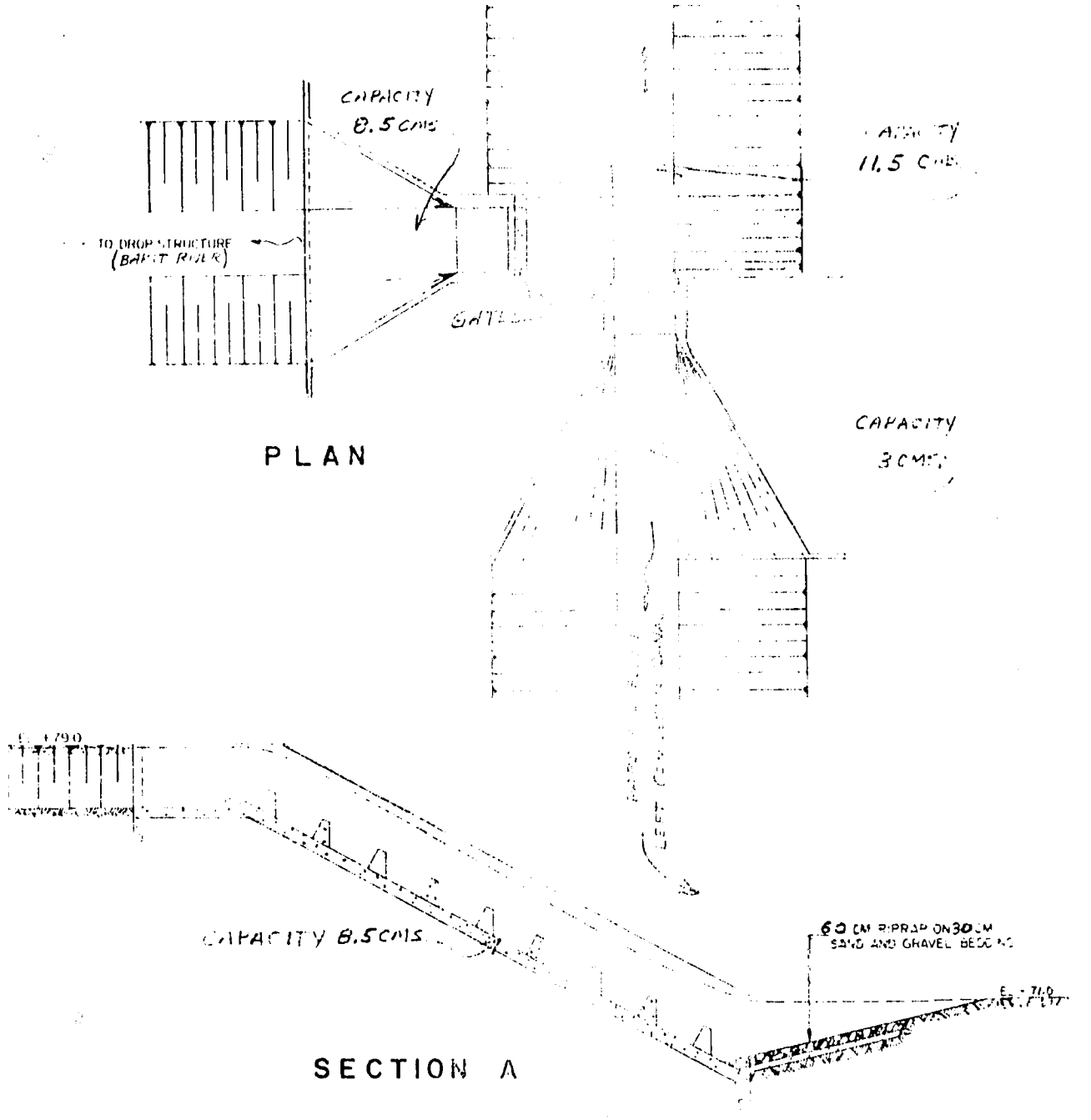
NPC FOREBAY RESERVOIR




SITE DEVELOPMENT PLAN

PROPOSED IRRIGATION
AT NPC WORKS

Figure

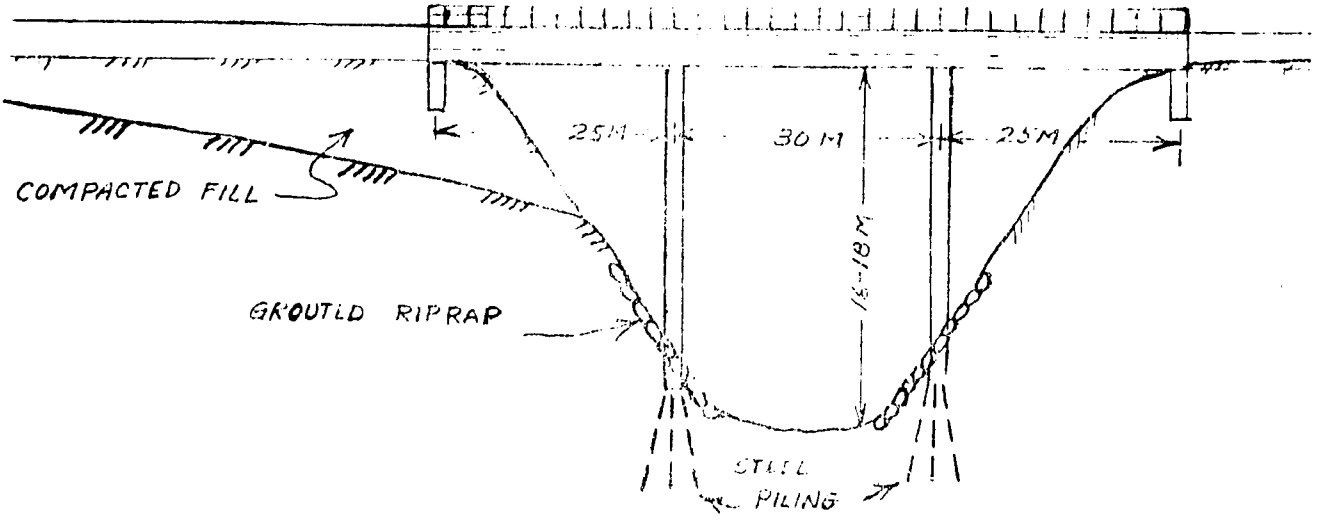



MATERIALS
CONCRETE
REINFORCING STEEL ASTM 615, GRADE 40

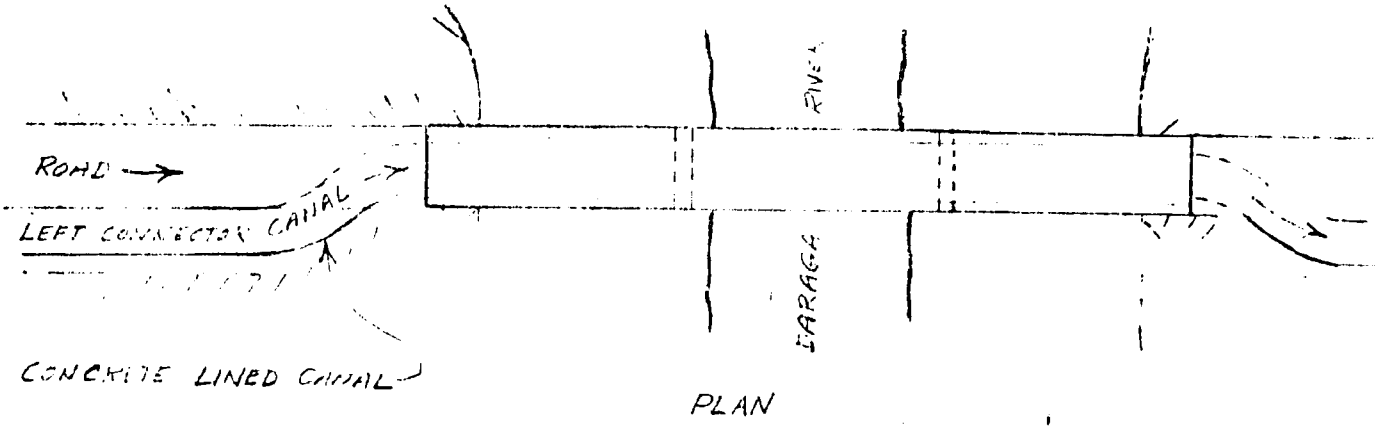
# DARAGA RIVER

# FLUME/BRIDGE CROSSING

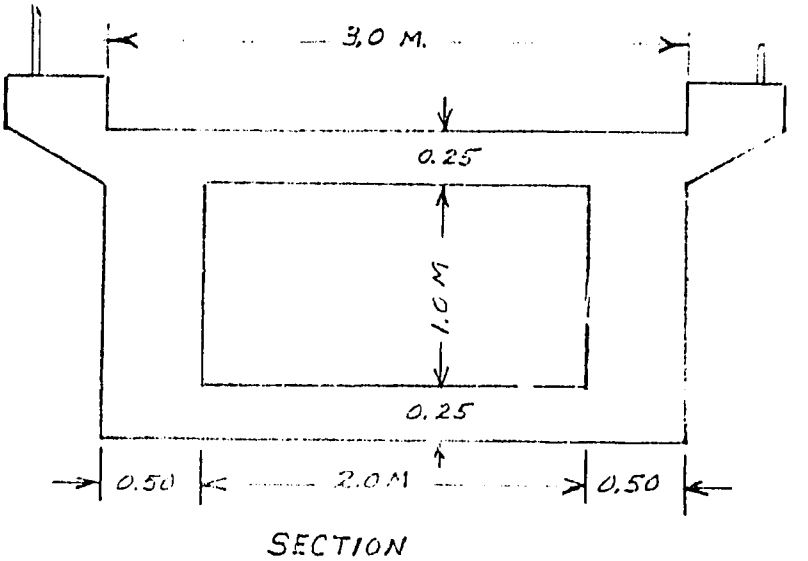
Figure G(1)-18



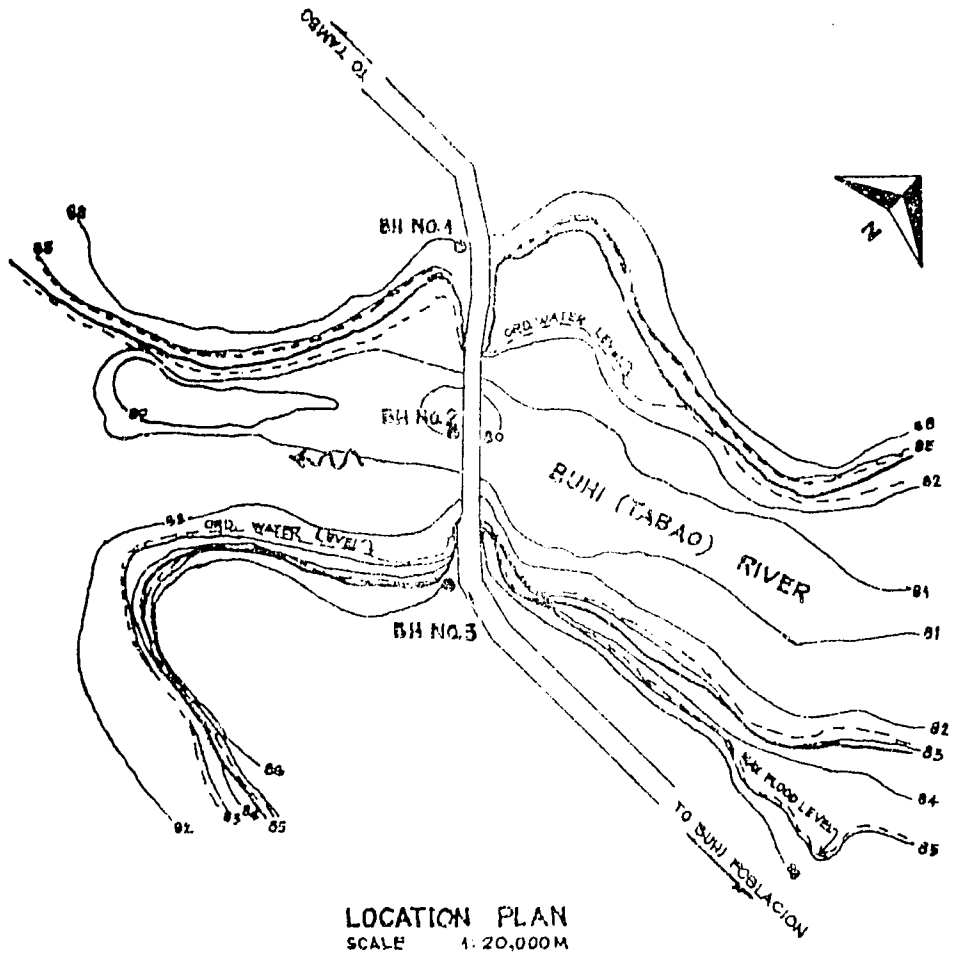

ELEVATION



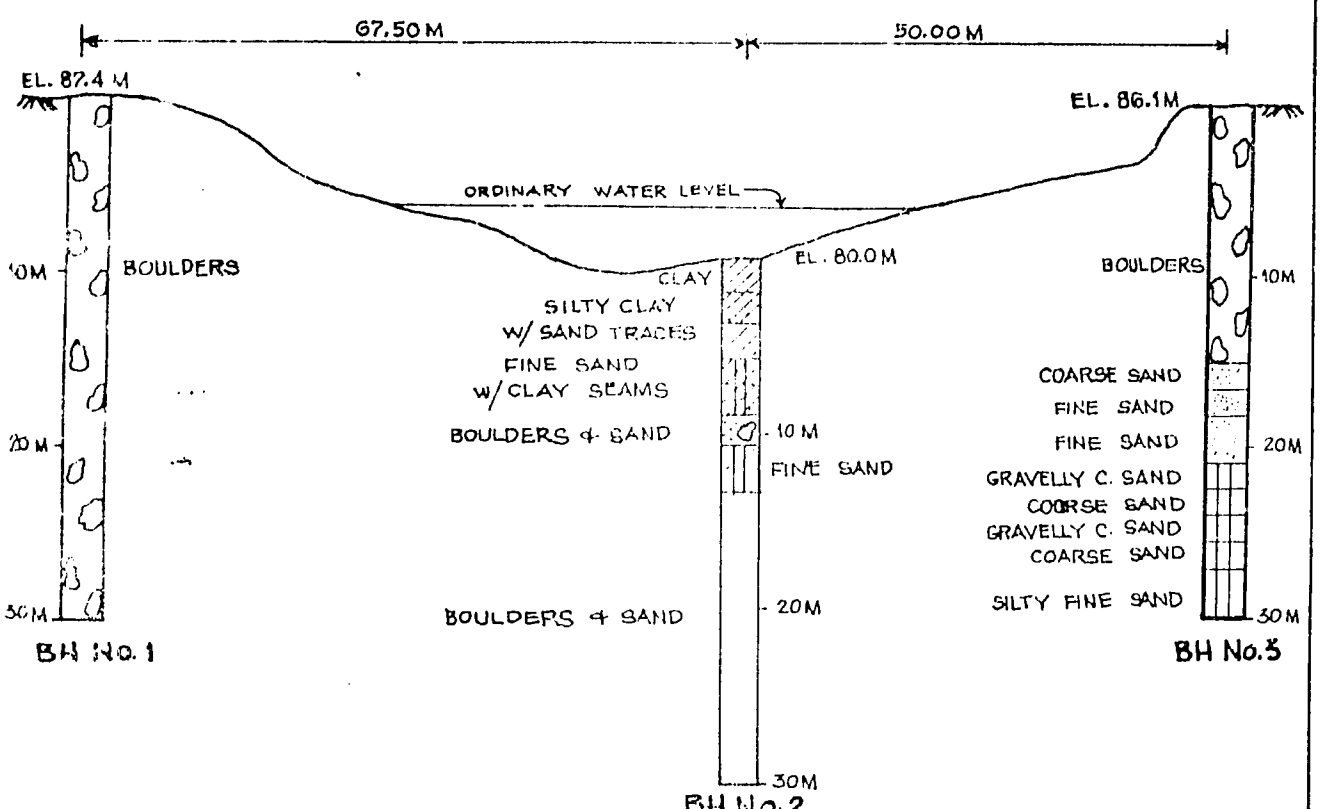

PLAN




SECTION



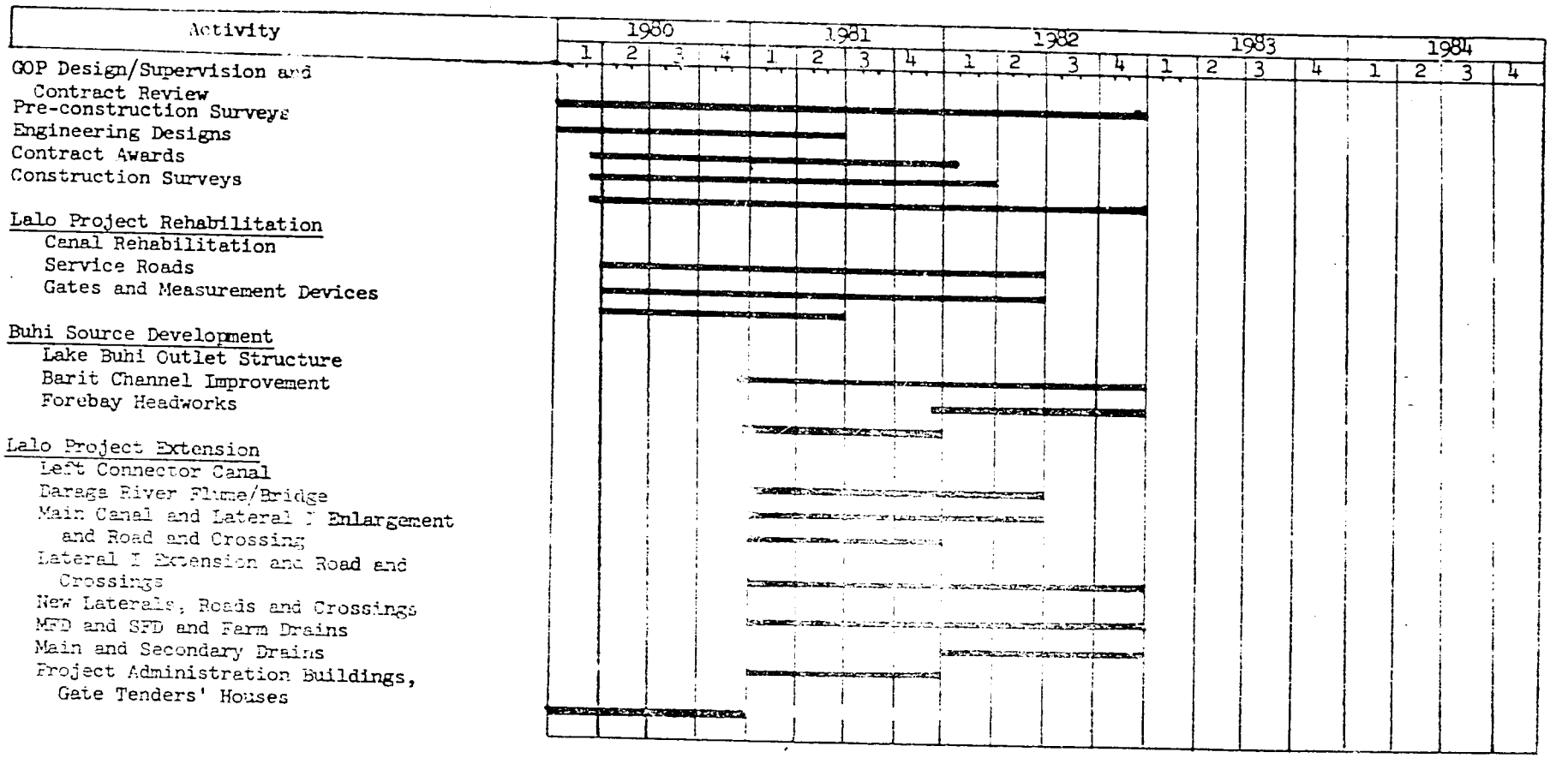

LOCATION PLAN
SCALE 1:20,000M




LAKE BUHI OUTLET CONTROL STRUCTURE
FOUNDATION CONDITIONS
FIG. NO. G(I)19

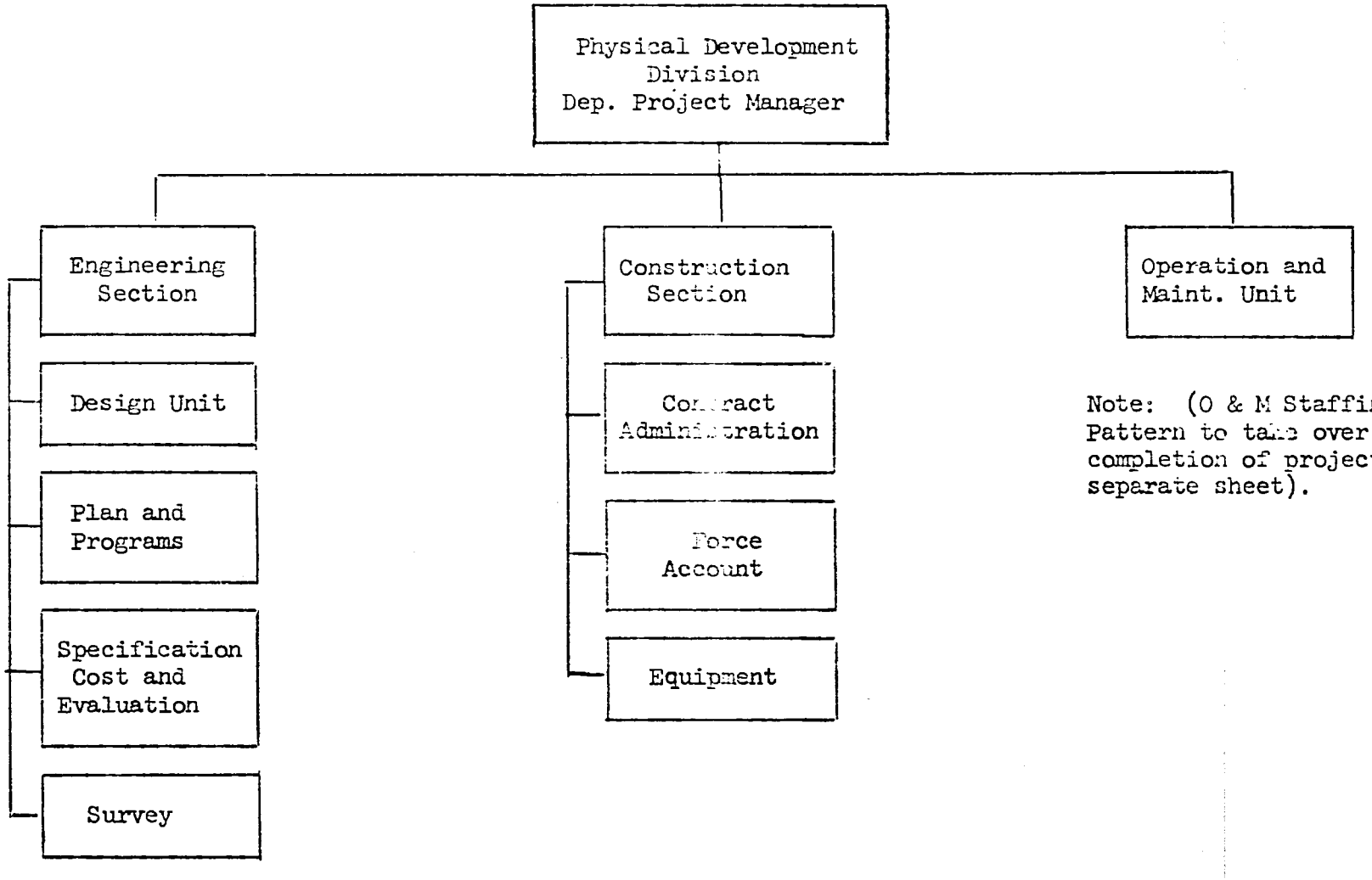
Table G(1)-22

Construction Schedule[1/]
Irrigation Facilities




1/ To be updated as part of detailed Project Implementation Plan

ORGANIZATION CHART
PHYSICAL DEVELOPMENT DIVISION
Buhi-Talo Integrated Development Project




Note: (O & M Staffing Pattern to take over after completion of project - see separate sheet).

**Figure G(1)-20**

# AGRICULTURAL AND INSTITUTIONAL DEVELOPMENT

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I. Farmer Irrigators' Organizations

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IV. Training and Organization of Rural Women

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## I. Farmer Irrigators' Organizations

The new and improved portions of the physical Lalo irrigation system have been designed to support effective water management. However, the organization of farmer beneficiaries, together with both classroom and on-the-job water management training, are equally essential elements in providing adequate and timely water deliveries.

Cognizant of rather limited success to date, the National Irrigation Administration (NIA) has recently adopted a new approach to organizing irrigators' associations. The application of this approach in the rehabilitated and expanded Lalo system is one of the project's primary farm-level institution building activities. NIA's goal is to ensure farmers are institutionally capable of maintaining terminal distribution and drainage facilities and to involve them more meaningfully in project design, construction and the water distribution decisions plus system monitoring/management activities.

In contrast to previous efforts which suffered from large and cumbersome farmer groupings,the basic cell in NIA's new approach is the rotational unit group (RUG). A RUG is composed of 8 to 10 farmers cultivating contiguous parcels, totalling approximately 10 hectares, which would all draw water from the same supplementary farm ditch. The method of water distribution adopted at the national level now calls for the simultaneous supply of water in the main and supplementary farm ditches. However, the distribution of water from the supplementary farm ditch to individual farm parcels is to be rotational. This method of rotational irrigation--a modification of that practiced in Taiwan--has proved the most workable on existing Philippine systems, including those where terminal facilities were designed to follow the strict Taiwanese model. The members of each RUG will be responsible for maintaining their supplementary farm ditch and--with the help of NIA technicians--devising and implementing a mutually satisfactory schedule of water distribution from the supplementary ditch. There will be approximately 280 RUG's formed in the Lalo area, and each will be headed by an elected rotational unit leader. He will be the water management coordinator

Table G(2)-1

Institutional Development
Buhi-Lalo Integrated Development Project

| Organizational Level (Title of Leadership) | Number of Farmers | Relationship to Water Distribution/Management | Primary Function of Organizational Level |
|---|---|---|---|
| Rotational Unit Group (RUG) (unit group leader) | 8 to 10 | Supplementary Farm Ditch (SFD) service area: ± 10 hectares | -Maintenance of SFD<br>-Water distribution from SFD to farm parcels |
| Farmer Irrigators Group (FIG) (chairman) | 40 to 50 | Main Farm Ditch (MFD) service area: ± 50 hectares | -Maintenance of MFD<br>-Water distribution from MFD to SFD's |
| Farmer Irrigators Assoc. (FIA) (president) | 450 to 500 | Area of responsibility of one Water Management Technician/ Watermaster (WMT/WM): ± 500 has. | -Primary organizational unit for facilitating communication between farmers and the NIA irrigation system management office. |
| Federation of Farmer Irrigators Associations (Board of Management) | (a) 2450 (6 FIAs, Lalo system)<br>(b) 7250 (Est. 19 FIAs, all systems to be served partially or fully by the Buhi water source). | (a) The entire Lalo Irrigation system<br>(b) The Rinconada irrigation complex including the Lalo, Barit, Baao and Pili-Bula, and other existing and proposed systems utilize Lake Buhi water. | -Policy and management<br>-Monitor diversion and regulation from forebay, and diversion from Lalo River. |

for his RUG and will represent it in the next higher level organization, the farmer irrigators group (FIG). While all farmers will receive several days of on-site training in farm-level water management, the rotational unit group leader will receive an extra week of special training in water management, leadership, and irrigators association organization at the nearby NIA training facility in La Trinidad, Iriga City. (See discussion of water management training program below).

There are normally about 5 supplementary farm ditches and, hence, the same number of RUGs receiving water from each main farm ditch. The farmer irrigators groups (FIG's) will be organizations of farmers within main farm ditch service areas. About 60 FIG's will be organized in the Lalo project area. Each FIG will be headed by a chairman who is elected by and from among the leaders of the rotational unit groups. The chairman of the FIG automatically becomes a member of the management committee of the next higher organization, the farmer irrigators' association (FIA).

The functions of the FIG correspond to those identified for the RUG. The FIG will maintain the main farm ditch and is charged with delivering the proper amount of water to each supplementary farm ditch turnout.

NIA operation and maintenance staff will operate and maintain the primary source and diversion structures, main canals and laterals. Water Management Technicians/Watermasters (WMT/WM) will be responsible for diverting adequate water from lateral canals through turnouts and into the various main farm ditches. Each WMT/WM will be responsible for about 500 hectares.

A farmer irrigators association (FIA) will have the same area of coverage as a WMT/WM. Each FIA will be organized as a non-stock, non-profit corporate body and will operate under rules and regulations established by NIA. A president will be elected for each FIA, by and from among the FIG chairmen. The presidents of the six FIA's planned for the Lalo system will become members of the Board of Management of the Federation of FIA's to be established at the system-level.

This Board of Management will deal directly with the PMO and other agencies involved in project development, implementation, operation and maintenance. It will be empowered to created committees to deal with grievance and complaints, training, extension and the like. Initially, at least, NIA will hire bill collectors to contact farmers directly and solicit the payment of water fees. There is some speculation that this task could, in time, be transferred to the federation and its component parts.

## II. Water Management Training

Under the project, training will be provided for water management trainers (5), NIA operation and maintenance personnel (38), farmers as end-water-users (2,450), and the rotational unit group leaders (280) of the proposed irrigators associations.

A. Training of Trainers - Five members of the project management staff and coordinating line agencies responsible for water management training will receive 30 days in-depth training in water management and related aspects of irrigated agriculture. It will be conducted at the Upper Pampanga River Irrigation System Water Management Training Center at Central Luzon State

University in Nueva Ecija, where complete training facilities and experienced instructors are available.

A. NIA Operation and Maintenance Personnel - Training for watermasters and gatekeepers will be held twice during the project implementation period. The first session, held in year two, will be given for the watermasters and the gatekeeper presently employed in the existing Lalo system service area. They will receive training in water management principles and the use of new water management measuring devices--Parshal flumes and steel headgates--provided by the project. A second, follow-up session will be held in the fourth-year during the "de-bugging" phase of the newly rehabilitated and expanded system. The original watermasters and gatekeepers will be called back for in-service training together with the additional employees who will operate the Buhi control structure and forebay headworks and be responsible for adequate water deliveries down to the main farm ditch turnouts in the Lalo expansion area. Training will be held on-site and at the nearby NIA Regional Training Facility in La Trinidad.

While farmers will be organized to maintain main and supplementary farm ditches (see Organization of Irrigators Associations above), NIA will be responsible for maintaining the primary source and diversion structures, main and lateral canals. For this purpose, 26 ditchtenders will be hired on a full-time basis for the Lalo irrigation system. These ditchtenders will be given a short course in the practical aspects of the Lalo irrigation system design and operation. This training will be conducted on-site and at the training facility in La Trinidad. A fuller appreciation and understanding of the system will help ensure the quality of their work and improve the ditch-tenders' ability to spot and anticipate malfunctions of the physical system.

C. Farmers as Water Users - An initial two days or more of training will be given for farmers within each barangay affected by the project rehabilitation and extension. This training will begin prior to the formal organization of rotational unit groups and the training of unit group leaders. Farmer training activities will be held during the first two years of the project in the existing Lalo system (1,100 ha.) affected by project rehabilitation activities. Rotational unit groups will be formed in this area and training programs will begin for rotational unit group leaders. Farm level water management training and the organization of irrigators in the extension area will be conducted during the last three years of the project's irrigation component.

Farmer training sessions will provide general information regarding the course of project implementation and construction activities, the rudiments of system design and operation, detailed farm-level water management recommendations, and the responsibilities of farmer as end-water-users. Where feasible, other line agency personnel will be included in barangay level training to teach improved production methods and encourage cooperative credit and marketing efforts. Water management will also become one element of on-going agricultural extension training courses.

D. Rotational Unit Group Leaders - Rotational unit group leaders will receive five days training at the NIA Regional Training Center in La Trinidad with 20 to 30 participants in each training session. Topics covered will include field demonstration and training in water management principles and practices and a

complete description of the proposed irrigators' association structure responsibilities and functions. The training will improve the technical competence of RUG leaders and qualify them for positions in the farmer irrigators groups, farmer irrigators' associations and the federation of FIA's.

E. USAID Technical Assistance - Because of the importance of adequate water management, beginning with proper distribution through the Lake Buhi control structures down to distribution within the system itself and on-farm water management, USAID and the BRBDPO have programmed technical assistance under the Bicol grant project (IRD 492-0303). Assistance includes funding for a U.S. Irrigation Engineer, U.S. farmers' organization specialist, a senior Filipino water management consultant and a senior Filipino engineer for full or part-time over a period of two years. This assistance shall focus on the three Bicol IAD projects with major irrigation components (8,900 ha.) supported by AID loans. It is proposed they will work under the general direction of the NIA Region V Director and be coordinated by the BRBDPO. This technical assistance will support and be fully coordinated with on-going efforts at the PCARR/BPI Regional Research Complex for Soil and Water Development, Farmer Systems Development Corporation (FSDC supported by AID Small Farmers' Systems loans), plus IRRI and Ford Foundation water management support in the Bicol. Third-country training of senior system operational personnel is also proposed in Taiwan or other locations under the Bicol grant project. Observation/OJ Training is also proposed at the more effective irrigation systems in the Philippines

III. Farmers Cooperative Training and Support 1/

Since the inception of the current nation-wide cooperative movement in 1973, one million small farmers have joined their barangay associations (Samahang Nayon) started under the direction of the Ministry of Local Government and Community Development (MLGCD) and the Ministry of Agrarian Reform (MAR). The Samahang Nayon (SN), a pre-cooperative, was originally conceived as an integral part of the support program to land reform beneficiaries. It was recognized that much of the success of agrarian reform would hinge on the evolution of cooperatives to replace the services formerly provided by landlords. While former tenants would no longer have unfair sharing arrangements to contend with, neither would they have the relatively easy access to market assistance and credit from the landlord.

At the apex of the cooperative system designed to provide these services are the provincial level Area Marketing Cooperatives (AMC) and Cooperative Rural Banks (CRB). Both have been established in Camarines Sur Province. These institutions are to be capitalized by the contributions generated at the Barangay level by the SN's. By mid-1977, the SN's in Camarines Sur and Naga and Iriga cities had been able to save some ₱1.7 million through their Barrio Savings and Barrio Guarantee Funds and membership fees. While equity is growing, it will probably be eight to ten years before the AMC's and CRB's

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1/ This discussion is primarily taken from the Samahang Nayon Support Project Proposal for PL-480 Fund use developed by the Agriculture Division of the USAID/Manila Mission.

will be capable of servicing virtually their entire membership.

For this primary cooperative structure to develop according to plan, the organizational base must remain both strong and active. However, at present there is evidence of waning membership in the SN's, largely and understandably because farmers want to "see" something tangible for their contributions.

The project will support the organization and training activities of the SN's located in the 23 barangays affected by the irrigation portion of the Rinconada-Buhi project (see Table G(2)-2). The present SN training program involves an eight-week pre-membership education program and a sixty-five week course administered by the MLGCD covering the gamut of small farmer problems. Under the project, this training will be closely coordinated with NIA and Ministry of Agriculture training and extension activities which emphasize water management and related production, post-harvest handling, and marketing practices.

Additional USAID support of the developing cooperative system in Camarines Sur includes the Cooperative Marketing, Samahang Nayon Development, and Samahang Nayon Support Projects. The Cooperative Marketing Project is a system of technical, managerial, and financial support to expedite the appearance of the province's area marketing cooperative and cooperative rural bank. As a pilot activity, the Samahang Nayon Development Project furnished valuable information to the soon-to-be-realized Samahang Nayon Support Project. It has identified a number of practical SN activities and services which facilitate active and meaningful membership and help develop barangay leadership. One such activity is the construction of simple multi-purpose buildings to serve as group warehouses and meeting places. These structures facilitate farmer training, farm record keeping, the introduction of cottage industries and a feeling of pride among members who constructed, maintain and utilize the structures.

## IV. The Training and Organization of Rural Women

In keeping with the recommendation of a recent study of women in Bicol,[1/] the project will provide for the training and organization of the women in the Buhi-Lalo area. Activities undertaken by the Bureau of Agricultural Extension's "Rural Improvement Clubs" will (1) address the rural women's traditional concerns as homemakers and mothers and (2) support the choice of a transitional mother-worker role.

As housewives, women's concerns pertain to the quality of housing and household possession, the health of family members and access to social services and benefits. It is worth noting here that only 25% of the married women in Bicol have ever visited social service institutions like hospitals, health and family planning centers. The few who are regular members or clients are found among the more urbanized and among working women. This

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1/ Illo, Jeanne Frances I., Involvement by Choice: The Role of Women in Development, Social Survey Research Unit (Naga City), Institute of Philippine Culture, Ateneo de Manila University, Quezon City, 1977.

Table G(2)-2 Affected Barangays and Number of Households[1/]
Buhi-Lalo Integrated Development Project

I. Agro-forestation/Watershed Development Component
(All barangays listed are in Buhi municipality)

A. Lake Buhi Watershed

| | | |
|---|---|---|
| 1. | Burocbusoc | - 150 |
| 2. | Cabatuan | - 163 |
| 3. | De la Fe | - 139 |
| 4. | Fatima (Ipil) | - 119 |
| 5. | Ibayugan | -172 |
| 6. | Igbac | - 135 |
| 7. | Iraya (Del Rosario) | - 235 |
| 8. | Monte Calvario | - 264 |
| 9. | Sagrada Familia | - 331 |
| 10. | Sta. Cruz | - 168 |
| 11. | Tambo | - 316 |

B. Lalo River Watershed

| | | |
|---|---|---|
| 1. | Cagmaslog | - 85 |
| 2. | Del Rosario (Amlongan) | - 60 |
| 3. | Gabas | -120 |
| 4. | Labawon | - 90 |
| 5. | Macaangay | - 84 |
| 6. | Namurabod | - 31 |

II. Lalo Irrigation Component

A. Buhi Municipality

| | | |
|---|---|---|
| 1. | Los Angeles | - 246 |
| 2. | San Francisco | - 111 |
| 3. | Sta. Isabel | - 130 |
| 4. | Sta. Justina | - 524 |
| 5. | San Isidro | - 282 |
| 6. | San Jose Salay | - 139 |

B. Bato Municipality

| | | |
|---|---|---|
| 1. | Masoli | - 234 |
| 2. | Niño Jesus | - 63 |
| 3. | San Miguel | - 215 |
| 4. | San Vicente | - 198 |
| 5. | Agos | - 164 |
| 6. | San Rafael (poblacion) | - 183 |
| 7. | Tres Reyes " | - 198 |
| 8. | Sta. Cruz " | - 342 |

C. Iriga City

| | | |
|---|---|---|
| 1. | San Antonio | -438 |
| 2. | Salvacion | -274 |
| 3. | La Medalla | -239 |
| 4. | Sto. Niño | -517 |

D. Nabua Municipality

| | | |
|---|---|---|
| 1. | Lourdes Young | -308 |
| 2. | Sagrada Palayon | -390 |
| 3. | San Antonio Ogbon | -261 |
| 4. | Lourdes Old | -114 |
| 5. | La Opinion | -544 |

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1/ All or portions of the identified barangays are within the immediate project area. On the average there are 6.2 persons per household and there are an average of 106.2 nuclear families per 100 households. Source: 1975 Integrated Census of the Population and Its Economic Activity, Volume I, Final Report, Phase I, Population: Camarines Sur, Republic of the Philippines, National Economic and Development Authority National Census and Statistics Office, Manila.

percentage would be much lower among the predominately rural and traditional housekeepers in the Buhi-Lalo project area. Organized womens' groups which serve as a means of bringing women together will facilitate the extension of integrated health services and other amenities at the barangay level. Home management training including nutrition, health, sanitation, family planning and child care will also address the more traditional concerns of the area's women.

Likewise, the clubs will serve as centers for developing cottage-industry income generation skills in dressmaking, food preservation, bagmaking and the like. Small-scale business management, particularly as it relates to backyard livestock management and the marketing and distribution of cottage industry products, will also be provided. The organizations themselves will serve as centers for organizing cottage-level enterprises and pre-organization for future barangay day-care centers should the need become manifest. Literacy improvement programs and other types of adult education have already grown out of similar clubs in other locations. Womens' organization and training activities in the Bula-Minalabac project area have proven to be very popular.

V. Intensified Extension and Farm Level Production Trial/Demonstrations

As an incentive for undertaking special assignments in addition to their normal functions, the project will provide reimbursable representation allowances for 34 line agency employees detailed to work in the irrigation project area. Twenty of these will be field technicians of the Ministries of Agriculture (Bureaus of Agricultural Extension, Soils, and Plant Industry), Local Government and Community Development, and Agrarian Reform.

Additionally, the project will support 10 farm-level crop trial/demonstrations. These will determine and exhibit productive combinations of high-yield seed varieties, fertilizers, pesticides, other inputs and practices which complement the new and improved irrigation service. These will provide valuable information for use by agricultural extension agents in their project-related training and extension programs.

VI. Land Tenure Improvement Activities

The project area lies within the Bicol Basin, and therefore is covered by the special covenants relating to the Ministry of Agrarian Reform (MAR) written for the Bicol Secondary and Feeder Roads Project (AID Loan No. 492-T-041). To aid in the identification of all potential land reform beneficiaries, the regional MAR office and the Bureau of Lands have recently begun municipality-wide "carpet mapping" efforts in the Rinconada vicinity. The procedure is time-consuming, but will provide accurate estimates of the amount of work yet required to fulfill Republic Act 3844, Presidential Decree 27 and subsequent implementing instructions. The anticipated increases in target numbers of beneficiaries were considered in the design of the agrarian reform covenants written for the proposed Buhi-Lalo project.

# ORGANIZATIONAL CHART
## BUHI-LALO INTEGRATED DEVELOPMENT PROJECT
## INSTITUTIONAL & AGRICULTURAL DEV'MT. DIVISION

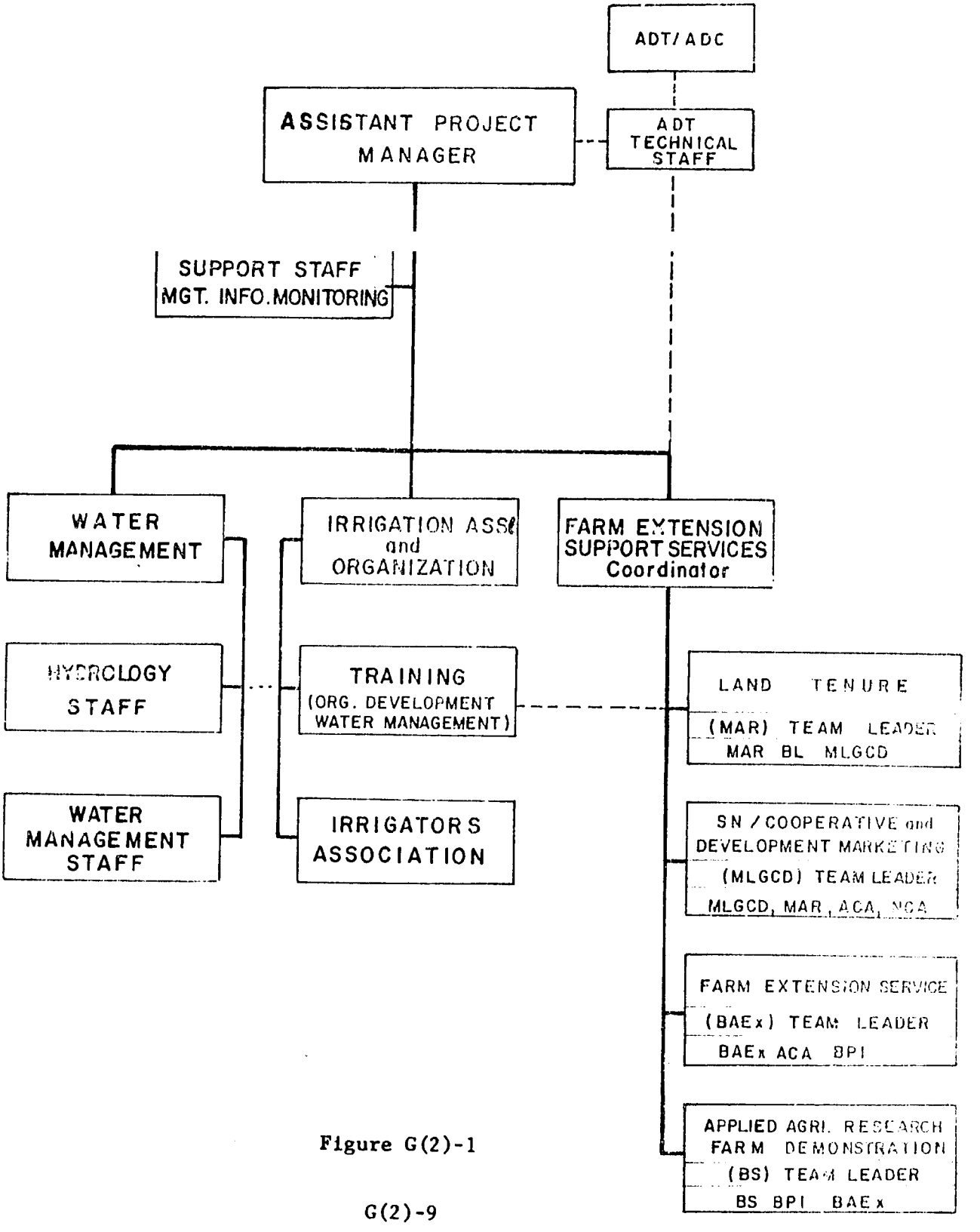


Figure G(2)-1

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Table H-1. Estimated Project Cost by Source of Funding (Financial Plan), Peso Values, Bicol IAD-III (Rinconada-Buhi/Lalo) Project (1000 Pesos)

| Project Component | Total Cost | AID Loan Total | AID Loan LC | AID Loan FX | GOP LC Total |
|---|---|---|---|---|---|
| I. Lake Buhi Water Source Development | 14040 | 10543 | 10543 | | 3497 |
| Lake Buhi Control Structure | 6623 | 4973 | 4973 | | 1650 |
| Barit R. Channel Improvement | 6625 | 4975 | 4975 | | 1650 |
| Forebay Headworks | 792 | 595 | 595 | | 197 |
| II. Lalo Irrigation Construction | 11645 | 8744 | 8744 | | 2901 |
| Left Connector Canal & Lat. I Ext. | 4516 | 3391 | 3391 | | 1125 |
| Daraga R. Flume/Bridge | 1538 | 1155 | 1155 | | 383 |
| Upper Lalo Rehabilitation | 1949 | 1464 | 1464 | | 485 |
| Lalo Ext. Laterals | 2478 | 1861 | 1861 | | 617 |
| Lalo Ext. Steel Gates & Term. Facil. | 637 | 478 | 478 | | 159 |
| Lalo Ext. Main & Secondary Drainage | 527 | 396 | 396 | | 131 |
| III. BMO for Irrigation & Agr. Support | 13369 | 3524 | 936 | 2588 | 9845 |
| Admin. & Physical Dev. Div. | 6069 | | | | 6069 |
| Project Facilities | 1170 | 285 | 285 | | 885 |
| Agr. & Inst. Dev. Div. | 2985 | 418 | 418 | | 2567 |
| O & M Equipment | 2475 | 2475 | | 2475 | |
| First Year O & M | 324 | | | | 324 |
| Impact Evaluation | 346 | 346 | 233 | 113 | |
| IV. Agro-Forestation/Watershed Dev. | 3864 | 2387 | 2387 | | 1477 |
| Land Dev./Tree Planting | 1683 | 1683 | 1683 | | |
| Nurseries | 564 | 564 | 564 | | |
| Training | 250 | 40 | 40 | | 210 |
| Equipment | 98 | | | | 98 |
| Project Mgt. & Extension Services | 1269 | 100 | 100 | | 1169 |
| SUB-TOTAL | 42918 | 25198 | 22610 | 2588 | 17720 |
| Cost Escalation 1/ | 12483 | 7411 | 6597 | 814 | 5072 |
| 15% Contingency | 8310 | 4891 | 4383 | 508 | 3419 |
| PROJECT TOTAL | 63711 | 37500 | 33590 | 3910 | 26211 |

Note: Figures may not add exactly to totals due to rounding.

1/ From 1978 base year prices, local currency costs are escalated by 7%/yr. and imported equipment costs by 15%/yr.

ORD:CSCallison,vbp 1/26/79

Table H-2. Estimated Project Cost, Annual Peso Values: Project Total from All Funding Sources
Bicol LAD-III (Rinconada-Buhi/Lalo) Project (1000 pesos)

| Project Component | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | Sub-Total | Cost Escalation | 15% Contingency | PROJECT TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| I. Lake Buhi Water Source Development | | 4923 | 9117 | | | | 14040 | 3941 | 2697 | 20678 |
| Lake Buhi Control Structure | | 2623 | 4000 | | | | 6623 | 1833 | 1268 | 9724 |
| Barit R. Channel Improvement | | 2000 | 4625 | | | | 6625 | 1887 | 1277 | 9789 |
| Forebay Headworks | | 300 | 492 | | | | 792 | 221 | 152 | 1165 |
| II. Lalo Irrigation Construction | 500 | 5254 | 5890 | | | | 11645 | 3085 | 2210 | 16940 |
| Left Connector Canal & Lateral I Ext. | | 2484 | 2032 | | | | 4516 | 1191 | 856 | 6563 |
| Daraga R. Flume/Bridge | | 700 | 838 | | | | 1538 | 418 | 293 | 2249 |
| Upper Lalo Rehabilitation | 500 | 700 | 749 | | | | 1949 | 463 | 362 | 2774 |
| Lalo Ext. Laterals | | 818 | 1660 | | | | 2478 | 700 | 477 | 3655 |
| Lalo Ext. Steel Gates & Term. Facil. | | 210 | 427 | | | | 637 | 180 | 123 | 940 |
| Lalo Ext. Main & Secondary Drainage | | 342 | 184 | | | | 527 | 134 | 99 | 760 |
| III. PMO for Irrigation & Agr. Support | 5692 | 2584 | 1898 | 1852 | 1111 | 233 | 13369 | 3878 | 2587 | 19834 |
| Admin. & Physical Dev. Div. | 1757 | 2578 | 1337 | 917 | 480 | | 6069 | 1635 | 1156 | 8860 |
| Project Facilities | 700 | 470 | | | | | 1170 | 207 | 207 | 1584 |
| Agr. & Inst. Dev. Div. | 647 | 736 | 561 | 611 | 631 | | 2985 | 951 | 590 | 4526 |
| O & M Equipment | 2475 | | | | | | 2475 | 798 | 491 | 3764 |
| First Year O & M | | | | 324 | | | 324 | 130 | 68 | 522 |
| Impact Evaluation | 113 | | | | | 233 | 346 | 157 | 76 | 579 |
| IV. Agro-Forestation/Watershed Dev. | | 726 | 766 | 825 | 891 | 663 | 3864 | 1579 | 816 | 6259 |
| Land Development/Tree Planting | | 256 | 351 | 399 | 447 | 229 | 1683 | 691 | 356 | 2730 |
| Nurseries | | 97 | 119 | 122 | 126 | 100 | 564 | 232 | 119 | 915 |
| Training | | 50 | 50 | 50 | 50 | 50 | 250 | 102 | 53 | 405 |
| Equipment | | 95 | 1 | 1 | 1 | 1 | 98 | 23 | 16 | 139 |
| Project Mgt. & Extension Services | | 227 | 239 | 253 | 267 | 283 | 1269 | 532 | 270 | 2071 |
| SUB-TOTAL | 6192 | 13487 | 17665 | 2677 | 2002 | 896 | 42918 | | | |
| Cost Escalation 1/ | 1336 | 3035 | 5490 | 1078 | 1002 | 542 | | 12483 | | |
| 15% Contingency | 1129 | 2478 | 3473 | 563 | 451 | 216 | | | 8310 | |
| PROJECT TOTAL | 8657 | 19000 | 26628 | 4318 | 3455 | 1654 | | | | 63711 |

Note: Figures may not add exactly to totals due to rounding.

1/ From 1978 base year prices, local currency costs are escalated by 7%/yr. and imported equipment costs by 15%/yr.

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Table H-3. Estimated Project Cost, Annual Peso Values by Funding Source: AID Loan
Bicol IAD-III (Rinconada-Buhi/Lalo) Project (1000 pesos)

| Project Component | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | Sub-Total | Cost Escalation | 15% Contingency | PROJECT TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| I. Lake Buhi Water Source Development | | 3697 | 6846 | | | | 10543 | 2959 | 2025 | 15527 |
| Lake Buhi Control Structure | | 1970 | 3004 | | | | 4973 | 1376 | 952 | 7302 |
| Barit R. Channel Improvement | | 1502 | 3473 | | | | 4975 | 1417 | 959 | 7351 |
| Forebay Headworks | | 225 | 369 | | | | 595 | 166 | 114 | 875 |
| II. Lalo Irrigation Construction | 375 | 3946 | 4423 | | | | 8744 | 2317 | 1659 | 12720 |
| Left Connector Canal & Lat. I. Ext. | | 1865 | 1526 | | | | 3391 | 894 | 643 | 4928 |
| Daraga R. Flume/Bridge | | 526 | 629 | | | | 1155 | 314 | 220 | 1689 |
| Upper Lalo Rehabilitation | 375 | 526 | 562 | | | | 1464 | 348 | 271 | 2183 |
| Lalo Ext. Laterals | | 614 | 1246 | | | | 1861 | 526 | 358 | 2745 |
| Lalo Ext. Steel Gates & Term. Facil. | | 158 | 321 | | | | 478 | 135 | 92 | 706 |
| Lalo Ext. Main & Secondary Drainage | | 157 | 138 | | | | 396 | 101 | 74 | 571 |
| III. PMO for Irrigation & Agr. Support | 2652 | 173 | 88 | 89 | 89 | 233 | 3524 | 1156 | 703 | 5383 |
| Admin. & Physical Dev. Div. | | | | | | | | | | |
| Project Facilities | | 285 | | | | | 285 | 64 | 52 | 401 |
| Agr. & Inst. Dev. Div. | 64 | 88 | 88 | 89 | 89 | | 418 | 137 | 83 | 638 |
| O & M Equipment | 2475 | | | | | | 2475 | 798 | 491 | 3764 |
| First Year O & M | | | | | | | | | | |
| Impact Evaluation | 113 | | | | | 233 | 346 | 157 | 76 | 579 |
| IV. Agro-Forestation/Watershed Dev. | | 383 | 498 | 549 | 601 | 357 | 2387 | 979 | 505 | 3871 |
| Land Dev./Tree Planting | | 258 | 351 | 399 | 447 | 229 | 1683 | 691 | 356 | 2730 |
| Nurseries | | 97 | 119 | 122 | 126 | 100 | 564 | 232 | 119 | 915 |
| Training | | 8 | 8 | 8 | 8 | 8 | 40 | 16 | 8 | 64 |
| Equipment | | | | | | | | | | |
| Project Mgt. & Extension Services | | 20 | 20 | 20 | 20 | 20 | 100 | 41 | 21 | 162 |
| SUB-TOTAL | 3027 | 8399 | 11855 | 638 | 690 | 590 | 25198 | | | |
| Cost Escalation | 877 | 1890 | 3685 | 257 | 345 | 357 | | 7411 | | |
| 15% Contingency | 585 | 1543 | 2331 | 134 | 155 | 143 | | | 4891 | |
| AID LOAN TOTAL | 4489 | 11832 | 17871 | 1029 | 1190 | 1089 | | | | 37500 |

Note: Figures may not add exactly to totals due to rounding.

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Table H-4. Estimated Project Cost, Annual Peso Values by Funding Source: GOP Unreimbursable Contribution
Bicol IAP - III (Rinconada-Buhi/Lalo) Project (1000 pesos)

| | Project Component | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | Sub-Total | Cost Escalation | 15% Contingency | PROJECT TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I. | Lake Buhi Water Source Development | | 1226 | 2271 | | | | 3497 | 982 | 672 | 5151 |
| | Lake Buhi Control Structure | | 653 | 996 | | | | 1650 | 457 | 316 | 2422 |
| | Barit R. Channel Improvement | | 498 | 1152 | | | | 1650 | 470 | 318 | 2438 |
| | Forebay Headworks | | 75 | 123 | | | | 197 | 55 | 38 | 290 |
| II. | Lalo Irrigation Construction | 125 | 1308 | 1467 | | | | 2901 | 768 | 551 | 4220 |
| | Left Connector Canal & Lat. I Ext. | | 619 | 506 | | | | 1125 | 297 | 213 | 1635 |
| | Daraga R. Flume/Bridge | | 174 | 209 | | | | 383 | 104 | 73 | 560 |
| | Upper Lalo Rehabilitation | 125 | 174 | 187 | | | | 485 | 115 | 91 | 691 |
| | Lalo Ext. Laterals | | 204 | 414 | | | | 617 | 174 | 119 | 910 |
| | Lalo Ext. Steel Gates & Term. Facil. | | 52 | 106 | | | | 159 | 45 | 31 | 234 |
| | Lalo Ext. Main & Secondary Drainage | | 85 | 46 | | | | 131 | 23 | 25 | 189 |
| III. | PMO for Irrigation & Agr. Support | 3040 | 2811 | 1810 | 1763 | 1022 | | 8845 | 2722 | 1881 | 14451 |
| | Admin. & Physical Dev. Div. | 1757 | 1576 | 1337 | 917 | 480 | | 6069 | 1635 | 1156 | 8860 |
| | Project Facilities | 700 | 185 | | | | | 885 | 143 | 155 | 1183 |
| | Ag. & Inst. Dev. Div. | 583 | 448 | 473 | 522 | 542 | | 2567 | 814 | 507 | 3888 |
| | O & M Equipment | | | | | | | | | | |
| | First Year O & M | | | | 324 | | | 324 | 130 | 68 | 522 |
| | Impact Evaluation | | | | | | | | | | |
| IV. | Agro-Forestation/Watershed Dev. | | 343 | 262 | 276 | 290 | 306 | 1477 | 600 | 311 | 2388 |
| | Land Dev./Tree Planting | | | | | | | | | | |
| | Nurseries | | | | | | | | | | |
| | Training | | 42 | 42 | 42 | 42 | 42 | 210 | 86 | 45 | 341 |
| | Equipment | | 95 | 1 | 1 | 1 | 1 | 98 | 23 | 18 | 139 |
| | Project Mgt. & Extension Services | | 207 | 219 | 233 | 247 | 263 | 1169 | 491 | 249 | 1909 |
| | SUB-TOTAL | 3165 | 5088 | 5810 | 2039 | 1312 | 306 | 17720 | | | |
| | Cost Escalation | 459 | 1145 | 1805 | 821 | 657 | 185 | | 5072 | | |
| | 15% Contingency | 543 | 935 | 1142 | 429 | 296 | 73 | | | 3419 | |
| | GOP TOTAL | 4167 | 7168 | 8757 | 3289 | 2265 | 565 | | | | 26211 |

Note: Figures may not add exactly to totals due to rounding.

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Table H-5. Cost of Project Outputs by Source of Funding
Bicol IAD-III (Rinconada-Buhi/Lalo) Project (1000 pesos)

| | Project Output | Magnitude of Output | Total Cost | AID Loan | GOP |
|---|---|---|---|---|---|
| I. | Lake Buhi Water Source Development (water for 8000 ha.) | | 14040 | 10543 | 3497 |
| | Lake Buhi control structure & bridge | 1 | 6623 | 4973 | 1650 |
| | Barit River channel | 1 | 6625 | 4975 | 1650 |
| | Forebay headworks | 1 | 792 | 595 | 197 |
| II. | Lalo Irrigation Construction (2700 ha. irrigated) | | | | |
| | a. Distribution facilities & structures | | 11645 | 8744 | 2901 |
| | Existing main canal rehabilitated | 10 km | 19 | 14 | 5 |
| | Service roads on existing laterals | 27 km | 1765 | 1325 | 440 |
| | Drainage structures in upper Lalo | 6 | 75 | 56 | 19 |
| | Left connector canal, service road & structures | 2 km | 1155 | 867 | 288 |
| | Lateral 1 extension & service road | 7 km | 2778 | 2086 | 692 |
| | Extension area lateral, service road & structures | 21 km | 2197 | 1650 | 547 |
| | Main & supplementary farm ditches | 125 km | 224 | 168 | 56 |
| | On-farm drains | 39 km | 81 | 61 | 20 |
| | Main & secondary drains & structures | 22 km | 645 | 484 | 161 |
| | Parshall flumes | 21 | 60 | 45 | 15 |
| | Turnouts & division boxes | 401 | 261 | 196 | 65 |
| | Gates installed | 401 | 162 | 122 | 40 |
| | Vehicle & pedestrian crossings | 56 | 685 | 514 | 171 |
| | Daraga River flume/bridge crossing | 1 | 1538 | 1155 | 383 |
| | b. Project facilities | | 1220 | 285 | 935 |
| | Administration building | 1 | 200 | | 200 |
| | Equipment building | 1 | 75 | | 75 |
| | Laboratory building | 1 | 75 | | 75 |
| | Compound & improvements | 1 | 250 | | 250 |
| | Improvement of NIA Regional Training Center | 1 | 420 | 210 | 210 |
| | Gatekeepers quarters | 3 | 90 | 45 | 45 |
| | Water management technician working stations | 6 | 60 | 30 | 30 |
| | Communication system | 1 | 50 | | 50 |
| III. | Agricultural & Institutional Development | | 2985 | 418 | 2567 |
| | a. Organizations formed and/or supported | | | | |
| | Rotational Unit Groups (8-10 farmers @) | 280 | | | |
| | Farmer Irrigators Groups (40-50 farmers @) | 60 | | | |
| | Farmer Irrigators Associations (500 farmers @) | 5 | | | |
| | Rural Improvement Clubs | 20 | | | |
| | b. People trained | | | | |
| | Water management trainors | 5 | | | |
| | Watermasters/Gatekeepers | 12 | | | |
| | Ditchtenders | 26 | | | |
| | Rotational unit group leaders | 280 | | | |
| | Farmers: water mgt./production | 2450 | | | |
| | Farmers: cooperatives/credit/mkt | 2450 | | | |
| | Homemakers | 2450 | | | |

Table II-5 Cont.

| Project Output | Magnitude of Output | Total Cost | AID Loan | GOP |
|---|---|---|---|---|
| c. Applied agricultural research | | | | |
| Trials/demonstrations | 10 | | | |
| IV. Agro-forestation/watershed Development | | 2498 | 2287 | 211 |
| Project staff trained | 6 | 46 | | 46 |
| In-service seminars for technicians | 15 | 134 | 40 | 94 |
| Assemblies for farmer organization & training | 30 | 71 | | 71 |
| New area terraced for rice/corn production | 270 ha. | 540 | 540 | |
| New mixed agro-forestry orchards planted | 900 ha. | 632 | 632 | |
| Firewood lots established | 180 ha. | 32 | 32 | |
| Denuded areas reforested | 800 ha. | 844 | 844 | |
| Upland access trails constructed | 40 km. | 200 | 200 | |
| Project Management (not included above) | | 10530 | 2921 | 7609 |
| Irrigation | | 9164 | 2821 1/ | 6343 |
| Agro-forestation/watershed development | | 1366 | 100 | 1266 |
| SUB-TOTAL | | 42918 | 25198 | 17720 |
| Cost Escalation | | 12483 | 7411 | 5072 |
| 15% Contingency | | 8310 | 4891 | 3419 |
| TOTAL | | 63711 | 37500 | 26211 |

Note: Items may not add to totals exactly due to rounding.

1/ ₱2,475,000 for maintenance equipment, the remainder for impact evaluation.

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Table H-6. Water Source and Irrigation Construction Costs

| Input Items | 1981 | 1982 | TOTAL |
|---|---|---|---|
| 1. Lake Buhi Control Structure | 2,623,070 | 4,000,000 | 6,623,070 |
| 2. Barit River Channel Improvement | 2,000,000 | 4 625 000 | 6.625 000 |
| 3. Forebay Headworks | 300,000 | 492 230 | 792,230 |
| 4. Left Connector Canal & Lat. I. Ext. | 2,483,640 | 2,032,070 | 4,515,710 |
| 5. Daraga River Flume/Bridge Structure | 700,000 | 837,500 | 1,537,500 |
| 6. Upper Lalo Rehabilitation | 1,200,000 | 748,780 | 1,948,780 |
| 7. Lalo Extension Laterals | 817,710 | 1,660,200 | 2,477,910 |
| 8. Lalo Ext. Steel Gates & Terminal Fac. | 210,300 | 426,960 | 637,260 |
| 9. Lalo Ext. Main and Secondary Drains | 342,300 | 184,320 | 526,620 |
| TOTAL | 4,633,460 | 20,660,860 | 25,684,080 |

Table H-7. Lake Buhi Control Structure

| ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|
| 1. Demolition of Existing Timber Bridge | Lump sum | | | 16,000 |
| 2. Cofferdam, Dewatering and Temporary Road | Lump sum | | | 100,000 |
| 3. Structure Excavation | cu.m. | 46,000 | 16.20 | 745,200 |
| 4. Impervious Fill | cu.m. | 26,000 | 34.00 | 884,000 |
| 5. 3,000 psi concrete | cu.m. | 2,900 | 930.00 | 2,697,000 |
| 6. Rubble Masonry | cu.m. | 150 | 244.40 | 36,660 |
| 7. Dry Riprap | cu.m. | 3,600 | 61.00 | 219,600 |
| 8. Gravel Blanket | cu.m. | 2,000 | 92.00 | 184,000 |
| 9. Steel Gates | pcs. (4 x 6.4) | 2 | 50,000.00 | 100,000 |
| 10. Bridge Railing | lin.m. | 100 | 160.00 | 16,000 |
| 11. Mobilization, General | | | | 300,000 |
| | DIRECT CONSTRUCTION COST | | | ₱5,298,460 |
| 12. Contractors' Overhead, Profit and Taxes (25%) | | | | 1,324,610 |
| | TOTAL | | | ₱6,623,070 |

Table H-8. Barit River Channel Improvement

| | ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|---|
| 1. | Excavation of Sand& Boulders | cu.m. | 190,000 | ₱ 25.00 | ₱4,750,000 |
| 2. | Rock Excavation | cu.m. | 5,000 | 50.00 | 250,000 |
| 3. | Mobilization, General | Lump sum | | | 300,000 |
| | | DIRECT CONSTRUCTION COST | | | ₱5,300,000 |
| 4. | Contractors' Overhead, Profit, and Taxes (25%) | | | | 1,325,000 |
| | | TOTAL | | | ₱6,625,000 |

Table H-9. Forebay Headworks

| | ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|---|
| 1. | Cofferdam & Dewatering | Lump sum | | | ₱ 15,000 |
| 2. | Common Excavation | cu. m. | 5,000 | ₱ 6.45 | 32,250 |
| 3. | Approach Channel Excavation | cu. m. | 800 | 25.00 | 20,000 |
| 4. | Structure Excavation | cu. m. | 600 | 16.20 | 9,720 |
| 5. | 3,000 psi concrete (structures) | cu. m. | 350 | 930.00 | 325,500 |
| 6. | Additional Reinforcing Steel | kg. | 3,024 | 4.00 | 12,100 |
| 7. | 3,000 psi concrete (canal lining) | cu. m. | 175 | 406.00 | 71,050 |
| 8. | Reinforcing Steel for Canal Lining | kg. | 4,025 | 4.00 | 16,100 |
| 9. | Dry Riprap | cu. m. | 50 | 61.00 | 3,050 |
| 10. | Gravel Blanket | cu. m. | 25 | 92.00 | 2,300 |
| 11. | Rectangular Box Culvert | lin. m. | 35 | 2,009.00 | 70,315 |
| 12. | Rectangular Steel Gates | sq. m. | 11 | 2,400.00 | 26,400 |
| 13. | Mobilization, General | | | | 30,000 |
| | | DIRECT CONSTRUCTION COST | | | ₱633,781 |
| 14. | Contractors' Overhead, Profit, and Taxes (25%) | | | | 158,445 |
| | | TOTAL | | | ₱792,230 |

Table H-10. Left Connector Canal including Lat. I Extension

| ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|
| 1. Right-of-Way | sq.m. | 203,148 | ₱ 1.20 | 243,780 |
| 2. Canal Structures | | | | |
| A. Checks, drops, siphons, etc. | | | | |
| a. 3000 psi concrete | cu.m. | 444 | 930.00 | 412,920 |
| b. Structure Excavation | cu.m. | 1,000 | 16.20 | 16,200 |
| c. R.C. Pipes | | | | |
| a) 18" Ø | lin.m. | 21 | 129.10 | 2,710 |
| b) 24" Ø | lin.m. | 46 | 181.30 | 8,340 |
| c) 36" Ø | lin.m. | 22 | 335.60 | 7,380 |
| d) 42" Ø | lin.m. | 8 | 429.00 | 3,440 |
| e) 48" Ø | lin.m. | 8 | 600.00 | 4,800 |
| B. Parshall Flume | pcs. | 1 | 8,000.00 | 8,000 |
| C. Vehicle crossings | pcs. | 15 | 15,000.00 | 225,000 |
| D. Pedestrian crossings | pcs. | 20 | 10,000.00 | 200,000 |
| E. Drainage, culverts, inlets, overflow | lump sum | | | 150,000 |
| 3. Canalization | | | | |
| a. Clearing & Grubbing | sq.m. | 203,148 | 0.50 | 101,570 |
| b. Common Excavation | cu.m. | 81,170 | 6.45 | 523,550 |
| c. Common Borrow | cu.m. | 31,500 | 6.45 | 203,180 |
| d. Canal lining | cu.m. | 2,000 | 406.00 | 812,000 |
| e. Reinforcing steel for 200m canal Lining adjacent to Daraga R. Flume | kg. | 5,250 | 4.00 | 23,000 |
| 4. Irrigation System Service Roads | km. | 9.26 | | |
| a. Selected borrow | cu.m. | 17,039 | 34.00 | 574,330 |
| b. Gravel Surfacing | cu.m. | 5,556 | 48.00 | 266,690 |
| c. Materials source cost | cu.m. | 22,595 | 2.00 | 45,190 |
| 5. Demolition of Existing Canal Structures | Lump sum | 18 structures | | 32,000 |
| | | | | 3,869,080 |
| | DIRECT CONSTRUCTION COST (Items 1,2, & 5 by Force Account) | | | |
| 6. Contractors' Overhead, Profit, & Taxes (25% of Items 3 & 4) (Item 3; ₱1,663,300; Item 4; ₱923,210 = ₱2,586,510) | | | | 646,630 |
| | TOTAL | | | ₱4,515,710 |

Table H-11. Daraga River Flume & Bridge

| ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|
| 1. Structure complete based upon estimated modification of similar bridge/flume design for Waras and Pawili River Structures for right main canal | lin.m. | 80 | ₱15,375 | ₱1,230,000 |
| | DIRECT CONSTRUCTION COST | | | ₱1,230,000 |
| 2. Contractors Overhead, Profit & Taxes (25%) | | | | 307,500 |
| | TOTAL | | | ₱1,537,500 |

Table H-12. Upper Lalo Rehabilitation

| ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|
| 1. Raising Embankment of Main Canal | cu.m. | 1,300 | ₱ 6.45 | 8,380 |
| 2. 3000 PSI concrete | lin.m. | 20 | 540.00 | 10,800 |
| 3. Parshall Flume | pcs. | 11 | 6,000.00 | 31,000 |
| 4. Headgates | | | | |
| A. Checkgates | pcs. | 10 | 2,200.00 | 22,000 |
| B. Lateral gates | pcs. | 11 | 1,100.00 | 12,100 |
| 5. Main T.O. | unit | 43 | 786.40 | 33,820 |
| 6. R.C.P. for T.O. Extension | unit | 43 | 516.40 | 22,010 |
| 7. Drainage Structures | unit | 4 | | |
| a. 3000 psi concrete | cu.m. | 4 | 930.00 | 3,720 |
| b. 24" Ø R.C. Pipes | lin.m. | 18 | 131.30 | 3,260 |
| c. Common excavation | cu.m. | 5,740 | 6.45 | 37,030 |
| 8. Irrigation System Service Roads | km. | 26.65 | | |
| a. 3000 psi concrete | cu.m. | 30 | 930.00 | 27,900 |
| b. Structure Excavation | cu.m. | 155 | 16.20 | 2,510 |
| c. 12" Ø R.C.P. | lin.m. | 50 | 98.10 | 4,910 |
| d. 18" Ø R.C.P. | lin.m. | 70 | 120.10 | 8,410 |
| e. 24" Ø R.C.P. | lin.m. | 15 | 181.30 | 2,720 |
| f. Common Borrow | cu.m. | 12,920 | 12.50 | 161,500 |
| g. Selected Borrow | cu.m. | 25,517 | 34.00 | 867,580 |
| h. Gravel Surface | cu.m. | 12,245 | 48.00 | 587,760 |
| i. Borrow and Gravel Souece Cost | cu.m. | 50,682 | 2.00 | 101,370 |
| | DIRECT CONSTRUCTION COST | | | ₱1,948,780 |
| | (All items by force account) | | | |

**Table H-13.** Lalo Extension Laterals and Lateral X

| ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|
| 1. Right-of-Way | sq.m. | 223,152 | ₱ 1.20 | 267,780 |
| 2. Canal Structures | | | | |
| A. Check, drops, siphons, etc. | | | | |
| a. 3,000 psi concrete | cu.m. | 254 | 930.00 | 236,220 |
| b. Structure Excavation | cu.m. | 4,770 | 16.20 | 77,280 |
| c. R.C. Pipes | | | | |
| a) 12" Ø | lin.m. | 43 | 98.10 | 4,220 |
| b) 18" Ø | lin.m. | 120 | 129.10 | 15,500 |
| c) 24" Ø | lin.m. | 40 | 131.30 | 7,250 |
| d) 30" Ø | lin.m. | 4 | 246.90 | 1,000 |
| e) 36" Ø | lin.m. | 4 | 335.60 | 1,350 |
| f) 42" Ø | lin.m. | 4 | 429.00 | 1,720 |
| B. Parshall Flumes | pcs. | 9 | 2,000 to 3,000 | 21,000 |
| C. Vehicle Crossings | pcs. | 10 | 15,000.00 | 150,000 |
| D. Pedestrian Crossings | pcs. | 11 | 10,000.00 | 110,000 |
| Canalization | | | | |
| a. Clearing & Grubbing | sq.m. | 223,152 | 0.50 | 111,580 |
| b. Common Excavation | cu.m. | 21,700 | 6.45 | 139,970 |
| c. Common Borrow | cu.m. | 49,400 | 6.45 | 318,630 |
| d. Canal Lining | cu.m. | 180 | 406.00 | 73,080 |
| 4. Lateral Service Roads | | | | |
| a. Common Borrow | cu.m. | 21,538 | 12.50 | 269,230 |
| b. Gravel Surfacing | cu.m. | 6,242 | 48.00 | 299,620 |
| c. Materials Source Cost | cu.m. | 27,780 | 2.00 | 55,560 |
| | DIRECT CONSTRUCTION COST (Items 1 & 2 by force account) | | | ₱2,160,990 |
| 5. Contractors' Overhead, Profit, and Taxes (25% of items 3 & 4) (Item 3: ₱643,260; Item 4: ₱624,410 = ₱1,267,670) | | | | 316,920 |
| | | | | ₱ 2,477,910 |
| | TOTAL | | | ₱ 2,477,910 |

**Table H-14. Lalo Extension Lateral X Steel Gates & Terminal Facilities**

| | ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|---|
| 1. | Gates, Double | Lump sum | 71 | ₱ 1,800.00 | ₱ 127,800 |
| 2. | Main T.O. | unit | 71 | 786.40 | 55,840 |
| 3. | RCP for T.O. Extension | unit | 71 | 516.40 | 36,670 |
| 4. | Sup. T.O. (Division Boxes) | unit | 195 | 576.90 | 112,500 |
| 5. | MFD | km. | 47 | 2,838.00 | 133,390 |
| 6. | SFD | km. | 78 | 1,161.00 | 90,560 |
| 7. | On-farm Drains | km. | 39 | 2,064.00 | 80,500 |
| | | DIRECT CONSTRUCTION COST (All items by force account) | | | ₱ 637,260 |

**Table H-15. Lalo Extension Main and Secondary Drainage**

| | ITEMS | UNIT | QUANTITY | UNIT COST | COST |
|---|---|---|---|---|---|
| 1. | Right-of-Way | sq.m. | 92,475 | ₱ 0.80 | 73,990 |
| 2. | Drain structures culvert and siphon crossings (4 in upper Lalo) | unit | 10 | 7,800.00 | 78,000 |
| 3. | Canalization 16.8 km. | | | | |
| | a. Common Excavation | cu.m. | 46,453 | 6.45 | 299,630 |
| 4. | Anticipated Additional Drains | km | 5 | 15,000.00 | 75,000 |
| | | DIRECT CONSTRUCTION COST (All items by force account) | | | ₱ 526,620 |

Table H-16.

Buhi-Lalo Integrated Development Project
Summary of Yearly Project Costs
Irrigation PMO Administration and Physical Development Division

| YEAR: | 1 | 2 | 3 | 4 | 5 | TOTAL |
|---|---|---|---|---|---|---|
| A. Personnel Services and Allowances | | | | | | |
| 1. Salaries & Wages (Project hired) | 769,700 | 1,055,965 | 906,449 | 635,535 | 309,040 | 3,676,689 |
| 2. GSIS, Insurance Medicare (9.5% of 1) | 73,122 | 100,317 | 86,113 | 60,376 | 29,359 | 349,287 |
| 3. 13th month bonus + Vacation/Sick Leave (16% of 1) | 123,152 | 168,954 | 145,032 | 101,686 | 49,446 | 588,270 |
| 4. Travel Allowances (TEV) | 28,000 | 46,000 | 38,000 | 20,000 | 12,000 | 144,000 |
| 5. Representation Allowances | 14,000 | 17,000 | 17,000 | 12,000 | 12,000 | 72,000 |
| 6. Honoraria | 22,000 | 30,000 | 27,500 | 22,000 | 20,000 | 121,500 |
| B. Supplies & Materials | 39,500 | 55,000 | 34,200 | 24,500 | 18,000 | 171,200 |
| C. POL, Repair & Maintenance | 40,000 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| D. Sundries | 11,500 | [illegible] | 12,500 | 10,500 | [illegible] | [illegible] |
| E. Capital Outlay | | | | | | |
| 1. Office Equipment & Furniture | 411,000 | | | | | 411,000 |
| 2. Admin. Vehicles (6 each) | 225,000 | | | | | 225,000 |
| 3. Project Facilities | 700,000 | 470,000 | | | | 1,170,000 |
| | 2,456,974 | 2,048,436 | 1,336,794 | 916,597 | 479,845 | 7,238,646 |

Table H-17

Buhi-Lalo Integrated Development Project
Irrigation PMO Administration and Physical
Development Division
Salaries & Wages (Project hired)1/

| | Grade | PA Rate | Person-Months | YEAR 1 | 2 | 3 | 4 | 5 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| **I Office of the Project Director** | | | | | | | | | |
| 1 - Secretary | 10 | 11550 | 32 | 9,630 | 12,360 | 13,170 | - | - | 35,160 |
| **II Office of the Project Auditor** | | | | | | | | | |
| 1 - Technical Property Inspector | 12 | 15120 | 60 | 15,120 | 16,130 | 17,270 | 18,480 | 21,170 | 88,170 |
| 1 - Examiner | 11 | 13170 | 28 | 6,000 | 14,110 | 15,120 | - | - | 35,230 |
| 1 - Audit Clerk | 6 | 7320 | 60 | 7,320 | 7,790 | 8,320 | 8,870 | 10,000 | 42,300 |
| **III Office of the Project Manager** | | | | | | | | | |
| 1 - Project Manager | 17 | 29570 | 60 | 29,570 | 31,580 | 33,600 | 36,200 | 41,660 | 171,690 |
| 1 - Stenographer | 8 | 8800 | 60 | 9,800 | 9,400 | 10,000 | 10,750 | 12,360 | 51,390 |
| **III(a) Construction Management Staff** | | | | | | | | | |
| 1 - Supv. Const. Engr. | 14 | 19820 | 44 | 13,200 | 21,160 | 22,640 | 24,250 | - | 81,250 |
| 1 - Supv. Agric. Engr. | 14 | 19820 | 44 | 13,200 | 21,160 | 22,640 | 24,250 | - | 81,250 |
| 1 - Sr. Const. Engr. | 13 | 17270 | 32 | 11,440 | 18,480 | 19,820 | - | - | 49,740 |
| **III(b) Materials Testing Section** | | | | | | | | | |
| 1 - Matl. Testing Supv. | 12 | 15120 | 44 | 10,080 | 16,120 | 17,270 | 18,480 | - | 61,950 |
| 1 - Sr. Matl. Lab. Tech. | 7 | 8320 | 32 | 5,540 | 8,860 | 9,400 | - | - | 23,800 |
| 1 - Matl. Lab. Tech. | 6 | 7320 | 24 | 4,880 | 7,790 | 8,325 | - | - | 20,995 |
| | | Subtotals | | 134,780 | 184,940 | 197,655 | 141,360 | 85,190 | 743,925 |

1/ Increased pay rate of approx. 7%/yr over preceding years - est. start Jan. 1980.

Table H-17 Cont.

| | Grad. | PA Rate | Person-Months | YEAR 1 | 2 | 3 | 4 | 5 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| **III(c) Monitoring & Evaluation Section** | | | | | | | | | |
| 1 - Management Analyst | 10 | 11550 | 42 | 5,770 | 12,360 | 13,170 | 14,110 | - | 45,410 |
| 1 - Economic Researcher | 9 | 10080 | 42 | 4,040 | 10,750 | 11,550 | 12,360 | - | 39,700 |
| **III(d) Administrative Division** | | | | | | | | | |
| 1 - Administrative Asst. II | 13 | 17270 | 60 | 17,270 | 18,480 | 19,820 | 21,160 | 24,250 | 100,980 |
| **III(d)-1 Personnel & Gen. Services Unit** | | | | | | | | | |
| 1 - Personnel Officer I | 11 | 13170 | 56 | 8,780 | 14,110 | 15,120 | 16,120 | 18,480 | 72,610 |
| 1 - Radio Tech. | 8 | 8800 | 18 | 4,400 | 9,400 | - | - | - | 13,800 |
| 1 - Clerk II | 5 | 6910 | 44 | 4,600 | 7,320 | 7,790 | 8,320 | - | 28,030 |
| 1 - Personnel Aide | 5 | 6910 | 56 | 4,600 | 7,320 | 7,790 | 8,320 | 8,860 | 36,890 |
| 1 - Senior Clerk | 7 | 8320 | 56 | 5,540 | 8,860 | 9,400 | 10,000 | 10,750 | 44,550 |
| 4 - Security Guards | 5 | 6910 | 132 | 17,270 | 29,200 | 26,460 | 22,200 | - | 95,210 |
| 1 - Janitor | 1 | 5300 | 56 | 3,530 | 5,700 | 6,110 | 6,510 | 6,910 | 28,760 |
| **III(d)-2 Accounting Unit** | | | | | | | | | |
| 1 - Proj. Accountant | 12 | 15120 | 60 | 15,120 | 16,120 | 17,270 | 18,480 | 21,160 | 88,150 |
| 1 - Bookkeeper | 8 | 8800 | 54 | 4,400 | 9,400 | 10,060 | 10,750 | 12,360 | 46,990 |
| 1 - Acctg. Clerk II | 7 | 8320 | 32 | 5,540 | 8,860 | 9,400 | - | - | 23,800 |
| **III(d)-3 Finance Unit** | | | | | | | | | |
| 1 - Cashier I | 9 | 10080 | 60 | 10,080 | 10,750 | 11,550 | 12,360 | 14,110 | 58,850 |
| 1 - Dist. Officer | 8 | 8800 | 36 | - | 9,400 | 10,080 | 10,750 | - | 30,230 |
| 1 - Clerk II | 5 | 6910 | 24 | - | 7,320 | 7,790 | - | - | 15,110 |
| **III-(d)-4 Procurement & Property** | | | | | | | | | |
| 1 - Supply Officer | 10 | 11550 | 60 | 11,550 | 12,360 | 13,170 | 14,110 | 16,120 | 67,310 |
| 1 - Storekeeper | 5 | 6910 | 48 | - | 7,320 | 7,790 | 8,320 | 8,860 | 32,290 |
| 1 - Canvasser | 5 | 6910 | 32 | 4,600 | 7,320 | 7,790 | - | - | 19,710 |
| 1 - Clerk | 4 | 6510 | 30 | 3,250 | 6,910 | 7,320 | - | - | 17,480 |
| | | Subtotals | | 131,340 | 219,340 | 219,450 | 193,870 | 141,860 | 905,860 |

Table H-17 Cont.

| | Grade | PA Rate | Person Months | Year: 1 | 2 | 3 | 4 | 5 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| **IV Physical Development Division** | | | | | | | | | |
| 1 - Dep. Proj. Manager | 16 | 25800 | 60 | 25800 | 27550 | 29500 | 31580 | 36280 | 150,770 |
| **IV(a) Engineering Section** | | | | | | | | | |
| 1 - Senior Planning Engr. | 13 | 17270 | 36 | 17270 | 18480 | 19820 | - | - | 55,570 |
| **IV(a)-1 Design Unit** | | | | | | | | | |
| 1 - Sr. Design Engr. | 13 | 17270 | 36 | 17270 | 18480 | 19820 | - | - | 55,570 |
| 1 - Design Engr. | 12 | 15120 | 24 | 15520 | 16120 | - | - | - | 31,640 |
| 1 - Hyd./Drainage Engr. | 12 | 15520 | 24 | 15520 | 16120 | - | - | - | 31,640 |
| 2 - Asso. Design Engr. | 11 | 13170 | 48 | 26340 | 28220 | - | - | - | 54,560 |
| 1 - Engr. Trainee | 9 | 10080 | 24 | 10080 | 10750 | - | - | - | 20,830 |
| 2 - CE Draftsman | 7 | 8320 | 48 | 16640 | 17730 | - | - | - | 34,370 |
| **IV(a)-2 Plans & Program Unit** | | | | | | | | | |
| **IV(a)-3 Specs, Cost & Evaluation** | | | | | | | | | |
| 1 - Sr. Cost Engr. | 13 | 17270 | 60 | 17270 | 18480 | 19820 | 21160 | 24250 | 100,980 |
| 1 - Specifications Engr. | 12 | 15120 | 24 | 15120 | 16120 | - | - | - | 31,240 |
| 1 - Cost Analyst | 12 | 15120 | 48 | - | 16120 | 17270 | 18480 | 21460 | 73,330 |
| | | Subtotals | | 176830 | 204170 | 106290 | 71220 | 81990 | 640,500 |

Table H-17 Cont.

| | Grade | PA Rate | Person-Months | Year: 1 | 2 | 3 | 4 | 5 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| **IV(a)-4 Pre-Construction Activities** | | | | | | | | | |
| 1 - Geodetic Engr. | 12 | 15120 | 48 | 15120 | 16120 | 17270 | 18480 | - | 66,990 |
| 4 - Instrument men | 7 | 8320 | 120 | 33280 | 35460 | 18800 | - | - | 87,540 |
| 1 - Tracer | 5 | 6910 | 36 | 6910 | 7790 | 8320 | - | - | 23,020 |
| 1 - Computer | 7 | 8320 | 36 | 8320 | 8865 | 9400 | - | - | 26,585 |
| 12- Survey Aides | 4 | 6510 | 324 | 78120 | 82920 | 21960 | - | - | 183,000 |
| 1 - ROW Negotiators | 7 | 8320 | 56 | 11090 | 17720 | 12530 | - | - | 41,340 |
| **IV(b) Construction Section** | | | | | | | | | |
| 1 - Sr. Const. Engr. | 13 | 17270 | 48 | 17270 | 18480 | 19820 | 21160 | - | 76,730 |
| **IV(b)-1 Contract Adm. Unit** | | | | | | | | | |
| 1 - Sr. Const. Engr. | 13 | 17270 | 48 | 17270 | 18480 | 19820 | 21160 | - | 76,730 |
| 1 - Const. Engr. | 12 | 15120 | 68 | 10080 | 16120 | 17270 | 18480 | - | 61,950 |
| 1 - Asso. Const. Engr. | 11 | 13170 | 66 | 6580 | 14220 | 15120 | 16125 | - | 52,045 |
| 3 - Engr. Trainee | 9 | 10080 | 144 | 10080 | 32250 | 31650 | 12360 | - | 86,340 |
| **IV(b)-2 Forced Account Unit** | | | | | | | | | |
| 1 - Sr. Const. Engr. | 13 | 17270 | 48 | 17270 | 18480 | 19820 | 21160 | - | 76,730 |
| 1 - Const. Engr. | 12 | 15120 | 48 | 15120 | 16720 | 17270 | 18480 | - | 67,590 |
| 1 - Asso. Const. Engr. | 11 | 13170 | 76 | 13170 | 14110 | 15120 | 16120 | - | 58,520 |
| 3 - Engr. Trainee | 9 | 10080 | 144 | 10080 | 32250 | 34674 | 12360 | - | 89,364 |
| **IV(b)-3 Equipment Unit** | | | | | | | | | |
| 1 - Mech. Engr. | 12 | 15120 | 48 | 15120 | 16120 | 17270 | 18480 | - | 66,990 |
| 1 - Mechanic | 7 | 8320 | 48 | 8320 | 8860 | 9400 | 10000 | - | 36,580 |
| 2 - Jr. Mechanic | 6 | 7320 | 54 | 3660 | 15580 | 16640 | - | - | 35,880 |
| 6 - Drivers (Personnel/Utility) | 5 | 6910 | 204 | 20730 | 44360 | 47470 | 16930 | - | 129,490 |
| 1 - Clerk I | 4 | 6510 | 42 | 6510 | 6910 | 7320 | 7790 | - | 28,530 |
| 1 - Serviceman | 1 | 5300 | 30 | 2650 | 5700 | 6110 | - | - | 14,460 |
| | | Subtotals | | 326750 | 447,517 | 303054 | 229085 | | 1,386,404 |

**Table H-18** Cost Derivation Data
PMO Administration and Physical Development Division

| Project Facilities (Force Account Construction) | Cost | |
|---|---|---|
| Administration, Equipment and Laboratory buildings | 350,000 | |
| Compound & improvements | 250,000 | |
| Expansion of (Barit) Regional Training Center | 420,000 | |
| Gatekeepers' quarters (3 each) | 90,000 | |
| Working stations (6 each) Water management technician | 60,000 | |
| | | 1,170,000 |
| **Furniture and Office Equipment** | | |
| 16 Typewriters @ 5,000 | 80,000 | |
| 12 Hand calculators @ 400 | 48,000 | |
| 2 Adding machines @ 3,000 | 6,000 | |
| 4 VHF/SSB tranceivers @ 12,500 | 50,000 | |
| 1 Camera | 12,000 | |
| 1 Copying machine | 40,000 | |
| 1 unit memeograph machine | 25,000 | |
| Furniture & fixtures | 150,000 | |
| | | 411,000 |
| **Personnel Vehicles** (GOP Peso Procurement) | | |
| 3 Jeeps @ 40,000 | 120,000 | |
| 3 Light utility vehicles @ 35,000 | 105,000 | |
| | | 225,000 |
| **POL, Repairs & Maintenance** | | |
| - Gasoline, 6 personnel vehicles only<br>1,000 km/mo = 200 liters/vehicle x 6<br>12 mo. x 5 yrs x 79,000 liters x ₱1.71 = (₱173,120) | 123,000 | |
| - Vehicle Maintenance (Lub., parts, tires, etc)<br>₱350/mo x 12 x 5 yrs x 6 vehicles | 126,000 | |
| | | 249,000 |

Table H-18 Cont

Cost Derivation Data
PMP Administration and Physical Development Division

| | | |
|---|---|---|
| Honoraria (ADT/ADB BRBCC Sub-committee, COA) | | |
| 15 persons x 54 months (over 5 yrs) | | |
| x 150/month | | 121,500 |
| Representation Allowances | | |
| For project director, Legal Officer, Project Manager, BRBDPO Project Coordinator, and Deputy Project Manager, others | | 72,000 |
| Travel Allowances | | |
| Average ₱300/mo x 12 mos x 5 yrs x 2 officers | 36,000 | |
| Average ₱150/mo x 12 mos x 5 yrs x 12 officers | 108,000 | |
| | | 144,000 |

Table H-19 Operation and Maintenance Costs

| I. Operation and Maintenance Activities | Present O&M Costs in Unrehabilitated Upper Lalo 1978 (est.) (1100 ha.) | "Debugging" of Extension Area 1983 1/ (1600 ha.) | O&M Costs 1984-2004 (2700 - 3000 ha.) |
|---|---|---|---|
| A. Personnel Services & Allowances 2/ | | | |
| 1. Salaries & Wages | ₱ 198,140 | ₱ 216,990 | ₱ 444,260 |
| 2. GSIS, Insurance, Medicare (9.5% of 1) | 18,820 | 20,614 | 42,205 |
| 3. 13th Mo. Bonus & Vacation/ Sick leave (16% of 1) | 31,700 | 34,718 | 71,082 |
| 4. Travel Allowances (TEV) 3/ | 1,800 | 1,800 | 1,800 |
| B. Supplies & Materials | 11,630 | 17,000 | 40,000 |
| C. POL, Repair & Maintenance 3/ | 23,760 | 24,912 | 77,116 |
| D. Sundries | 5,000 | 8,000 | 21,000 |
| Subtotal | ₱ 290,850 | ₱ 324,034 | ₱ 697,463 |
| Plus contingency (15%) | 43,628 | 48,605 | 104,619 |
| TOTAL | ₱ 334,478 | ₱ 372,639 | ₱ 802,082 |

II. Annual Incremental O&M Costs (considered in the project's economic analysis)

| | |
|---|---|
| With-project O&M costs | ₱ 802,068 |
| Less Without-project O&M costs | - 334,478 |
| Incremental O&M costs | ₱ 467,590 |

III. 25% of Operations and Maintenance Equipment Expenditure incurred in 1980, 1992, and 2001 (Considered in the project's economic analysis)

| | | |
|---|---|---|
| 25% of ₱2,475,000 | = | ₱618,750 |
| + contingency (15%) | | 92,813 |
| | | ₱711,563 |

1/ O&M costs incurred during the one-year "debugging" period following the completion of construction activities are considered a direct project cost.
2/ Drawn from Table H-20
3/ Drawn from Table H-21

**Table H-20.** Personnel Services (Salaries & Wages)
Annual Irrigation System Operation and Maintenance

A. 1-Year "Debugging" Period (Extension Area only, 1600 ha.)

| | Grade | PA Rate | Total |
|---|---|---|---|
| 1 - Irrig. Superintendent | 11 | 16120 | ₱ 16,120 |
| 3 - Watermasters | 9 | 12360 | 37,080 |
| 3 - Gate Keepers 1/ | 6 | 8860 | 25,580 |
| 14 - Ditchtenders | 5 | 8320 | 116,480 |
| 3 - Drivers (personnel/utility) | 5 | 6970 | 20,730 |
| | Total | | ₱ 216,990 |

B. Post-Project (Entire Area 2700-3000 ha.)

| | | | |
|---|---|---|---|
| 1 - Irrig. Superintendent | 11 | 18480 | ₱ 18,480 |
| 6 - Watermasters | 8 | 12360 | 74,160 |
| 3 - Gate Keepers 1/ | 6 | 10000 | 30,000 |
| 26 - Ditchtenders | 5 | 8860 | 230,360 |
| 2 - Billing Clerks | 5 | 8860 | 17,720 |
| 1 - Bill Collector | 6 | 10000 | 10,000 |
| 1 - Security Guard | 5 | 8860 | 8,860 |
| 1 - Clerk | 4 | 8320 | 8,320 |
| 4 - Drivers (personnel/utility) | 5 | 6910 | 27,640 |
| 1 - Mechanic | 7 | 8320 | 8,320 |
| 5 - Heavy Equipment Operators (Quarter-time) | 7 | 8320 | 10,400 |
| | Total | | ₱ 444,260 |

1/ One senior gatekeeper to operate and perform routine maintenance on the Buhi Control Structure and Forebay Headworks.

**Table H-21.** Annual Irrigation System Operation and Maintenance (Cost Derivations)

| | |
|---|---|
| Travel Allowances | ₱ 1,800 |

₱150/month x 1 irrigation superintendent x 12 months

| | |
|---|---|
| POL, Repair and Maintenance | ₱77,116 |

4 Personnel utility vehicles

- Gasoline
  1,000 kms/month = 200 liters/vehicle
  200 liters x 12 months
  x 4 vehicles = 9,600 liters
  x ₱1.71/liter = ₱16,416

- Vehicle Maintenance (lubrication, tires, spare parts, etc.)
  ₱350/month x 12 months x 4 vehicles = ₱16,800

Subtotal for "debugging" period = (16,416 + 16,800) .75 = ₱24,912

Heavy Equipment

- Fuel
  10 liters/hr x 8 hr/day
  x 65 days (Quarter-time)
  x 5 pieces of equipment
  x ₱1.40/liter = ₱36,400
- Equipment Maintenance (lubrication, tires, etc.)
  One-quarter share of ₱6,000/yr x 5 pieces of equipment = ₱7,500

| | |
|---|---|
| Vehicle and O&M Equipment Sinking Fund Requirement (Considered in the determination of project area water fees) | ₱ 53,955 |

The project will provide the first set of O&M vehicles and equipment. Assuming 12 percent interest can be earned on funds set aside each year, the annual allotment to replace the vehicles and equipment listed below every 8 years at a cost of ₱663,625 is ₱53,955.

| | | (Estimated 1978 prices) |
|---|---|---|
| Full-time for Lalo irrigation system use | | |
| 2 jeeps | | ₱ 80,000 |
| 2 pick-up trucks | | 176,000 |
| | Subtotal | ₱256,000 |
| Quarter-time for Lalo irrigation system use | | |
| 1 tractor, D-6 | | ₱525,000 |
| 1 wheel loader, 1.76 cm | | 157,500 |
| 1 dump truck, 6-ton | | 262,500 |
| 1 grader, 115-125 H.P. | | 389,250 |
| 1 backhoe, .3-.45 cm | | 262,500 |
| 2 concrete mixers, 1-bag | | 15,000 |
| 1 welding machine | | 18,750 |
| | Subtotal | ₱1,630,500 |
| | x .25% | 407,625 |
| | TOTAL | ₱ 663,625 |

**Table H-22.** Operation and Maintenance Equipment[1/]
(Dollar Funded from AID Loan)
Buhi-Lalo Integrated Development Project

| | $ Unit Price | Number Required | $ Total |
|---|---|---|---|
| A. New Procurement[2/] | | | |
| Tractor, D-6 | 70,000 | 1 | 70,000 |
| Wheel loader, 1.76 cm. | 21,000 | 1 | 21,000 |
| Dump trucks, 6 ton | 35,000 | 1 | 35,000 |
| Grader, 115-125 H.P. | 51,900 | 1 | 51,900 |
| Backhoe, wheel mounted .3-.45 c.m. | 35,000 | 1 | 35,000 |
| Pickup, 1 ton | 10,400 | 2 | 20,800 |
| Jeeps, serve 4 WD | 7,400 | 2 | 14,800 |
| Concrete Mixers, 1 bag | 1,000 | 2 | 2,000 |
| Welding Machine, 250 amp. | 2,500 | 1 | 2,500 |
| | Subtotal | | 253,000 |
| Spare parts (15%) | | | 37,950 |
| | Rounded Estimate | | $ 291,000 |
| B. U.S. Government Excess Property Equipment/Furniture | | | 39,000 |
| | TOTAL | | 330,000 |
| | | | (₱2,475,000) |

1/ The first five items will be supported by the NIA Regional V Maintenance Equipment Pool in Naga City, but will be specifically assigned for O & M of the larger Buhi Lake-Barit River NIA Irrigation Complex (est. 12,000 ha by 1985). One-fourth POL/operation is costed to the project, 3/4 from the Regional Pool. All O&M costs of the pick-ups and jeeps are costed to the Project. Project-provided plus other NIA Regional Pool equipment will be assigned to the Project for system maintenance and repairs as required. List is illustrative only.

2/ Where satisfactory units are not available from U.S. excess sources.

Table H-23. Agricultural/Institutional Development Division
Buhi-Lalo Integrated Development Project
(₱1000)

| Item | Year: 1 | 2 | 3 | 4 | 5 | TOTAL |
|---|---|---|---|---|---|---|
| A. Personnel Services & Allowances | 432 | 455 | 480 | 507 | 536 | 2409 |
| Salaries & Wages | 265 | 283 | 303 | 324 | 347 | 1521 |
| GSIS, Insur., Medicare 1/ | 25 | 27 | 29 | 31 | 33 | 145 |
| 13th Mo. Bonus & Leave 2/ | 42 | 45 | 48 | 52 | 56 | 243 |
| Travel Allowances (TEV) | 13 | 13 | 13 | 13 | 13 | 65 |
| Representation Allowances | 7 | 7 | 7 | 7 | 7 | 36 |
| Sr. Staff Honoraria | 16 | 16 | 16 | 16 | 16 | 81 |
| Line Agency Technicians Allowances | 64 | 64 | 64 | 64 | 64 | 318 |
| B. Supplies & Materials | 10 | 10 | 10 | 10 | 10 | 50 |
| C. POL, Repair & Maintenance | 25 | 25 | 25 | 25 | 25 | 125 |
| D. Sundries | 5 | 5 | 5 | 5 | 5 | 25 |
| E. Vehicles & Equipment | 172 | | | | | 172 |
| Lab & Training Equip. | 50 | | | | | 50 |
| Vehicles 3/ | 105 | | | | | 105 |
| Office Equipment | 17 | | | | | 17 |
| F. Farmer Training (in Barangays) | | 31 | 32 | 44 | 43 | 150 |
| Water Management/Production | | 23 | 23 | 32 | 32 | 110 |
| Cooperatives/Farmer Groups/Homemaker Clubs | | 8 | 9 | 12 | 11 | 40 |
| G. Water Mgt. Technician Training (in Center) | 3 | 10 | 9 | 20 | 12 | 54 |
| Water Mgt. Technologists 4/ | 3 | | | | | 3 |
| Watermasters & Gatekeepers 5/ | | 1 | | 4 | | 5 |
| Ditchtenders 6/ | | | | 4 | | 4 |
| Rotational Unit Group Leaders 7/ | | 9 | 9 | 12 | 12 | 42 |
| TOTAL | 647 | 536 | 561 | 611 | 631 | 2985 |

1/ 9.5% of salaries & wages.
2/ 16% of salaries & wages.
3/ 3 personnel vehicles @ ₱35,000
4/ 5 trainees for 1 mo. at ₱500/mo.
5/ 14 trainees (3 of them twice) for 15 days at ₱30/day
6/ 26 trainees for 5 days at ₱30/day.
7/ 250 trainees for 5 days at ₱30/day.

**Table H-24.** Personnel Services (Salaries and Wages)
Institutional & Agricultural Development Division

| Administrative/Supervisory | Grade | PA Rate 1/ | Year I |
|---|---|---|---|
| 1 - Deputy Proj. Mgr. | 16 | 25,804 | 25,804 |
| 1 - Secretary | 8 | 13,803 | 18,803 |
| 1 - Clerk II | 5 | 6,916 | 6,916 |
| 1 - Clerk I | 4 | 6,513 | 6,513 |
| 1 - Illustrator (Training) | 6 | 7,320 | 7,320 |
| 1 - Draftsman (Farm Plans) | 5 | 6,916 | 6,916 |
| 2 - Utilitymen | 1 | 5,304 | 10,608 |
| 1 - Driver/Mechanic (Pool) | 7 | 8,328 | 8,328 |
| 2 - Drivers (Pool) | 5 | 6,916 | 13,838 |
| **Mgt. Information & Monitoring** | | | |
| 1 - Agric. Econ. Specialist | 13 | 17,270 | 17,270 |
| 1 - Research Asst. (Sociologist | 11 | 13,171 | 13,171 |
| 1 - Research Aide | 5 | 6,916 | 6,916 |
| **Water Management** | | | |
| 1 - Sr. Irrigation Engineer | 13 | 17,270 | 17,270 |
| 1 - Hydrologist | 13 | 17,270 | 17,270 |
| 3 - Water Mgt. Technologist | 8 | 8,803 | 26,409 |
| **Irrig. Asso. Orgn. & Dev.** | | | |
| 1 - Inst'l Dev. Specialist | 13 | 17,270 | 17,270 |
| 1 - Agric. Extension Specialist | 13 | 17,270 | 17,270 |
| 1 - Agric. Training Officer | 12 | 15,120 | 15,120 |
| 1 - Agriculturist | 10 | 11,558 | 11,558 |

| | | |
|---|---|---|
| Total Estimated Project Hire Personnel Requirements | Year 1 | 264,570 |
| | Year 2 | 283,090 2/ |
| | Year 3 | 302,906 2/ |
| | Year 4 | 324,110 2/ |
| | Year 5 | 346,797 2/ |
| | Salaries & Wages Total | 1,521,473 |

1/ Rate beginning Jan. 1980
2/ Includes annual step increases of 7% over preceding year.

Table H-25. Institutional/Agricultural Development Division
(Cost Derivations)

| | | | |
|---|---|---|---|
| **Travel Allowances** | | | |
| ₱150/month x 7 officers x 12 months x 5 years | | | ₱ 65,000 |
| **Representation Allowances** | | | |
| For Deputy Project Manager and 3 section heads | | | |
| ₱150/mo x 12 months x 5 years x 4 key persons | | | ₱ 36,000 |
| **Office Equipment** | | | |
| 4 hand calculators w/adaptors | (₱400) | ₱ 1,600 | |
| 3 typewriters | (₱5,000) | 15,000 | |
| | | | ₱ 16,600 |
| **Farmer Training Costs** | | | |
| - Following each of three 7-10 day training sessions of farmers and homemakers, an allowance of ₱10 per family for incidental training costs. 2450 families x 3 sessions x ₱10 = | | 73,500 | |
| - Handouts and training materials, etc. | | 76,500 | |
| | | | ₱150,000 |
| **POL and Vehicle Maintenance** | | | |
| - Gasoline - 3 personnel vehicles x 5 years | | | |
| 1,000 kms/month = 200 liters/vehicle | | | |
| 200 liters x 12 months x 5 years x 3 vehicles = 36,000 liters x ₱1.71/liter = ₱61,560) | | 62,000 | |
| - Vehicle maintenance (lubrication, tires, spare parts, etc.) | | | |
| ₱350/month x 12 months x 5 years x 3 vehicles | | 63,000 | ₱125,000 |

Table H-25.

Line Agency Personnel Allowance[1/]
Institutional and Agricultural Development

Senior Line Agency Personnel (On call/consultation basis

| | Technical Staff (₱150 x 12 months = ₱1,800) | Agency | Per Year | Duration | Total |
|---|---|---|---|---|---|
| 1 | Agrarian Reform Specialist | MAR | ₱ 1,800 | 5 | ₱ 9,000 |
| 1 | Cooperative Development Specialist | MLGCD | 1,800 | 5 | 9,000 |
| 1 | Agricultural Nutrition Specialist | MA (BAEx) | 1,800 | 5 | 9,000 |
| 1 | Plant Nutrition Specialist | MA (BS) | 1,800 | 5 | 9,000 |
| 1 | Legal Officer | MAR | 1,800 | 5 | 9,000 |
| 1 | Development Coordinator | BRBDP | 1,800 | 5 | 9,000 |
| 1 | Crop Production Specialist | MA (BPI) | 1,800 | 5 | 9,000 |
| 1 | Agricultural Credit Specialist | ACA | 1,800 | 5 | 9,000 |
| 1 | Training Specialist | MLGCD | 1,800 | 5 | 9,000 |
| | | | | Subtotal | ₱81,000 |

Detailed Full-Time Field Level Personnel

| | | Per Month | Per Year | Duration | Total |
|---|---|---|---|---|---|
| 1 | Coordinator, Farm Extension/Support Services | ₱ 300 | ₱ 3,600 | 5 | ₱18,000 |
| 4 | Team Leaders (Supervision/Coordination) | 250 | 24,000 | 5 | 60,000 |
| 20 | Field Technicians (130 ha/tech) | 200 | 48,000 | 5 | 240,000 |
| | | | | Subtotal | ₱318,000 |
| | | | | TOTAL | ₱399,000 |

1/ Termed "Reimbursable Representation Allowance" for additional expenditures and incentive to carry special assignments in addition to normal functions.

Table H-27. Determination of Water Fee - Lalo Irrigation System

Presently, the per hectare water fee charged in the existing Lalo system (1,100 ha.) is 3 cavans of palay[1/] (or the cash equivalent) for dry season service and 2 cavans in the wet season. Collection rates on current account during the past two years have been 50 to 60 percent, a good deal higher than found on most national systems.

Recently, the National Irrigation Administration (NIA) has reiterated its view that those farmers served by new or improved national systems must begin paying a fee which covers amortization as well as operation and maintenance expenses. A new per hectare water fee is expected to be derived for the Lalo system given (a) the costs of constructing, operating and maintaining the proposed irrigation component of the Buhi-Lalo project, (b) the expanded area covered, and (c) the current indication of the terms NIA plans to use in determining an amortization schedule.

While the derivation is provided below, a summary of the findings is presented here. Assuming 1978 prices, the annual amortization payment, operation and maintenance expenses, and a vehicle/equipment sinking fund requirement amounts to a total annual system-wide cost of ₱1,718,000. The completed system will allow irrigation of some 2700 hectares of riceland plus 300 or more hectares of coconut lands which may be converted to irrigated rice production. Using the 2700-hectare figure the annual cost on a per hectare basis is about ₱640. Assuming a cavan of palay is worth ₱50 to ₱55, this represents a minimum annual water fee of 12 cavans per hectare. Such a fee would cover all foreseen costs if the collection rate could be raised to 100 percent. NIA is making serious efforts to improve the quality of its service, the primary determinant of farmers' willingness and ability to pay. To facilitate system operation and fee collection, new ideas in organizing farmer beneficiaries into irrigator groups and associations are being tried. Still, it is unlikely that a 100 percent collection will be realized in the near future.

This implies a continuing subsidy for irrigation development in the case of national systems including Lalo. At 12 cavans per year, a 50 percent rate of collection in the proposed 2700-hectare system would produce about ₱850,000--enough to cover system O & M costs and vehicle/equipment sinking fund requirements. The cost of system construction would need to be borne by the government and through it, Philippine society as a whole.

Any discussion of this subsidy should also consider the price farmer beneficiaries receive for the primary goods they produce, in this case rice. Due partly to the limit on the price of rice imposed by the Philippine government, it can be argued that farmers in the project area receive substantially less than that which they would receive if the farm level price were based on the prevailing world market price. Government policy on rice prices influences the ability of farmers to pay irrigation fees. Farmers are, in effect, subsidizing the food budget of non-farm consumers. This relationship is taken into account when the government considers the appropriate subsidy element of irrigation development for national systems like Lalo.

I <u>Amortization Payment</u>

A. Financial cost of project activities related to irrigated palay production[2/] ₱ 29,561,000

1/ 1 cavan equals 50 kgs; palay is term for unmilled rice.
2/ Drawn from the first column of Table I-7. Constant 1978 costs plus 15% contingencies.

Table H-27 Cont.

B. NIA guidelines for repayment[1/]
- 10% of the total cost shall be free,
- 70% of the total cost shall be repaid without interest,
- 20% of the cost shall be repaid with interest at 6% per annum,
- the periods of repayment shall be not less than 25 years for gravity irrigation projects.

These statements on financing reduce to the payment of 90% of the cost at an annual interest rate of 1.33% (6% x 20%)/90% = 1.33%

C. This analysis assumes a repayment period of 40 years--the same period likely to be provided for the GOP to repay the AID loan.

| | | |
|---|---|---|
| Project Cost | ₱29,561,000 | |
| Less 10% | 2,956,000 | |
| | ₱26,605,000 | |
| Annual rate of interest | | 1.33% |
| Duration of repayment period | | 40 years |

| | |
|---|---|
| Annual amortization payment | ₱ 861,973 |
| Say ... | ₱ 862,000 |

II Operation and Maintenance Costs

| | |
|---|---|
| Annual O & M costs for the 2700 hectare system are given in Table H-19 as | ₱ 802,082 |
| Say ... | ₱ 802,000 |

III Vehicle/Equipment Sinking Fund[2/]

The project will provide the first set of O & M vehicles and equipment. Assuming
a) these items will need to be replaced every 8 years,
b) the Lalo system farmers need only cover one-quarter of the cost of replacing heavy equipment which is used 75% of the time on other systems,
c) 12% can be earned on funds set aside each year,

| | |
|---|---|
| The annual sinking fund requirement is | ₱ 53,955 |
| Say ... | ₱ 54,000 |

IV Annual per Hectare Water Fee

| | |
|---|---|
| Annual amortization payment | ₱ 862,000 |
| Annual O & M costs | 802,000 |
| Annual vehicle/equipment sinking fund requirement | 54,000 |
| Total annual system-wide cost | ₱ 1,718,000 |
| Annual per hectare water fee assuming<br>- 2,700 hectares<br>- 1 cavan is worth ₱50 to ₱55<br>- 100% collection | 12 cavans |

1/ Guidelines provided by the Regional NIA Office in Naga City.
2/ See Table H-21 for details.

Table H-28. Financial Farm Plans Without-Project and With-Project Conditions
(Pesos Per Hectare or Per Farm)

| ITEM | WITHOUT-PROJECT Rainfed[1] 1st Crop | WITHOUT-PROJECT Rainfed[1] 2nd Crop | WITHOUT-PROJECT Irrigated Dry Season | WITHOUT-PROJECT Irrigated Wet Season | WITH-PROJECT Irrigated Dry Season | WITH-PROJECT Irrigated Wet Season |
|---|---|---|---|---|---|---|
| I. Yield (cavans) | 25 | 28 | 57 | 49 | 85 | 82 |
| Gross Return (₱50/cavan)[2] | 1250 | 1400 | 2850 | 2450 | 4250 | 4100 |
| II. Cash Requirements | 791 | 793 | 859 | 853 | 1117 | 1115 |
| A. Hired Labor[3] | 420 | 420 | 420 | 420 | 420 | 420 |
| 1. Clearing and Land Preparation (13 days @ ₱8 and 12 days @ ₱15) | 284 | 284 | 284 | 284 | 284 | 284 |
| 2. Repair of Dikes and Ditches (2 days @ ₱8) | 16 | 16 | 16 | 16 | 16 | 16 |
| 3. Transplanting (15 days @ ₱8) | 120 | 120 | 120 | 120 | 120 | 120 |
| B. Materials | 371 | 373 | 439 | 433 | 697 | 695 |
| 1. Fertilizers and Pesticides[4] | 224 | 224 | 268 | 268 | 505 | 505 |
| 2. Seed | 128 | 128 | 128 | 128 | 128 | 128 |
| 3. Thresher Fuel, Oil & Repair[5] | 19 | 21 | 43 | 37 | 64 | 62 |
| III. Farm Loan Interest and Service Charges[6] | 47 | 48 | 52 | 51 | 67 | 67 |
| IV. Peso Equivalent of In-Kind Requirements | 230 | 252 | 451 | 403 | 662 | 640 |
| A. Harvesting and Threshing[5] | 180 | 202 | 401 | 353 | 612 | 590 |
| B. Barrio Guarantee Fund Contribution[7] | 50 | 50 | 50 | 50 | 50 | 50 |
| V. Water Fee[8] | - | - | 135 | 90 | 318 | 318 |
| VI. Per Hectare Net Return Prior to Payment of Rent or Amortization | 182 | 307 | 1353 | 1053 | 2086 | 1960 |
| VII. Average Farm Size (hectares)[9] | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| VIII. Net Return to Farm Household Labor and Management Prior to Payment of Rent or Amortization | 200 | 338 | 1488 | 1158 | 2295 | 2156 |

1/ The 1st crop is planted in October-November of the preceding year and harvested through February and March. The 2nd rainfed crop is planted in June-July and harvested through October.

Table H-28 Cont.

2/ The price received by farmers for their palay varies primarily with moisture content and market access. National Grains Authority (NGA) will pay up to ₱57.50 for a 50-kilogram cavan of palay (95% purity) dried to 14% moisture capacity. However, most farmers in the Buhi area sell palay immediately after threshing at something less than premium prices. Additionally, a recent survey in Buhi found 70 farmers (100% of the sample) reporting that it is the buyer who sets the price. (See: The Technical and Economic Characteristics of Rice Postproduction Systems in the Bicol River Basin, Agricultural Engineering Department of the International Rice Research Institute and the Process Engineering Department of the Institute of Agricultural Engineering and Technology, University of the Philippines at Los Banos, April 1978). It is likely that the provision of project service roads along main canals and laterals and the completion of two links financed by the Bicol Secondary and Feeder Roads Project (AID loan) in the Lalo area will facilitate market access. This should eventually lead to an increase in farmgate prices. However, a farmgate price of ₱50 per cavan is felt representative of what farmers will continue to receive for the rice they market.

3/ Included here are farm operations undertaken during peak labor demand periods. While farm household members may take part in these activities, additional labor from outside the household is usually required. Recent evidence indicates that exchange labor arrangements are on the decline and hired labor is increasing dramatically. Therefore, these labor requirements are treated as a cash cost. Source: Ricardo R. San Andres and Jeanne Frances I. Illo, Beyond Share Tenancy, Institute of Philippine Culture, September 1978, pp. 19-20 and 26-27.

4/ Please see notes for Table I-2 in the Economic annex. Both without-project and with-project farm plans assume farmers expend ₱105 on pesticides each season. While some fertilizer use is assumed in the without-project plans, under with-project conditions farmers apply 150 kg of 14-14-14 (₱225) and 100 kg of 42-0-0 (₱175).

5/ Over 60% of the farmers in Buhi indicate they make use of small threshers. Cost of fuel, oil and repair is identified as a cash cost of about ₱15 per metric ton. Approximately 16% of the gross yield per hectare goes as in-kind payment to harvester-threshers in the Buhi area. This is 3.2 cavans per metric ton (20 cavans) or ₱144 per ton at ₱45 per cavan. Source: Op. cit., The Technical and Economic Characteristics of Rice Postproduction Systems in the Bicol River Basin, Tables 4 and A7, and Figure 11.

6/ Six percent (1.5% per month x 4 months) of cash requirement.

7/ One cavan per hectare per crop paid to the farmer's Samahang Nayon (farmer's pre-cooperative) to be used in ensuring the payment of Operation Land Transfer amortizations.

8/ The present water fee for farmers in the unrehabilitated Lalo irrigation system is 3 cavans for dry season service and 2 cavans in the wet season. The with-project water fee, derived so as to cover system amortization as well as operation and maintenance and the replacement of maintenance equipment is about ₱640 or about 12 cavans per year. (See discussion of Water Fee Determination).

9/ Almost all palay is grown on family farms rarely exceeding 3 hectares in size. Estimates of the average farm size in the project area vary, but for this analysis the figure of 1.1 hectares is adopted as being the most indicative.

# ECONOMIC ANALYSIS

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## Introduction to Annex I

The following tables present the assumptions and procedures used in the economic analysis of the irrigation component of the Buhi-Lalo Integrated Development Project.

The first four tables provide typical per hectare economic costs and returns for palay or unmilled rice production in the project area. (Tables I-5 through I-10 compare "with-project" as other economic indicators, and subjects the analysis to a sensitivity test. The "with-project" scenario incorporated in these tables (Scenario I) assumes the rehabilitation and construction of the multiple Barit, Baao and Pili-Bula irrigation systems by the GOP, most likely under a separate foreign donor assisted project. In addition to an assured water supply for existing systems, this justifies the proportioning of certain Buhi-Lalo project costs for developing the Lake Buhi water source and the procurement of operation and maintenance equipment.

Tables I-12 through I-18 present a similar benefit-cost analysis (Scenario II) of the Buhi-Lalo irrigation system activities. It differs from Scenario I in assuming no complementary project is undertaken in the Buhi-Goncobada vicinity. There is no proportioning of costs. Therefore, this analysis weighs all associated costs against the benefits expected to accrue in the Lalo system and on 600 hectares in the Barit system. These 600 hectares in Barit is the incremental area which would receive supplemental dry season irrigation service through the development of the Lake Buhi source alone, without any additional improvement of the existing irrigation facilities.

David A. Heesen
Consultant

**Table I-1** Derivation of Shadow Price of Palay Used in the Economic Analysis of the Bubi-Lalo Integrated Development Project

| | Value Per Metric Ton ($) |
|---|---|
| World Bank projected long-run average FOB price Bangkok Thai milled rice (1977 price levels)1/ | 390 |
| Plus 8% one-year price escalation | 31 |
| Equals long-run FOB price Bangkok Thai milled rice (1978 price levels) | 421 |
| Minus 20% downward adjustment for quality | 84 |
| Equals long-run FOB price Manila milled rice (1978 price levels) | 337 |
| Minus wharfage at Manila | 2 |
| Minus average cost of transport to Manila from Iriga City2/ | 35 |
| Equals long-run price Iriga City milled rice (1978 price levels) | 300 |
| Equivalent price of palay at the average milling recovery rate of 60% | 180 |
| Minus cost of milling, plus value of milling by-products3/ | 0 |
| Equals long-run shadow price of palay in Iriga City (1978 price levels) | 180 |

Shadow value per 50-kilogram cavan of palay:

| | |
|---|---|
| (a) in US $ | 9 |
| (b) in pesos at shadow foreign exchange rate of ₱9=$1.4/ | 81 |
| | Say ... ₱ 80/cavan |

1/ The World Bank Price Prospects for Major Primary Commodities, Report No. 814/77; the World Bank, Washington, D.C., June 1977, p. 32.

2/ ₱0.50/MT/km. Source: Bureau of Transportation, Ministry of Public Works, Transportation and Communications, Quezon City.

3/ The cost of milling palay is usually equal to the value of the milling by-products, primarily bran used as feed. Source: Project Economic Staff of the National Economic and Development Authority, Manila (NEDA).

4/ Shadow foreign exchange rate suggested by NEDA.

Table I-2. Without-Project Economic Farm Plans Rainfed and Irrigated Land
(Pesos Per Hectare)

| ITEM | Rainfed[1/] 1st Crop | Rainfed[1/] 2nd Crop | Irrigated[2/] Dry Season | Irrigated[2/] Wet Season |
|---|---|---|---|---|
| I. Yield (cavans)[3/] | 25 | 28 | 57 | 49 |
| Gross Production Value (shadow value ₱80/cav) | 2000 | 2240 | 4560 | 3920 |
| II. Farm Level Production Cost | 1196 | 1210 | 1423 | 1385 |
| A. Fixed Production Costs | 774 | 774 | 798 | 798 |
| 1. Labor[4/] | 646 | 646 | 670 | 670 |
| a. Clearing and Land Preparation[5/] | 284 | 284 | 284 | 284 |
| b. Repair of Dikes and Ditches | 32 | 32 | 32 | 32 |
| c. Seedbed Preparation, Sowing and Care | 56 | 56 | 56 | 56 |
| d. Transplanting | 150 | 150 | 150 | 150 |
| e. Weeding | 100 | 100 | 100 | 100 |
| f. Fertilizing | 8 | 8 | 16 | 16 |
| g. Chemical Application | 16 | 16 | 16 | 16 |
| h. Irrigating and Draining | - | - | 16 | 16 |
| 2. Seed[6/] | 128 | 128 | 128 | 128 |
| B. Variable Production Costs | 313 | 326 | 496 | 461 |
| 1. Labor | 90 | 101 | 205 | 176 |
| a. Harvesting, Threshing and Drying[7/] | 65 | 73 | 148 | 127 |
| b. Handling and Hauling[8/] | 25 | 28 | 57 | 49 |
| 2. Fertilizers and Pesticides[9/] | 204 | 204 | 248 | 248 |
| 3. Thresher Fuel, Oil and Repair | 19 | 21 | 43 | 37 |
| C. Contingency and Miscellaneous[10/] | 109 | 110 | 129 | 126 |
| III. Net Production Value | 1804 | 1030 | 3137 | 2535 |

1/ The 1st rainfed crop refers to that planted in October through November of the preceding year and harvested in February or March. The 2nd crop is usually planted in June or July and harvested through October.

2/ The irrigated dry season crop is usually harvested in April through June. The wet season crop is harvested in October.

3/ There are 50 kilograms per cavan at 14% moisture capacity. The estimates of without-project per hectare yield are based upon farm surveys recently undertaken in the Rinconada vicinity. See: (1) Table VIII-4 of the Special Study: Economic and Financial Analysis, Rinconada Integrated Development Area Project Feasibility Study, by TAMS/TAE, Jan. 1979, (2) Figure 1 and Table 10 of The Technical and Economic Characteristics of Rice Post-production Systems in the Bicol River Basin, The Agricultural Engineering Department of the International Rice Research Institute and the Institute of Agricultural

(Footnotes Table I-2 Contd.)

Engineering and Technology, University of the Philippines at Los Banos, April 1978, and (3) pp. 32-40 of Beyond Share Tenancy, Ricardo R. San Andres and Jeanne Frances Illo, Institute of Philippine Culture, Ateneo de Manila, Quezon City, April 1978. In the with-project farm plans (Tables I-3 and I-4), it is assumed that average yields on irrigated land within the project area will increase to 4.1 metric tons (82 cavans) and 3.9 metric tons (78 cavans) in the dry and wet seasons, respectively. These per hectare figures are quite modest and well within the biologic potential of the high-yielding varieties already adopted by nearly 100 percent of the project area's farmers. They reflect the average yield levels realized by those farmers with comparatively good water control and drainage who adequately protect their crops from pests and disease and fertilize moderately.

4/ Manual labor is valued in these budgets at ₱8 per day.

5/ This operation includes 13 days of manual labor and 12 days of manual-and-carabao labor valued at ₱15 per day.

6/ A hectare requires 75 kilograms of seed valued at ₱1.70 per kilogram.

7/ Investigations in the Buhi area indicate most farmers utilize small mechanical threshers or a combination of mechanical and manual threshing methods. Additionally, almost all farmers in the area dry their palay under the sun. Harvesting, threshing, and drying a ton of palay (20 cavans) with such methods requires about 52 hours of manual labor valued at ₱1 per hour. Another ₱15 per ton is required for fuel, oil and repair of the small mechanical thresher. Source: Op. cit., The Technical and Economic Characteristics of Rice Post-production Systems in the Bicol River Basin, p. 17 and appendix tables A2, A3, and A7.

8/ ₱1 per cavan.

9/ In these without-project budgets, it is assumed that ₱165 and ₱120 are expended on fertilizer each season by irrigated and rainfed farmers, respectively. (See p. 27 of Beyond Share Tenancy, (Op. cit.). The with-project budgets assume farmers eventually use 150 kg of 14-14-14 (₱225) and 100 kg of 42-0-0 (₱175) each season as recommended by the Bureau of Agricultural Extension. Fertilizers are presently neither subsidized nor taxed and the retail prices quoted have not been adjusted. The use of pesticides is quite popular among the area's irrigated and rainfed farmers. In this analysis, it is assumed that farmers will continue applying one phosphate based (Folidol), one sulfuric acid ester (Thiodan), and one carbonate based chemical each season. The total 1978 retail price in the area for these chemicals is about ₱105. Plant protection chemicals are presently subjected to a 15% import tariff and a 7% sales tax. Their adjusted value in these economic farm plans is ₱85. Ideally, the imported portions of these fertilizers and pesticides should be estimated and their prices adjusted upward in keeping with NEDA's practice of shadow-pricing foreign exchange at ₱9=$1 (See note 3, Table I-7). Such an adjustment has a negligible affect on the outcome of the overall economic analysis and for the sake of simplicity is ignored here. In addition, the sensitivity analysis presented in Table I-9 investigates the impact of a 20% increase in all costs and a 20% decrease in all benefits and indicates that the project is still very viable.

10/ 10% of labor, seed, fertilizer, pesticides, and thresher fuel, oil and repairs.

Table I-3 With-Project Economic Farm Plans Irrigated Dry Season Crop[1/]
(Pesos Per Hectare)

| I T E M S | YEARS AFTER CONSTRUCTION[2/] 0 | 1 | 2 | 3 | 4 | 5 & Thereafter |
|---|---|---|---|---|---|---|
| I. Yield (cavans)[2/] | 57 | 60 | 64 | 69 | 75 | 82 |
| Gross Production Value (shadow value ₱80/cavan) | 4560 | 4800 | 5120 | 5520 | 6000 | 6560 |
| II. Farm Level Production Cost | 1423 | 1469 | 1529 | 1606 | 1697 | 1804 |
| A. Fixed Production Cost | 798 | 798 | 798 | 798 | 798 | 798 |
| 1. Labor | 670 | 670 | 670 | 670 | 670 | 670 |
| a. Clearing and Land Preparation | 284 | 284 | 284 | 284 | 284 | 284 |
| b. Repair of Dikes and Ditches | 32 | 32 | 32 | 32 | 32 | 32 |
| c. Seedbed Preparation, Sowing and Care | 56 | 56 | 56 | 56 | 56 | 56 |
| d. Transplanting | 150 | 150 | 150 | 150 | 150 | 150 |
| e. Weeding | 100 | 100 | 100 | 100 | 100 | 100 |
| f. Fertilizing | 16 | 16 | 16 | 16 | 16 | 16 |
| g. Chemical Application | 16 | 16 | 16 | 16 | 16 | 16 |
| h. Irrigating and Draining | 16 | 16 | 16 | 16 | 16 | 16 |
| 2. Seed | 128 | 128 | 128 | 128 | 128 | 128 |
| B. Variable Production Cost | 496 | 537 | 592 | 662 | 745 | 842 |
| 1. Labor | 205 | 216 | 230 | 248 | 270 | 295 |
| a. Harvesting, Threshing and Drying | 148 | 156 | 166 | 179 | 195 | 213 |
| b. Handling and Hauling | 57 | 60 | 64 | 69 | 75 | 82 |
| 2. Fertilizers and Pesticides | 248 | 276 | 314 | 362 | 419 | 485 |
| 3. Thresher Fuel, Oil and Repair | 43 | 45 | 48 | 52 | 56 | 62 |
| C. Contingency and Miscellaneous | 129 | 134 | 139 | 146 | 154 | 164 |
| III. Net Production Value | 3137 | 3331 | 3591 | 3914 | 4303 | 4756 |

1/ See Notes for Table I-2

2/ That is, the yield and farm level production cost for year 0 describe the typical situation on irrigated land in the dry season prior to rehabilitation. With the completion of project construction activities in their area, farmers begin passing through a 5-year transition period until the ultimate production level of 82 cavans per hectare is reached. This level is then maintained indefinitely.

Table I-4

With-Project Economic Farm Plans Irrigated Wet Season Crop[1/]
(Pesos Per Hectare)

| I T E M S | YEARS AFTER CONSTRUCTION 0 | 1 | 2 | 3 | 4 | 5 & Thereafter |
|---|---|---|---|---|---|---|
| I. Yield (cavans) | 49 | 53 | 58 | 64 | 71 | 78 |
| Gross Production Value (shadow value ₱80/cavan) | 3920 | 4240 | 4640 | 5120 | 5680 | 6240 |
| II. Farm Level Production Cost | 1385 | 1441 | 1510 | 1592 | 1689 | 1785 |
| A. Fixed Production Cost | 798 | 798 | 798 | 798 | 798 | 798 |
| 1. Labor | 670 | 670 | 670 | 670 | 670 | 670 |
| a. Clearing and Land Preparation | 284 | 284 | 284 | 284 | 284 | 284 |
| b. Repair of Dikes and Ditches | 32 | 32 | 32 | 32 | 32 | 32 |
| c. Seedbed Preparation, Sowing and Care | 56 | 56 | 56 | 56 | 56 | 56 |
| d. Transplanting | 150 | 150 | 150 | 150 | 150 | 150 |
| e. Weeding | 100 | 100 | 100 | 100 | 100 | 100 |
| f. Fertilizing | 16 | 16 | 16 | 16 | 16 | 16 |
| g. Chemical Application | 16 | 16 | 16 | 16 | 16 | 16 |
| h. Irrigating and Draining | 128 | 128 | 128 | 128 | 128 | 128 |
| B. Variable Production Cost | 461 | 512 | 575 | 649 | 737 | 825 |
| 1. Labor | 176 | 191 | 209 | 230 | 256 | 281 |
| a. Harvesting, Threshing and Drying | 127 | 138 | 151 | 166 | 185 | 203 |
| b. Handling and Hauling | 49 | 53 | 58 | 64 | 71 | 78 |
| 2. Fertilizers and Pesticides | 248 | 281 | 322 | 371 | 428 | 485 |
| 3. Thresher Fuel, Oil and Repair | 37 | 40 | 44 | 48 | 53 | 59 |
| C. Contingency and Miscellaneous | 126 | 131 | 137 | 145 | 154 | 162 |
| III. Net Production Value | 2535 | 2799 | 3130 | 3528 | 3991 | 4455 |

1/ See notes for Tables I-2 and I-3

(Scenario I)

Table I-5 Derivation of Yearly Incremental Production Values and Farm Level Production Costs[1/]
(₱1000)

| Year | Gross Production Values | | | Farm Level Production Costs | | |
|---|---|---|---|---|---|---|
| | With-Project | Without-Project | Incremental | With-Project | Without-Project | Incremental |
| 1980 | 15012 | 15012 | 0 | 6281 | 6281 | 0 |
| 1981 | 15012 | 15012 | 0 | 6281 | 6281 | 0 |
| 1982 | 15012 | 15012 | 0 | 6281 | 6281 | 0 |
| 1983 | 24408 | 15012 | 9396 | 7857 | 6281 | 1576 |
| 1984 | 26352 | 15012 | 11340 | 8205 | 6281 | 1924 |
| 1985 | 28728 | 15012 | 13716 | 8635 | 6281 | 2354 |
| 1986 | 31536 | 15012 | 16524 | 9142 | 6281 | 2861 |
| 1987 | 34560 | 15012 | 19548 | 9690 | 6281 | 3409 |
| 1988 | 34560 | 15012 | 19548 | 9690 | 6281 | 3409 |
| 1989-2004 | (Same as Year 1988) | | | | | |

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Yearly gross production values and farm level production costs are based upon the per hectare economic farm plans in Tables I-2, I-3 and I-4. The existing irrigated area due to benefit from project rehabilitation activities is 1100 hectares. There are about 1760 hectares of rainfed riceland in the Lalo extension area including Sta. Justina. At present, a first rainfed crop is harvested on about 1050 hectares, and a second crop is realized on 1600 hectares. When construction begins in 1980, there may be some interference with farm activities. However, it is assumed that the usual fallow area will reflect such crop losses during the construction period. In the post-construction period, 1983 and thereafter, it is assumed that there are only 1600 hectares of productive irrigated land in the Lalo extension area realizing two crops per year. This new figure reflects the loss of area due to right-of-way acquisition for canals, ditches and roads (about 10%). Therefore, the net irrigated area in the entire Lalo system upon completion of the project is 1100 hectares + 1600 hectares = 2700 hectares. Finally, there are 357 low-lying hectares of coconut land in the extension area which can be converted to irrigated palay production. The project facilities have been designed and costed so as to provide service to all of this convertible land. Indeed, many of the farmers concerned have expressed their desire to undertake conversion should irrigation water be made available. However, the benefits arising from such activities have not been considered in this economic analysis. Should all of this coconut land convert to irrigated palay production, the eventual service area of the entire Lalo system would be a little over 3,000 hectares.

(Scenario I)

Table I-6 Calculation of Net Value of Power Generation Lost Due to Diversion for the Lalo System through Forebay Headworks and into the Left Connector Canal 1/

| | | |
|---|---|---|
| 1. | Annual value of Kwh presently produced by NPC Station | ₱ 2,029,000 |
| 2. | Potential production of Kwh with Buhi Control Station and channelization of the Barit River | ₱ 2,932,000 |
| 3. | Annual per hectare cost of diverting water from the power station forebay | ₱ 220 |
| 4. | Net irrigable area in proposed Lalo (1900 ha.2/), Baao (2450 ha.2/), and Pili-Bula (2350 ha.) irrigation schemes to be served with water diverted from the power station forebay.3/ | 6,700 ha. |
| 5. | Annual value of Kwh loss due to diversion from forebay (6700 ha. x ₱220) | ₱ 1,474,000 |
| 6. | Future annual value of Kwh produced by NPC station (₱2,932,000 minus ₱1,474,000) | ₱ 1,458,000 |
| 7. | Net loss of value from present situation (₱2,029,00 minus ₱1,458,000) | ₱ 571,000 |
| 8. | Let loss per hectare (₱571,000 ÷ 6700 ha.) | ₱ 85.22 |
| 9. | Annual net value of power generation lost due to diversion for the Lalo system (₱85.22 x 1900 ha.) | ₱ 161,918 |

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1/ This analysis is drawn from pp. EF 243-8 of the TAMS-TAE Rinconada Integrated Development Area Project Feasibility Study, Special Study: Economic and Financial Analysis, August 1978 (Draft).

2/ These potential areas include convertible coconut lands.

3/ The Barit River Irrigation System Diversion dam is located downstream of the power plant and no diversions are made for Barit from the Forebay.

(Scenario I)

Table I-7 Derivation of Total Economic Costs

| | Financial Cost of Project Activities Related to Irrigated Paley Prod'n.[1] (1978 Price Levels) Total | (FX Component) | 15% Adjustment to Eliminate Taxes & Other Transfer Payments | Shadow FX Cost Adjustment[3] | Value of Power Lost Due to Forebay Diversion for Valo[4] | Incremental O & M Costs[5] | Incremental Farm Level Prod'n. Costs[6] | Total Economic Costs |
|---|---|---|---|---|---|---|---|---|
| 1980 | 3570 | (38) | - 536 | 8 | | 712 | 0 | 3754 |
| 81 | 11006 | (2625) | -1651 | 525 | | | 0 | 9880 |
| 82 | 11577 | (2885) | -1737 | 577 | | | 0 | 10417 |
| 83 | 2130 | (32) | - 320 | 6 | 162 | | 1576 | 3554 |
| 84 | 1278 | (26) | - 192 | 5 | 162 | 468 | 1924 | 3645 |
| 85 | | | | | 162 | 468 | 2354 | 2984 |
| 86 | | | | | 162 | 468 | 2861 | 3491 |
| 87 | | | | | 162 | 468 | 3409 | 4039 |
| 88 | | | | | 162 | 468 | 3409 | 4039 |
| 89 | | | | | 162 | 468 | 3409 | 4039 |
| 90 | | | | | 162 | 468 | 3409 | 4039 |
| 91 | | | | | 162 | 468 | 3409 | 4039 |
| 92 | | | | | 162 | 1180 | 3409 | 4751 |
| 93 | | | | | 162 | 468 | 3409 | 4039 |
| 94 | | | | | 162 | 468 | 3409 | 4039 |
| 95 | | | | | 162 | 468 | 3409 | 4039 |
| 96 | | | | | 162 | 468 | 3409 | 4039 |
| 97 | | | | | 162 | 468 | 3409 | 4039 |
| 98 | | | | | 162 | 468 | 3409 | 4039 |
| 99 | | | | | 162 | 468 | 3409 | 4039 |
| 2000 | | | | | 162 | 468 | 3409 | 4039 |
| 01 | | | | | 162 | 1180 | 3409 | 4751 |
| 02 | | | | | 162 | 468 | 3409 | 4039 |
| 03 | | | | | 162 | 468 | 3409 | 4039 |
| 04 | -13063[2] | (-3766) | -1960 | -753 | 162 | 112 | 3409 | -8173 |

1/ **Includes:** a) 25% of the Lake Buhi water source development costs (The total net area to be irrigated with water provided by the improvements at Lake Buhi is about 8000 hectares. Of this total, the Lalo extension area includes 1600 net hectares of riceland and a little over 300 hectares of low-lying coconut land which may be converted to irrigated palay);

b) Pre-construction and construction costs incurred in the system's rehabilitated and extension areas and the first year operation and maintenance cost in the extension area;

c) Agricultural and institutional development costs for water management training, irrigator association and farmer cooperative development, and intensified extension/demonstration efforts;

d) Project administration costs with the exception of that amount identified for project impact evaluation;

e) All related contingencies determined at 15%.

2/ Estimated salvage value assumes a 50-year life-span of project facilities and consists of 50% of items a, b and d in note 1 above together with a 15% contingency.

3/ Increases the FX component by a factor of 1.2 to account for the shadow foreign exchange rate of ₱9=$1 recomended by the National Economic Development Authority, Manila.

4/ Drawn from Table I-6.

5/ Drawn from Annex Tables H-19 and H-22. The figure for the purchase of operation and maintenance equipment in 1980, 1992 and 2001 is one-quarter of equipment cost and 15% contingency. That is, (₱2,475,000 x 1.15)/4 = ₱711,563. Entry for year 2004 includes salvage value for O & M vehicles and equipment purchased in 2001.

6/ Drawn from Table I-5.

(Scenario I)

Table I-8

Benefit-Cost Analysis: Base Case
(₱1000)

| Year | Total Economic Costs 1/ | Total Economic Benefits 2/ | Present value at 15% Costs | Present value at 15% Benefits | Present value at 20% Costs | Present value at 20% Benefits | Net Undiscounted Benefits | Present Value Net Benefits at 35% Discount |
|---|---|---|---|---|---|---|---|---|
| 1980 | 3754 | 0 | 3264 | 0 | 3128 | 0 | -3754 | -2781 |
| 81 | 9880 | 0 | 7471 | 0 | 6861 | 0 | -9880 | -5421 |
| 82 | 10417 | 0 | 6849 | 0 | 6029 | 0 | -10417 | -4232 |
| 83 | 3554 | 9396 | 2032 | 5372 | 1714 | 4531 | 5842 | 1759 |
| 84 | 3645 | 11340 | 1813 | 5638 | 1465 | 4558 | 7695 | 1716 |
| 85 | 2984 | 13716 | 1290 | 5930 | 999 | 4593 | 10732 | 1773 |
| 86 | 3491 | 16524 | 1312 | 6212 | 974 | 4612 | 13033 | 1595 |
| 87 | 4039 | 19548 | 1320 | 6390 | 940 | 4546 | 15509 | 1406 |
| 88 | 4039 | 19548 | 1149 | 5557 | 782 | 3788 | 15509 | 1041 |
| 89 | 4039 | 19548 | 998 | 4832 | 653 | 3157 | 15509 | 771 |
| 90 | 4039 | 19548 | 868 | 4202 | 543 | 2631 | 15509 | 572 |
| 91 | 4039 | 19548 | 755 | 3653 | 453 | 2193 | 15509 | 423 |
| 92 | 4751 | 19548 | 772 | 3177 | 444 | 1827 | 14797 | 299 |
| 93 | 4039 | 19548 | 571 | 2763 | 315 | 1522 | 15509 | 232 |
| 94 | 4039 | 19548 | 496 | 2402 | 262 | 1269 | 15509 | 172 |
| 95 | 4039 | 19548 | 432 | 2089 | 218 | 1057 | 15509 | 128 |
| 96 | 4039 | 19548 | 375 | 1817 | 183 | 882 | 15509 | 94 |
| 97 | 4039 | 19548 | 327 | 1580 | 151 | 734 | 15509 | 70 |
| 98 | 4039 | 19548 | 284 | 1373 | 127 | 612 | 15509 | 52 |
| 99 | 4039 | 19548 | 246 | 1194 | 105 | 510 | 15509 | 38 |
| 2000 | 4039 | 19548 | 215 | 1039 | 88 | 424 | 15509 | 28 |
| 01 | 4751 | 19548 | 219 | 903 | 86 | 355 | 14797 | 21 |
| 02 | 4039 | 19548 | 163 | 786 | 61 | 295 | 15509 | 15 |
| 03 | 4039 | 19548 | 141 | 682 | 51 | 246 | 15509 | 12 |
| 04 | - 8173 | 19548 | -249 | 594 | -86 | 204 | 27721 | 15 |
| | | | 33113 | 68185 | 26546 | 44546 | | -204 |

1/ Drawn from Table I-7

2/ This column is drawn from Table I-5 where it is identified as "Incremental Gross Production Value"

| | 15% Discount | 20% Discount |
|---|---|---|
| Benefit/Cost Ratio | 2.1 | 1.7 |
| Net Present Value | ₱35.1 M | ₱18.0 M |
| Internal Rate of Return = 35% | | |

Note: Figures may not add exactly to totals due to rounding.

(Scenario I)

Table I-9

Benefit-Cost Analysis: Sensitivity Tests
(₱1000)

| Year | Total Economic Costs[1/] + 20% | Total Economic Benefits[1/] - 20% | Present Value at 15% Costs | Present Value at 15% Benefits | Present Value at 20% Costs | Present Value at 20% Benefits | Net Undiscounted Benefits | Present Value Net Benefits at 23% Discount |
|---|---|---|---|---|---|---|---|---|
| 1980 | 4505 | 0 | 3917 | 0 | 3754 | 0 | -4505 | -3663 |
| 81 | 11856 | 0 | 8965 | 0 | 8234 | 0 | -11856 | -7836 |
| 82 | 12500 | 0 | 8219 | 0 | 7233 | 0 | -12500 | -6718 |
| 83 | 4265 | 7517 | 2439 | 4298 | 2057 | 3625 | 3252 | 1421 |
| 84 | 4374 | 9072 | 2174 | 4510 | 1758 | 3646 | 4698 | 1669 |
| 85 | 3581 | 10973 | 1549 | 4744 | 1199 | 3675 | 7392 | 2135 |
| 86 | 4189 | 13219 | 1574 | 4970 | 1169 | 3689 | 9030 | 2120 |
| 87 | 4847 | 15638 | 1585 | 5112 | 1128 | 3637 | 10791 | 2060 |
| 88 | 4847 | 15638 | 1378 | 4445 | 939 | 3031 | 10791 | 1674 |
| 89 | 4847 | 15638 | 1198 | 3866 | 783 | 2525 | 10791 | 1362 |
| 90 | 4847 | 15638 | 1042 | 3361 | 652 | 2105 | 10791 | 1107 |
| 91 | 4847 | 15638 | 906 | 2923 | 544 | 1754 | 10791 | 899 |
| 92 | 5701 | 15638 | 926 | 2541 | 533 | 1461 | 9937 | 674 |
| 93 | 4847 | 15638 | 685 | 2210 | 377 | 1218 | 10791 | 595 |
| 94 | 4847 | 15638 | 596 | 1922 | 315 | 1015 | 10791 | 484 |
| 95 | 4847 | 15638 | 518 | 1671 | 262 | 846 | 10791 | 393 |
| 96 | 4847 | 15638 | 450 | 1454 | 218 | 705 | 10791 | 319 |
| 97 | 4847 | 15638 | 392 | 1263 | 182 | 587 | 10791 | 260 |
| 98 | 4847 | 15638 | 340 | 1099 | 152 | 490 | 10791 | 212 |
| 99 | 4847 | 15638 | 297 | 955 | 126 | 408 | 10791 | 171 |
| 2000 | 4847 | 15638 | 257 | 831 | 106 | 340 | 9937 | 140 |
| 01 | 5701 | 15638 | 263 | 723 | 103 | 283 | 10791 | 105 |
| 02 | 4847 | 15638 | 195 | 628 | 73 | 236 | 10791 | 92 |
| 03 | 4847 | 15638 | 170 | 546 | 61 | 197 | 10791 | 75 |
| 04 | -6538 | 15638 | -199 | 475 | -68 | 164 | 22176 | 125 |
| | | | 39836 | 54547 | 31890 | 35637 | | -125 |

1/ Drawn from Table I-8

Note: Figures may not add exactly to totals due to rounding.

| | 15% Discount | 20% Discount |
|---|---|---|
| Benefit/Cost Ratio | 1.4 | 1.1 |
| Net Present Value | ₱14.7 M | ₱3.7 M |
| Internal Rate of Return = 23% | | |

Table I-10 (Scenario I)

Irrigation Development Costs Per Hectare

Net Area:[1/]

| | | |
|---|---|---|
| Rehabilitation | 1,100 | hectares |
| Expansion | 1,600 | " |
| | 2,700 | " |

Costs[2/]

| | |
|---|---|
| Lake Buhi Water Source Development (25%) | ₱ 5,170,000 |
| Lalo Irrigation Construction | 16,987,000 |
| PMO for Irrigation & Agricultural Support (less O&M Equipment & Impact Evaluation) | 15,491,000 |
| | ₱37,648,000 |

Cost Per Hectare:

@ 2,700 hectares = ₱13,950 or $1,860[3/]

1/ See note for Table I-5.

2/ Taken from Table H-2. Cost figures include escalation and contingencies.

3/ At $1.00 = ₱7.50.

(Scenario II)

Table I-11. Derivation of Yearly Incremental Production Values and Farm Level Production Costs[1/]
(₱1000)

| Year | Gross Production Values | | | Farm Level Production Costs | | |
|---|---|---|---|---|---|---|
| | With-Project | Without-Project | Incremental | With-Project | Without-Project | Incremental |
| 1980 | 18234 | 18234 | 0 | 7830 | 7830 | 0 |
| 1981 | 18234 | 18234 | 0 | 7830 | 7830 | 0 |
| 1982 | 18234 | 18234 | 0 | 7830 | 7830 | 0 |
| 1983 | 29832 | 18234 | 11598 | 9603 | 7830 | 1773 |
| 1984 | 32208 | 18234 | 13974 | 10029 | 7830 | 2199 |
| 1985 | 35112 | 18234 | 16878 | 10553 | 7830 | 2723 |
| 1986 | 38544 | 18234 | 20310 | 11174 | 7830 | 3344 |
| 1987 | 42240 | 18234 | 24006 | 11844 | 7830 | 4014 |
| 1988 | 42240 | 18234 | 24006 | 11844 | 7830 | 4014 |
| 1989-2004 | (Same as Year 1988) | | | | | |

1/ Please see the note for Table I-5. As before, yearly gross production values and farm level production costs are based upon the per hectare economic farm plans in Tables I-2, I-3 and I-4. The area due to benefit from project activities in this analysis is 3300 hectares as opposed to the 2700 discussed in the note to Table I-5. The same areas--1100 and 1600 hectares--are assumed to benefit from rehabilitation and irrigation service expansion in the Lalo area. Additionally, this analysis includes 600 hectares in the Barit River system currently receiving partial irrigation service. This area presently realizes two crops each year, the first being a rainfed crop harvested in February or March and the second an irrigated wet season crop. It has been determined that with the development of the Lake Buhi source, this area will realize a dry season irrigated crop in the place of the rainfed crop. This expansion of irrigation service is made possible by the development of the Lake Buhi source alone without any additional improvement of existing irrigation facilities in the area.

**Table I-12** (Scenario II)

Calculation of Value of Power Generation Gained Through Development of the Buhi Water Source, Adjusted for Diversion to the Lalo System via Forebay Headworks and Left Connector Canal

| | | |
|---|---|---|
| 1. | Annual value of Kwh presently produced by NPC Station | ₱ 2,029,000 |
| 2. | Potential production of Kwh with Buhi Control Structure and channelization of the Barit River | ₱ 2,932,000 |
| 3. | Annual per hectare cost of diverting water from the power station forebay | ₱ 220 |
| 4. | Net irrigable area in proposed Lalo (1900 ha.)2/ irrigation scheme to be served with water diverted from the power station forebay.3/ | 1,900 ha. |
| 5. | Annual value of Kwh loss due to diversion from forebay (1900 ha. x ₱220) | ₱ 418,000 |
| 6. | Future annual value of Kwh produced by NPC station ₱2,932,000 -₱418,000) | ₱ 2,514,000 |
| 7. | Net gain of value from present situation (₱2,514,000 - ₱2,029,000) | ₱ 485,000 |

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1/ This analysis is drawn from pp. EF 243-8 of the TAMS-TAE Rinconada Integrated Development Area Project Feasibility Study, Special Study: Economic and Financial Analysis, August 1978 (Draft).

2/ This potential area includes convertible coconut land.

3/ The 600 incremental hectares in the Barit River Irrigation System receiving dry season service would be irrigated with water passing through the power station and used for generation.

**Table I-13**

(Scenario II)
**Derivation of Total Economic Benefits**
(Thousand of Pesos)

| Year | Incremental Production Value 1/ | Economic Value of Increased Power Generation 2/ | Total Economic Benefits |
|---|---|---|---|
| 1980 | 0 | | 0 |
| 81 | 0 | | 0 |
| 82 | 0 | | 0 |
| 83 | 11598 | 485 | 12083 |
| 84 | 13974 | 485 | 14459 |
| 85 | 16878 | 485 | 17363 |
| 86 | 20310 | 485 | 20795 |
| 87 | 24006 | 485 | 24491 |
| 88 | 24006 | 485 | 24491 |
| 89 | 24006 | 485 | 24491 |
| 90 | 24006 | 485 | 24491 |
| 91 | 24006 | 485 | 24491 |
| 92 | 24006 | 485 | 24491 |
| 93 | 24006 | 485 | 24491 |
| 94 | 24006 | 485 | 24491 |
| 95 | 24006 | 485 | 24491 |
| 96 | 24006 | 485 | 24491 |
| 97 | 24006 | 485 | 24491 |
| 98 | 24006 | 485 | 24491 |
| 99 | 24006 | 485 | 24491 |
| 2000 | 24006 | 485 | 24491 |
| 01 | 24406 | 485 | 24491 |
| 02 | 24406 | 485 | 24491 |
| 03 | 24406 | 485 | 24491 |
| 04 | 24406 | 485 | 24491 |

1/ Drawn from Table I-11.

2/ Drawn from Table I-12.

Table I-14

(Scenario II)
Derivation of Total Economic Costs

| | Financial Cost of Project Activities Related to Irrigated Palay Prod'n.[1/] (1978 Price Levels) Total | (FX Component) | 15% Adjustment to Eliminate Taxes & Other Transfer Payments | Shadow FX Cost Adjustment[3/] | O & M Equipment[4/] | Incremental O & M Operations[5/] | Incremental Farm-Level Prod'n Costs[6/] | Total Economic Costs |
|---|---|---|---|---|---|---|---|---|
| 1980 | 3570 | (38) | - 536 | 8 | 2846 | | 0 | 5888 |
| 1981 | 15256 | (4014) | -2288 | 803 | | | 0 | 13771 |
| 82 | 19441 | (5920) | -2916 | 1184 | | | 0 | 17709 |
| 83 | 2130 | (32) | - 320 | 6 | | | 1773 | 3589 |
| 84 | 1278 | (26) | - 192 | 5 | | 644 | 2199 | 3934 |
| 85 | | | | | | 644 | 2723 | 3367 |
| 86 | | | | | | 644 | 3344 | 3988 |
| 87 | | | | | | 644 | 4014 | 4658 |
| 88 | | | | | | 644 | 4014 | 4658 |
| 89 | | | | | | 644 | 4014 | 4658 |
| 90 | | | | | | 644 | 4014 | 4658 |
| 91 | | | | | | 644 | 4014 | 4658 |
| 92 | | | | | 2846 | 644 | 4014 | 7504 |
| 93 | | | | | | 644 | 4014 | 4658 |
| 94 | | | | | | 644 | 4014 | 4658 |
| 95 | | | | | | 644 | 4014 | 4658 |
| 96 | | | | | | 644 | 4014 | 4658 |
| 97 | | | | | | 644 | 4014 | 4658 |
| 98 | | | | | | 644 | 4014 | 4658 |
| 99 | | | | | | 644 | 4014 | 4658 |
| 2000 | | | | | | 644 | 4014 | 4658 |
| 01 | | | | | 2846 | 644 | 4014 | 7504 |
| 02 | | | | | | 644 | 4014 | 4658 |
| 03 | | | | | | 644 | 4014 | 4658 |
| 04 | -19121[2/] | (-4939) | + 2868 | - 988 | -1423 | 644 | 4014 | -14006 |

1/ Please see notes for Table I-7. These costs differ from those presented in I-7 due to the Rinconada of the entire cost (100%) of developing the Lake Buhi water source.

2/ & 3/ Please see notes for Table I-7.

4/ This represents 100% of the cost of operation and maintenance equipment procured by the project. Table I-7 included only 25% of the cost. Drawn from Annex Table H-22.

5/ Incremental O&M costs for the Lalo System are taken from Table H-19. Incremental O&M costs associated with irrigating 600 additional hectares in the Barit River Irrigation System during the dry season are estimated at approximately ₱176,000 per year.

6/ Taken from Table I-11.

Table I-15

(Scenario II)

Benefit-Cost Analysis: Base Case

| Year | Total Economic Costs 1/ | Total Economic Benefits 2/ | Present Value at 15% Costs | Present Value at 15% Benefits | Present Value at 20% Cost | Present Value at 20% Benefits | Net Undiscounted Benefits | Present Value Net Benefits at 31% Discount |
|---|---|---|---|---|---|---|---|---|
| 1980 | 5888 | 0 | 5120 | 0 | 4907 | 0 | -5888 | -4495 |
| 1981 | 13771 | 0 | 10413 | 0 | 9563 | 0 | -13771 | -8024 |
| 1982 | 17709 | 0 | 11644 | 0 | 10248 | 0 | -17709 | -7878 |
| 1983 | 3589 | 12083 | 2052 | 6908 | 1731 | 5827 | 8494 | 2885 |
| 1984 | 3934 | 14459 | 1956 | 7189 | 1581 | 5811 | 10525 | 2728 |
| 1985 | 3367 | 17363 | 1455 | 7507 | 1128 | 5815 | 13996 | 2769 |
| 1986 | 3988 | 20795 | 1500 | 7817 | 1113 | 5803 | 16807 | 2539 |
| 1987 | 4658 | 24491 | 1522 | 8006 | 1083 | 5696 | 19833 | 2286 |
| 1988 | 4658 | 24491 | 1324 | 6962 | 903 | 4746 | 19833 | 1746 |
| 1989 | 4658 | 24491 | 1152 | 6054 | 752 | 3956 | 19833 | 1333 |
| 1990 | 4658 | 24491 | 1001 | 5264 | 627 | 3296 | 19833 | 1017 |
| 1991 | 4658 | 24491 | 871 | 4578 | 522 | 2747 | 19833 | 776 |
| 1992 | 7504 | 24491 | 1219 | 3980 | 702 | 2289 | 16987 | 508 |
| 1993 | 4658 | 24491 | 659 | 3462 | 362 | 1907 | 19833 | 452 |
| 1994 | 4658 | 24491 | 572 | 3009 | 303 | 1590 | 19833 | 346 |
| 1995 | 4658 | 24491 | 498 | 2618 | 252 | 1325 | 19833 | 263 |
| 1996 | 4658 | 24491 | 433 | 2275 | 210 | 1104 | 19833 | 202 |
| 1997 | 4658 | 24491 | 376 | 1979 | 175 | 920 | 19833 | 153 |
| 1998 | 4658 | 24491 | 327 | 1721 | 145 | 766 | 19833 | 118 |
| 1999 | 4658 | 24491 | 285 | 1497 | 122 | 639 | 19833 | 89 |
| 2000 | 4658 | 24491 | 247 | 1301 | 101 | 532 | 19833 | 68 |
| 2001 | 7504 | 24491 | 347 | 1131 | 136 | 444 | 16987 | 45 |
| 2002 | 4658 | 24491 | 187 | 984 | 70 | 370 | 19833 | 40 |
| 2003 | 4658 | 24491 | 163 | 856 | 59 | 308 | 19833 | 30 |
| 2004 | – 14006 | 24491 | -426 | 744 | -147 | 256 | 38497 | 45 |
| | | | 44897 | 85842 | 36648 | 56147 | | 41 |

| | 15% Discount | 20% Discount |
|---|---|---|
| Benefit/Cost Ratio | 1.9 | 1.5 |
| Net Present Value | ₱40.9 M | ₱19.5 M |

Internal Rate of Return = 31%

1/ Drawn from Table I-14.
2/ Drawn from Table I-13.

Table I-16

(Scenario II)
Benefit-Cost Analysis: Sensitivity Tests

| Year | Total Economic Costs 1/ + 20% | Total Economic Benefits 1/ - 20% | Present Value at 15% Costs | Present Value at 15% Benefits | Present Value at 20% Costs | Present Value at 20% Benefits | Net Undiscounted Benefits | Present Value Net Benefits at 20% Discount |
|---|---|---|---|---|---|---|---|---|
| 1980 | 7066 | 0 | 6144 | 0 | 5888 | 0 | -7066 | -5888 |
| 1981 | 16525 | 0 | 12496 | 0 | 11476 | 0 | -16525 | -11476 |
| 1982 | 21251 | 0 | 13972 | 0 | 12298 | 0. | -21251 | -12298 |
| 1983 | 4307 | 9666 | 2463 | 5527 | 2077 | 4661 | 5359 | 2584 |
| 1984 | 4721 | 11567 | 2347 | 5750 | 1897 | 4649 | 6846 | 2752 |
| 1985 | 4040 | 13890 | 1747 | 6005 | 1353 | 4652 | 9850 | 3298 |
| 1986 | 4786 | 16636 | 1799 | 6255 | 1336 | 4643 | 11850 | 3307 |
| 1987 | 5590 | 19593 | 1827 | 6405 | 1300 | 4556 | 14003 | 3257 |
| 1988 | 5590 | 19593 | 1589 | 5569 | 1083 | 3797 | 14003 | 2714 |
| 1989 | 5590 | 19593 | 1382 | 4843 | 903 | 3165 | 14003 | 2262 |
| 1990 | 5590 | 19593 | 1202 | 4212 | 753 | 2637 | 14003 | 1884 |
| 1991 | 5590 | 19593 | 1045 | 3662 | 627 | 2197 | 14003 | 1571 |
| 1992 | 9005 | 19593 | 1463 | 3184 | 841 | 1832 | 10588 | 989 |
| 1993 | 5590 | 19593 | 790 | 2769 | 436 | 1526 | 14003 | 1091 |
| 1994 | 5590 | 19593 | 687 | 2408 | 362 | 1271 | 14003 | 909 |
| 1995 | 5590 | 19593 | 598 | 2094 | 303 | 1060 | 14003 | 757 |
| 1996 | 5590 | 19593 | 519 | 1820 | 252 | 883 | 14003 | 631 |
| 1997 | 5590 | 19593 | 452 | 1584 | 210 | 736 | 14003 | 526 |
| 1998 | 5590 | 19593 | 392 | 1376 | 175 | 613 | 14003 | 439 |
| 1999 | 5590 | 19593 | 342 | 1198 | 146 | 511 | 14003 | 365 |
| 2000 | 5590 | 19593 | 297 | 1040 | 121 | 426 | 14003 | 348 |
| 2001 | 9005 | 19593 | 416 | 906 | 163 | 355 | 10588 | 148 |
| 2002 | 5590 | 19593 | 225 | 787 | 85 | 296 | 14003 | 211 |
| 2003 | 5590 | 19593 | 195 | 684 | 70 | 246 | 14003 | 177 |
| 2004 | -11205 | 19593 | -340 | 595 | -118 | 206 | 30798 | 322 |
| | | | 54049 | 68673 | 44037 | 44918 | | 880 |

| | 15% Discount | 20% Discount |
|---|---|---|
| Benefit/Cost Ratio | 1.3 | 1.0 |
| Net Present Value | ₱14.6 M | ₱0.9 M |
| Internal Rate of Returns = 20% | | |

1/ Drawn from Table I-15 and adjusted accordingly.

Table I-17 (Scenario II)

Irrigation Development Cost Per Hectare

**Net Area:**[1/]

| | | |
|---|---|---|
| Lalo area | 2,700 | hectares |
| Barit area | 600 | " |
| | 3,000 | " |

**Costs**[2/]

| | |
|---|---|
| Lake Buhi Water Source Development (100%) | ₱20,678,000 |
| Lalo Irrigation Construction | 16,937,000 |
| PMO for Irrigation & Agricultural Support (Less O&M Equipment & Impact Evaluation) | 15,491,000 |
| | ₱53,156,000 |

**Cost Per hectare:**

@ 3,300 hectares = ₱16,100 or $2,150[3/]

1/ See note for Table I-11.

2/ Taken from Table H-2. Cost figures include escalation and contingencies.

3/ At $1.00 = ₱7.50.

# SOCIAL SOUNDNESS ANALYSIS 1/

## I. Socio-Cultural Feasibility

The residents of the project area are socially and culturally quite similar to the total rural farm population of the Bicol region. They speak "Bicol" and are organized in nuclear family households and social alliance groups which function to integrate them into the local social organizations established to provide for subsistence and other human requirements. Like the rest of Bicol, a two class stratification system, the wealthy (5-10%), and the poor (90-95%), related to the social alliance groupings, reinforces a symbiotic pattern whereby the more affluent control the majority of the resources and the poor, in turn, provide manual help and legitimize the existing patterns. Social acceptance and security are highly valued. Cross-cutting the social and cultural patterns supporting the status quo are two value orientations that relate to responsiveness to social change. First, the class system and the social alliance groupings are viewed as instrumentalities or means by which the individual's and household's human requirements are met.

"Big (affluent) and little (poor) Bicolanos stay together because they need one another's help, and because they have judged, consciously or unconsciously, that they can afford the going price. Let the need decline, or the price exceed the current limit set on either side, and they will drift, more likely fly, apart."2/

The rural farmers of the Bicol aspire to have a secure, but better life than they have now. For example, a sample of household heads in Camarines Sur, responding to questions concerning changes that would improve their quality of life, reported that increased income, a sturdy home that was adequately furnished, sufficient food and drink, and favorable status and esteem were important.3/

A market orientation further supports a perspective that it is not the cultural traditions that are responsible for the current low level of development in the Bicol region, but rather it is the prevailing opportunity structure. That is, given better physical infrastructure, access to expanded resources, markets and distribution centers for increased

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1/ The TAMS-TAE Joint Venture, with Mr. Bruce Koppel as Sociologist, undertook a special study on social soundness analysis in 1978. Primary data source were the survey of all barangay leaders and a sample survey of household heads in Rinconada. The Analysis establishes what is called a dynamic social baseline - a 'moving' benchmark of socio-economic change underway and consequences already unfolding as a result of prior programs and projects, social and economic forces, etc. It is within this context that impacts of proposed projects for Rinconada are assessed.

2/ Lynch, Frank et al., August 1976. "Let My People Lead: Rationale Outline of a People-Centered Assistance Program for the Bicol River Basin." SSRU, IPC, Ateneo de Manila University, Quezon City p. 14-22.

3/ Op. cit., p. 26

production, and means to convert the increased production into increased wealth and higher quality of life, empirical evidence is available to support the hypothesis that rural development would occur in the region.

Survey findings of the Rinconada IAD indicated the following:

(a) 82% of Rinconada rice farmers use HYV's (BAECON, 1973);
(b) 94% of farms use HYV's in the wet season and 92% in the dry season (SSRU);
(c) 49% of irrigated rice farms use fertilizer in the wet season and 46% in the dry season (TAMS-TAE); and
(d) the need for more and improved irrigation ranks second to roads and bridges in the priority of major problems as perceived by Rinconada barangay heads (TAMS-TAE).

Efforts to elicit involvement and participation of targetted beneficiaries in problem identification and solution as well as in project design were effected through series of dialogues and consultations with farmers in 23 barangays in Baao, Bula and Bato. Acceptability of the irrigation project as proposed is indicated in the following:

(a) Significant attendance in meetings (average of 63 persons/barangay) held which surpasses the usual average attendance;
(b) Overt expressions of enthusiasm and interest over the project;
(c) willingness of some coconut landowners to shift to rice cultivation; and
(d) positive reactions to the explanation of irrigation fee requirements to operate and maintain the system.

A survey of the travel patterns in the Bicol region shows that 40% of all travel in the region is for economic reasons, 12% for marketing, 20% for business, and 8% job related.[1/] Particularly relevant for the project is the location of several large municipal centers directly in the Rinconada vicinity. Relatively close to the project area are Iriga City and Naga City - the dominant urban centers in the province of Camarines Sur. Among Basin area residents 80% had been to the latter, and more than 33% to the former.[2/] This should encourage the development of marketing activities and other complementary rural-urban linkages necessary for development.

The following discussion focuses on the primary cultural feasibili' issues addressed by the project.[3/]

1. The likelihood of forming effective irrigators' organizations capable of operating and maintaining new and improved project facilities. This issue is complicated by a number of considerations:

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1/ Roco, Sulpicio and Lynch, Frank, August 1974. Travel Patterns in the Bicol River Basin. Ateneo de Naga, Naga City, p. 1.
2/ Ibid., p. 5
3/ TAMS-TAE, January 1979. Special Study on Social Soundness Analysis (RIDAP), "Irrigation and Drainage Improvements," Chapter IV.

--irrigation is a relatively new technology in the Rinconada area, and basic operational lessons are still being gleaned;
--existing systems are relatively small, and the expansion of scale proposed brings with it social implications that grow from the issue of size itself;
--farmers perceive water allocation as a more pressing problem than system maintenance and do not feel personally responsible for maintaining system facilities;
--formal organizations familiar to most Bicol residents are executive, not deliberative, in nature; they do not encourage the participation of members in resolving local problems.

The project design addresses this issue in a number of ways. First, it recognizes that farmers lack the administrative experience, technical expertise and time required to operate and maintain an entire irrigation complex the size proposed for the Rinconada area. Therefore, it is proposed that the National Irrigation Administration (NIA) operate and maintain the major diversion and delivery facilities down through the lateral canals to the turn-outs where water is diverted into main farm ditches. Farmer groups will only assume direct responsibility for the distribution of water from the main and supplementary farm ditches and for the maintenance of terminal facilities. Even at this level, NIA will continue to provide supervision and technical assistance.

The proposed method of organizing irrigators is detailed in Annex G(2). The approach is based upon rotational unit groups (RUG's) and farmer irrigators groups (FIG's), of approximately 10 and 50 farmers respectively. By concentrating organizational efforts on such small groups, the issues related to scale will be minimized.

Additionally, the basis for identifying farmers as members of various RUG's or FIG's is the location of their farm parcels. That is, the 8 to 10 farmers who will compose a RUG cultivate contiguous farm parcels which will receive water from the same supplementary farm ditch. The RUG's primary function will be to maintain the ditch and coordinate water deliveries from it. The farmer irrigators groups (FIG's) have similar responsibilities at the main farm ditch level. Such groups facilitate and enhance organizational cooperation and participation among neighbor-farmers. They will build upon a facet of indigenous Bicolano social alliance--sadiring tawo--which exacts loyalty or assistance through bonds of neighborship, friendship or kinship. In sum, the hierarchial structure of the irrigators organizations discussed in Annex G(2) will help form a broad management unit in a fashion which avoids stress among farmer members likely to balk if faced by a more complex organizational structure.

To address farm-level management problems likely to accompany the introduction of the new technology, the project will provide barangay-level training sessions in water management and related irrigated agriculture production techniques. Farmers elected to serve as rotational unit group leaders will receive a week of additional training in water management, the functions and structure of irrigator organizations, and barangay leadership. The goal of these training and organizational efforts is to ensure that farmers have the

institutional capability required to operate and maintain the terminal distributional facilities as well as to increase their productivity once water becomes available.

Detailed engineering analysis has determined that the development of Lake Buhi will provide adequate dry season water for a minimum of 8,000 hectares. Additionally, the project plans to shoulder the construction of all necessary main and supplementary farm ditches as a project cost. These two aspects of the physical system, together with the successful training and organizing of farmers will ensure that irrigation service is adequate and timely. The quality of such service, it should be noted here, is the primary determinant of both farmers' willingness and ability to pay irrigation fees. Water Management Technicians/Water Masters will submit weekly reports regarding the equitable distribution of water in their assigned areas of responsibility (approximately 500 hectares). Such reports will require personal visits to the area two or three times each week and will reduce the likelihood of unjust billings.

2. Obtaining the consent of farm households to give up land traversed by project facilities.

During community dialogue sessions, farmers were clearly apprehensive about compensation for right-of-way acquisition. Citing the predominance of small landholdings, there was fear that some farmers may loose substantial portions of their cultivated land. Therefore, the project has incorporated expropriation costs to provide immediate financial assistance for the rehabilitation of affected farmers.

3. The willingness of project area farmers to take part in labor-intensive construction activities.

One of the unexpected successes of the Libmanan-Cabusao IAD project has been the important role played by project beneficiaries in system construction. By granting small pakyao[1/] contracts to individuals who organize teams of farmers utilizing labor-intensive (pick-and-shovel) construction techniques, the PMO has ensured the timely completion of project drains and farm ditches. When a Manila-based contractor began falling behind in the scheduled construction of major system facilities, the level of pakyao activities increased to fill the gap. Pakyao teams are presently responsible for the completion of certain laterals and sub-laterals. Drawing from the Libmanan experience, it was decided that construction and improvement of certain project facilities in Rinconada could be completed under such pakyao arrangements. At community dialogues in the project area, farmers have reacted enthusiastically to the possibility of supplemental employment during the project's construction phase.

The PMO will qualify pakyao contractors, distribute work assignments, and monitor the performance of each pakyao team. Hired and organized by the various contractors, these teams will be comprised of farm and landless

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1/ Pakyao - contract to perform a particular piece of work in a stipulated time for a specified amount.

household members. They will initially excavate terminal facilities and drains in the areas nearest their own homes and farms. Such construction activities will be scheduled so as not to interfere with the calendar of farm labor requirements. Hopefully these activities will facilitate and complement the concurrent efforts in organizing farmer irrigators into associations capable of operating and maintaining on-farm distribution and drainage facilities.

4. The future ability of cooperatives in meeting farm financing and marketing requirements.

As discussed in Annex G(2), the current nation-wide cooperative system was originally conceived as an integral part of the support program required by beneficiaries of the government's ambitious agrarian reform program. At its appex are the provincial-level Area Marketing Cooperative (AMC) and Cooperative Rural Bank (CRB). These institutions are to be capitalized by the contributions generated at the barangay-level by the member barangay associations, Samahang Nayons (SN's). The Rinconada area is located in the province of Camarines Sur. Both an AMC and a CRB have been established in this province. While their equity is growing, it will probably be some time before they are capable of servicing their entire membership.

Apart from on-going USAID support in the form of the Cooperative Marketing, Samahang Nayon Development and Samahang Nayon Support Projects, the proposed Buhi-Lalo project will support the organization and training activities of the SN's located in the 23 barangays affected by the project's irrigation activities. These activities will benefit from recent experience with Compact Farms and Samahang Nayon cooperatives gained in the Libmanan-Cabusao project area, which indicates they are socially feasible.

The organization and financing of compact farms in Camarines Sur began in 1969. Its history is somewhat checkered and has varied greatly on the basis of location.[1/]

Due to low repayment rates, by late 1977 Masagana 99 credit had all but ceased flowing to farmers in the Libmanan-Cabusao Integrated Area Development Project area. However, during the last year 5 new compact farms have been organized by members of the LCIAD project support staff, and at present 96 farmers have secured M99 loans from the Agricultural Credit Administration (ACA) or individual collateral loans from the Libmanan Rural Bank.

The provision of these loans has been facilitated by the formation of an inter-agency LCIAD project staff team called the Intensified Farm Management Support Service (IFMSS). Members of the IFMSS are field technicians of the Ministries of Agriculture, Agrarian Reform, and Local Government and Community Development. The technicians are responsible for organizing compact farms, preparing farm loan documentation, and supervising farmers' use of loan-acquired inputs. As of early 1979 this team has organized 5

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1/ For details the reader is referred to Frank Lynch, Rice-Farm Harvests and Practices in Camarines Sur: Do Compact Farms, Masagana 99, and the Samahang Nayon Make a Difference?, SSRU Research Report No. 2, January 1974, The Social Survey Research Unit, Ateneo de Naga, Naga City.

compact farms, and 23 more are in various stages of development. A total of about 130 will eventually be organized in the Libmanan project area.

Within the pilot area, farmers are now responding to the organizational efforts required for the management of irrigation water and facilities. The IFMSS team reports that compact farm (CF) organization is facilitated by delimit CF membership within the same farmer groupings as the new rotational unit groups (RUG's) and farmer irrigator groups (FIG's) of the developing irrigators' association. Lately farmers themselves are beginning to grapple with ways of ensuring not only adequate irrigation service, but also the collection of water fees, means of dealing with errant farmers, and the organization of their post-harvest activities so as to secure a fair price for their palay. This final concern relates immediately to their ability to meet water fee requirements and loan repayments.

IFMSS members feel some of these problems will be minimized or at least different in the Rinconada area, due to the smaller land-holdings, "more progressive" attitudes, and alternative income sources of upper basin farmers.

At a recent workshop on post-production activities in Bicol, the National Grains Authority (NGA) indicated that its in-field procurement activities would be greatly facilitated if farmers could bring their produce to central pick-up locations for procurement by the truck crews. The most apparent institution to facilitate this organizational requirement are the Samahang Nayon barangay organizations.

Together with NGA's current warehousing and procurement improvement efforts in Camarines Sur Province, the improved access and farmers' institutional support provided by this project should improve the likelihood of farmers receiving a fair price for their rice.

The socio-cultural problems involved in farm-level agricultural credit programs have become matters of national concern and are being addressed by the Ministry of Agriculture on a national basis, in part through its efforts to strengthen the AID-supported Samahang Nayon cooperative program and its group-credit approach. Additional farm credit is therefore not provided by this project.

A survey conducted in the River Basin in 1977 found 64% of the sampled farmers (213 out of a total of 332) having outstanding debts.[1/] Of these, 79% (169 out of 213) had institutional loans secured from rural or commercial banks, the Agricultural Credit Administration, or other government lending institution. (See the TAMS/TAE Special Study: "Economic & Financial Analysis," August 1978 (Draft) pp. EF-380 through 387 for a fuller discussion of existing credit services for farmers in Rinconada). The report went on to state:

> "Landlords seem to have lost their traditional function as dispensers of cash advances as less than 4 percent report them as a source of credit. Even the once-popular private

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1/ Ricardo R. San Andres and Jeanne Frances I. Illo, Beyond Share Tenancy, SSRY-Naga City, Institute for Philippine Culture, Ateneo de Manila Univeristy, 1978, Table 12.

lenders have been cited by only 12 percent of the borrowers included in the 1977 sample. Kinsmen as source of credit were also mentioned by as many respondents. In sum, (farmers) who have outstanding loans resorted primarily to rural banks and other similar institutions, then to kinsmen and private lenders, and least, to landlords."[1/]

The same study indicates that the rate of repayment in the basin appears to be about 30%. This is substantially lower than the 72% repayment rate identified for the government's Masagana 99 loan program in an earlier 1973-74 study.[2/]

5. The willingness of upland farmers to plant agro-forestry crops.

Dialogues conducted with upland residents indicate that inasmuch as watershed agriculture is subsistence-oriented, watershed farmers are concerned that any change in crops or cropping pattern might endanger their fragile economic condition. The existence of several large land-holdings within the upland area legally released for agriculture justifies the concern of tenants that their access to land may be endangered by any significant changes. (Watershed Development Program, see Annex G(3))

Survey findings indicate 46% of upland respondents are owner-cultivators.[3/] However, there is no data available on tenural status of upland residents. Since respondents were obtained from a sample survey, those with stable access to land are therefore permanent residents and have greater chances of being included in the sample. On the other hand, tenants or landless households are susceptible to upland-lowland mobility, especially for seasonal employment elsewhere as fishing, and are more likely to be unavailable for interview and subject to substitution in the sample.

A large, but as yet undetermined, proportion of the remainder occupy land owned by the government, and the security of their tenure will be improved in conjunction with this project. Upland farmers with secure land tenure can normally be expected to participate more actively in organizational and extension activities encouraging investments in long-term land improvements.

Social indicators do not portray a marked difference between upland and lowland farmers, aside from the greater relative poverty of the farmer. The socio-cultural patterns, values and associations of upland farmers are generally not different from those of lowland farmers.

Whether occupants or cultivators of land above the 10% gradient are willing to forego their normal cultivation practices and cooperate with the project's agro-forestation and reforestation activities is a serious question.

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1/ Ibid.,p. 29

2/ Frank Lynch, S.J., and Jose V. Barrameda, Jr., "The M99 Delivery System: How Well Does it Work in Camarines Sur?," SSRU-Naga Research Report Series No. 3, Feb. 1974, p. 35.

3/ TAMS-TAE, Op. cit., Chapter V, "Watershed Protection/Management".

In this regard, the full participation of line agencies involved (see Agro-Forestry/Watershed Development Annex G(3) is necessary to draw up plans for the social issues that will arise. Experiences gained and methods developed to improve the acceptability of agro-forestation and reforestation and the enforceability of existing forest laws and the Presidential Decree on Watershed Management will enable the refinement of a watershed program that will create the least disruption and dislocation. Phase I of the program, implemented in 2 years and involving 45 families, is therefore a crucial test of its replicability in the Basin area, as well as in other areas in the Philippines.

## II. Beneficiary Profile

Who captures these benefits will depend upon socio-economic institutions and arrangements prevailing in the area, some of which may be modified or encouraged by the project itself. To the extent possible, the project will intervene to try and ensure that the employment opportunities and increases in productivity are captured by the "rural poor."

The vast majority of families residing in the project are both "rural and "poor." Approximately 81% of the households reside in rural barangays and 78% of these households have per capita incomes below ₱3,000,1/ identified as the appropriate "poverty threshold." The typical rural home is a single dwelling of one or two rooms, made of light materials,2/ with water obtained from public facilities or natural sources. It is lit by a kerosene lamp, and cooking is done over a wood fire. The average family has 6.5 members. The demand they face for productive labor is highly seasonal, being concentrated during those months when palay is transplanted or harvested. The rural on-farm labor demand is 7-man-months per farm (1.1 hectare) per year.

Unemployment, outmigration and malnutrition are all chronic. While unemployment rate for the basin areas is at 7.7%, that for Rinconada is greater than the 8.5% NEDA regional estimate, considering the predominance of agriculture. Population growth rate is at 1.4%, indicating a considerable outmigration, with more females leaving than males. The former are older (20-34 years) in comparison to the latter (15-29 years old). Of those who migrate, a high frequency (87%) are of non-professional or non-business occupations. While Metro Manila is the primary destination, the aggregate of intra-regional migration (45%) is high. This is significant where the area's lagging status would mean minor remittances to places of origin. (TAMS-TAE). The weighing of pre-school children revealed them as most affected by malnutrition: 47% first degree, 20% second degree and 6% third degree malnutrition, which is very close to the basin average.3/

However, this general characterization ignores significant differences among project area residents. It is useful here to identify a few basic groupings of "potential project beneficiaries."

1) Farm Households

Families in this category would be those with access to land which they farm as outright owners, amortizing owners, lessees or share tenants. Their livelihood is primarily secured by cultivating palay or corn on farms which are on the average 1.1 hectares. Less than one-fourth of farmers are owner-cultivators. Tenants--generally males and under 30--are the most likely to be unemployed.

1/ Walls of bamboo and/or nipa with nipa or cogon-grass roof or similar materials.

2/ TAMS-TAE

3/ Operation Timbang, Dept. of Health Annual Report, 1976.

In the project area 62% of the labor force depend directly on agriculture for their livelihood. The majority of these cultivate small landholdings--with 74% of farms less than 3 hectares, accounting for 42% of cultivated lands. On the other hand, farms planted to financial crops are of bigger size than those planted to rice or corn. (TAMS-TAE) Farm income is low, as indicated in the following table:

Annual per hectare income (in pesos) for major crops 1975*

| Crop | Average income |
|---|---|
| Irrigated rice | 1615 |
| Rainfed rice | 779 |
| Coconut | 920 |
| Coconut with upland field crop | 1400 |
| Corn | 1300 |

* Based on data from Corn Marketing in Bicol, NFAC (National Food & Agriculture Council), 1976.

Considering the number of new farm households and the problem on land fragmentation, it would appear to follow that in most instances, new farm household are having to occupy more marginal and/or smaller parcels of land. The employment implication would not appear to be full utilization of new farm household labor. The number of farm households that have stopped production and the amount of land that has gone out of production and is currently idle or being used for pasture or residential purposes does not suggest a significant increase in employment due to fragmentation. (TAMS-TAE) .

2) Landless Households

Families in this category would be those residing in rural barangays who have no farm of their own. They lack direct access to the normal resource base, and most are unskilled. They live by working as hired labor on other people's farms during land preparation, transplant and harvest or by scrounging firewood, catching fish, and the like. Some work as contracted "farm managers," who are paid a small stipend by the landlord to live near some land and cultivate it in accord with his wishes.

Unemployment of males under 30 in this group is potentially more serious because there is no stable access to a resource base. Malnutrition has strong preponderant effect on non-farmers. In rural barangays, many non-farmers will be members also of the unemployed and the lowest income groups, considering the localized and low net growth rate for non-agricultural enterprise, with 49 barangays having new establishments while 20 barangays experienced business failures since 1970. (TAMS-TAE)

In 1970, the rural on-farm labor demand for hired farm laborers was about 7 man-months per year. That has increased, but considering that at least 20% of rural households are not farm households and that land reform will not benefit non-farming rural households, it is plausible to conclude that a significant proportion of the rural malnourished are unemployed or

only seasonally employed non-farm rural households. Further evidence is provided by the concentration of high proportions of malnourished persons in relatively smaller communities with relatively higher levels of migration. (TAMS-TAE) The situation in the area is, of course, far more complex. However, this simple two-category model is helpful in identifying who will benefit from the proposed irrigation project and how.

In the area affected by the project's agro-forestry/watershed development component, most families would be classified as farm households and almost half consider themselves as land owners. The others would be classified as squatters or in various forms of tenancy. In the lowland barangays that receive new or improved irrigation service, it is estimated that 80% are farm households. These households number approximately 2500 (1.1 ha./family), and as members of the "rural poor," constitute the project's target beneficiaries. The majority are or used to be under various tenancy arrangements. Households in the landlord category (leasing 7 ha. or less) are normally not members of the "rural poor." While some benefits are likely to accrue to landlords, the project is designed to maximize the shares captured by farm and landless households. (See following discussion)

## III. Benefit Incidence and Social Consequences

Three major categories of benefits are expected from this project.

1) Employment opportunities generated directly by project implementation and construction.

   a. The agro-forestry/watershed development component will require nearly 466,000 man-days of unskilled labor. Such labor will be hired on pakyao basis.

   b. The construction of specified drains, laterals, terminal facilities and associated structures identified in the project's irrigation and drainage component will require considerable man-days of similar unskilled labor.

It is intended that members of both farm and landless households should take part in the labor-intensive construction of project facilities.

2) Increased small farm productivity

   a. The provision for new or rehabilitated gravity-fed irrigation and drainage facilities will:

      - increase cropping intensities particularly in rainfed areas;
      - alleviate crop losses due to moisture stress or inundation;
      - increase average yields by modifying the cropping pattern to avoid periods of high typhoon probability and to coincide more closely with the plant's photo periodism;
      - substantially reduce the cost of irrigation in areas presently irrigated by water pumped from the Pawili River or deep groundwater wells.

b. The adoption of proper land use practices will increase the yield of upland rice and corn.

c. More profitable agro-forestry enterprises will be introduced in sloping upland areas presently planted to palay and corn. Long-term productivity in the uplands will be assured through consequent improvements in soil stability.

d. Information on improved farm and water management practices will be generated and disseminated through intensified applied research, demonstration and extension services.

e. The improved availability of credit and technical knowledge and of processing and marketing services will increase productivity and income.

3) More productive employment will be generated by more intensive application of labor to land, higher yields due to improved technology, and increased demand for inputs, processing, and marketing services.

a. An increase in the demand for on-farm labor will arise from:

--more intensive cultivation of the land, as when a second crop becomes possible or when certain improved farm management practices (such as "straight 'row" transplanting) are adopted;
--higher per hectare yields per crop which will require additional labor in harvesting, threshing, drying and hauling.

b. As farm productivity and incomes rise, induced off-farm employment opportunities should appear, particularly in agricultural processing, input supply, warehousing and transportation. Demand for non-agricultural products and services will also increase as a result of increased purchasing power.

The extent of productive employment to be generated depends upon a number of social and economic considerations. Farm operations where additional labor might be required are of two basic types. First, there are those strictly associated with higher cropping intensities which do not vary with the magnitude of the crop's yield. These include land preparation (plowing and harrowing), the repair of dikes and ditches, transplanting, weeding, and the like. The second type are those generally associated with increases in crop yields. That is, harvesting, threshing, drying, and hauling. Milling is a similar operation, but in Bicol, most milling is performed by kiskisan or large-scale cono millers, not on the farm.

When the need for additional labor rises, the farm operator has a number of alternatives. He may call on the members of his own household. He may engage in an informal "exchange labor" arrangement bayanihan with other farm households. He may mechanize certain operations, calling in a hand-tractor for land preparation or a power thresher at harvest. Finally, he has the option of hiring someone from a landless household.

Given the variety of responses, it does appear however that these house-

holds will benefit from increased small farm productivity as it may result in a higher demand for labor. In view of the number of youth bound to enter the labor force during the next five to ten years, any such relief would be short-run at best. Clearly the need for off-farm employment opportunities is serious and growing. Other BRBDP projects will begin addressing this need in the near future.

Undoubtedly some off-farm opportunities will be generated as secondary or induced benefits by the project. A good number of these opportunities should appear in the agribusiness support structure including agricultural marketing and processing, input supply, warehousing and transportation. Demand for non-agricultural goods and services will also increase as a result of augmenting farm household incomes and providing some members of the "rural poor" with effective demand.

Farm households, including farm labor, and landlords are the two groups in position to benefit directly from increases in farm productivity. How the benefits are distributed between these two groups will depend primarily upon land tenure arrangements. To the extent that landlords are paid a proportion of the gross or net harvest, they will benefit from the increases in production occasioned by project activities. To the extent that farm households own their land or pay only a fixed rent, any increases in production will be captured by the household itself.

Traditionally, the incidence of share tenancy in the project area has been high. Recent and current efforts of the Ministry of Agrarian Reform (MAR) and other concerned line agencies are geared to converting share tenants into amortizing owners or lessees (the latter only in cases where the landlord owns less than seven hectares). This program has been concentrated on rice and corn land below 10 meters in elevation. Within this mandate, MAR's activities are nearing completion.

On the other hand, financial crops as coconuts, abaca and sugarcane are planted in farms larger in size--5.8 hectares on the average. Nothing is being done at the present time to change the status of these farms and little information is available about them. Generally, these farms are larger than rice and corn farms and are operated by tenants or landless labor. Only limited converted coconut land will receive project water.

In a recent survey in Rinconada, roughly half of rice and corn "lessees" (85%) indicated that they were paying share rents.

Share rents in the area range from landlord/tenant proportions of 15/85 percent of the net harvest to 55/45 percent of the gross harvest. The most common landlord share is in the range of 25 to 33 percent of the net harvest, that is what's left after the payment to those involved in the harvesting threshing operations has been subtracted. Any discussion of landlord/tenant relationships is further complicated by the various kinds of benefits provided by landlords. In many instances they provide seed, fertilizers, pesticides, housing or homelots, "soft" credit, school tuitions for a tenant's children, and other commodities and services. Thus, the share payment usually represents something more than a simple rent for the use of land.

In spite of the alternatives offered by the government's land reform programs, it appears that many farm households prefer continuing the share rent arrangement with their landlords. The relationship has apparently proved mutually beneficial in the past, and recent experience indicates it is not easily changed. To the extent tenants opt to continue shareholding arrangements, some of the benefits generated by the Rinconada project will accrue to landlords, who do not constitute targetted project beneficiaries, as the farm production they share increases.

MAR has agreed, however, and it will be so specified in a covenant of the loan agreement, to determine land production levels for all land in the project area as of 1972, and that this will be used as the basis for calculating farmer amortization payments on land transferred and the levels of legal leasehold rents on land still legally tenanted. For those tenants who opt to participate in the MAR land reform programs, then, all project benefits will accrue to the tenants or former tenants and none will go to the remaining landlords, except that, in the case of the latter, legal tenants should suffer fewer crop failures and full legal rents should therefore be paid on a more regular basis than without the project.

As time passes existing rice and corn share tenants may opt for the status of lessee or amortizing owner. Recent evidence in Bicol indicates that the provision of irrigation service (and, in fact, the very increases in productivity it allows) is a powerful incentive encouraging tenure status improvements. The project will also finance additional development and activities of the primary farm-level institutions to grow out of the recent land reform effort, the area's Samahang Nayons cooperatives. Samahang Nayon support is discussed [illegible] in Annex I. It is sufficient here to indicate that a number of the activities proposed for the Samahang Nayons will, in time, supplant some of the functions presently performed by landlords which seem to bind tenants so closely. These include farm financing, the provision of critical inputs, crop processing, and the marketing of excess production. By providing a profitable and cooperative-style alternative to the existing share tenant arrangement, perhaps the potential benefits of the land reform program can be made a bit more alluring. Samahang Nayon organizations also encourage and assist tenant farmers to apply for and insist on their rights under the land reform program. They are empowered to issue receipts for rent payments to landlords during the transfer process, which will then be credited as amortization payments by the Land Bank. Likewise, project-financed improvements in applied research, demonstration and extension will help assure a freer flow of information regarding improved farm practices directly to farm households.

The location of the watershed management/protection activities is above 10 meters elevation and outside the mandate of the existing land reform program. Then, too, the nature of land tenure arrangements in the uplands is less well understood. At this point it can only be said that one of the objectives of the project is to devise a method which will ensure tenure security of upland farm households. This is an essential step in encouraging farm households to plant agro-forestry crops that often require the passing of several years before any produce is harvested. The issuance of forest occupancy permits by the Bureau of Forest Development

(BFD) to upland farmers in order to regularize and secure their tenure status is also to be included as a covenant to the Loan Agreement.

## IV. Spread Effects

Discussions with farmers indicate that they recognize the value of cooperative efforts among themselves to ensure efficient operation and maintenance of an irrigation system. Collective action is expected to be reinforced among other farmer organizations, particularly in obtaining credit, farm inputs, marketing and organization, by the development of Farmers Irrigators Groups (FIGs) and compact farms. In addition, non Samahang Nayon members organized into compact farms for irrigation purposes are expected to be motivated to join the Samahang Nayon as a result of diffusion of collective action in irrigation systems to other farming activities as well.

The agro-forestry/watershed development program is expected to benefit other critical watersheds as the experience gained here is used to refine project design and implementation methodology; and such replication will improve the quality of life and income of other upland farmers.

With higher productivity and an associated rise in rural incomes, the rural market centers of the project area--Baao, Bula and Buhi--are expected to expand. The main sectors impacted will be agricultural processing, warehousing, and transportation. Demand for non-agricultural products will rise as increased farm income augments farmers' purchasing capacity for other goods and services available in the urban centers. Moreover, increased travel opportunities will strengthen urban-rural linkages with Naga and Iriga cities. Inasmuch as Bicolanos like to travel and opportunities for travel will increase, diffusion elsewhere of project progress, benefits and innovations should occur even without conscious efforts on the part of project management.

Transport, health, fishery and other complementary development programs will provide additional support to the area's development. The integrated development efforts are expected to enhance the diffusion of benefits through demonstration and concentric ripple effects.

## V. Role of Women

Women of the Bicol River Basin constitute over half of its population and are engaged in farm work, petty trading or clerical jobs. The predominant alternative female roles are the pure-housewife (traditional) and the part-time working mother (traditional-transitional), with career women in an incipient role. Participation in formal organizations are limited to a few urbanized or working women. Only 25% of all women take advantage of social services, and a higher malnutrition rate has been measured among children of pure housewives.

Housing, household possessions, social services and benefits are the primary concerns, in accordance with their role as housekeeper and mother. However, education is a perceived need, since it is seen as a means of gaining access to well-paying employment opportunities that are education-

specific. The latter would enhance their status and esteem in the community.1/

The Rinconada project would benefit women in consonance with the International Labor Organization's development strategy:

> "One is to enable them to contribute more effectively to the satisfaction of their families' basic needs, within the framework of their traditional responsibilities. The other, which is a fundamental need of women, themselves, is to ease their work burden while furthering their economic independence and their more equitable integration into the community, beyond the narrow circle of the family."2/

The project will function most directly in the realm of the first aspect. Positive effects anticipated for women include: 1) broader utilization of a farm household's labor potential as a result of more intensive agriculture and higher productivity, 2) self-sufficiency in food production and accessibility to better health care that will improve personal well-being and work capacity, 3) profitable home and cottage industries that will provide alternative employment or entrepreneurial activity for rural women, 4) cooperative activities that will provide women more opportunities to exercise leadership roles, and 5) increased affluence, mobility and training that will enable women to participate more fully in social, economic and cultural activities outside the home.

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1/ Illo, Jeane Frances, 1977. Involvement by Choice: The Role of Women in Development, Ateneo de Manila University, Quezon City.

2/ Ibid., p. 103.

# 1978 Bicol Multipurpose Survey

## A. Objectives

1. To develop a greater depth of understanding of the problems that the people of the Bicol region endure and the constraints that must be removed to solve them. These results will be applied in BRBDP project planning and design.

2. To provide reliable and valid information to assess the impact of the broader Bicol River Basin Development Program (BRBDP) and to assess indicators of each component Integrated Area Development (IAD) project. These indicators will measure agricultural production and productivity per hectare; the levels and distribution of income; time allocation and employment status; fertility and mortality levels and family planning use; health and nutritional status and social service use; the contribution of women; and the perceived and actual quality of life.

3. To develop adequate baseline data to be able to understand the combine and synergistic effects of the various GOP projects and programs along with other positive and negative processes of growth outside the control of regional development efforts. Together with other organization evaluations, this will document the rural development process in the Bicol. This 1978 BMS will be followed with resurveys every three years which will develop both a BMS panel and additional representative sample surveys. The second BMS scheduled for 1981 will re-interview the 1978 BMS households. Funding is programmed in joint GOP-USAID Bicol grant assistance project for data collection and analyses of the 1981 BMS.

## B. Description of the BMS

### 1. Sample Size

Twenty project areas (IAD's and sub-IAD's) were sampled to provide a sample of 1900 households. Households were selected on a cluster basis to provide a representative picture of the urban and rural barangay populations in the provinces of Albay, Camarines Sur, and Sorsogon.

### 2. The BMS Instruments

A series of actions over the 1976-1977 period led to the development of the BMS instruments. Under the coordination of a BRBDP consultant, Barry M. Popkin, persons from the BRBDPO and USAID/ORD offices developed a set of objectives which were to be answered by the BMS. These included information to meet the three objectives stated above. With the assistance of leading researchers from the University of the Philippines, Diliman and Los Banos, a draft BMS was developed. The draft was tested and redesigned and submitted to a group of Filipino and foreign researchers at a conference sponsored by the BRBDP in Naga City. The results were a significant revision in the instrument--a revision developed by these experts under the supervision of BRBDP and USAID personnel. This revised instrument was tested and translated to form the BMS. The Social Survey Research Unit (SSRU) of the Institute of Philippine Culture (IPC) was

instrumental in the finalization and pretesting of these BMS instruments.

Numerous government and private agencies were represented in this process. These included representatives of the Department of Health; National Economic and Development Authority (NEDA) Region V; the various offices of the BRBDPO; USAID/ORD and USAID/OD; The Nutrition Center of the Philippines; the School of Economics and College of Nursing, U.P. Diliman; the Institute of Agricultural Development Administration, U.P. Los Baños; and IPC.

A contract was signed in November 1977 with IPC to conduct the field survey and data processing portions of the BMS. Scheduled date of completion of the computer tapes is March 1979, after which separate contracts will be negotiated for analysis.

The following sections comprise the BMS:

a. Socio-Economic Survey

Two visits to each household were conducted to collect on a recall basis this information. Demographic time-use in home and market activities, health and nutrition beliefs and practices, family planning beliefs and practices, detailed agricultural inputs and outputs, other income, employment, and labor force information, household assets and liabilities and perceived and objective quality of life indicators were measured with this instrument. Data were collected both on each individual and the household.

b. Individual nutritional and health status profiles - height, weight, hemoglobin and arm circumference data were collected by trained medical technologists to provide data on accurate welfare measure of all members of our household samples.

c. Barangay (barrio) survey - an inventory of physical infrastructure and social services provided in each barangay was developed. In addition, prices at the usual shopping centers for barangay residents were measured. These barangay data will provide an index of both the impact of outside forces and the BRBDP on the barangay infrastructure.

d. Surveys of all personnel in the Rural Health Units/City Health Offices, the Bureau of Agricultural Extension and Bureau of Plant Industries were conducted by questionnaire. Both a schedule of worker activities and a test of worker knowledge are included in these survey instruments.

C. Implementation

The training, data collection, coding and computerization were handled by the Institute of Philippine Culture (IPC). IPC with its Bicol-based affiliate, the Social Survey Research Unit (SSRU), selected the sample with the assistance of the BRBDP and developed spot maps, training guides, coding manuals editing programs for the keypunched data and SPSS files for the household, individual and community data. Dr. Popkin assisted by providing technical advice and some computer programs.

The final instruments, coding manuals, edited raw data and SPSS files will be turned over to the BRBDPO for distribution to the Filipino scholars who will conduct the analysis. Researchers will have submitted proposals for analysis of the initial 1978 BMS to the BRBDPO and USAID, Naga City offices for appraisal by this group before April 1979. Contracts will be developed for analysis during 1979.

The final BMS tapes will contain household, individual and community data for the entire sample. Analysts can easily link the individual, community and household data. In addition, summary individual and household income variables for each source of income. Income quintile variables for household will be classified by IAD and the total sample will be prepared.

D. Analyses

Tabular analyses and in-depth reports on seven substantive areas will be prepared by analysts connected with the qualified Philippine research or teaching institutions and firms. In many cases the analysts who will undertake the analysis will be the same as those involved in the development of the BMS and the BMS conference and will have been consulted in all substantive changes made to the BMS.

The key areas of analysis correspond to eight major indicators of development. They are:

1. Agricultural Production
2. Level and Distribution of Income
3. Time Allocation
4. Demographic Change
5. Health and Nutritional Status
6. Consumption, Wealth and Investment Patterns
7. The Contribution of Women
8. Objective Quality of Life Index

E. BMS Supervision

The analysis phase of the 1978 BMS and the proposed 1981 BMS will be jointly undertaken by the Planning Research Division of the BRBDPO and the USAID Office of Regional Development. For this initial 1978 BMS, Mr. Perfecto J. Bragais, Jr., Research Supervisor of the Planning Research Division has represented the BRBDP; Dr. Stuart Callison has represented USAID/ORD and Dr. Barry M. Popkin has acted as a consultant to both groups.

F. The Future of the BMS

The contracted analyses of the 1978 BMS will be completed by early 1980. It is proposed that key BMS researchers, Filipino and international scholars and policymakers will be invited to a 2-3 day workshop to discuss analyses findings of the 1978 BMS. The workshop is scheduled for May or June, 1980.

The objectives of the 1981 BMS and the 1981 sample design will be discussed and finalized at the workshop. The researchers will also be asked to provide short appraisals of the 1978 BMS. This will be followed by a work

session at which the draft 1981 BMS instruments will be finalized. Each invited researcher will have been involved at an earlier date in 1979 and 1980 in the design of the BMS 1981.

Key foci of analyses of the 1981 BMS will be the determinants and consequences of changes in certain issues such as agriculture production, and the contribution of women, and critical issues such as employment absorption, migration, and the nature of the beneficiaries of GOP programs, and specific BRBDP projects. Changes in all indicators developed from the 1978 BMS will be examined.

G. Is the BRBDP Experience Useful for other development projects?

Clearly the BMS has been tailored to meet the needs of the Bicol Program. Nevertheless, it has been designed to provide flexibility over time as needs change. Individual blocks and clusters of blocks of questions can be adjusted without affecting the use of the BMS. Consequently, regions with different socio-economic background or planning needs can utilize the BMS package by making major or minor adjustments in various blocks.

What is the main value of the BMS? These complex survey data will be used quickly. Within 15 months after the BMS went into the field, a large battery of socio-economic, agricultural, health and other tables will be available to the BRBDPO. Within an additional nine-month period, a large series of in-depth analyses will be prepared. Also subsamples of the BMS can be resurveyed to learn about additional issues as the needs arise.

ORD 3/79

Attachment 1

ANALYSES OBJECTIVES - 1978 BICOL MULTIPURPOSE SURVEY

BRBDP Studies: 1979-80

I. Agricultural production (rice, coconuts, sugar cane, corn, abaca, vegetables, rootcrops, poultry and livestock and fish).

The BRBDP seeks to understand and document:

1. The key determinants of a) total agricultural production,
   b) production/hectare, and
   c) labor productivity (production/worker)
2. The efficiency of the present delivery system of several key programs. Foremost is irrigation, agriculture credit and land utilization. By land utilization, we mean the nature of the cropping pattern and the seasonality of usage. Secondary is the use of other factor inputs (seeds, fertilizer and other chemicals, extension agent contacts, labor), agricultural credit, and important cultural practices.
3. The present knowledge and working schedules of key agricultural technicians is needed for workers in survey areas.

Two reports are proposed. One is an analysis of the factors which affect productivity (I.1) which includes inputs and technician knowledge. The second will focus on a key delivery system problem area, agriculture credit. The issue of credit and debt and saving levels is critical and one which the BRBDP requires detailed analysis. Included will be the characteristics of informal and formal credit markets, the impact of credit on factor use, and the effects of credit on production and income.

II. Income: Levels, Composition and Distribution

The BRBDPO wishes to understand the individual and combined effects of such programs such as rural electrification, national and provincial roads, irrigation facilities, agricultural extension services, land consolidation and tenure reform, and so forth on the following:

1. The level and sources of income for the household (men, women and children).
2. The distribution of income including income going to landlords and tenants and other types of equity/income distribution issues.
3. The returns per hour of labor of the men, women, children.

Two reports are proposed. One is on the factors related to the distribution of income and the second is on the factors affecting the returns per hour of men, women and children (their value of time).

III. Time Allocation in Home and Market Production and Leisure

The BRBDPO is interested in understanding the determinants of the time allocation patterns of men, women and children in market and home production and leisure and important components of market production. Market production components include farm, wage, business/professional, handicraft, and travel time. The home production components, which

include child care, food preparation, and washing/cleaning, will be analyzed in more depth in topic VII. The location of the work and the time spent traveling to work are of special interest. Some work must be undertaken on the determinants of market labor participation but we are also interested in the more in-depth time allocation patterns. Thus the analyst should look not only at whether or not the person has employment but also at the hours of employment.

The BRBDPO expects at least one report to address factors affecting the employment status and time allocation of men, women, children. Total household time in market and home production should be examined as separate dependent variables. Focus should be on the use as independent variables of the policy factors which the GOP can affect through its projects programs (e.g. roads, electricity, etc).

## IV. Population Growth Rates - Fertility and Family Planning Usage

The chief concerns of the BRBDPO and agencies supporting the family planning program are:

1. The present characteristics of the basin population. This include age and sex composition, age-specific fertility rates and education levels.
2. The key determinants of present fertility levels. Included are socio-economic and belief factors, breast-feeding, contraceptive usage, age of marriage, etc.
3. The key determinants of family planning utilization.
4. The present knowledge and time allocation of family planning workers in the municipalities being surveyed. Health workers' knowledge about contraceptives is desired.

The BRBDPO will add migration analysis to the 1981 re-survey and examine persons and households who have left.

Two reports are proposed. The first will emphasize the determinants of fertility levels and the second, the determinants of family planning usage.

## V. Health-Nutrition-Environmental Sanitation

The BRBDPO wishes to know the following:

1. The present health and nutritional status, infant mortality and the type and use of domestic water and sanitation facilities.
2. The key determinants of nutritional and health status which include socio-economic, environmental, and health service usage factors.
3. The key determinants of the health service usage patterns. First, what are the perceived needs of the household and what proportion of these are met though the use of modern public, modern private and traditional health services. Second, what factors affect the usage of and expenditures on modern private, modern public and traditional services.
4. The health and nutrition knowledge and practice patterns of the mother and of key public and private modern and traditional workers in the study areas.

5. Some environmental quality and domestic water supply and sanitation-related information is needed for measuring the impact of the proposed Bicol Integrated Health and Nutrition Project.

Two reports are proposed. The first addresses the determinants of health and nutritional status, and the second the determinants of health service utilization and health expenditure patterns. Many of the factors mentioned in items 1-5 should be included in these reports and the key issues mentioned in items 1-5 should be presented in tabular form to the BRBDPO.

## VI. Consumption, Wealth, Investment Patterns

The BRBDPO wishes to understand the key factors which relate to the perceived and actual quality of life.

1. PQL Factors include housing; education of children; the types of accessible roads; the formal organizations in which men and women participate; general household health status; food and drink consumption levels; the present role of the mother as female head of household; and the change during the past year in the overall PQL of the household.
2. The actual pattern of food and non food expenditures.
3. The actual household present value of wealth in housing; land; agricultural; fishing; other employment-related capital; household consumer durables; and livestock and poultry.

One report on the PQL is proposed and a second on factors affecting wealth, consumption and expenditure levels.

## VII. Contribution of Women

The BRBDPO wishes to understand the present contribution of women to the Bicolano household and economy, and ways to improve their participation and efficiency in these activities. Other sections of analysis will concentrate on the efficiency of women in economically productive activities, both within the household and outside, plus their income and wage levels. In this section, the BRBDPO wishes to focus on the factors which determine:

1. The participation of women in household non-market and market-oriented activities, other market activities, and formal organizations; and
2. The efficiency of women in child care, food preparation, and other aspects of home management.

One report is expected to address these two issues.

## VIII. Objective Quality of Life Index

An index will be prepared using nutritional status, infant mortality, real income, wealth, housing, sanitation and a wide variety of other social and economic factors. This will provide one or two objective quality of life indices, for the three-province Bicol Program Area and for each IAD and sub-IAD.

# Overview of AID Assistance
# BICOL RIVER BASIN DEVELOPMENT PROGRAM

## AID Assistance - General

The Bicol River Basin Development Program (BRBDP) being undertaken by the Government of the Philippines (GOP) is a test case in its overall rural development strategy. The innovative, sub-regional integrated area development (IAD) approach includes decentralized planning and implementation of multi-sectoral projects in a defined geographical area of critical need and high growth potential. Equally important to success of the Program has been the development of the organizational structure and institutional capability to achieve an increasing degree of regional and local level coordination of development activities (see attachment 1 for summary background).

AID has played a key supporting role in helping to initiate and sustain the Bicol Program to date. AID assistance includes one completed and one follow-on grant technical assistance project; two sub-loan feasibility studies, including a basin-wide comprehensive water resources development study and the Rinconada IAD III feasibility study; and three on-going Bicol loan assistance projects (see Table 1). As of December 1978, AID loan obligations totaled 17.6 million for the Bicol Program. GOP commitments against loan projects are estimated at $39.7 million which is an indication of the national priority attributed to the Bicol Program as a test case. Assuming approval and signing of loan agreements for the two loan projects now in the Project Paper stage (i.e., Rinconada/Buhi-Lalo and the Bicol Integrated Health, Nutrition and Population) added to planned grant obligations through FY 1981, the total AID grant and loan contribution to the Bicol Program would be $29.6 million. The total GOP contribution is estimated at $58.6 million (in local currency). The combined GOP and AID total is estimated at $88.2 million in existing and proposed inputs, one-third by AID and two-thirds by the GOP.

## Other Donor Support

In early January 1979, the Asian Development Bank sent a three-man project identification ("fact-finding") team to the Bicol. Based on a GOP request and follow-on discussions, the current estimate for a possible Bicol loan assistance project is $25-30 million in foreign exchange with possible follow-on assistance. The proposed project is a combination of the Naga-Calabanga IAD IV project and major Rinconada IAD III components. It will provide resources for irrigation, drainage, access roads, and supporting agricultural activities. The target is to negotiate an ADB loan agreement in 1979. Additional IAD projects are in the identification stage. An investment grade feasibility study is now in process for the Baliwag-San Vicente IAD V Project. Quinali IAD IV in Albay Province and Irosin valley (SDA III) in Sorsogon Province are attractive projects under consideration. Other possible donors (IBRD, Japan and Germany) have also informally expressed interest in supporting the Bicol Program.

In relation to other donors, USAID has proposed obligations (see Table 1) up through 1981, including a second tranche loan obligation in 1980 and a grant obligation in 1981. Grant expenditures would continue through 1982 and loan draw-down to 1985. The 1979 USAID Mission Country Development Strategy Statement (CDSS) does not propose additional major projects for the Bicol at this time. For this reason, the Mission is encouraging other

Table 1

On-going and Proposed Projects Assisted by AID
Bicol River Basin Development Program

| | Duration CYs | AID Obligations FYs | $ Million 2/ AID | GOP |
|---|---|---|---|---|
| **Grant Technical Assistance Projects** | | | | |
| - Bicol River Basin Development | 74-78 | 74-77 | 2.2 | 4.3 |
| - Bicol Integrated Rural Development | 78-82 | 78-81 | 2.3 | 8.6 |
| **Consulting Services (Sub-Loans)** | | | | |
| - Bicol River Basin Comprehensive Water Resources Development Pre-feasibility Study | 75-76 | - | 0.6 | 0.4 |
| - Rinconada IAD III Feasibility Study 1/ | 77-78 | - | 0.5 | 0.5 |
| - Others (to be determined) | 80-82 | - | - | - |
| **Development Loan Projects** | | | | |
| - Libmanan IAD I | 76-80 | 75 | 3.5 | 5.0 |
| - Bicol Secondary and Feeder Roads | 77-81 | 76 | 10.0 | 30.0 |
| - Bala IAD II | 78-82 | 78 | 3.0 | 3.8 |
| - Rinconada IAD III 1/ Buhi-Lalo Component (Proposed) | 79-85 | 79 (3.5)<br>80 (1.5)<br>Total | 5.0 | 3.5 |
| - Bicol Integrated Health, Nutrition & Population (Proposed) | 79-84 | 79/80 | 2.5 | 2.5 |
| Total | | | $29.6 | $58.6 |

1/ Feasibility study covered multiple components of Rinconada IAD (also called IDA), only one of which is proposed for funding by AID. Discussions are underway between GOP and ADB for an estimated $25-30 million loan in foreign exchange for a combination assistance project which includes Naga-Calabanga IAD IV, and the major components of the Rinconada IAD III (primarily irrigation and drainage) with a total estimated cost of $50-58 million (1979-85).

2/ AID dollar obligations are fixed amounts. AID dollar inputs also provide for local cost components under a Fixed Amount Reimbursement (FAR) arrangement. GOP input levels may increase or decrease based on actual costs. GOP funds are appropriated each year.

2/79

donor assistance, particularly for major infrastructure projects. This includes priority areas in Albay and Sorsogon provinces as well as in the physical Bicol River Basin located mostly in Camarines Sur.

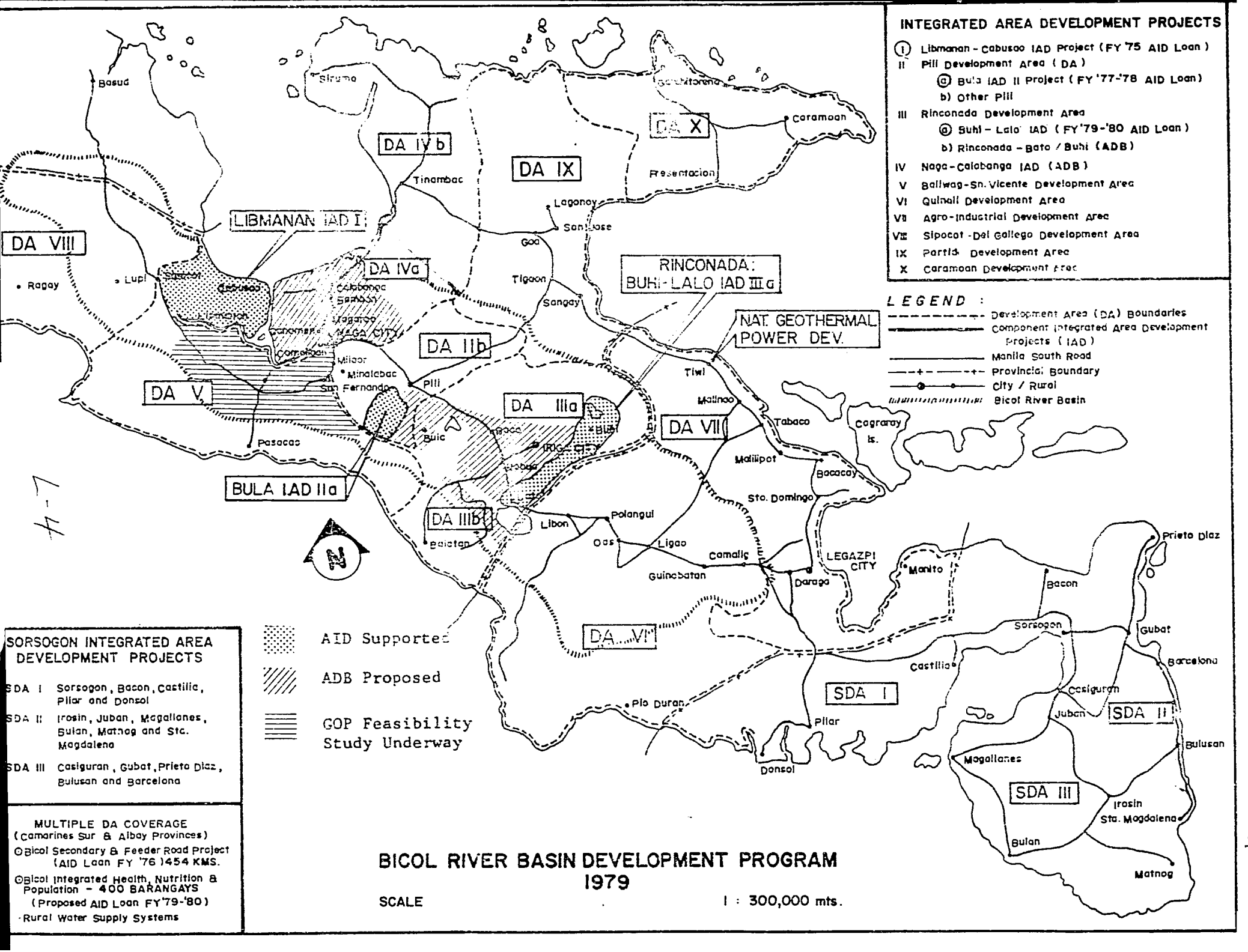
Summary of AID-Supported Projects (See Bicol Program map)

The following briefly describes the background and status of the completed, on-going and proposed Bicol projects supported by AID.

Grant Bicol River Basin Development Project (1974-78) - The joint objective was the establishment and institutional development of the broader GOP Bicol River Basin Development Program. AID inputs included technical assistance in planning, preliminary technical and socio-economic studies, initial loan project development, third country training and commodity procurement. In addition to the first two Bicol development loan projects, the early Bicol Program helped to induce or facilitate additional GOP and other investments in the Bicol (e.g., rural electrification, roads, ag research complex, drainage, national railroad improvement, etc.). A joint, in-depth Bicol evaluation in June 1977 (Arthur Mosher, AID team leader) critically examined and described the status of the Bicol Program; the joint objectives of the early Bicol Program and AID support were clearly achieved.

Grant Bicol Integrated Rural Development (Support) Project (1978-82) - The joint objective is to support the expanded and accelerated GOP Bicol Development Program. AID inputs are primarily in the form of technical assistance: (1) to support GOP line agency implementation and BRBDPO/USAID monitoring of on-going Bicol projects assisted by AID loans, and to coordinate other AID-supported (Mission and AID/W funded) projects in the Bicol, (2) to promote accelerated private sector investment in agribusiness and small-scale rural industry, (3) to identify, design, support feasibility analysis and package additional component projects for other external donor funding, (4) to support adequate impact evaluation of component projects and of the overall GOP Bicol Program, and (5) to facilitate spin-off and spread effects from the Bicol Program. The coverage is now a three-province area of 2.3 million people, but with concentration in the more densely populated Bicol River Basin core area in support of on-going AID loans. An in-depth joint evaluation of this support project and the larger Bicol program is scheduled for May-June 1979. (See Evaluation Schedule, Attachment 2)

Libmanan IAD I Project (loan assistance 1976-80) - This project provides for the construction of a 4,000-hectare irrigation and drainage system plus flood control, salt water intrusion protection facilities, and farm access roads in an economically depressed, but high growth potential area in the lower Bicol River Basin. Supporting institutional and agricultural components are built into the project and post-project operation. The lead implementing agency is the National Irrigation Administration. As in all Bicol component projects, the Bicol Program Office has overall coordinating and monitoring responsibilities. Other technical line agencies are involved in institutional and agricultural support components. Direct beneficiaries are 2,500 small-scale farm households. Another 10,000 households in the two major towns will be indirect beneficiaries of flood protection and secondary economic activity. As of March 1979, approximately 85% of the construction work had been completed, including major work on the pump


INTEGRATED AREA DEVELOPMENT PROJECTS
I Libmanan - Cabusao IAD Project (FY '75 AID Loan)
II Pili Development Area (DA)
a) Bula IAD II Project (FY '77-'78 AID Loan)
b) Other Pili
III Rinconada Development Area
a) Buhi - Lalo IAD (FY '79-'80 AID Loan)
b) Rinconada - Bato / Buhi (ADB)
IV Naga - Calabanga IAD (ADB)
V Baliwag - Sn. Vicente Development Area
VI Quinali Development Area
VII Agro-Industrial Development Area
VIII Sipocot - Del Gallego Development Area
IX Partido Development Area
X Caramoan Development Area
LEGEND :
Development Area (DA) Boundaries
Component Integrated Area Development Projects (IAD)
Manila South Road
Provincial Boundary
City / Rural
Bicol River Basin
DA VIII
DA IV b
DA IX
DA X
LIBMANAN IAD I
DA IVa
RINCONADA: BUHI-LALO IAD IIIa
NAT. GEOTHERMAL POWER DEV.
DA IIb
DA V
DA IIIa
DA VII
BULA IAD IIa
DA IIIb
DA VI
SDA I
SDA II
SDA III
Basud
Siruma
Tinambac
Caramoan
Resentacion
Lagonoy
San Jose
Goa
Tigaon
Sangay
Ragay
Lupi
Sipocot
Cabusao
Calabanga
Bombon
Naga City
Camaligan
Canaman
Milaor
Minalabac
San Fernando
Pili
Pasacao
Buhi
Bato
Iriga City
Tiwi
Malinao
Tabaco
Cagraray Is.
Malilipot
Bacacay
Sto. Domingo
Polangui
Libon
Oas
Ligao
Camalig
Guinobatan
Daraga
Legazpi City
Manito
Prieto Diaz
Bacon
Sorsogon
Gubat
Barcelona
Castilla
Casiguran
Juban
Bulusan
Magallanes
Irosin
Sta. Magdalena
Bulan
Matnog
Pio Duran
Pilar
Donsol
AID Supported
ADB Proposed
GOP Feasibility Study Underway
SORSOGON INTEGRATED AREA DEVELOPMENT PROJECTS
SDA I Sorsogon, Bacon, Castilla, Pilar and Donsol
SDA II Irosin, Juban, Magallanes, Bulan, Matnog and Sta. Magdalena
SDA III Casiguran, Gubat, Prieto Diaz, Bulusan and Barcelona
MULTIPLE DA COVERAGE (Camarines Sur & Albay Provinces)
Bicol Secondary & Feeder Road Project (AID Loan FY '76) 454 KMS.
Bicol Integrated Health, Nutrition & Population - 400 BARANGAYS (Proposed AID Loan FY'79-'80)
Rural Water Supply Systems
BICOL RIVER BASIN DEVELOPMENT PROGRAM
1979
SCALE 1 : 300,000 mts.

Map 1

system, main canals and laterals, irrigation terminal facilities, drainage, and flood protection dikes. Terminal facilities and drainage involve primarily labor-intensive construction. The four large electric pumps (U.S.) are being installed. Supporting activities to organize irrigators' associations and farmers' groups for water management and improved production training are underway. Extension and applied research activities are ongoing. Targeted land reform activities are virtually completed.

The project is expected to achieve its development objectives even though implementation was delayed due to start-up problems and poor weather. Although most physical work should be completed by the end of the current dry season, June 1979, it was necessary to extend the project for one additional dry season. As of April 1979, accrued expenditures against the AID loan were estimated at 83%. The loan contribution, other than pumps and equipment costs, however, cannot be drawn down until physical facilities are completed and the system is operational in order to meet AID fixed amount reimbursement requirements.

Experience from the design and implementation of the Libmanan IAD Project has been important in the design of the Bula IAD II and the Buhi-Lalo Project. Many of the trained personnel are expected to be assigned to Buhi-Lalo as work is completed at Libmanan.

The next evaluation is scheduled in May-June 1979 together with the Bula IAD evaluation. A final project evaluation is scheduled in April 1980. An additional impact evaluation is proposed in 1981 or 1982 after the irrigation system is fully operational.

Bicol Secondary and Feeder Roads Project (loan assistance 1977-81) - This project provides for the rehabilitation and improvement of 191 km. of secondary roads and 241 km. of feeder roads within the Bicol River Basin. Fourteen separate road and bridge sub-project systems are being constructed by the GOP through 25 separate construction contracts over a four-year period (1978-81). USAID inputs include $3 million in maintenance equipment and $0.2 million for U.S. road maintenance consultancy. Effective maintenance of all existing and project roads in the provinces of Camarines Sur and Albay is as important as new construction. The remaining $6.8 million from AID provides for part of the local currency costs for engineering design and construction using fixed amount reimbursement procedures. The Ministry of Public Highways is the lead implementing agency. The Bicol Program Office provides overall coordination.

This project increases the road density in the Bicol River Basin area by approximately 50% (from 0.29 to 0.59 km. per square kilometer of arable land). It is projected that average transport costs will be reduced by 42% for cargo and 40% for passengers, and that travel time will be reduced by 55% because of improved roads. The roads generally traverse intensively cultivated lands, serve small-scale farmers and connect relatively isolated communities with existing highways and market centers. The road project is integrated into the larger Bicol Program and specifically provides secondary and feeder road access to and within the Libmanan IAD I Project, Bula IAD II Project and the proposed Buhi-Lalo Project in Rinconada IAD III. These

connect with farm access roads on main canals and laterals to be constructed in the IAD projects. The Bicol roads project map shows the location of the 14 sub-project systems. (See Attachment 3)

As of April 1979, the Bicol Roads Project is approximately 25% completed. Notice to proceed has been issued on 22 of 25 construction contracts for road and bridge segments. Construction is underway on 12 segments. Three contracts are now in the bidding, award or approval process and are targeted to begin during the current dry season. Efforts are being made to accelerate the contract approval and review process which has delayed scheduled construction. A U.S. contract for road maintenance management will be completed in December 1979, and $3 million in equipment to be procured from the U.S. should be advertised by April 1979. Major portions of the AID loan will be drawn down in 1980 and 1981 as useable road sub-projects are completed. With multiple contractors, the proposed 1981 project completion date is still realistic. The next evaluation is scheduled in July 1979.

Bicol IAD II (Bula-Minalabac - 1978-82). This project is basically a combination land consolidation and irrigation project covering 2,300 hectares in the middle Bicol Basin. The project also includes construction of community buildings, improved water supply facilities, organization of farmer associations and cooperatives, land consolidation and redistribution, and training of project area residents in agriculture, health and other community activities. It is the most functionally integrated of Bicol component projects to date. Irrigation water for three quarters of the project will be pumped from the Bicol River and one quarter from ground water sources. The Ministry of Agrarian Reform is the lead implementing agency. The Bicol Program Office is the coordinating agency and ten other line agencies are actively involved in the institutional, agricultural and community support activities. There are 1230 small-scale farm family beneficiaries (aver. 1.2 ha./family).

As of March 1979, approximately 6% of the total project was completed. Contracts have been let for final A&E design and continuation of construction on Phase I. Much of the training has been successfully carried out. Land consolidation procedures have been completed. The lengthy GOP contracting process from advertizing to final approvals and national level review has delayed engineering design and construction. One alternative being considered is temporarily shifting more of the contracting functions from the Bicol region to Manila.

Bicol Integrated Health, Nutrition and Population Project (1979-84). This project designed by the GOP was provisionally approved by USAID/Philippines in early February 1979. It is awaiting the final loan negotiation which is estimated in June 1979. The project initiates an essential social services component to balance the broader GOP Bicol Program, which is currently heavily oriented towards physical infrastructure. The project deploys 400 Barangay Health Aides, funds environmental sanitation improvements (household water, waste disposal and drainage), and strengthens Ministry of Health management and inter-agency coordination. There will be an estimated 400,000 targeted beneficiaries in 400 barangays which make up about one-third of the rural barangays of Albay and Camarines Sur provinces. The Ministry of Health is the lead implementing agency. Both the ministry and local governments have placed a high priority on implementation of this project. The design specifically addresses the replicability question and embodies a significant attempt to mobilize local resources and maximize local government and beneficiary participation.

Rinconada IAD III (Buhi-Lalo - 1979-85). The project will develop and regulate water from Lake Buhi for dependable dry season gravity water to irrigate an additional 8,000 hectares by constructing a lake control structure and forebay regulation facilities, and excavating the outlet channel. From the forebay, a left bank connector canal will be constructed to expand the Lalo irrigation system to 2,700 hectares with new and rehabilitated irrigation and drainage facilities. Continuation irrigation laterals canals and farm access roads will connect with Bicol Project and other secondary and feeder roads. Maintenance equipment will be procured. There are an estimated 2,450 small-scale farm family beneficiaries (aver. 1.1 ha/family) in this system.

The existing Barit irrigation system requires dry-season water for an additional 600 has. which can be supplied by storage and regulation of Lake Buhi. A proposed GOP (and ADB) project will further rehabilitate or construct new irrigation facilities in the Rinconada area to utilize the Buhi water supply (est. 5,800 hectares).

Improved water management, farmer organizations and farm family training activities are also supported under the project. Another component is the agro-forestation of 1,350 hectares on the Lake Buhi upland watershed by 900 small-scale farm families and reforestation of 800 hectares of denuded public forest lands. The objective is to assist poor upland farmers increase their productivity and to protect the watershed and water source.

A basin level pre-feasibility study and the Rinconada IAD III feasibility study, both funded in part by USAID feasibility study sub-loans, confirmed the feasibility of developing lake water supplies and expanding/rehabilitating gravity irrigation systems. The Rinconada study provided preliminary/engineering and cost data. The project paper is being reviewed by GOP/NEDA. Both the Rinconada-Buhi/Lalo and Bicol Health Project can be authorized at Mission level. Loan signing is targeted for August 1979.

Other AID-Supported Projects - Being multisectoral in scope, the GOP Bicol River Basin Development Program focuses on coordinated planning leading to funding of major IAD projects. IAD projects are based on the water resources potential in a specific area. Exceptions have been rural roads and social services projects which are better coordinated at the provincial or sub-regional level. Implementation and post-project operation is the responsibility of the concerned national line agency but decentralized to their regional level office to the degree feasible. When national programs or projects are already in place, the Bicol Program functions to support and coordinate with them. This is true for AID-assisted projects such as Rural Electrification, Provincial Development and PDAP Rural Roads, Rural Service Centers (3 cities in Bicol), Agrarian Reform, Cooperative Marketing, Integrated Agricultural Production and Marketing, Small Farmer Systems, Real Property Tax Administration, plus Population, Health and Nutrition project activities. The selection of the Bicol location as one of the four original sites for the Agricultural Research loan project (Bicol Soil and Water Research Complex) for example, was planned as part of the Bicol Program. Bicol Program surveys and evaluations will also attempt to measure the impact of other AID-supported projects as they relate to sub-regional development.

# Bicol River Basin Development Program (BRBDP)

## The Bicol Region

The Bicol Region consists of 6 provinces (2 of them separate islands) at the southeastern tip of Luzon. It comprises 8% (3.5 million) of the total Philippine population and 6% of its total land mass. It is characterized by:

- a declining per capita income, already at $172 (in 1974) one of the lowest among the 12 Philippine regions and only 49% of the national average
- a serious maldistribution of income, with the poorer half of the people surviving on $45 per capita in 1974
- the lowest share among regions of employment and production in large, modern manufacturing establishments, in proportion to population
- a lack of employment opportunities, resulting in high rates of under-employment and outmigration to Manila (1.1%)
- high rates of malnutrition, morbidity and mortality (78% of preschoolers malnourished, of which 5.5% are serious 3rd degree cases)

## Development Constraints

The chief obstacles to more rapid development have been:

- physical isolation due to neglected transportation infrastructure
- poor communication facilities
- hostile physical environment (particularly typhoon and flooding)
- inefficient production, storage and marketing technology
- capital scarcity
- inequitable land tenure arrangements
- rapid rate of crude population growth (3.3% annually before migration)
- poverty and technological ignorance about health and nutrition
- ineffective government institutions and low revenue collection

## GOP Development Strategy

Pursuant to a national strategy of rural mobilization and development, the Bicol Program is an innovative effort to prioritize and reduce these constraints in a phased, coordinated, decentralized manner:

- The BRBDP institution is itself designed to improve the effectiveness of government entities to plan and implement development programs and projects. Its Integrated Area Development approach focuses on a delineated area of recognized socio-economic need with high growth potential to maximize benefits. It directs an integrated, cross-sectoral, interagency planning process to ensure coordination. It decentralizes project planning and management to maximize local government and popular participation.
- Basic infrastructure development demands high priority to reduce costs of other activities and to best utilize natural resources: drainage and flood control, irrigation facilities, watershed protection, roads, bridges, port facilities, the railroad, geothermal power and rural electrification, intra-regional telecommunications.
- Land reform is designed to reduce income inequality.
  Agricultural development - IAD component projects focus on full development of water resources and provide supporting programs to increase productivity of small-scale farmers; upland watershed development expands the focus to include conservation of natural resources.
- Integrated health, nutrition and population. This project will train and help rural residents to improve environmental sanitation, reduce morbidity, malnutrition and population growth.
- The promotion of private sector investment is designed to expand productive and employment-generating capital assets and to stimulate technological improvements.

Revised 5/79

## Evaluation Schedule 1978-1982[1/]
Bicol River Basin Development Program

| Program/Project | 78 | 79 | 80 | 81 | 82 |
|---|---|---|---|---|---|
| Overall Bicol Program & Bicol Integrated Rural Development (grant)[2/] | - | June-July | - | June-July | - |
| Libmanan-Cabusao Integrated Area Development (Bicol IAD I)[3/] | April | April | April | - | April |
| Bicol Integrated Area Development II (Bula)[4/] | - | May | May | May | May |
| Bicol Integrated Area Development III (Rinconada-Buhi/Lalo)[5/] | - | - | - | June | June |
| Bicol Secondary and Feeder Roads[6/] | July | July | July | July | - |
| Bicol Integrated Health, Nutrition and Population[7/] | - | - | Jan. | Jan. | Jan. |

1/ U.S. evaluation team members will normally be funded from the Bicol IRD grant project and/or assigned from USAID/Manila. The same U.S. team members may be assigned to one or more annual evaluations. The BRBDPO, the lead implementing agency, NEDA (Region V), and special team members will be designated by the GOP. Joint members will be designated no later than 30 days before an established evaluation start date. Evaluations shall be conducted as scheduled (to begin first work day of month listed unless otherwise specified) to allow for timely GOP and USAID/Manila review and approval of each Project Evaluation Summary (PES). The PES format is available at BRBDPO and USAID. PES reports are scheduled to arrive in AID/W within 30 days after month listed above.

2/ Joint biennial evaluations of the Bicol Program and the prior Bicol grant project were conducted June/July 1975 and July/August 1977. The follow-on Bicol grant agreement (IRD) was signed March 1978.

3/ A March 1977 joint evaluation (operational assessment) and a special September 1977 joint evaluation were combined to prepare the 1977 Project Evaluation Summary (PES); 1978 evaluation conducted as scheduled.

4/ First evaluation May 1979.

5/ Estimated loan signing June 1979. Proposed USAID Project Officer, David Heesen est EOD 7/79.

6/ The 1977 evaluation was limited to an in-house assessment of the implementing organization and A&E design work; construction started January 1978; first regular evaluation was conducted in July 1978.

7/ Estimated loan signing June 1979.

Concurrence:

**GOP Project Managers**

Bicol IRD - C. Balisnomo, BRBDPO
Libmanan IAD I - R. Caceres, NIA
Bula IAD II - C. de la Cruz, MAR
Rinconada IAD III - C. Gimpaya, NIA
Bicol Roads - A. Salvador, MPH
Bicol Health - Dr. Santiago, MOH

**USAID Project Officers**

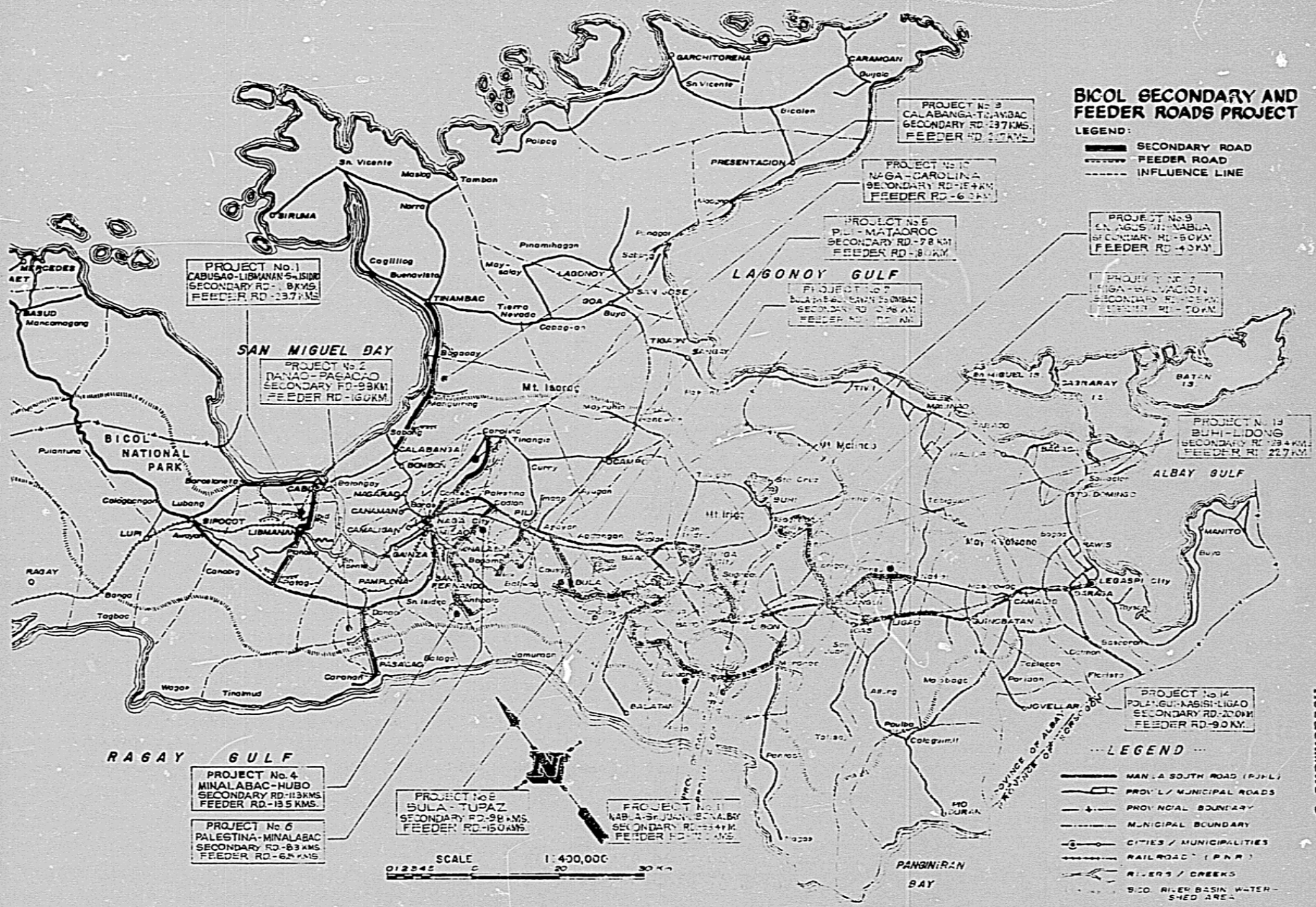
D. Wadley, ORD
D. Smith, OCD
R. Bird, ORD/OCD
(D. Heesen) ORD
R. Bird, ORD/OCD
Dr. Van der Vlugt, O/HLTH

Approval: Camilo A. Balisnomo, Program Director, BRBDPO

4/25/79
Date

Daniel L. Leaty, PO/Evaluation Officer

5/8/79
Date






Attachment 3

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"A Report on the Bicol River Basin" (January 1967); 53 pp.

"A Report of Geological Reconnaissance and a Program for Geological Feasibility Investigation: Bicol River Basin, Philippines" (December 1974); 93 pp.

# BICOL INTEGRATED AREA DEVELOPMENT III
## (Rinconada/Buhi-Lalo)

# VOLUME II
# PROJECT PAPER ANNEX G(3)

PROJECT TECHNICAL DETAILS

AGRO-FORESTATION/WATERSHED DEVELOPMENT
BUHI-LALO INTEGRATED DEVELOPMENT PROJECT

USAID/PHILIPPINES

JUNE 1979

# Agro-Forestation/Watershed Development Program
# Component of Buhi-Lalo Integrated Development Project


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(Phase I Start-Up, IRD Bicol grant project 492-0303)

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# Agro-Forestation/Watershed Development Program
## Phase II (1980-1985)
## Buhi-Lalo Integrated Development Project[1/]

## I. Project Description and Background

### A. Project Description

1. Goal and Purpose. The Buhi-Lalo Integrated Development Project, which includes Agro-forestation/Watershed Development, is a component of the broader Bicol River Basin Development Program (BRBDP). It pursues the BRBDP goal of improving the socio-economic situation and the quality of life of the rural poor residing in the project area. It focuses directly on the sub-goals of:

- increasing agricultural production and productivity per hectare,
- increasing productive employment opportunities,
- increasing farmer participation in development activities affecting them, and
- reversing the deterioration of upland watershed areas.

The specific purposes to be achieved by the end of the fifth year of the Phase II Agro-forestation/Watershed Program are:

(1) Upland farmers utilizing more productive and environmentally sound land-use practices in Lake Buhi watershed (see Map 1).

(2) GOP effectively managing existing and replanted public forest land in the Lake Buhi watershed.

Indications of successful achievement of the purposes and their magnitude are discussed below.

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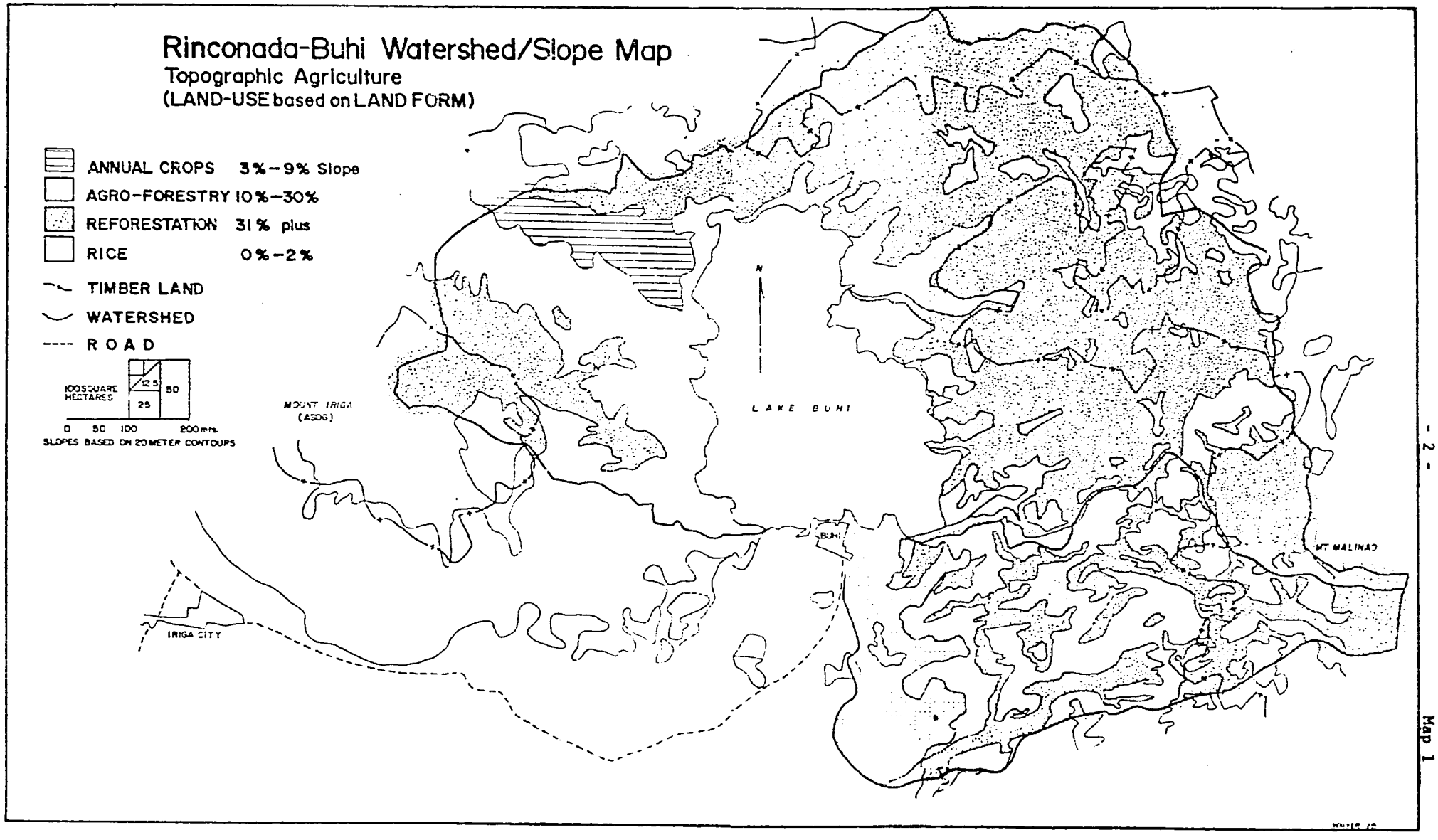
1/ This separate Annex Volume II presents a more complete background and technical details of the Watershed Development component. It is written in the Project Paper format for clarity and consistency with the larger project of which it is an essential part. It was also prepared to serve as a background document for the on-going Phase I Agro-forestation/Watershed Development Program and planning for possible expansion of watershed development activities in other critical areas of the Bicol by the BRBDPO and other donors. It was prepared through the joint efforts of the BRBDPO, other line agency staff, and USAID/ORD staff and consultants.


Rinconada-Buhi Watershed/Slope Map
Topographic Agriculture
(LAND-USE based on LAND FORM)
ANNUAL CROPS 3%-9% Slope
AGRO-FORESTRY 10%-30%
REFORESTATION 31% plus
RICE 0%-2%
TIMBER LAND
WATERSHED
ROAD
100 SQUARE HECTARES
12.5
50
25
0 50 100 200 mts.
SLOPES BASED ON 20 METER CONTOURS
MOUNT IRIGA (ASOG)
LAKE BUHI
N
BUHI
MT MALINAO
IRIGA CITY



Map 1

2. Project Inputs. Proposed GOP and AID financial inputs for the Agro-forestation/Watershed Development component of the Buhi-Lalo Project[1/] are summarized by source in Table G(3)-1. Total cost is estimated to be approximately $834,000 (₱5,259,000) of which $516,000 (₱3,869,000) or 62% is being requested from the project loan, and the remainder GOP-funded. See Part III, Financial Plan, for further details and scheduling.

3. Project Outputs. The principal outputs over five years (see Table G(3)-2) are direct land improvements on 1,350 hectares farmed by 900 small-scale upland farmers, and reforestation of 800 hectares of public forest lands. A further breakdown of project supported outputs include:

- planting 900 hectares of mixed species of fruit trees, nuts, bamboo, underplanted with cover crops (1 ha/family agro-forestation on a voluntary basis)

- construction of bench terraces and/or contour farming on a total of 270 hectares (3000 sq.m./family) to supply minimum rice/corn requirements (on a voluntary basis), if required

- planting 900 family firewood lots on a total of 180 hectares (2000 sq.m./family on a voluntary basis) to supply firewood for home use or for sale with continuous rotational planting

- reforestation of 800 hectares of denuded public forest land or timber land

- construction of 40 kms. of graded mountain trails to facilitate access for production inputs, marketing and forest protection personnel

- production of 1,500,000 high yielding fruit, nut and firewood seedlings and 15,000 bamboo starts on site; some seedlings may be secured from existing GOP sources, if transportation is feasible

- production of 850,000 seedlings of various reforestation species to rehabilitate denuded public timber land. (Coupled with adequate protection, this will facilitate "regeneration" of over 1000 hectares of forest area in addition to 800 to be planted directly).

- Direct seeding of some species is recommended; some seedlings may be be secured from GOP agency sources if transportation is feasible.

- in-service staff training program including 15 quarterly seminars

- 30 bi-monthly farmer assemblies/training sessions: to organize and conduct farmer association business matters; to teach improved conservation, improved land use and production methods and marketing

- provision of extension services and on-job-training for cooperating upland farmers

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1/ AID obligations proposed in FY 1979 and FY 1980; 5-year irrigation component to be funded in FY 79 and FY 80 tranches and 5-year watershed development component to be funded in the FY 80 tranche. Latest start date of physical implementation is estimated January 1981.

Table G(3)-1. Estimated Project Cost by Source of Funding - Buhi-Lalo Project Agro-forestation/Watershed Development, Phase II

| Project Components | Total Cost | AID Loan Total | AID Loan LC | AID Loan FX | GOP LC Total |
|---|---|---|---|---|---|
| Land Development/Tree Planting | 1683 | 1683 | 1683 | | |
| Nurseries | 564 | 564 | 564 | | |
| Training | 250 | 40 | 40 | | 210 |
| Equipment | 98 | | | | 98 |
| Project Management & Extension Services | 1269 | 100 | 100 | | 1169 |
| Sub-total | 3864 | 2387 | 2387 | | 1477 |
| Cost Escalation 1/ | 1579 | 977 | 977 | | 602 |
| 15% Contingency | 816 | 505 | 505 | | 311 |
| PROJECT TOTAL | ₱6259 | ₱3869 | ₱3869 | | ₱2390 |
| | ($834) | ($516) | ($516) | | ($319) |
| | 100% | 62% | | | 38% |

Note: Figures may not add exactly to totals due to rounding.

Conversion: $1.00 = ₱7.5

1/ From 1978 base-year prices, cost estimates are escalated at a compounded rate of 7%/year.

Table G(3)-2

Magnitude of Outputs
Agro-forestation/Watershed Development

| Project Outputs | | Year: 1981 | 1982 | 1983 | 1984 | 1985 | Total |
|---|---|---|---|---|---|---|---|
| ORGANIZATION AND TRAINING | | | | | | | |
| Project staff trained | (No.) | 6 | | | | | 6 |
| In-service seminars for technicians | (No.) | 3 | 3 | 3 | 3 | 3 | 15 |
| Assemblies for farmer organization & training | (No.) | 6 | 6 | 6 | 6 | 6 | 30 |
| LAND DEVELOPMENT AND TREE PLANTING (1,350 Ha.) | | | | | | | |
| New area terraced for rice/corn production | (Ha.) | 67 | 68 | 67 | 68 | | 270 |
| New mixed agro-forestry orchards | (Ha.) | 225 | 225 | 225 | 225 | | 900 |
| Firewood lots established | (Ha.) | 45 | 45 | 45 | 45 | | 180 |
| REFORESTATION (800 Ha.) | | | | | | | |
| Denuded areas reforested | (Ha.) | | 200 | 200 | 200 | 200 | 800 |
| Upland access trails constructed | (Km.) | 8 | 8 | 8 | 8 | 8 | 40 |

- construction and maintenance of 2 siltation and sediment measuring stations and 4 runoff plots. Among other outputs, the stations are to be monitored and data evaluated by technical services contractor (UPLB-UHP).

In addition to portion of farm areas (1.5 ha/family) to be supported under the project, one measure of project achievement will be expansion of agro-forestry plantings by farmers in their farms.

4. End-of-Project Status.[1/] The successful accomplishment of the above project outputs, together with certain conditions that are assumed will be favorable, should lead to achievement of project purposes. Conditions that, if present by 1985, will indicate project purpose achievement are:

- 900 project upland farmers changed to more permanent and improved land use (agro-forestation)

- Currently non-forested hectarage on 10-30% slopes planted to agro-forestry crops increased from 370 to 1450

- Currently non-forested hectarage on 3-10% slopes either terraced or planted on contour increased from 10 to 280

- Currently non-forested hectarage on 10-30% slopes not planted to agro-forestry crops decreased from 3,230 to 2,150

- Currently non-forested hectarage on 3-10% slopes neither terraced nor planted on contour decreased from 290 to 20

- The denuded portion of areas classified as public forest or timber land on slopes above 30% decreased to near zero (5-hectare patches)

5. Measures of Sub-Goal Achievement. The achievement of the project purposes listed above, given certain favorable conditions outside the control of the project management is expected to lead to successful sub-goal achievement. This can be measured in 1988 as:

- Non-forested percentage of project area above 30% slope decreased from 73% to near zero.

- Percentage of project area between 10-30% slope neither forested nor planted to agro-forestry crops decreased from 89% to 61%

- Percentage of project area between 3-10% slope neither forested, planted to agro-forestry crops, nor terraced/formed on the contour decreased from 97% to 7%

- By 1988 there is evidence that farmers are actively supporting and benefiting from participation in farmer organizations.

---

1/ See Tables G(3)-20,21,22 in Attachment B for derivation of area for Start and End of Project Status.

6. Measures of Goal Achievement. Sub-goal achievement, in turn, should result in a significantly favorable movement toward achievement of the goals in the project area. Indications of goal achievement expected by 1988 are:

- Per capita income and/or consumption expenditure within the project area raised by 150% from ₱ in 1978 to ₱ in 1988 (in 1978 prices, peso amounts to be determined by analysis of 1978 BMS in late 1979)

- Productive labor employment rate increased significantly by 1988 (to be determined by analysis of 1978 BMS in late 1979)

- Perceived quality of life index on 0-10 point scale raised from 3.62 in 1974 to at least 4.00 by 1988[1/]

B. Background

1. Bicol Region and Bicol River Basin Program. The Buhi-Lalo project area is in the heart of the Bicol River Basin and Bicol Region. Recent studies indicate the Bicol River Basin has immediate and high growth potential, particularly for irrigation and upland agriculture, agri-business and basic infrastructure investments. The Bicol Program, of which this project is a component, represents an integrated area development (IAD) approach to developing this potential. It is based on three basic precepts:

- that development efforts targeted on the rural sector should focus on delimited geographic areas of high growth potential and recognized socio-economic need.

- that such development planning should be integrated, cross-sectoral and interagency in nature.

- that project planning and management should be decentralized to maximize participation from all sectors, especially from the intended beneficiaries.

The Region consists of 6 provinces (2 of them separate islands) at the southeastern tip of Luzon. It comprises 8% (3.5 million) of the total Philippine population and 6% of its total land mass. It is characterized by:

- a declining per capita income, already at $172 (in 1974) one of the lowest among the 12 Philippine regions and only 49% of the national average

- a serious maldistribution of income, with the poorer half of the people surviving on $45 per capita in 1974

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1/ "Happiness Starts with a Good Job and a Good Home--So Say the People of the Bicol River Basin," Research Report Series No. 12, IPC/SSRU, Naga City, December 1974, page 31.

- the lowest share among regions of employment and production in large, modern manufacturing establishments, in proportion to population

- a lack of employment opportunities, resulting in high rates of under-employment and outmigration to Manila (1.1%)

- high rates of malnutrition, morbidity and mortality (78% of pre-schoolers malnourished, of which 5.5% are serious 3rd degree cases)

The chief constraints to more rapid development have been:

- physical isolation due to neglected transportation infrastructure

- poor communication facilities

- hostile physical environment (particularly typhoon and flooding)

- inefficient production, storage and marketing technology

- capital scarcity

- inequitable land tenure arrangements

- rapid rate of crude population growth (3.3% annually before migration)

- ineffective government institutions and low revenue collection

Pursuant to a national strategy of rural mobilization and development, the Bicol River Basin Development Program is an innovative effort to prioritize and reduce these constraints in a phased, coordinated, decentralized manner:

- The BRBDP institution is itself designed to improve the effectiveness of government entities to plan and implement development programs and projects. Its Integrated Area Development approach focuses on a delineated area of recognized socio-economic need with high growth potential to maximize benefits. It directs an integrated, cross-sectoral, interagency planning process to ensure coordination. It decentralizes project planning and management to maximize local government and popular participation.

- Basic infrastructure development demands high priority to reduce costs of other activities and to best utilize natural resources: drainage and flood control, irrigation facilities, watershed protection, roads, bridges, port facilities, the railroad, geothermal power and rural electrification, intra-regional telecommunications.

- Land reform is designed to reduce income inequality.

- Agricultural development in IAD component projects focus on full development of water resources and provide supporting programs to increase the productivity of small-scale farmers; upland watershed development expands the focus to include conservation of natural resources.

- Integrated health, nutrition and population which a component BRBDP project will train and help rural residents to improve environmental sanitation, reduce morbidity, malnutrition and population growth.

- The promotion of private sector investment is designed to expand productive and employment-generating capital assets and to stimulate technological improvements.

The objectives of the BRBDP and of this project component are in direct response to the Philippine development strategy outlined and recommended by the Government of the Philippines (GOP), USAID, World Bank and an International Labor Office team of the United Nations (the "Ranis Report"). The Bicol development strategy is the result of a long history of development planning within and for the Bicol Region itself, dating back to 1967.

2. Buhi-Lalo Integrated Development Project. One of the features of the proposed Buhi-Lalo Integrated Project not included in prior IAD projects is the simultaneous involvement of both lowland and upland farmers. The lowland farmer will benefit from assured water and other inputs on irrigated riceland; for the upland farmer, the program is designed to provide incentives to encourage the adoption of more productive, profitable and environmentally sound land-use practices.

The integrated area development approach addresses the primary constraints to increased productivity and welfare within a geographically delimited area. The project's irrigation and watershed activities are functionally related and will take place in contiguous areas within the larger Rinconada area. The improvement of the Lake Buhi watershed and Lalo River drainage can provide increased dry season flow for the rehabilitated and expanded downstream irrigation systems as well improved domestic water quality and availability.

Both activities address high priority concerns identified at the national, regional and local levels. Rising domestic and foreign donor financing throughout the country attest to the high economic and social returns accruing to investments in irrigation development. Much of the present interest in agro-forestation and watershed management grew out of the threat posed to certain irrigation investments by deteriorating watersheds. Concurrently, there has been growing interest in the situation of subsistence upland farmers. In the Lake Buhi area, as elsewhere, improper land-use practices threaten the long-run productivity of upland soils and, hence, the long-run welfare of upland households. The municipality of Buhi and the Bicol Program Office have expressed a growing concern over the course of events in the Lake Buhi and other Bicol River Basin watersheds. In September 1978, a special watershed management seminar/workshop was held which recommended technical approaches for Buhi, the Basin's test case. At the regional level, the Bicol River Basin Coordinating Committee proposed a set of policy recommendations in October 1978 to address watershed problems and specifically urged agro-forestation and watershed development activities be initiated as soon as possible.

The inclusion of the watershed activity then is based on the IAD approach, beneficiary needs, potential productivity and protection of the watershed and the water source.

3. Pre-Project Development. Many Bicol Region residents do not reside and work in lowland rice growing areas. Many small-scale farmers have migrated from the lowlands to the uplands due to population pressure and increasing requirements for land. The land tenure status of many upland farmers is insecure and permanent investment in the lands they till is typically meager. Intensified slash-and-burn agriculture, which no longer allows time for the soil to regenerate some measure of fertility, has become a common practice. Increasing soil erosion and siltation is the chronic result. The degree to which these uplanders abuse or protect their productive environmental resources directly degrades or enhances the quality of their own lives as well as those of people living in the lowlands. While reforestation of the public timberland, is urgently needed, in itself it is insufficient to arrest the deterioration of the Bicol eco-system. Only an aggressive program of agro-forestation involving the upland farmers coupled with reforestation can cope effectively over the long run with the watershed deterioration.

The BRBDPO and involved line agencies, together with technical assistance provided by USAID, have designed and are initiating a two-phase (three-stage) agro-forestry/watershed development program in the Rinconada-Buhi area. It is designed to support the integrated development of the larger Rinconada area (Bicol IAD III). The start-up of this program is described in the "Joint Project Implementation Letter No. 5" (see Attachment 1).

The start-up stage of Phase I is scheduled to be implemented over six months or longer, commencing in April 1979. It is financed by USAID grant funds (IRD Project 492-0303) and will be implemented by the BRBDPO and other line agencies. This stage is essentially concerned with training and putting to work an on-site management team, organizing a nucleus of 20 upland farmers as project participants, and initiating other agro-forestry related activities needed to assure that the longer term agro-forestation effort will not be delayed.

A second, or "follow-on" stage of this initial phase of the agro-forestation/watershed development program, covering an estimated 18 months, is being readied for approval and funding from other sources. One possibility is a sub-project under the proposed NEDA/USAID Community Agro-forestation Project using PL-480 funding sources. The suggested administrative organization for that project is the UPLB-Upland Hydroecology Program (UHP) staff. This follow-on stage will expand the project test area and participation by increasing the number of farmer cooperators to 45 and by expanding the area to 67.5 hectares. Additional surveys, mapping and training would be carried out.

The primary purpose of the Phase I two-year agro-forestation initiative is to (a) test and demonstrate the applicability of appropriate agro-forestation technology in the Bicol, (b) organize pioneer upland cooperator-farmer groups, and (c) train an indigenous management team. All of this is being undertaken in preparation for a full-scale introduction of agro-forestation technology and appropriate upland farm management practices throughout the uplands of the Lake Buhi watershed. It is

estimated there are about 1,230 upland farm families in the area, 900 of whom have been targeted as prospective cooperator-farmers and direct beneficiaries of the expanded Agro-forestation/Watershed Development Program (Phase II) to be funded as a component of the Buhi-Lalo Integrated Development Project (1979-1985).

4. Program Site, Problems and Interventions

Program Site. The Buhi-Lalo watershed uplands cover over 10,000 hectares surrounding Lake Buhi, Camarines Sur. (See Map No. 1.) The surface area of Lake Buhi is 1600 hectares. From the eastern shore of the lake, the land sweeps upward in a series of steep foothills and sharp ridges interspersed with a few patches of level land. The eastern ridge reaches its maximum height (1,657 meters MSL or 5,436 feet) at the peak of Mt. Malinao, a dormant volcano. (The Tiwi geothermal power site is located on the opposite side of Mt. Malinao where its base slopes to the sea.) To the west of Lake Buhi, the terrain slopes more gradually away from the lake shore for a distance averaging about one kilometer whence it rises sharply to the peak of Mt. Iriga, a nearby 1,200-meter (3,960 feet) extinct volcano. A ridge ranging from 100 to 700 meters MSL provides the northern boundary of the watershed connecting the two volcanic mountain chains. Between the lake shore and the northern ridgeline are steep foothills and a few mini-deltas formed where small streams drain into Lake Buhi.

The southern shore of Lake Buhi is the site of Buhi township (poblacion) and the main drainage systems of the lake which flow into the eastern lowlands of the Bicol River Basin. The separate Lalo River drainage commences on the adjacent slopes of Mt. Malinao and runs along the mountain to the southeast. This drainage adjoins the Lake Buhi watershed and also empties into the Bicol River Basin. While the Buhi and Lalo uplands terminate a short distance south of the lake, the lowlands directly irrigated by their waters extend some 20 kilometers in a westerly direction to Lake Bato and the Bicol River.

A quantitative idea of the lay of the upland terrain is presented below.[1/]

| Gradients | No. of Hectares | Percent of Area |
|---|---|---|
| Slopes 30% and higher with the bulk exceeding 80% | 5,578 | 54.2 |
| Slopes of 10% to 30% grade | 3,546 | 34.5 |
| Slopes of 3% to 10% | 293 | 2.8 |
| Lowland drainage and flat areas in the uplands (0% to 3%) | 873 | 8.5 |
| Total Lake Buhi and Lalo River upland drainage | 10,290 | |

1/ David Smith, OCD AID/M. Planimeter determinations. 1978

Rainfall in the Buhi uplands averages 2,700 mm (106 in.) per annum and occurs throughout the year with maximum precipitation in July-August and November-December. Minimum rainfall months are February through April.

In general, the upland soils have developed in place from weathered products of parent materials including andesitic lava layers, varied types of pyroclastic materials, and volcanic ejecta. Transported soils originating from the mountain slopes make up the mini-deltas where streams discharge into the lake.

In areas where the hardwood (dipterocarp) forests have not been disturbed, the soil is deep and fertile. Unfortunately, such areas are now quite limited. "Kaingin" (slash-and-burn) farming has denuded most of the land that was formerly virgin tropical rainforest and soil fertility has been badly depleted. Exceptions are in areas where farmers have built some rice terraces or planted mixtures of fruit trees, abaca, and bamboo.

Major Problems. An estimated 7,900 or 84% of the targeted Lake Buhi watershed uplands have been cleared of forests and at one time or another planted in various crops, principally upland rice and corn (See Table G(3)-3). At present, approximately 3,500 hectares are best classified as marginal, upland timber areas characterized by shifting cultivation or areas abandoned to cogon grass with patches of secondary brush and trees. As is to be expected, crop yields are low given the steep, erosion-prone terrain and the high rainfall which lead to rapid loss of humus and fertility. In addition to the practice of "kaingin" farming, many farmers continue to cultivate up and down the slopes rather than along horizontal contours.

What forests remain continue to be exploited.1/ Trees are poached, cut, and sold for firewood or they are handsawn into "flitches" and pulled out of the woods by carabao and sold for lumber. As late as January 1979, the Philippine Constabulary (PC) were investigating illegal logging on Mt. Malinao (Tiwi side).

Reliable data on household income and expenditures is not available, but the average annual family (cash) income in the upland area is estimated to be ₱2,300 (approx. $300). The major sources of income are farming, fishing, and cutting wood for sale. Many families, to some degree, do all three and still remain at a subsistence level.2/ There also appear to be some farmers or family members who live in the lowlands but cultivate additional fields in the uplands.

Considering the generally poor economic conditions of upland farmers, few are in a position to make permanent investments in land development on their own. Such measures require capital for bench terracing and tree seedlings. Uncertainty of tenure further inhibits land improvement activities as some time must usually pass before such investments start paying back.

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1/ Even though PD 705 classifies illegal removal of timber from forest reserves as qualified theft punishable by imprisonment and fines.

2/ Socio-economic profile of Buhi watershed farmers. Bicol River Basin Development Program Office. February 1978.

Table G(3)-3. Descriptive Classification of Watershed Land Areas and Proposed Project Intervention
Agro-forestation/Watershed Development Program[1/]
Buhi-Lalo Integrated Development Project

| | Descriptive Classification | Area Ha. | Project Intervention |
|---|---|---|---|
| 1. | Forest reserve areas (virgin forest) | 1,500 | facilitate protection only |
| 2. | Marginal upland timberland areas (shifting cultivation, abandoned cogon grass areas and secondary brush/trees) | 3,500 | 800 ha.[1/] reforestation and support for protection |
| 3. | More permanently settled upland areas (permanent and shifting cultivation) | 4,400 | 1,350 ha.[2/] agro-forestation and extension services for 900 families[3/] |
| 4. | Targeted Lake Buhi Upland Watershed[4/] | 9,400 | |

1/ Phase I Program funded from AID grant funding (Start-up) and proposed for PL-480 funding (Follow-on) is scheduled over a two-year period--Feb. 1979 to Dec. 1980. It includes some reforestation and on-farm agro-forestation, the latter by 45 families. It will provide empirical data and operational experience for Phase II.

2/ Estimated 50 ha. in Phase I.

3/ An additional 67.5 ha. for 45 families in Phase I.

4/ The Lalo River upland drainage (est. 800 hectares) is contiguous to the Lake Buhi watershed and provides water for the upper Lalo River irrigation system to be rehabilitated under the larger Buhi/Lalo Project. For purposes of this Program, Lalo drainage areas are also included in the Buhi watershed and upland farmers may participate on the same voluntary basis.

Additionally, farmers lack basic skills required to cultivate such crops as fruit trees, nuts, bamboo, improved cover crops, and other perennials that can conserve the soil. Effective marketing mechanisms, such as farmers organizations or cooperatives with access to market centers, do not exist.

There is a further need for farmers to develop a better knowledge of crop harvesting, handling, and quality control. Road access is limited and there are few satisfactory trails into and within the uplands to facilitate movement of produce to the markets.

Without government intervention to help overcome these constraints, a scenario can be predicted of further denudation on the remaining forested slopes, further losses in soil fertility, increased erosion and siltation. This will result in further environmental degradation, loss of productive land, and reductions in family incomes that are already very low.

Project Interventions. This Agro-forestation/Watershed Development Program is designed to help farmers in the area change their land-use practices and adopt cropping systems more suited to the terrain they occupy. The basic systems themselves are not new nor unfamiliar to the intended beneficiaries. They include:

- contour farming and bench terracing of areas where this can be done economically. Where feasible, terraces would be irrigated. A terraced area of 3,000 sq.m. per cooperator-farm family is programmed to raise family grain and vegetable requirements.

- planting one hectare of orchards per farm family, including fruit and nut trees, with leguminous covercrops and shade-tolerant food crops underneath

- planting bamboo

- planting firewood lots of 2,000 sq. meters per cooperator-farm family for home use and for sale

These methods have already been applied by some local farmers who possess the necessary resources and have made a conscious decision to make permanent investments on the land. Fruit trees, abaca, bamboo and other perennials are being planted on a few farms. Terrace construction, in particular, is an established feature of Philippine agriculture. It is practiced in the lowlands where land slopes very gently as well as in the extreme terraine of the rugged Cordillera Mountains of Northern Luzon. Some terrace building is being undertaken on the Buhi-Lalo watershed at the present time.1/ The project is designed to help the poorer farmers practice what a few better-off neighbors are doing and on a scale large enough to have a favorable environmental impact on the entire watershed.

1/ From on-site inspection reports of BRBDP-USAID watershed consultants.

Sound engineering practices, applied for the benefit of farmers by trained project staff, will systematize terrace construction. The use of transits and hand-levels will help the farmer determine the most favorable contours and thereby reduce the amount of labor needed to build terraces. The same land survey methods can help a farmer decide whether the run-off in his vicinity can be collected to irrigate terraces and orchards. Project extension activities are designed to assist farmers in improving and maintaining terrace fertility with lime, green manure, compost and fertilizer. The farmer will also be assisted in the procurement of certified seeds which would be difficult to secure otherwise.

Nurseries will be established to provide farmers with familiar and new tree species, the produce of which is readily marketable or demonstrates firm investment potential. Budding, grafting, marcotting, and other vegetative methods of plant propagation will be practiced in the nursery to assure the farmer he is getting the best available genetic material. Such methods also reduce the time he must wait for trees to begin bearing fruit. The farmer will be taught how to prune trees, protect them from pests and diseases, and process harvests to improve quality and marketability. He will be shown the uses of leguminous covercrop, supplied with covercrop seeds, and guided in planting them. Trained staff will show him how he may plant trees on the natural contour to develop natural terraces and advise what mixtures of compatible trees can be used to secure the benefits of biologically stable and economically productive agriculture.

Each cooperator-farmer will be assisted in planting a woodlot of fast growing trees for firewood to meet home consumption requirements and provide a surplus for sale. Bamboo starts will be supplied. These measures should lessen the pressure on the remaining forests which are now being cut to supply these needs.

Funds supplied by the project are proposed to subsidize 50% of the labor costs involved in terracing, operations and in planting orchards, bamboo and firewood, provided the beneficiary farmer is willing to contribute the balance of 50% in the form of his own labor. Maximum direct project assistance levels per farmer will be established, but farmers will be encouraged to further expand areas under agro-forestation crops on their own with minimal outside help.

In addition to farm improvements, the project will construct graded trails connecting farms with existing road systems or the lake shore so farmers can market with less time and expense. Reforestation and the building of graded trails will be funded by the project using labor intensive methods. Farmers will be provided these job opportunities to supplement their income while waiting for orchard crops to begin bearing fruit.[1] Work will be undertaken by the "pakyao" method.[2] This will allow the farmer to schedule and accept a job without interrupting seasonal work on his own farm.

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1/ The Philippine Coconut Authority (PCA) is already providing subsidies to coconut farmers outside watershed areas (₱1,000/ha/year for 5 years).

2/ Payment on a piecework basis after completion of a fixed task, and at a price agreed upon in advance.

The project will implement a step-by-step sequence of activities to include:

- information campaigns covering all barangays in the watershed to explain the program to intended beneficiaries

- demonstration of what is involved on a small scale with selected cooperator-farmers

- farmer assemblies to teach improved farming methods

- organizing barangay work teams to build graded trails, bench terraces and plant trees in cooperation with one another

- cash payments to team members for this work, excepting that a farmer whose land is being developed by the team will be expected to donate his own labor to that effort

- involving the farmers in project planning

- enlarging functions of the barangay work teams to engage in other group efforts such as cooperative processing and/or marketing of their produce

- with the work teams as the nucleus, helping farmers develop their own organizations to take over when the project is terminated

- providing continuous extension services

These and other project interventions will be spelled out in a detailed implementation plan to be prepared by the project staff and participating line agencies involved on the basis of experience gained in the Phase I stage of the project (See I-B.3, "Pre-Project Development").

## II. Project Specific Analysis

### A. Economic Feasibility

Cost Effectiveness Analysis. The Agro-forestation/Watershed Development Program is designed to (1) rehabilitate the watershed by reestablishing vegetative cover that will conserve the soil, prevent landslides and reduce erosion and downstream siltation, (2) improve the productivity and income of upland watershed farmers by helping them implement positive land use methods, and (3) alter the socio-economic attitudes of upland watershed farmers to sustain the economic and environmental improvement in the future. The proposed program is expected to achieve these objectives at an approximate cost, in 1978 prices, of $515 (₱3859) per family for agro-forestation (900 families) and $162 (₱1213) per hectare for reforestation (800 hectares). Under agro-forestry activities, about 270 hectares of land will be terraced for rice and corn production and productive but environmentally appropriate vegetative cover will be planted on another 1080 hectares, for a total of 1350 at a cost of $343 (₱2573) per hectare.

The costs of this program compare very favorably with the alternative of resettlement, i.e., moving the upland watershed farmers to some other area to live where the slopes are less steep. It was recently announced that the 25-year program of the National Resettlement and Rehabilitation Administration has resettled a total of 53,051 families between 1953 and 1978 at a total cost of ₱710 million. This amounts to $1784 (₱13,380) per family. Most of these expenditures occurred in the early years of the program--the mid- to late-1950's--and the Philippine Consumer Price Index rose by 338% (from 100 to 438) between 1960 and 1978. This implies that the current cost of resettlement would be somewhere in the neighborhood of $8,000 (₱60,000), almost 16 times higher than the proposed agro-forestry program.

Maintenance of the status quo is another alternative. The present land use methods exhaust soil fertility, and in time farmers will have to leave the area of their own accord when the land can no longer provide subsistence production. At that time, reforestation could be instituted and the cost of resettlement avoided. This alternative would not address one of the principal objectives of the program, which is to improve the living standards of the farmers. Since most of the soil fertility would be lost and some areas permanently denuded, later rehabilitation would be more difficult and costly.

A third approach would be to initiate a soil conservation program that would financially and technically assist farmers to modify their land use. At the present time, kaingin (slash-and-burn) is the prevailing farming method. Farmers practicing kaingin agriculture in Buhi live at the subsistence level, with average monthly cash incomes of $25 (₱186) per farm family.[1/] Appropriate soil conservation measures--such as terracing,

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1/ Socio-Economic Profile of Buhi watershed farmers, Bicol River Basin Development Program Office, February 1978.

planting orchards (agro-forestry) and covercropping--would raise farm income, reduce erosion and help prevent landslides. For the lower slopes this is feasible; however, as slopes become steeper, the cost of implementing these soil conservation methods becomes greater so more economical methods must be considered.

In this project, terracing and orchard planting (agro-forestry system) is proposed on slopes up to 30% gradient. Where slopes exceed 30%, orchards generally will not provide ground cover thick enough to prevent soil erosion. Bench terracing could be resumed on these higher slopes; however, risers (retaining walls) may require artificial reinforcement with stones to stand the additional stress. Depending on the site, this could increase cost per hectare to as much as $2133 (₱16,000), so was not considered.1/

Cost effectiveness is sensitive to slope conditions, and a combination of approaches is required to meet the varying conditions and degrees of slope on the watershed, beginning with contour farming, vegetative terracing (grass, bushes or trees), to more costly embankment of hard soil and stone walls.

B. Social Soundness (also see Annex J, Project Paper, Vol. I)

1. Socio-Cultural Feasibility

Beneficiaries. The residents of the project area are socially and culturally similar to other rural families in the Bicol. They speak a common Bikol dialect called "Buhianon" and are organized in nuclear family households and social alliance groups through which they meet their requirements for subsistence and interaction with their neighbors. Social acceptance and security are highly valued, although the pressures related to social acceptance may not be felt to the degree that they are in the lowlands due to the relatively greater distance between their homes. Sixty-seven percent (67%) of the farmers within the watershed live on or adjacent to their farms, whereas lowland farmers tend to live physically closer to one another and commute to their farms.2/

Forty-six percent (46%) of the targeted beneficiaries perceive themselves as owners of the lands they occupy.2/ Compared to those in the lowlands, this represents a relatively larger percentage of the beneficiaries.

Migration and Social Impact. Upland migration in large numbers is a comparatively recent phenomenon in the Philippines. It started during World War II with people eluding invading forces and accelerated in the post-war years as a result of population pressures and fragmented landholdings in the lowlands. Some lowland farming practices, like clean culture and mono-cropping, have been transferred to the uplands, but some of the watershed farmers subsequently abandoned or modified these practices. We can only speculate how and to what degree social patterns may have been similarly altered by a change in physical environment. This is relevant to the

1/ UNDP reports more than 2,000 mandays/ha. required to build terraces with stone wall reinforcement in Baguio, Philippines, where slopes are steep. At ₱8.00/manday, costs would be a minimum of ₱16,000.

2/ TAMS/TAE, Rinconada Integrated Development Area Feasibility Study, Special Study: Social Soundness Analysis, Bicol River Basin Development Program, January 1979.

distinct two-class stratification system in Bicol, wherein a small affluent class (5-10%) controls most of the resources and a majority, which make up the poorer class (90-95%), provides the labor.

The desire to achieve a better socio-economic status is manifested in the physical mobility of farmers. While population pressures must have played a major part in the decision to migrate, other contributing factors cannot be ignored. Socio-economic surveys indicate that the Bicol farmers value security, but at the same time aspire for a better life than they have now.[1/] The migration to new surroundings may be viewed as a logical expression of such aspirations.

The considerations stated above support the basic design of this project. They indicate that development of the watershed through a change in land-use practices is socially and culturally acceptable to the targeted beneficiaries and that farmer beneficiaries desire to improve their living standards.

Preliminary project design dealt with physical resource and environmental issues. Measures were proposed to arrest watershed denudation through the conventional methods of increased ecological protection, tree planting and stricter control over the use of land. However, after further studies and discussions, it became apparent that protection of the physical resource and environment would become feasible only if outstanding socio-economic issues were addressed first. Project design was consequently modified and priority was given to incorporate measures that would help watershed farmers change land use practices to improve their living conditions and at the same time sustain the productivity of the soil. This scheme would stabilize upland agriculture by providing attractive economic alternatives to shifting, slash-and-burn agriculture. It was recognized that addressing this socio-economic issue is a pre-requisite to permanent physical improvement of the watershed. Consequently, environmentally sound land-use practices already familiar to target area farmers were used as the basis for re-designing the project. Technical and financial assistance is proposed to enable farmers to use those improved farming methods that are already a part of the existing socio-cultural practices but which cannot presently be availed of by all the farmers due to financial constraints.

The main concerns of watershed farmers are that their fragile economic condition not be endangered by a change in cropping systems and that their access to land is retained and protected.[2/] These concerns are valid and are addressed in the project design. The project does propose major modifications in land-use patterns that are technically necessary to preserve soil fertility and the watershed but which also promise greater economic benefits. The project approach is to start with small demonstration areas on a voluntary basis then expand cautiously. The Project further proposes that these changes be made <u>in situ</u>, not by

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1/ Frank Lynch, "<u>Let My People Lead</u>: Rational Outline of a People-Centered Assistance Program for the Bicol River Basin." Ateneo de Manila University, Quezon City, August 1976.

2/ Ma. Carmen Lorenzo Portacio, Summary Report Level III Dialogue Component: Watershed Protection and Management. TAMS/TAE Report, 1978.

resettlement, which has been found more expensive.[1/] Maintaining access to land is not only seen as vital by the watershed farmers but represents a more economical approach to watershed protection.

Bench Terracing. The proposed land-use practices include changes in crops and cropping patterns. The project design incorporates investments in bench terracing land to accommodate the farmers main crop, upland rice or corn. Bench terraces will allow continued rice production on stabilized areas to control erosion. These terraces would be constructed on a voluntary basis to the extent required to meet the subsistence needs for rice presently met by kaingin (slash-and-burn) culture.

Terrace building is not a new innovation, but an established feature of farming in the Philippines. Upland and lowland terracing vary according to scale. Wider areas are stabilized by terraces in the lowlands and relatively smaller areas are terraced in the mountains. Presently, farmers with resources to finance terrace building are practicing this in the project area. The Buhianon dialect uses the word "mag-uma" specifically to describe terrace building on sloping land. As far as Buhi watershed farmers are concerned, terrace farming is not a radical method; many are already familiar with it and are aware of its benefits. Thus, acceptance is not expected to be a major problem.

2. Tree Farming. The introduction of tree farming with organized, well-planned orchards is a departure from present practices and initial acceptance may be slow. Philippine farmers generally do not engage in orchard culture, with the exception of coffee growers, citrus or mango farmers, lanzones producers, and mixed fruit farmers in Mindanao. The pili nut in Bicol, for example, is produced principally from trees that grew by chance, rather than by design, even though it now has a fairly high economic return. Fruit trees are mostly limited to a few trees around the house.

Surveys have been conducted to examine this phenomenon, considering the variety of excellent fruits and nuts crops that grow well throughout the country. Approximately 95% of those interviewed in five different areas of the Philippines (including the Bicol) said they would like to plant fruit trees.[2/] Those who did not plant trees gave the following reasons listed in a descending scale of importance:

(1) there are no seedlings available
(2) they do not have money
(3) they do not own the land
(4) it takes too long
(5) the trees might die
(6) the fruits will just get stolen
(7) not interested

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1/ See Cost Effectiveness. Sec. II-1.
2/ Dr. Anacleto Duldulao, University of the Philippines at Los Baños, May 1978.

Proposed Bicol Agro-forestation activities will address the first two points by supplying free seedlings through nurseries located on site, and by providing financial and technical assistance. Objection No. 3 ("they do not own the land") is not addressed directly as part of the project, but clarification of uncertain tenure status will be encouraged. Issuance of appropriate forest occupancy permits is the subject of a covenant to be included in the loan agreement. It is hoped that Phase I can offer some viable solutions. Objection No. 6 ("the fruits will just get stolen") is a valid consideration that the project is not able to deal with. Farmer's groups may help establish a new norm. The other objections will be addressed through technical assistance and information campaigns. Project staff will provide training to teach farmers how to keep trees healthy and hasten fruit bearing, and will stress the economic potentials of fruit and nut trees. There is sufficient reason to expect that the technical assistance, extension work and an information campaign will increase tree planting among watershed farmers, although acceptance will be slow and initially areas will be kept to a small portion of total holdings. There are no known religious, superstitious or social biases against tree planting in the Bicol.

Dialogues with barangay captains of Ipil, Iraya and Sta. Cruz barangays indicated that the project could be perceived as a threat to the source of income of firewood gatherers. Respondents were aware, however, that there are fast-growing trees they can plant that can be cut and sold as firewood. Giant ipil-ipil (leucaena leucocephala) was specifically mentioned as a tree they would like to plant. They knew that this species is a valuable source of firewood and that its leaves can be used for livestock feed (several tons are exported from the Bicol basin area each day).

The project provides financial and technical support for the establishment of a small but adequate firewood lot on each cooperator farm. Trees are planted in the lowlands, particularly "Bangkal" (Nauclea orientalis) to mark boundaries between lowland farms and serve as a source of firewood. The establishment of firewood lots is in fact an expansion of this existing practice. Obviously, the advantage of fast-growing trees, both for domestic use and to provide a surplus for sale, should be easily perceived when compared to cutting trees in the distant forest and risking arrest by forest guards. Phase I experience will indicate whether the establishment of firewood lots will be considered an adequate replacement for present firewood sources.

3. Pakyao Labor System. The project proposes the use of labor intensive methods for the construction of graded trails and bench terraces. Interviews with the mayor of Buhi indicate that the municipality has had good success in several projects using labor intensive methods, provided the work was organized under a "pakyao" system.[1/] Project area farmers have indicated that they are willing and anxious to work for additional income. Additionally, work will be undertaken to complete tasks whose direct benefits are readily apparent to the farmers. Problems in allocation of "pakyao" jobs will affect work performance and, consequently,

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1/ Payment upon completion of a specified task at a previously agreed piece rate.

acceptance by the beneficiaries. The management staff will need to be especially keen to make sure that "pakyao" work is allocated impartially and paid for on an equitable basis.

4. Farmer Organizations. Using "pakyao" work teams as a nucleus to organize for specific tasks, efforts will be made to expand these teams into informal groups in preparation for farmer associations through which cooperative marketing and other collective activities may be carried out. There are examples of successful indigenous organizations in the area; e.g., the "Mr. and Mrs. Club," an organization that manages social occasions, and the Pro-Coma, a cooperative movement organized and managed by the Good Shepherd Sisters (financed by Philippine Business for Social Progress and other donors). Several Samahang Nayon cooperatives have also been organized in the area. Eligible farmers have become members to secure a Certificate of Land Transfer under the Land Reform Program. Farmer families live far apart, but they do get together, organize themselves for social and religious activities like barangay fiestas, and participate collectively in farm work like clearing lands for kaingins.

Initial activities to form farmer groups in Phase I will provide a basis for evaluating possible alternative organizations, their utility and acceptability. This experience will provide guidance for the PMO staff.

5. Relocation. It is possible that some (est. less than 50) farmers living on denuded slopes that could cause landslides and other serious environmental damage should be encouraged to relocate by local leaders. Farmers affected by such relocation, even on their own land, may not find this desirable at the time. Relocation may still have to be undertaken for two reasons. First, the interests of farmers living on the lower slopes and lowland residents are jeopardized by slides and erosion from the uplands. Secondly, farmers who would be affected by such relocation probably would not be able to support their families on these lands over the long-term, anyway. In such cases, eventual relocation would have to be initiated by the farmers themselves, once the land they occupy loses its fertility. Such farmers will be encouraged to relocate voluntarily and participate in the Program.

Methods for a planned relocation of farms to more suitable sites will be drawn from the practical experience of Phase I for modified or replicated application in Phase II implementation.

6. Beneficiaries Profile. The average farmer living in the watershed is similar in many respects to the rural poor in the rest of Bicol. The average monthly cash income is only ₱186 ($25). This average income figure was derived from surveys in six barangays located within the upland watershed areas of Buhi municipality and ranges from a low of ₱141 to a high of ₱225 per month.[1/]

For Camarines Sur, the educational median of workers is 6.3 years of schooling, excluding members of an aboriginal nomadic tribe, the Agta, who have not been accurately censused. The Agta speak their own language, which is distinct from Bicol although ethnically related to the broad

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1/ Socio-Economic Profile, BRBDPO, Feb. 1978.

family of Malay languages. The Augustinian sisters, who manage a foundation serving the Agta, estimate their number at 4-5,000 for the entire Rinconada area. If these numbers are included in a census of the watershed, the educational median would probably decrease, since very few Agta send their children to school.

Underemployment is chronic in the target area.[1/] In Buhi municipality, full-time employment is estimated for only 20% of the population. Seventy-one percent (71%) of workers in the municipality are engaged in agriculture. On the watershed itself, all families are primarily involved in agriculture. Cutting firewood and fishing are supplementary occupations.

Malnutrition is also chronic in the target area. Respiratory diseases, including tuberculosis, affect practically every family, according to the mayor of the municipality, who is a doctor of medicine. The outmigration rate of Bicol in general is close to 1.1%. This applies to Buhi town as it does to the other municipalities in the area. Additional analysis is required to differentiate this rate between the urban poblacion and the upland rural residents.

The watershed farmers live in houses made of nipa or cogon and bamboo; they cook their meals with firewood. None of the houses on the watershed have electricity or piped-in potable water. Some farm homes have toilet facilities consisting of outside latrines, but generally waste is disposed of in the open.

7. Conclusion. The types of activities and the methods of intervention proposed under the Project appear to be culturally acceptable, but their economic and financial attractiveness at the farm-level must be demonstrated. Because of perceived economic risk and related factors, acceptance may start slowly. For these reasons, only limited areas of each volunteer farmer's holding should be included for initial support.

## C. Technical Feasibility

The project proposes three basic technical measures which will be applied collectively to attain the dual objectives of improving the economic life of beneficiaries and protecting the environment. These measures include bench terracing and contour farming, agro-forestation plantings and reforestation.

1. Bench terracing and contour farming allow the production of annual crops and the simultaneous control of erosion. These methods will provide an alternative to kaingin farming which farmers now resort to for their basic food requirements, but which has been proven environmentally unsound.[2/] Bench terracing is a standard engineering practice used to stabilize erodable land by erecting physical structures. Contour farming, planting and cultivation methods can be readily applied where slopes (or soil conditions) are not so steep that it requires terracing.

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1/ Socio Economic Profile, BRBDPO, Feb. 1978.

2/ W. P. David, Watershed Protection (Seminar Paper), Department of Agricultural Engineering, UPLB, 1975.

2. Agro-forestry is defined as "the planned and simultaneous production of agricultural, forest and other crops on designated areas."[1/] The project staff will provide financial and technical assistance to farmer-cooperators to help them establish orchards with mixed species of fruit and nut trees, bamboo, shrubs and covercrops. This will provide multi-storied vegetative protection of the soil.

Tall trees and bamboo will be interplanted with shorter trees and shrubs that are shade-loving or shade-tolerant, while leguminous covercrops and/or food crops requiring shade will be grown at the ground level. Fast-growing wood species will be incorporated into this scheme. A plant ecological environment similar to tropical rain forests will be simulated by means of a multi-tiered blanket of vegetative cover to protect the soil. This encourages topsoil production by the decay of detritus from leaf and branch fall (litter) developed through the action of fungi, bacteria, earthworms and other soil micro-organisms. This helps balance normal topsoil loss and nutrient leaching from rain-induced runoff. The species mix will be composed of indigenous or adapted species that have been shown to bring economic returns to the farmer. Produce will consist of fruits, nuts, firewood, forage, edible leaves and building materials.

This method has technical limitations. Agro-forestry is applicable only where slope, soil, and rainfall conditions permit a stable topsoil condition when using a planting system that allows sufficient space for movement between trees and shrubs to harvest produce and tend the plants. The steeper the slope, the closer plants have to be for the natural balance to be maintained, assuming rainfall and soil conditions remain fairly constant. When plants must be placed so close that movement is severely restricted and agricultural production is no longer feasible, other conservation methods should be used. On the project area, agro-forestry is feasible on slopes of up to 30%. Planimeter determinations based on information contained in reliable contour maps show that 3,840 hectares of the project area are between 3-30% slope gradient. Agro-forestry inputs are programmed for these slopes.

3. Reforestation will be applied on slopes above 30% gradient with planting densities varying (becoming thicker) as slopes become steeper. A mix of species will be used to create the multi-story structure required to maintain the soil production-loss balance. Seedling production and planting systems for reforestation currently practiced by GOP agencies are well established and are applicable for project purposes. Labor intensive methods are recommended. Nurseries should be established on site to save transportation costs. Terrace building and agro-forestry activities limited to orchard and covercrop planting are technically feasible and culturally acceptable. The selection of the species mix will be determined by the project staff and technical consultants after consultation with beneficiaries. Considering the wide variety of Philippine trees, shrubs, bamboo and covercrops that have economic value, the selection of a proper mix of different species will not be a problem.

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1/ Presidential Decree (P.D.) No. 1515, Proposed Integrated Management of Resources in Water Reservations, Jan. 1979.

## D. Administrative Feasibility

The Buhi-Lalo Integrated Project, of which Agro-forestation/Watershed Development is a part, will be under the overall supervision of the National Irrigation Administration (NIA). NIA is currently undertaking reforestation and agro-forestation activities, with a major effort in the Central Luzon Pantabangan Dam watershed. A deputy project manager

will head up the Agro-forestation/Watershed Development Program Division (see Organization Charts Figs. 1 and 2). The proposed staffing of the division (16 full-time management operational personnel plus 7 laborers) and line agency inputs are judged to be adequate. The proposed technical assistance to be contracted with UPLB is considered the best available in the Philippines.

The UPLB Upland Hycroecology Program (UHP), which is currently assisting NIA at the national level, will be contracted to provide technical consultancy and training assistance. The content will be based upon their extensive experience in program implementation to date, much of which has been funded by NIA, the Ford Foundation and the Bureau of Forest Development (BFD).

An Interagency Management Group will be organized to provide technical inputs and assist with implementation. It will be composed of members from various government line agencies whose normal functions or interests relate to the program. BFD, BS, BAEx and BPI, for example, would assist primarily on agricultural extension, agro-forestry, reforestation and soil management. MAR, BL and BFD will help address land tenure issues. The Buhi municipality, MLGCD and MHS would assist in organizing farm families to participate in the project. The BRBDPO will provide overall coordination.

A local level Promotion Committee would be formed by the BRBDPO and include MLGCD, the Buhi Municipal Government (BMG) and other interested agencies operating in Buhi. It will assist in organizing farmers, solve implementation problems and encourage two-way information flow. The Interagency Management Group and the Promotion Committee will backstop the Project Management Office (PMO) staff.

The ability and attitude of individuals selected for the Agro-forestry/Watershed Development Division of the PMO, and the relationships that they develop with local officials and participating farmers are key to the success of the program. Active farmer-cooperator participation is essential. Staff members must come to their assignments with an affinity for the Bicol upland farmers and be accepted as "natural leaders". Effective core staff hired under Phase I of the Program are expected to be assigned to the Phase II Program under the loan project. They should be seasoned by experience and familiar with the physical, social, and administrative terrain in which they must operate. The additional PMO staff will be recruited in the first year of the project.

Organization/Functional Chart
Buhi-Lalo Integrated Development Project
Agro-Forestation/Watershed Development Component

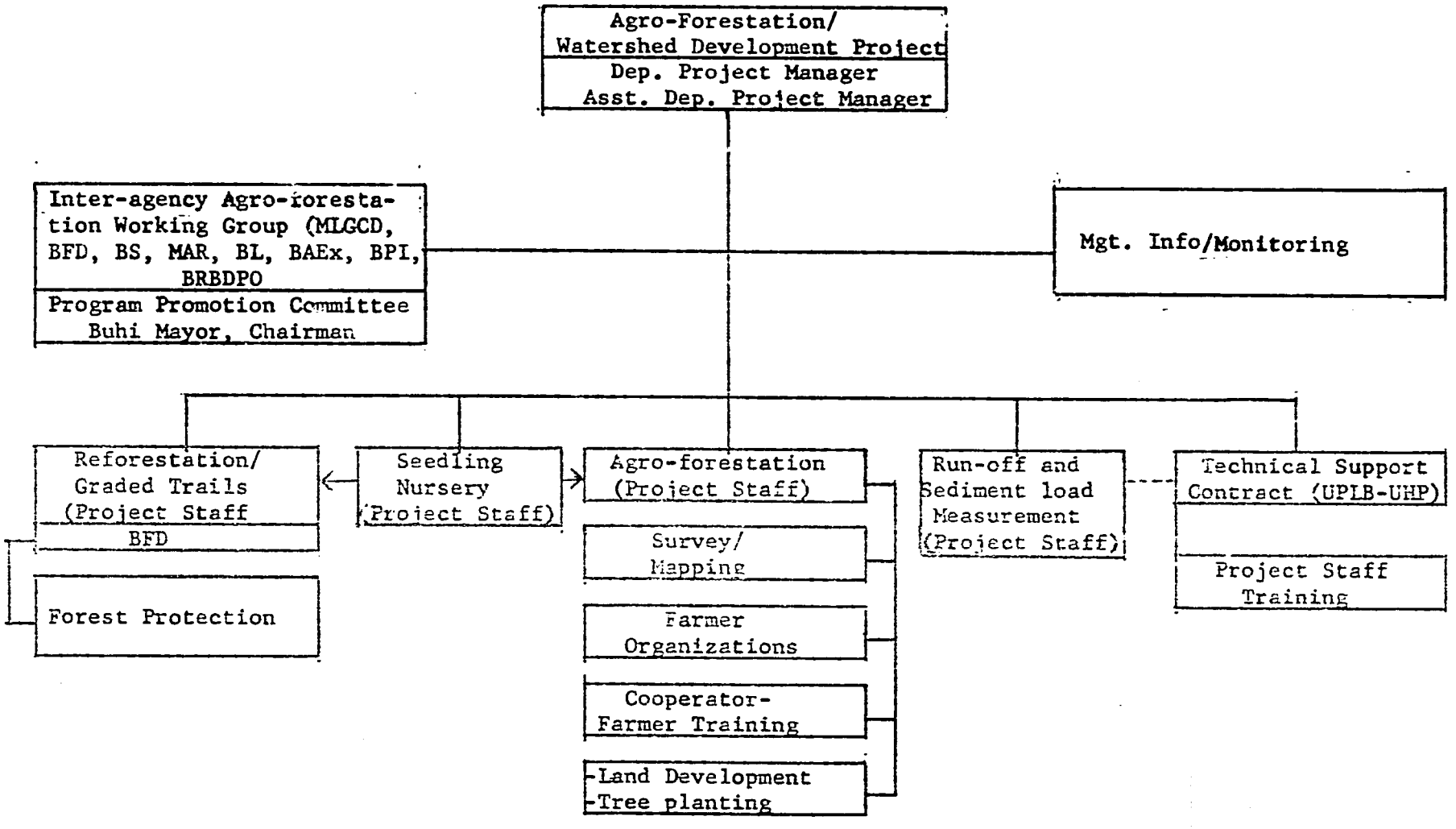





Figure 1

Figure 2

# PROPOSED ORGANIZATIONAL CHART
## PROJECT MANAGEMENT OFFICE
## RINCONADA IAD III
## BUHI-LALO INTEGRATED DEVELOPMENT PROJECT

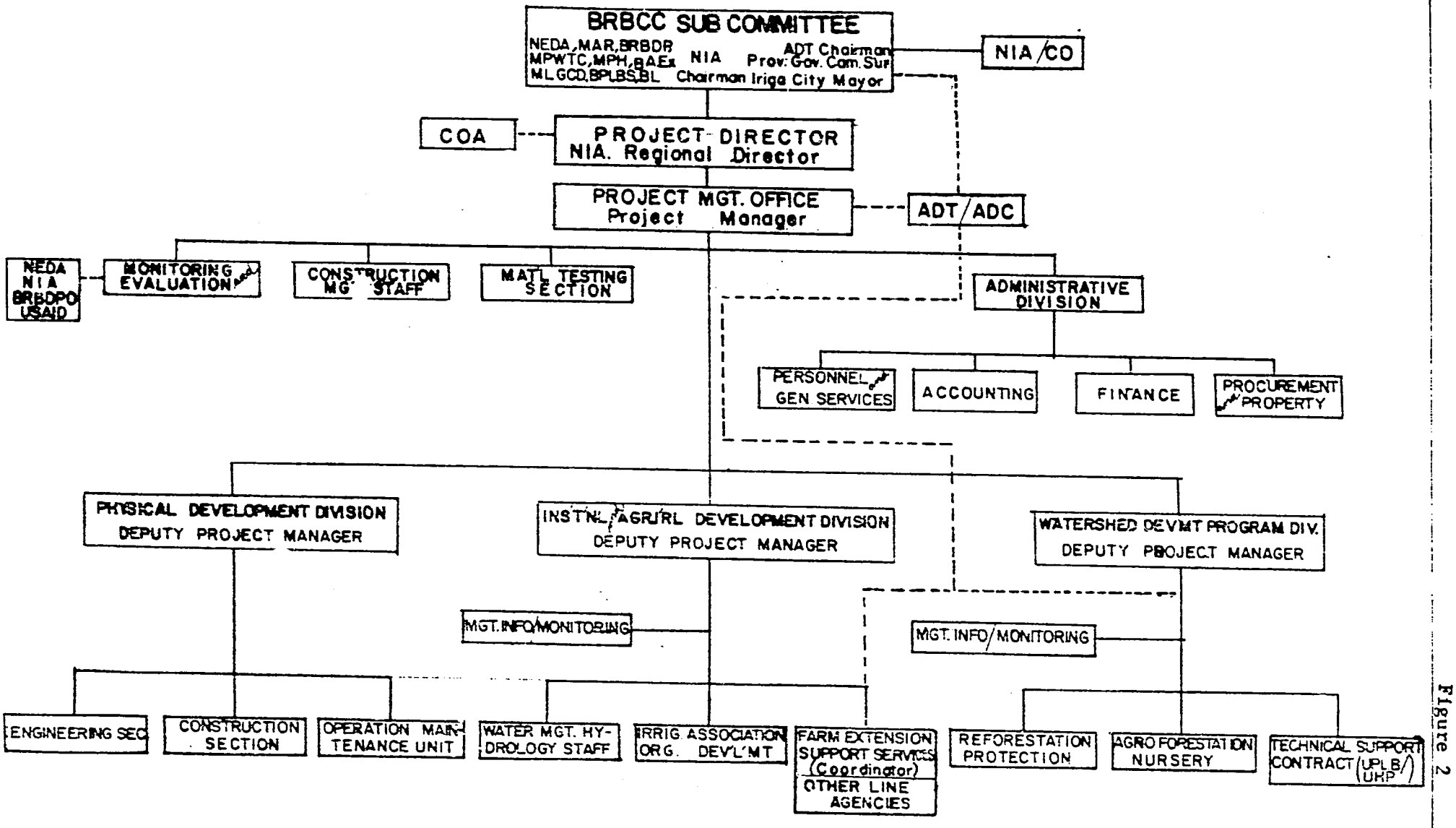





Figure 2

E. Environmental Concerns

Approximately 7,900, or 84%, of the 9,400 hectares that comprise the upland drainage area of Lake Buhi watershed have at some time been cleared, burned and planted with various agricultural crops. These have been principally rice and corn, but have also included coconuts, abaca, miscellaneous root crops and fruit trees. The soil on roughly two-thirds of the watershed is Tigaon clay capable of good moisture retention and rich in organic matter. It is friable and easily cultivated but susceptible to sheet and gulley erosion. One-third of the area is covered with Macolod sandy loam, also rich in organic matter, friable and easily cultivated, but low in moisture retention and resistance to erosion. The combination of steep slopes, high rainfall (averaging 2,700 mm per annum) and poor ground cover on these soil types has resulted in gradual but sustained watershed erosion. Rough calculations have been made to quantify soil loss. Results are estimated from 1-10 MT/ha./yr. on the better covered lands up to several hundred MT/ha./yr. on poorly cultivated and abandoned lands, using rainfall-soil constants and slope-vegetative cover variables. Soil loss in forested areas of the watershed is assumed to be about 4 MT/ha./yr., similar to other forested areas where siltation and other measurements are made. Clearly, considerable environmental damage has taken place with predictable effects on the productivity of the land. Loss of nutrients is ultimately reflected in the productivity and earnings of watershed farmers.

Agro-forestry is a major method of re-establishing favorable environmental conditions. Agro-forestry includes contour farming, bench terracing and establishing mixed species of orchards with leguminous covercrops to minimize soil erosion on slopes up to 30% grade. Aside from erosion control, the tree cover will improve rainfall retention. The litter fall retained by covercrops will hasten humus formation. Leguminous covercrop species will enrich the soil by maintaining conditions that hasten decomposition of detritus and increase available nitrogen through the action of rhizobium and enhanced mycorrhizal association. Using several species in the vegetative cover will result in improved biotic stability.

On steeper grades, more diversified vegetative cover and higher plant density per unit area are required to maintain a balance between soil loss from erosion and soil production from decomposing litter. On slopes above the 30% level, reforestation of denuded areas with mixed species in patches of approximately 30 hectares is recommended. Such patches of biotically stable systems will establish themselves and regenerate natural vegetation in intervening areas not disturbed. Eventually, the introduced reforestation species will give way to natural succession plants preserved in the gene pool of the virgin forest remaining in the watershed. Over time, the indigenous hardwood (dipterocarp) dominated tropical rain-forest can be re-established. Agro-forestry and reforestation can help create favorable conditions to re-establish a favorable watershed environment.

Graded trails are to be built within the watershed. Forty kilometers are proposed with average widths of 2 meters. Trails will cover an area of 8 hectares or only .07% of the entire area. This is considered a tolerable level of interference in the ecosystem, considering the advantage of access for farmers and greater mobility for forest guards charged with enforcing forest protection measures.

The Program is designed to actively intervene and rehabilitate the forest ecosystem disrupted by improper land use while at the same time bringing socio-economic benefits to the watershed occupants. A favorable environmental impact will be created by the Program.

Impacts on the natural environment which will result from the broader Bicol Program are discussed in the "Environmental Assessment of Bicol River Basin Development Projects" prepared by the Philippine Inter-Agency Committee on Ecological Studies in 1978[1/] which is Annex N to this Project Paper. Environmental concerns for elements of Rinconada IAD III elements are described in appropriate sections of the TAMS/TAE Rinconada Feasibility Study completed in January 1979.[2/]

## III. Financial Plan

The total Buhi-Lalo Integrated Development Project (AID inputs: $5 million loan) is scheduled for approval in the fourth quarter (August) of FY 1979 but with AID obligation of funds over two years: $3.5 million in FY 1979 with the GOP and AID signing of the loan agreement, and $1.5 million in FY 1980 as an amendment to the loan agreement. AID inputs for the Agro-forestation/Watershed Development component was purposely included in the later FY 1980 tranche (estimated third quarter, July 1980). Disbursement or reimbursement of AID funds will begin after fulfillment of the subsequent condition precedent (CP) applicable to the amended loan agreement (see Part VI below), requiring an updated, detailed implementation plan for the watershed development component, estimated due October 1980. Field implementation is scheduled to begin in January 1981, but could begin earlier utilizing GOP funds.

Financial plan data presented in Table G(3)-4, below, and in Table G(3)-1, under Part I, indicate a total Peso requirement of ₱6,259,000 ($834,000) for the Phase II Agro-forestation/Watershed Development Program of which about sixty-two percent (62%) would be provided by AID loan funds. The U.S. dollar equivalent of loan inputs is approximately $516,600 and the GOP contribution $318,400.

Approximately 59% of project funds, or about ₱3,645,000 will be used for land development, bench terracing, agro-forestry plantings, reforestation and nurseries. Loan funds are proposed to reimburse up to 100% of these costs (see Table G(3)-1,5,6).

Over 39% of total funding is allocated to project management and extension type services (₱2,070,000) and training (₱405,000). The GOP share is 100% of the former and 84% of the latter. In addition, 100% of equipment costs are proposed from GOP sources to allow immediate local procurement to begin implementation (U.S. off-shore procurement often takes 18-24 months). Some additional equipment, however, is proposed for procurement under the Bicol grant project in 1979. The cost in both dollars and pesos of separate project outputs by source are presented in Table G(3)-5 and 6. Direct costs attributed to farmer agro-forestation assistance is $166,000 and direct cost attributed to public land reforestation is $130,000.

1/ Inter-Agency Committee on Ecological Studies - Man and the Biosphere, Environmental Assessment and Bicol River Basin Development Projects, Volumes I & II, (December 1978). Financial support provided by AID/W.

2/ Printed copies of the five-volume report are expected to be provided by the contractor in March 1979. Copies will be provided to AID/W.

Table G(3)-4. Estimated Project Cost, Annual Peso Values - Agro-forestation/Watershed Development, Phase II
(1000 Pesos)

| Project Components and Sources of Funds | 1981 | 1982 | 1983 | 1984 | 1985 | Sub-Total | Cost Escalation | 15% Contingency | Project Total |
|---|---|---|---|---|---|---|---|---|---|
| Land Development/Tree Planting | 258 | 351 | 399 | 447 | 229 | 1683 | 691 | 356 | 2730 |
| Nurseries | 97 | 119 | 122 | 126 | 100 | 564 | 232 | 119 | 915 |
| Training | 50 | 50 | 50 | 50 | 50 | 250 | 102 | 53 | 405 |
| Equipment | 95 | 1 | 1 | 1 | 1 | 98 | 23 | 18 | 139 |
| Project Management & Extension Services | 227 | 239 | 253 | 266 | 283 | 1269 | 532 | 270 | 2071 |
| Sub-Total | 726 | 760 | 825 | 890 | 663 | 3864 | | | |
| Cost Escalation (7% compounded) | 167 | 236 | 326 | 446 | 404 | | 1579 | | |
| 15% Contingency | 134 | 149 | 173 | 200 | 160 | | | 816 | |
| PROJECT TOTAL | 1027 | 1145 | 1324 | 1536 | 1227 | | | | 6259 |
| AID Loan | 383 | 498 | 549 | 601 | 357 | 2387 | 979 | 505 | 3871 ($516)1/ |
| GOP Contribution | 343 | 262 | 276 | 290 | 306 | 1477 | 600 | 311 | 2388 ($318)1/ |

Note: Figures may not add exactly to totals due to rounding. The base year for cost escalation is 1978.

1/ $1.00 = ₱7.50

Table G(3)-5 Dollar Cost of Project Outputs by Source of Funds
Agro-Forestry/Watershed Development ($1000)

| Project Component | Total Magnitude of Output | Total Cost | AID Loan | GOP |
|---|---|---|---|---|
| Project Staff trained | 6 | 6 | | 6 |
| In-service seminars for technicians | 15 | 18 | 5 | 13 |
| Assemblies for farmer organizations & training | 30 | 9 | | 9 |
| New areas terraced for rice/corn production | 270 ha. | 72 | 72 | |
| New mixed agro-forestry orchards planted | 900 ha. | 84 | 84 | |
| Firewood lots established | 180 ha. | 4 | 4 | |
| Denuded areas reforested | 800 ha. | 113 | 113 | |
| Upland access trails constructed | 40 km. | 27 | 27 | |
| Project Management (not included above) | | 182 | 13 | 169 |
| Sub-Total | | 515 | 318 | 197 |
| Cost Escalation 1/ | | 211 | 131 | 80 |
| 15% Contingency | | 109 | 67 | 41 |
| TOTAL | | $835 | $516 | $318 |

Table G(3)-6 Peso Cost of Project Outputs by Source of Funds
Agro-Forestation/Watershed Development (₱000)

| Project Component | Total Magnitude of Output 2/ | Total Cost | AID Loan | GOP |
|---|---|---|---|---|
| Project Staff trained | 6 | 46 | | 46 |
| In-service seminars for technicians | 15 | 134 | 40 | 94 |
| Assemblies for farmer organizations & training | 30 | 71 | | 71 |
| New areas terraced for rice/corn production | 270 ha. | 540 | 540 | |
| New mixed agro-forestry orchards planted | 900 ha. | 632 | 632 | |
| Firewood lots established | 180 ha. | 32 | 32 | |
| Denuded areas reforested | 800 ha. | 844 | 844 | |
| Upland access trails constructed | 40 km. | 200 | 200 | |
| Project Management (not included above) | | 1366 | 100 | 1266 |
| Sub-Total | | 3864 | 2387 | 1477 |
| Cost Escalation 1/ | | 1579 | 979 | 600 |
| 15% Contingency | | 816 | 505 | 311 |
| TOTAL | | ₱6259 | ₱3871 | ₱2388 |

1/ From 1978 base-year prices, cost estimates are escalated at a compounded rate of 7%/year.
2/ Total of 1,350 ha. agro-forestry, and 800 ha. reforestation.

## IV. Implementation Plan

The Agro-forestry/Watershed Development Program Phase II) is scheduled to be initiated approximately one year after the start of the overall Buhi-Lalo Integrated Development Project--late 1980, with upland physical work to start at the beginning of the 1981 dry season. As mentioned in the financial plan, program approval and implementation is conditioned, in part, on the success of Phase I activities over the 1979-1980 period which is being funded from other GOP/USAID sources. Based on joint agreement by the GOP and USAID to proceed, the Agro-forestation/Watershed Development Annex shall be revised, if required, by January 1980. It would be submitted to USAID/Manila and NEDA for subsequent review and approval. The proposed AID contribution for both the watershed development portion (est. $518,000) and the second tranche for irrigation development would be included in the FY 1980 obligation and amendment to the basic loan agreement. GOP funding for watershed activities may be provided earlier, however.

AID funding shall be made available for disbursement after fulfillment of subsequent conditions precedent, most importantly, submission of a detailed implementation plan, including a hard schedule and quarterly budget for watershed activities.

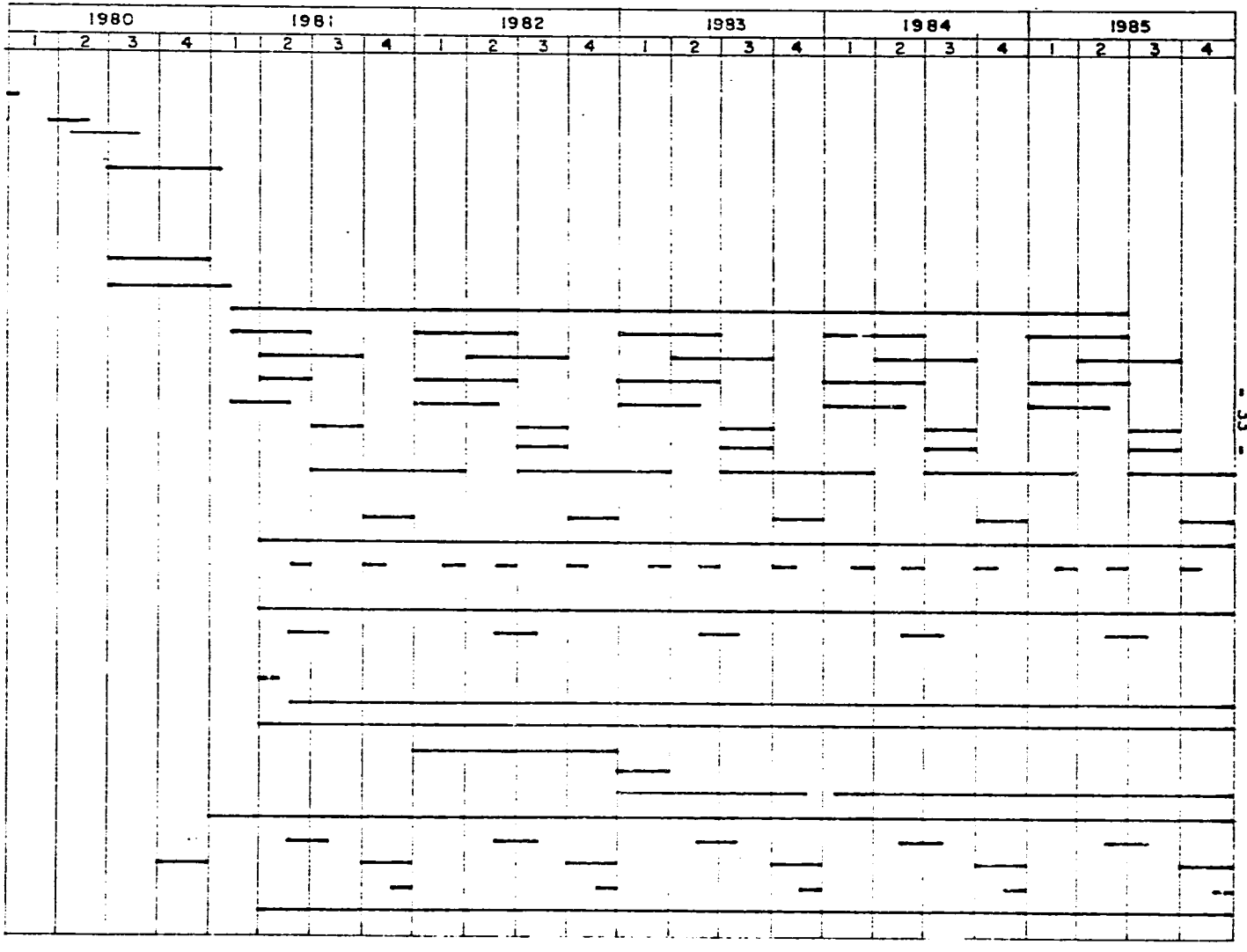
It is proposed that the field complement of program staff be hired in late 1980 and physical work begin in January 1981 at the advent of the dry season. The best estimate of scheduling of other proposed watershed activities at this time is outlined in the following "Proposed Implementation Schedule, 1980-81," Figure G(3)-3. Technical and other concerns relating to implementation are included in Part I.B.3 above (Program Site, Problems and Approaches) and in Attachment 1 (Implementation Letter No. 5, Bicol Grant Project), which outlines the Phase I Start-up effort.

## V. Evaluation Plan

General. The Agro-forestation/Watershed Management component will be carried out concurrently with the overall Buhi-Lalo Project, and with special evaluations as required. Both implementation assessments and later impact evaluations will utilize operational progress reports from the PMO, reports from project hired and USAID-funded Filipino and U.S. consultants (from the Bicol grant project), inputs from the Interagency Management Group and the Promotional Group, plus socio-economic household surveys. Evaluations shall cover: 1) the operational efficiency and effectiveness of the management organization implementing the project, 2) the degree of acceptability by farmer-cooperators (greater or less than projected), 3) the accomplishment of physical output targets, 4) environmental impacts, 5) socio-economic impact at different stages, and 6) effects on the general quality of life, attitudes and social awareness of the beneficiaries. Implementation evaluations (progress assessments) will be undertaken in May of each year beginning 1981 through 1984 as part of the overall Buhi-Lalo Integrated Development Project evaluation by a joint team (NEDA, BRBDP, USAID, NIA and possibly others). The final joint impact evaluation is scheduled in late 1985.

Figure G(3)-3

Proposed Implementation Schedule
Agro-forestation/Watershed Development
Buhi-Lalo Integrated Development Project



Operational Progress Reports. The Deputy Project Manager for Agro-forestation/Watershed Development shall prepare monthly and annual progress reports to be submitted as part of the overall PMO reports by the lead implementing agency (NIA). Reports will include the rate of progress and accomplishment against objectively verifiable inputs and outputs, problems encountered during implementation, action taken to resolve problems and unresolved issues or problems requiring guidance/coordination/assistance from the Interagency Management Group, the Promotional Group or the PMO/NIA. These reports shall compare actual against projected accomplishments within the time frame covered by each periodic report. An explanation shall be provided for progress greater or less than pre-set targets as a guide for possible modification of the implementation plan. The extent of physical improvements and the number of farmer-cooperators participating in the program will be noted.

Key indicators in the above reports shall also be summarized in the regular Bicol Program monthly reports by the BRBDPO Project Management Information System (PMIS).

Consultants Reports. Project hired consultants (UHP) will report on technical concerns and progress: growth rates of trees and other plants used, pest and disease problems encountered, if any, significance of changes in run-off or siltation as a result of project inputs (as measured by the project hydrographer) and on-going environmental impacts (e.g., cogon suppression by covercrops). Monthly reports shall be submitted to the PMO, with copies furnished to the Deputy Project Manager, the Interagency Management Group, the Promotional Group, and USAID. The UHP consultant will also comment on the status of program management and utilization of staff training.

Socio-Economic Household Surveys. The Rinconada Feasibility Study, concluded by TAMS/TAE, included 245 families in upland watershed areas, within its randomly selected sample taken to generate data for a social soundness analysis. Coding and computerization problems have delayed publication of the findings from this BRBDPO survey. The Buhi-Lalo Integrated Development Project has included funding to utilize these data. Phase I of the Agro-forestry/Watershed Development Program also includes a small budget for a socio-economic survey of the first 45 cooperator-farm families. The results of these two surveys will supply baseline data to measure the economic and social impact of the project on the target beneficiaries.

The Bicol Multipurpose Survey (BMS), a randomly sampled, socio-economic household survey covering three Bicol provinces, recognizes the key indicators of social and economic change which are discussed in Annex K of this project paper. These indicators can apply to upland as well as lowland farmers. The BMS is to be conducted every three years. It is proposed that the 1981 survey include a sample in the agro-forestation/watershed development target area. Staff-in-service training by UHP should include instruction in the methodology for conducting socio-economic surveys.

Interagency Management Group and Local Promotional Group. The designated chairmen of these two active support groups shall provide quarterly comments to the PMO/NIA on their participation and a summary of their technical and management recommendations. This independent judgement is deemed particularly valuable and is important to the longer term Bicol implementation perspective.

## VI. Conditions and Covenants

### A. Condition Precedent

"Prior to disbursement under the Loan, or the issuance by A.I.D. of documentation pursuant to which disbursement will be made, to finance the agro-forestation/watershed development component under the seond increment of the Loan, the Borrower shall, except as the Parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D. an updated plan for the implementation of these activities incorporating the experience and evaluation recommendations arising out of Phase 1 of the ongoing Bicol Agro-forestation/Watershed Development Program, including an updated quarterly projection of funds available to finance the various elements of this component."

### B. Covenants

1. "The Borrower shall budget and allocate adequate funding to assure effective implementation of protective measures on existing and newly reforestated plantings in the Lake Buhi watershed and Lalo River drainage area.

2. "The Borrower, through the regional offices of the Ministry of Agrarian Reform (MAR) and Bureau of Lands (BL), shall develop and implement adequate procedures to allow permanent farmers, or groups of permanent farmers, to secure title to the uplands that they till, particularly rice and corn land, if not otherwise prohibited by public law or regulations.

3. "The Borrower will issue the appropriate forest occupancy permits, if required, to qualified watershed farmers or groups of farmers occupying land within the Project area by December 1984.

4. "The Borrower, through the Bureau of Forestry Development (BFD) shall supply, without cost at the nursery site, seeds and/or seedlings for reforestation, and covercrop seeds and cuttings.

5. "In addition to assured and timely release of local currency funding for the first few years of the Project, the Borrower shall budget and allocate adequate funding for implementation of the farmer extension and support for the sixth and seventh year of the planned Agro-forestation/Watershed Development component."

ATTACHMENT A
ANNEX G(3)

Date: January 25, 1979

IRD-05

**Subject** : Joint Project Implementation Letter No. 5
Agro-Forestation (Rinconada-Buhi Watershed Development Program - Phase I Start-up)

**Reference:** Bicol Integrated Rural Development Project No. 492-0303
Grant Agreement No. 78-19, Amendment No. 2 dated December 22, 1978 (Table 3.C)

## 1. Summary

This Joint Implementation Letter earmarks funds for a direct grant to the Bicol River Basin Development Program Office (BRBDPO) to initiate agro-forestry activities (Phase I Start-up) in the Rinconada-Buhi area. It outlines a general program of work and establishes an estimated budget.

This activity covers the first six months of a proposed two-year Phase I Agro-Forestation - Watershed Development Program. One objective is to develop the empirical data and operational experience to implement a longer range Phase II program under the proposed Buhi-Lalo project to be assisted by a USAID loan (see schedule, Attachment 2, Table 1).

The peso equivalent of $15,000 (est. ₱109,500) shall be granted by USAID to the BRBDPO to fund preparatory activities and actual farm level demonstration of agro-forestry land use by 20 upland families. It is proposed that another 25 families be added under a follow-on Phase I component. Reforestation of some steeper uplands with wood species is proposed under the follow-on Phase I, and in Phase II, the latter under the proposed Buhi-Lalo Integrated Area Development Project (Rinconada).

Phase I Start-up agro-forestation activities include staff training, development of agro-forestry nurseries, purchase of tools, land terracing, land preparation, planting cover crops, a topographic survey and mapping, and a baseline sociological survey. The primary purpose of the two-year Phase I program is to (a) demonstrate the application of appropriate agro-forestation technology in the Bicol, (b) organize upland farmer groups, and (c) train a management team. Empirical data and operational experience will be an important output.

Funding (PL-480) for the follow-on eighteen months of Phase I has been proposed under a joint NEDA-USAID Community Agro-Forestation Project. The farm demonstrations to be carried out over the first six months or longer are designed to be a complete package if continuation is not approved. The estimated starting date for the Start-up Phase I program is February 15, 1979.

## 2. Background and Proposed Activities

The BRBDPO, with technical assistance provided by USAID and cooperating agencies, is in the process of designing an agro-forestry/watershed

development program (Phase II) for the Rinconada-Buhi area. Implementation of Phase II is scheduled to start in January 1981. While the immediate justification for support of agro-forestation/watershed protection is to initially improve the social and economic life of the small-scale upland farmers, the longer range justification is the conservation of soil fertility on the uplands to sustain economic productivity. In addition, sound watershed management is physically required to restore and maintain the ability of the soil to hold precipitation, control soil erosion, and reduce flooding (see attachments 3 and 4). The Phase II Watershed Development Program in Buhi includes both agro-forestation plantings by an estimated 900 small-scale farmers and GOP reforestation of denuded steeper uplands classified as timberland. Proposed foreign donor loan assistance projects (AID and ADB) in the lowland Rinconada area includes improvement and expansion of irrigation systems, drainage, flood protection, access roads and supporting agricultural programs. The site of this initial demonstration is in the watershed draining into Lake Buhi which is the primary water source for an estimated 10,000 hectares of irrigated land in the proposed loan assistance project areas. A specific agro-forestation/watershed development component is proposed in the Buhi-Lalo Integrated Area Development Project supported by USAID to begin to assist disadvantaged upland farmers, as well as irrigated farms in the project area. A description and proposed implementation plan will be a technical annex in the joint GOP-USAID Project Paper for the proposed Buhi-Lalo loan project.

In addition to beneficiary basic needs, and the required protection of Lake Buhi water sources, area selection was also based on the expression of interest and commitment of support by senior officials of Buhi Municipality. Buhi barangay leaders have also petitioned for government assistance in watershed protection.

While there is considerable experience with reforestation in the Bicol under the Bureau of Forestry Development (BFD) and cooperating agencies, there is little private sector or government experience with agro-forestation of uplands occupied by small-scale farmers. Several agencies have expressed interest and agencies such as the Bureau of Soils are beginning to support upland farmers with their limited resources. It was recognized early in the program design that there is a critical need to gain experience in applying appropriate technology, developing upland farmers organizations and developing implementation management capability to undertake any major agro-forestation watershed development effort. The development of a technology/organization/management package should start immediately to ensure that a watershed development program can be successfully implemented in sequence with other Rinconada-Buhi components by 1981.

Planting of orchards and reforestation under the two-year Phase I program must be timed with the start of the rainy season to be successful. Preliminary training, nursery work, and land preparation must precede this planting which begins at the onset of the rains in June or July. A June 1979 start-up, for example, would be too late for the pre-planting season activities to be accomplished in 1979. This grant activity to initiate Phase I is important to gain at least one year of operational experience

(in farmer organization through actual planting) prior to finalizing the implementation plan under the Buhi-Lalo loan assistance project in 1980.

This grant will finance the following Phase I start-up activities:

- salaries (limited to allowances if GOP employee) of the management staff, i.e., program manager, assistant manager and two field foremen.

- establishment of a nursery to produce 16,500 seedlings (primary fruits, nuts, firewood species and bamboo); wages for nursery workers; purchase of nursery tools, seeds, planting materials, chemicals and fertilizer.

- 50% subsidy for labor for bench terracing plots for grain crop requirements totalling 3 ha. by 20 farmer-cooperators (1,500 sq.m. each) and for tree planting. Small water sources will also be diverted for use.

- purchase of sets of hand tools for 20 upland farm families to do labor-intensive terracing and orchard land preparation (cost to be deducted from wages received from subsidized employment).

- survey and preparation of contour maps totalling 40 ha. (6 ha. terraces, 24 ha. for tree crop plus overrun area); sketching of farm plans. 30 has. include follow-on Phase I area if on same farm.

- survey of potential beneficiaries in the total Phase I area to determine farm family attitudes, document land tenure status and other baseline information.

- costs of Filipino technical consultants from the UPLB Upland Hydroecology Program including per diem and travel; and training costs for 4 management staff at UPLB.

An Agro-forestation Working Group will be organized by the BRBDPO. It shall be composed of representatives of technical agencies from the provincial and the regional levels, as appropriate (NIA, MLGCD, MAR, BFD, BPI, BS, BAEx, BL and BAI), and participating local government representatives (Buhi Municipality and Camarines Sur Province) to monitor start-up activities and provide technical support as needed. This Working Group will assist in redesigning the follow-on Phase I and Phase II of the longer range Program. An initial set of policy recommendations have been approved by the Bicol River Basin Coordination Committee (Attachment 4) but are expected to be updated with more specificity as more experience is gained.

A project level promotion committee shall be formed and be composed of representatives of concerned technical agencies. This committee shall be chaired by the Mayor of Buhi Municipality. The committee shall facilitate project implementation and advise the core project staff as required including organizing farmers' groups, site selection and recommendation of farmer-cooperators.

3. Agreement and Contract Administration

USAID agrees to allocate grant funding up to $15,000 (in pesos) directly to the BRBDPO. The BRBDPO agrees to provide in-kind technical assistance, clerical and vehicle support which has been allocated for support to the Bicol grant project. The BRBDPO shall assign a Project Coordinator and technical expertise. USAID shall provide watershed management consultancy (funded separately).

The BRBDPO, represented by the Program Director, is authorized to request and receive AID grant allotments. Expenditures shall be based on a mutually acceptable work plan (see budget in para. 4 below and additional budget details in Attachment 1). The BRBDPO may procure goods and services by direct contract with individuals or firms, and/or by contract with other government entities by Memorandum of Agreement (MemoAg).

The BRBDPO shall contract for technical assistance with consultants from the UPLB Upland Hydroecology Program (UHP) on a personal services or institutional basis. For flexibility, it is proposed that start-up technical assistance be on a personal services basis, but the follow-on phase may warrant an institutional contract/MemoAg. A MemoAg covering staff training costs will be made with the UPLB/UHP. An estimated 36-40 work days of technical assistance plus travel and per diem are budgetted over six months, but may be increased, if required, drawing from the contingency category. The purpose of this technical consultancy is to draw on the existing experience of UPLB and other upland development programs in the Philippines. A proposed follow-on contract with UPLB/UHP arrangement shall be developed based on requirements identified during initial implementation.

All procurement of goods and services shall follow established BRBDPO procedures regarding grant-in-aid resources.

4. Budget and Release of Funds

The budget is estimated as follows:

| | |
|---|---|
| Management staff (salaries and/or allowances) | ₱21,200 |
| Nursery development (workers and supplies) | 15,700 |
| Land improvements (50% labor subsidy for bench terracing and tree plantings; max/ per farmer ₱455) | 9,100 |
| Hand tools (cooperating farm families) | 9,000 |
| Topographic survey | 3,200 |
| Baseline data survey | 5,000 |
| Staff training at UPLB/UHP and Technical Assistance | 20,000 |
| Other direct costs and contingency | 26,300 |
| Total | ₱109,500 |
| | ($ 15,000) |
| Dollar equivalent (₱7.3 = $1.00) | |

Changes in line items of up to 25% may be made by the BRBDPO with corresponding decreases or increases in other categories. Other modifications within the total amount will require the documented joint approval of the BRBDPO and USAID/ORD. Additional budget details are presented in Attachment 1.

USAID agrees to grant the peso equivalent of $15,000 (approximately ₱109,500) in two or more quarterly releases; the first advanced after NEDA and USAID Manila approve this Joint Implementation Letter and a written request is made by the BRBDPO. Additional quarterly releases will be made based on a positive joint assessment of progress to date and a submission of a financial statement of actual expenditures/obligations to date and requirements for the follow-on quarter or part thereof.

5. Evaluation

The Bicol Grant Project Manager (BRBDPO/PMD) and USAID Project Officer shall monitor this Phase I Start-up activity. Performance and output shall be assessed on a quarterly basis with the assistance of the interagency Agro-forestation Working Group. Monthly summary progress reports shall be prepared by the Field Manager with inputs by the assigned BRBDPO project coordinator and the USAID consultant (2 copies to BRBDPO and 2 copies to USAID).

6. Other Provisions

Accounts and records will be maintained by the BRBDPO and any government entity contracted by Memorandum of Agreement, for a period of two years after completion of this activity and will be subject to audit by NEDA and AID or their duly authorized representatives.

7. **Approval**

The GOP/BRBDPO and USAID, each acting as duly authorized representatives, hereby agree to the above:

Camilo A. Balisnomo
Program Director, BRBDPO

1/26/79
Date

Don F. Wadley
Chief, Office of Regional Development
USAID

1/26/79
Date

B. G. Villavicencio
Director, External Assistance Staff
NEDA

2/28/79
Date

William F. Mulcahy
Program Officer, USAID

2/28/79
Date

Clearances:

USAID

OAD RHP Kurd

CSD

CO

GOP

Buhi Municipality 1-27-79

Attachment 1

Estimated Budget for Phase I Start-up Project[1/]
Rinconada-Buhi Agro-forestation Watershed Development Program

**Summary**

| | | |
|---|---|---|
| 1. | Management Staff - salaries of 4 key personnel (Contract) during training and field implementation (only authorized GOP allowances if detailed from GOP agency) | ₱ 21,200 |
| 2. | Nursery Development - purchase of seeds, seedlings, tools and supplies, construction of nursery facilities, plus wages of nursery 3 man-crew | 15,700 |
| 3. | Permanent Watershed Improvements - 50% labor subsidy to 20 selected farmer-cooperators to develop 15 has. of land (1500 sq. m. per family of terraces and .6 ha. per family of agro-forestry plantings) | 9,100 |
| 4. | Hand Tools for Farmer-Cooperators - Tools needed to build terraces and farm ditches and to dig planting holes for trees. Charged to recipient and cost deducted in installments from wages earned through labor intensive employment in 3. above | 9,000 |
| 5. | Topographic Survey - topographic surveys and preparation of maps for land to be developed. Farm plans or schedules may also be prepared | 3,200 |
| 6. | Baseline Data Survey - baseline sociological survey estimated at one month and review of marketing constraints/opportunities | 5,000 |
| 7. | Training at UPLB/UHP and Technical Assistance - training of 4 key management personnel at Los Baños (in addition to salaries per 1 above), including living and transportation expenses, UPLB Training Center and consulting fees by members of UPLB Upland Hydroecology team (estimated 36-40 work days) | 20,000 |
| | | ₱ 83,200 |
| 8. | Contingency & Other Direct Costs - Travel, materials for farmers meetings, office supplies, etc. Above budget categories 1-7 may be increased by 25% by the BRBDPO from this contingency item. The total peso equivalent of $15,000 cannot be exceeded | 26,300 |
| | | ₱109,500 ($15,000)[2/] |

1/ Budget represents estimate for full activity for six months but if not expended, funds may be utilized up to one year to achieve stated objective. Target beginning date is February 15, 1979 with full operation by April 1, 1979.

2/ USAID to provide the peso equivalent of $15,000 at time of conversion; estimated exchange rate of ₱7.3/$1.00.

Other Budget Assumptions

1) The BRBDPO will provide the following office equipment on loan basis: 1 typewriter, 1 adding machine, 1 filing cabinet, 3 desks and 3 chairs

2) The UPLB Upland Hydroecology Program Group will help negotiate with the Horticulture Department and other sources for concessional rates on purchase of high yielding clones of fruit trees.

3) The Upland Hydroecology Group will assist in securing cover crop seeds (stylosanthes) from Bureau of Animal Industry (BAI).

4) The BRBDPO will supply clerical support (type reports, vouchers, payrolls, etc.) for this initial work. The BRBDPO will negotiate a memorandum of agreement with Buhi Municipality to provide a portion of the clerical support, temporary office space and a portion of the boat transportation to project sites across the Lake Buhi.

Schedule
Rinconada-Buhi Watershed Development Program
1978-1985

Table 1

| Phase and Funding Source | 1979 (1 2 3 4) | 1980 (1 2 3 4) | 1981 (1 2 3 4) |
|---|---|---|---|
| Phase I Start-Up (6 mo.) (Bicol Grant Project) | 20 farmers - 15 hectares (Feb.-July 79) | | |
| Phase I Follow-on (18 mo.) (NEDA-USAID Community Agro-Forestation Project) | 20 above + 25 new farmers - 15 + 37.5 has. (July 79-Dec 80) | | |
| Phase II (Agro-forestation/Watershed Development component of Buhi-Lalo Loan assistance project) 5 years | | | 900 farmers - 1,350 has. (Jan. 81 - Dec. 85) |

Table 2

| | Maximum Land Development Assistance Per Farmer | | | | |
|---|---|---|---|---|---|
| | Terrace for Grain Crop 1/ | Orchard crops | Firewood Lot 3/ | Total Area Cost | |
| Phase I - Start-Up | 0.15 1/ | .5 2/ | .1 3/ | 0.75 | ₱455 |
| Phase I - Follow-on and Phase II 4/ | 0.3 | 1.0 | .2 | 1.5 | 910 |

Table 3 Derivation - Maximum Land Development Assistance Per Farmer

| | Development Duration | Subsidy Duration | Total Dev. Costs/Ha. 5/ | 50% Labor Subsidy/Ha. | Has./Farmer | Maximum Assistance Per Farmer |
|---|---|---|---|---|---|---|
| Terraces | 1-2 yrs. | 1 yr. | ₱4000 | ₱2000 | .30 Has. | ₱600 |
| Orchards | 7 yrs. | 2 yrs. | 900 5/ | 275 | 1.00 " | 275 |
| Firewood Lot | 2 yrs. | 2 yrs. | 460 5/ | 175 | .20 " | 35 |
| | | | Totals | | 1.5 | ₱910 4/ |

1/ 50% Subsidy = ₱300
2/ 50% Subsidy = ₱137.50
3/ 50% Subsidy = ₱17.50 (This may be converted to orchard crops)
4/ Estimate before escalation est. 7% per year
5/ Materials and labor for planting and maintenance until trees begin to produce.

Attachment 2

1a

Attachment 3

**POLICY RECOMMENDATIONS APPROVED BY BRBCC ON OCTOBER 6, 1978 TO GOVERN THE BICOL RIVER BASIN WATERSHED MANAGEMENT PROGRAM**

1. In recognition of the danger of the deteriorating conditions existing in the Bicol watersheds, the Bicol River Basin Coordination Committee (BRBCC) and the Regional Development Council (RDC) strongly recommend corrective measures be implemented immediately and be sustained to ensure a stable watershed environment over the long term. The present vegetative cover clearly does not provide adequate soil protection and water conservation; consequently, soil erosion, siltation and flooding are increasingly becoming serious problems.

2. Since the productivity of the fixed agricultural farming base can be sustained only if upland watershed management is effectively applied, the management of soil and water resources must be given high priority in the allocation of public funds. Therefore, financial planning in the Bicol River Basin and the Bicol Region must be directed toward greater equity between upland and lowland public investment in order to achieve an environmentally sound balance between the lands used for annual cropping and the supporting areas devoted to forests and permanent crops.

3. A major portion of the critical watersheds is now in private hands and farmed by small farm families. Therefore, the cooperation and active involvement of the actual cultivators and land owners is essential for the development of a viable watershed management program. Since planning for watershed improvements must start at the farm family level, it is necessary to determine the extent to which farmers are prepared to participate in the program and devise plans to enlist the farmers full cooperation.

4. The present deteriorating condition of the watershed is a result of improper land use. Philippines and other country experience indicates that better land use methods such as contour farming, terrace construction, and agro-forestation can be effectively implemented through the joint efforts of the farmers, landholders, and the government. The government can justifiably subsidize the farmer to help him improve the conservation of natural resources and management of the watershed on private lands in order to prevent soil erosion, siltation and flooding. These subsidies or investments will benefit the entire community and country and are, therefore, warranted on socio-economic grounds. Such investments must directly benefit the cultivator in the form of increased productivity which provides for his economic well-being.

5. Inequitable land tenure arrangements must be restructured to insure the accrual of benefits, including increased land values, to the small farm family cultivating the land.

6. Conservation of existing forests is essential. The achievement of this objective requires the professionalizing of forest protection capabilities plus community involvement through the designation of barangay captains as deputy forest rangers (under P.D. 705). Enforcement of laws against illegal logging and destructive slash-and-burn (kaingin) farming on Bicol upland watersheds must be strengthened.

7. Sustained funding for adequate forest protection must be assured. The BRBCC and RDC shall request the national government to designate Bicol as a regional pilot area for the application of funds generated from Forestry Administrative Order No. 64 to carry out a major watershed improvement program. Grants from this fund should be provided to requesting municipalities and barangays who are willing to develop and implement forest protection programs.

8. Reforestation must be implemented on all lands presently under effective government control. Monocultures should not be allowed because they are ecologically unstable and do not provide adequate soil protection. Reforestation and agro-forestation programs must include a mixture of several species.

9. Additional nurseries must be established to supply seedlings/seeds free or at cost for agro-forestry and reforestation and must be located near the planting sites. Farmer groups will be represented in policy making bodies and in operations of nurseries.

10. Extension services will be provided specifically to deal with upland problems. These services should be progressively expanded to one extension worker for every thirty farm families. Cooperating farmers shall participate in the performance evaluation of extension agents.

11. The development of tree plantations will be encouraged to provide the lumber, firewood, leafmeal and other industrial requirements of the Bicol Region and develop its export potential.

12. Control over the use of uplands already released for agricultural production must be strengthened and existing regulations implemented to stop further watershed deterioration. The GOP must assert its right and fulfill its duty to assure that land use is environmentally sound in addition to being economically beneficial to the tiller and landholder.

13. All local executives should receive watershed management training including exposure to agro-forestry techniques and development of strategies to achieve effective community involvement in tree-planting activities mandated by P.D. 1153.

14. All road building contracts must specify that contractors will plant trees along roadsides. Where road shoulders are too narrow, shrubbery may be substituted. Releases of funds to contractors will be based on accomplishment of this work.

The following information is from preliminary field observations and planning of the Rinconada-Buhi Watershed Development Program:

1. Rinconada uplands make up 58% (44,700 hectares) of the total development area (76,500 has.). Only 3.6% (1,625 has.) of the uplands are protected by adequate forest cover. An additional 7.8% (3,500 has.) currently has marginal forest cover.

2. An estimated 88.6% of the uplands (39,600 has.) is either under cultivation or already abandoned to cogon grass, the latter indicating degraded fertility. Current land-use practices on some steeper slopes, particularly slash-and-burn farming (kaingin), are causing denudation and increasing soil erosion.

3. Depending on the area, 34 to 46% of the upland occupants perceive themselves as owners. The others have various tenancy relationship or are squatters. The average annual family income is ₱2,208 ($300).

4. A farmer feels he must own the land he tills, or have a long-term leasehold or other secure tenancy arrangement before he will make permanent land improvements.

5. Upland farmers, most of whom live on a subsistence level, do not have the resources to develop the land for more intensive and permanent culture. To change land use, both technical and financial assistance must be provided over time.

6. It is assumed that environmentally sound and economically viable land use is possible under Bicol upland soil and weather conditions. Further, that improved land use can substantially improve the economic condition and quality of life of permanent upland farmers. A start-up agro-forestation project (20-40 small demonstrations) is proposed to begin to test this assumption.

Attachment B
ANNEX G(3)

List of Supporting Tables
Agro-forestation/Watershed Development Program
(Buhi-Lalo Integrated Development Project)


| No. G(3)- | Title | Page |
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| 7 | Cost Summary by Year, Agro-forestation/Watershed Development | 1 |
| 8 | Summary Cost by Year, Improved Land-use Activities | 2 |
| 9 | Detailed Costs by Year, Improved Land-use Activities | 3-3a |
| 10 | Detailed Costs Per Farm, Agro-forestry Farm Development | 4-4a |
| 11 | Detailed Costs Per Hectare by Year Reforestation Activity | 5 |
| 12 | Summary Costs by Year, Seeding Nursery Activity | 6 |
| 13 | Detailed Costs by Year, Nursery Activity | 7-7a, b |
| 14 | Summary of Costs by Year, Training Activity | 8 |
| 15 | Detailed Costs by Year, Training Activity | 9-9a |
| 16 | Summary of Equipment Costs by Year | 10 |
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| 18 | Summary of Costs by Year, Project Management and Extension Services | 12 |
| 19 | Detailed Costs, Project Management and Extension Services | 13, 13a |
| 20 | Start of Project Status by Area | 14 |
| 21 | End of Project Status by Area | 14 |
| 22 | Derivation of Magnitude of Outputs | 15 |
| 23 | List of Buhi Municipality Barangays and Households (from which farmer-cooperators may be drawn) | 16 |

Table G(3)-7

Cost Summary by Year
Agro-Forestation/Watershed Development
Buhi-Lalo Integrated Development Project

| | YEAR 1 | 2 | 3 | 4 | 5 | TOTAL |
|---|---|---|---|---|---|---|
| 1. Land development/tree planting (improved landuse activities) | 257,500 | 350,750 | 398,750 | 446,750 | 229,250 | 1,683,000 |
| 2. Nurseries | 97,329 | 118,543 | 122,212 | 126,138 | 99,974 | 564,196 |
| 3. Training | 50,045 | 50,045 | 50,045 | 50,045 | 50,045 | 250,225 |
| 4. Equipment | 94,522 | 825 | 825 | 825 | 825 | 97,822 |
| 5. Project Management & Extension Services | 226,822 | 239,401 | 252,860 | 267,261 | 282,670 | 1,269,014 |
| Sub-total | 726,218 | 759,564 | 824,692 | 891,019 | 662,764 | 3,864,257 |
| Cost Escalation 1/ | 163,399 | 236,072 | 332,021 | 446,133 | 401,502 | 1,579,127 |
| 15% Contingency | 133,443 | 149,345 | 173,507 | 200,573 | 159,640 | 816,508 |
| TOTAL | 1,023,060 | 1,144,982 | 1,330,220 | 1,537,725 | 1,223,906 | 6,259,892 |

1/ From 1978 base-year prices, cost estimates are escalated at a compounded rate of 7% annually, with Year 1 as 1981. Escalation factors are therefore, for Year 1, 14.49%; Year 2, 22.50%; Year 3, 31.08%; Year 3, 40.26%; Year 4, 50.07%; and Year 5, 60.58%.

Table G(3)-8

Attachment B

Summary Cost by Year
Improved Land-Use Activities
Buhi-Lalo Agro-forestry/Watershed Development

| | 1 | 2 | 3 | 4 | 5 | TOTALS |
|---|---|---|---|---|---|---|
| A. Bench Terracing/Contour Farming | 135,000 | 135,000 | 135,000 | 135,000 | - | 540,000 |
| B. Orchards | 50,625 | 61,875 | 61,875 | 61,875 | 11,250 | 247,500 |
| C. Firewood Lots | 7,875 | 7,875 | 7,875 | 7,875 | - | 31,500 |
| D. Graded Trails | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 | 200,000 |
| E. Reforestation | 24,000 | 106,000 | 154,000 | 202,000 | 178,000 | 664,000 |
| | 257,500 | 350,750 | 398,750 | 446,750 | 229,250 | 1,683,000 |

Table G(3)-9

Attachment B

## Detailed Costs by Year
## Improved Land-Use Activities
## Buhi-Lalo Agro-forestry/Watershed Development

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| A. Bench Terracing/Contouring - 270 has. (.3 has/family and 900 farmer-cooperator families) 225 families/yr @ ₱600 | 135,000 | 135,000 | 135,000 | 135,000 | - |
| B. Orchards - 900 has (One ha per family and 900 farmer-cooperator/families) | | | | | |
| 1st yr planting - 225 has @ ₱200 | (45,000) | | | | |
| maintenance - 225 has @ ₱25 | ( 5,625) | | | | |
| 2nd yr planting - 225 has @ ₱200 | | (45,000) | | | |
| maintenance 1st yr planting - 225 has @ ₱50 | | (11,250) | | | |
| maintenance 2nd yr planting - 225 has @ ₱25 | | ( 5,625) | | | |
| 3rd yr planting - 225 has @ ₱200 | | | (45,000) | | |
| maintenance 2nd yr planting - 225 has @ ₱50 | | | (11,250) | | |
| maintenance 3rd yr planting - 225 has @ ₱25 | | | ( 5,625) | | |
| 4th yr planting - 225 has @ ₱200 | | | | (45,000) | |
| maintenance 3rd yr planting - 225 has @ ₱50 | | | | (11,250) | |
| maintenance 4th yr planting - 225 has @ ₱25 | | | | ( 5,625) | |
| 5th yr maintenance - 4th yr planting - 225 has @ ₱50 | | | | | (11,250) |
| | 50,625 | 61,875 | 61,875 | 61,875 | 11,250 |
| C. Firewood Lot - 180 has (. 2 has/family and 900 farmer-cooperator families) 225 families/yr @ ₱35 | 7,875 | 7,875 | 7,875 | 7,875 | - |
| D. Graded Trails - 40 kms 8 kms @ ₱5000/km | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 |

Table G(3)-9 (Cont.)

Attachment B

E. Reforestation - 800 has.

| | Brushing/Controlled burning cover cropping | Planting | Maintenance | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|
| 1st yr | 200 has @ ₱120/ha | | | 24,000 | | | | |
| 2nd yr | 200 has @ ₱120/ha | | | | (24,000) | | | |
| | | 200 has @ ₱250 | 200 has @ ₱160- | | (50,000) | | | |
| | | | 2nd yr plantings | | (32,000) | | | |
| 3rd yr | 200 has @ ₱120/ha | | | | | (24,000) | | |
| | | 200 has @ ₱250 | 200 has @ ₱240- | | | (50,000) | | |
| | | | 2nd yr plantings | | | (48,000) | | |
| | | | 200 has @ ₱160- | | | | | |
| | | | 3rd yr plantings | | | (32,000) | | |
| 4th yr | 200 has @ ₱120/ha | | | | | | (24,000) | |
| | | 200 has @ ₱250 | 200 has @ ₱240- | | | | (50,000) | |
| | | | 2nd yr plantings | | | | (48,000) | |
| | | | 200 has @ ₱240- | | | | | |
| | | | 3rd yr plantings | | | | (48,000) | |
| | | | 200 has @ ₱160- | | | | | |
| | | | 4th yr plantings | | | | (32,000) | |
| 5th yr | | 200 has @ ₱250 | 200 has @ ₱240- | | | | | (50,000) |
| | | | 3rd yr plantings | | | | | (48,000) |
| | | | 200 has @ ₱240- | | | | | |
| | | | 4th yr plantings | | | | | (48,000) |
| | | | 200 has @ ₱160- | | | | | |
| | | | 5th yr plantings | | | | | (32,000) |
| | | | | 24,000 | 106,000 | 154,000 | 202,000 | 178,000 |

Table G(3)-10

Detailed Costs Per Farm
Agro-forestry Farm Development
Buhi-Lalo Agro-Forestry/Watershed Development

Attachment B

| | Mandays Required | | Proj. Share (Mandays)[1] | | Proj. Share (₱ Equivalent) | | Total Assistance Per Farmer |
|---|---|---|---|---|---|---|---|
| | 1st yr | 2nd yr | 1st yr | 2nd yr | 1st yr | 2nd yr | |
| 1. Bench Terracing/Contouring - 300 sq.m. (.3 has)/farm<br>500 mandays/ha x .3 has | 150 | | 75 | | ₱ 600 | | ₱ 600 |
| 2. Orchards - 1 ha<br>(fruit/nut trees & bamboo) | | | | | | | |
| Land clearing (brushing) - 10 mandays/ha | 10 | | 5 | | ( 40) | | |
| Contour lining/staking - 285 trees/man/day (5.7 days-say 6) | 6 | | 3 | | ( 24) | | |
| Digging holes - 285 holes x ₱.25 ÷ ₱8/manday(8.9 days-say 9) | 9 | | 5 | | ( 40) | | |
| Seedlings (provided for in nursery budget) | | | | | | | |
| Seedling transport-345 seedlings[2] ÷ 20 seedlings/man/trip<br>4 trips/man/day[3] | | | | | | | |
| Planting & replanting-345 seedlings[2] x ₱.20 seedling ÷ ₱8/manday<br>(8.6 mandays - say 8.5) | 8.5 | | 4.5 | | ( 36) | | |
| Covercrop seeds - (Stylosanthes) 1 kg @ ₱50 | - | | - | | ( 50) | | |
| Covercrop planting - 2 mandays/ha | 2 | | 1 | | ( 8) | | |
| Total planting cost | | | | | ( 198) | | |
| | | | | | Say 200 | | ₱ 200 |
| Ringweeding[4]<br>1st yr - 285 trees @ ₱.10/ringweeding x 2 ringweedings<br>÷ ₱8/manday (7.1 mandays - say 7) | 7 | | 3 | | ( 24) | | |
| | | | | | Say 25 | | 25 |
| 2nd yr - 285 trees @ ₱.10 x 2 ÷ ₱8 (10.6 mandays - say 11) | | 11 | | 6 | | ( 48) | |
| | | | | | | Say 50 | 50 |
| Carried forward | 192.5 | 11 | 96.5 | 6 | | | ₱ 875 |

Table G(3)-10 (cont.)

| | Mandays Required 1st yr | Mandays Required 2nd yr | Proj. Share (Mandays)1/ 1st yr | Proj. Share (Mandays)1/ 2nd yr | Proj. Share (₱ Equivalent) 1st yr | Proj. Share (₱ Equivalent) 2nd yr | Total Assistance Per Farmer |
|---|---|---|---|---|---|---|---|
| Carried forward | 192.5 | 11 | 96.5 | 6 | | | ₱ 875 |
| 3. Firewood Lot - 2000 sq.m. (.12 has)/farm | | | | | | | |
| Land clearing (brushing)-10 mandays/ha x .2 has | 2 | | 1 | | ( 8) | | |
| Seedling transport - 300 seedlings bundle x 4 bundles one trip for 1 man | | | | | | | |
| Planting -- 1200 seedlings @ ₱.02/seedling ÷₱8/manday5/ | 3 | | 1 | | ( 8) | | |
| Ringweeding6/ - 1000 trees x 2 ringweedings (in 1st yr) x ₱.05 ringweeding ₱8/manday (6.25 days - say 6.5) | 6.5 | | 2.5 | | ( 20) | | |
| | | | | | ( 36) | | |
| | | | | | Say 35 | | ₱ 35 |
| TOTAL FIRST YEAR | 204 | | 102.5 | | | | |
| TOTAL SECOND YEAR | | 11 | | 6 | | | |
| TOTAL BOTH YEARS | 215 mandays | | 108.5 mandays | | | | ₱ 910 |

1/ One manday = ₱8.00
2/ 20% for replanting due fail spots in the field
3/ Assume distance from nursery to farm averages two kilometers. 2 trips AM, 2 trips PM total 4 trips
4/ Assume planting in July. Two ringweedings in the first year and three in second year. From 3rd yr onward maintenance undertaken by farmer with no further financial assistance.
5/ Assuming ipil-ipil, no staking or digging of holes required. Planting is by bare foot method. Average task/man/day-400 seedlings. No replanting of fail spots but 20% overplanting practiced.
6/ High rainfall in project area should enable trees to shade out weeds in 2nd yr.

Table G(3)-11

Attachment B

Reforestation Activity
Detailed Costs Per Hectare by Year
Buhi-Lalo Agro-Forestry/Watershed Development

| | 1 | 2 | 3 | 4 | TOTAL |
|---|---|---|---|---|---|
| Land preparation | | | | | |
| Brushing - 10 mandays/ha @ ₱8/manday | 80 | | | | |
| Controlled burning - 1 manday/ha @ ₱8/manday | 8 | | | | |
| Contour lining and staking[1] | | | | | |
| 800 trees/ha ÷ 100 trees/man/day @ ₱8/manday (₱6.64 say ₱6.65) | | (65) | | | |
| Digging holes - 800 holes @ ₱.10/hole | | (80) | | | |
| Seedling cost (absorbed in nursery budget) | | | | | |
| Seedling transport[2] | | | | | |
| Bare root seedlings - 500/ha @ ₱.01 | | ( 5) | | | |
| Potted seedlings - 300/ha @ ₱.10 | | (30) | | | |
| Planting cost[3] | | | | | |
| Bare root seedlings 500/ha @ ₱.02 (400/manday) | | (10) | | | |
| Potted seedlings 300 @ ₱.20 | | (60) | | | |
| Covercrop planting | | 250 | | | |
| a) seeds - 2 kgs/ha - supplied at no cost by BFD | | | | | |
| b) Planting labor - 4 mandays/ha @ ₱8/manday | | | | | |
| Total Planting Cost | | | | | |
| Maintenance: | | | | | |
| 1st yr - 2 ringweedings/tree x ₱.10/ringweeding x 800 trees | | 160 | 240 | 240 | |
| 2nd yr - 3 ringweedings/tree x ₱.10/ringweeding x 800 trees | | | | | |
| 3rd yr - 3 ringweedings/tree x ₱.10/ringweeding x 800 trees | | | | | |
| | 120 | 410 | 240 | 240 | ₱1,010 |

1/ Need for accuracy not as important as in orchards.
Contour lines average 4 meters apart, trees in row average 3 meters.
Total stand average 825/trees/ha - say 800

2/ Cost of transport varies depending upon distance from nursery and what species planted. Some species possible bare root, some must be potted. Assume a mixture of species to avoid monoculture.

3/ No replanting. Assuming 20% fail spots remaining stand 640 trees/ha which, in combination with covercrop will provide adequate protection and stimulate growth of desireable succession - vegetation.

Table G(3)-12

Attachment B

Summary Costs by Year
Seedling Nursery Activity
Buhi-Lalo Agro-Forestry/Watershed Development

| | Year No. 1 | 2 | 3 | 4 | 5 | TOTALS |
|---|---|---|---|---|---|---|
| A. Salaries & premiums | 53,739 | 57,168 | 60,837 | 64,761 | 68,964 | ₱305,471 |
| B. Seedlings and seeds | | | | | | |
| 1) Agro-forestry seedlings | (21,390) | (21,390) | (21,390) | (21,390) | | |
| 2) Reforestation seedlings | - | (10,000) | (10,000) | (10,000) | (10,000) | |
| | 21,390 | 31,390 | 31,390 | 31,390 | 10,000 | ₱125,560 |
| C. Fertilizer | 3,145 | 4,930 | 4,930 | 4,930 | 1,785 | 19,720 |
| D. Plastic bags | 5,830 | 11,830 | 11,830 | 11,830 | 6,000 | 47,320 |
| E. Insecticides | 225 | 225 | 225 | 225 | 225 | 1,125 |
| F. High Yielding (clonal) Scions, budwood, etc. | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 50,000 |
| G. Misc. supplies & maintenance | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 15,000 |
| | ₱97,329 | ₱118,543 | ₱122,212 | ₱126,138 | ₱99,974 | ₱564,196 |

Table G(3)-13

Attachment B

Detailed Costs by Year
Nursery Activity
Buhi-Lalo Agro-Forestation/Watershed Development

A. Salaries

| | | |
|---|---|---|
| One (1) Agriculturist/nursery manager @ | 8238/annum | (₱8,328) |
| One (1) foreman/senior plant propagator @ | 7320/ " | ( 7,320) |
| Three (3) plant propagators/nursery laborers @ | 6916/ " | (20,748) |
| One (1) nursery laborer @ ₱10/day (₱2640/annum) | 2640/ " | ( 2,640) |
| | | 39,036 |
| G.S.I.S. insurance & medicare - 9.5% of ₱39,036 | | 3,708 |
| 13th month bonus + vacation/sick leave - 16% of ₱39,036 | | 6,245 |
| | | ₱48,989 |

| | Year No. 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Basic Salary and Benefits | ₱48,989 | ₱52,418 | ₱56,087 | ₱60,013 | ₱64,214 |
| Premiums (for successful budding/grafting/ inarching/marcotting) | 4,750 | 4,750 | 4,750 | 4,750 | 4,750 |
| | ₱53,739 | ₱57,168 | ₱60,837 | ₱64,763 | ₱68,964 |

Table G(3)-13 (cont.)

B) Seedlings and Seeds (Yearly requirement years 1 - 4 incl.)

| | | Totals | |
|---|---|---|---|
| | | Number of Seedlings | Cost |
| 1) Agro-Forestry Seedlings | | | |
| Pili - 17,000 seedling stocks x ₱.05 viable fresh seed - | ₱ 850 | (17,000) | 850 |
| Jackfruit - 3300 seedlings - 25 viable seeds/fruit x ₱10.00 selected ripe fruit - ₱1,392 | say 1,320 | ( 3,300) | 1,300 |
| Coffee - 33,000 seeds ÷ 500 seeds/kg x ₱10/kg for selected ripe berries | 660 | (33,000) | 660 |
| Cacao - 33,000 seeds ÷ 20 seeds/pod x ₱7.00/pod | 11,550 | (33,000) | 11,550 |
| Rambutan - 1700 seeds ÷ 100 viable seeds/kg. of fresh fruit x ₱10/kg = ₱119 say ₱120 | 120 | ( 1,700) | 120 |
| Lanzones - 3300 seeds ÷ 80 viable seeds/kg. of fresh fruit x ₱7.00/kg. = ₱288 (say ₱290) | 290 | ( 3,300) | 290 |
| Bamboo - 3000 seedlings ÷ 10 viable nodes/stem x ₱10/steam | 3,000 | ( 3,000) | 3,000 |
| Ipil-ipil - 270,000 seeds ÷ 6000 viable seeds/kg. x ₱80.00/kg. | 3,600 | (270,000) | 3,600 |
| | | 364,300 | ₱21,390 |
| 2) Reforestation Seedlings (Yearly requirement years 2-5 incl.) | | | |
| 200,000 tree seedlings required (see note) | | (200,000) | |
| 10,000 bamboo seedlings @ ₱1.00 (same rate as above) | 10,000 | ( 10,000) | 10,000 |
| | | 210,000 | |
| | | 574,300 | ₱31,390 |

Note: BFD to supply free tree seeds.
Species preferred: Gmelina arborea, Swietenia macrophylla, Alnus japonica, Ficus spp., Anthocephalus chinensis, Vitex parviflora, Eucalyptus deglupta, Intsia bijuga, Pterocarpus indicus

Table G(3)-13 Cont.

Attachment B

| | Totals | |
|---|---|---|
| | Number of Seedlings | Cost |
| C) Fertilizer | | |
| 1st yr - 364,300 seedlings @ 5 grams/seedling-37 sacks @ ₱85.00 | | 3,145 |
| 2nd yr - 574,300 " " " -58 " " | | 4,930 |
| 3rd yr - 574,300 " " " -58 " " | | 4,930 |
| 4th yr - 574,000 " " " -58 " " | | 4,930 |
| 5th yr - 210,000 " " " -21 " " | | 1,785 |
| | | (19,720) |
| D) Plastic Bags | | |
| 1st yr for: Pili - 17,000 | | |
| Jackfruit - 3,300 | | |
| Cacao - 33,000 | | |
| Rambutan - 1,700 | | |
| Lanzones - 3,300 | | |
| 58,300 @ ₱.10/bag | | 5,830 |
| 2nd yr for: 58,300 (Agro-forestry seedlings) | | |
| 60,000 (reforestation species) | | |
| 118,300 @ ₱.10/bag | | 11,830 |
| 3rd yr - Same as 2nd yr | | 11,830 |
| 4th yr - Same as 2nd yr | | 11,830 |
| 5th yr - 60,000 @ ₱.10/bag | | 6,000 |
| | | (₱47,320) |
| Note: Not all seedlings that will be produced need plastic bags. Balance planted bare root. | | |
| E) Insecticides - 5 bottles (8 oz. each) per spraying x 3 spraying x 3 sprayings/yr x ₱15.00/bottle | | 225 |
| (Materials for shed gathered locally using paid nursery labor. Tools for nursery included in equipment budget.) | | |
| F) Purchase of high yielding clonal trees and/or budwood - including travel for inspection purposes - 50 trees/yr @ ₱200 | | 10,000 |
| G) Misc. supplies as needed - ₱250/mo x 12 mos | | 3,000 |

Table G(3)-14

Summary of Costs by Year
Training Activity
Buhi-Lalo Agro-forestation/Watershed Development

| | Year No. 1 | 2 | 3 | 4 | 5 | Totals |
|---|---|---|---|---|---|---|
| A. Farmers Training | | | | | | |
| a. Formal assemblies and printed materials | 11,700 | 11,700 | 11,700 | 11,700 | 11,700 | 58,500 |
| b. Informal training | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | 12,000 |
| B. Project Staff-In-Service Training | 26,745 | 26,745 | 26,745 | 26,745 | 26,745 | 133,725 |
| C. Staff Attendance at National Seminars (may be used to visit similar or related projects) | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 21,000 |
| D. Purchase of Books and Periodicals | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 25,000 |
| | 50,045 | 50,045 | 50,045 | 50,045 | 50,045 | 250,225 |

Attachment B

Table G(3)-15

Detailed Costs by Year
Training Activity (Derivation of Costs)
Buhi-Lalo Agro-forestation/Watershed Development

| | | |
|---|---|---|
| **A. Farmers Training** | | |
| 1. Formal Training | | |
| ₱15/day/farmer and his family member trainees for meal and merienda x 100 trainees per assembly x 6 assemblies/yr. | | |
| 600 person days @ ₱15 | ₱ 900.00 | |
| Handouts at ₱20/ 600 participants | 1,200.00 | |
| Resource speaker honorarium ₱100/assembly x 6 assemblies | 600.00 | |
| Printing of reading materials - ₱10/family x 900 watershed families | 9,000.00 | ₱ 11,700 |
| 2. Informal Training | | |
| Merienda to farmer-cooperators visiting nursery and/or field headquarters 100 visitors/mo. x ₱2.00/man/visit x 12 mos. | 2,400.00 | 2,400 |
| **B. Project Staff In-Service Training** | | |
| Three in-service seminars/yr., each lasting three days with two resource speakers/seminar. | | |
| Honorarium to resource speaker - ₱300/day x 3 days/resource speaker x 2 speakers | ₱ 1,800.00 | |
| PAL RT from Manila - ₱200 x 2 speakers | 400.00 | |
| Per Diem ₱150/speaker/day x 2 speakers x 3 days | 900.00 | |
| Lodging for 15 participants @ ₱20/day x 3 days | 900.00 | |
| Food for 15 participants @ ₱30/day x 3 days | 1,350.00 | |
| Handouts to participants - ₱50/participant x 15 participants | 750.00 | |
| Transportation to and from site of seminar ₱10/participant x 15 | 150.00 | |
| Merit Award presentations during seminar for exceptional achievements in project implementation. Estimate of three awards/seminar at ₱100 | 300.00 | |
| Rental of facilites and payment of extra secretarial services - ₱400/day x 3 days | 1,200.00 | |
| | (₱ 7,750.00) | |
| Miscellaneous (15%) | 1,165.00 | |
| | ₱ 8,915.00 | |
| ₱8,915.00 x 3 seminars/yr. | | 26,745 |
| | | ₱ 40,845 |

Table G(3)-15 (Continued)

Attachment B

| | | |
|---|---|---|
| Carried Forward | | ₱40,845 |
| C. Attendance at national or regional seminars, visits to similar development projects by project staff | | |
| 1. Project Manager - 2 trips/yr. | | |
| a. Transportation RT - ₱500/trip x 2 trips | ₱ 1,000.00 | |
| b. Five days per diem/trip at ₱100/day x 2 | 1,000.00 | |
| 2. Asst. Project Manager - 2 trips/yr. | | |
| a. Transportation RT - ₱250/trip x 2 trips | 500.00 | |
| b. Five days per diem/trip at ₱100/day x m2 | 1,000.00 | |
| 3. Nursery Manager - attendance at one selected PCARR conference/yr. | | |
| a. Transportation RT to Los Baños | 200.00 | |
| b. Five days per diem at ₱100/day | 500.00 | |
| | ₱ 4,200.00 | 4,200 |
| D. Purchase of books, magazines, periodicals/yr. | | 5,000 |
| | | ₱50,045 |

Table G(3)-16

Summary of Equipment Costs by Year
Buhi-Lalo Agro-forestation/Watershed Development Division

| | Year No. 1 | 2 | 3 | 4 | 5 | TOTALS |
|---|---|---|---|---|---|---|
| Surveying | 17,332 | | | | | 17,332 |
| Forest Protection Support | 16,800 | | | | | 16,800 |
| Office | 4,600 | | | | | 4,600 |
| Nurseries | 9,120 | 825 | 825 | 825 | 825 | 12,420 |
| Run-off & Sedimentation Studies | 15,670 | | | | | 15,670 |
| Miscellaneous | 31,000 | — | — | — | — | 31,000 |
| | 94,522 | 825 | 825 | 825 | 825 | 97,822 |

Table G(3)-17

Detailed Equipment Costs (Derivation of Costs)
Buhi-Lalo Agro-forestation/Watershed Development

Attachment B

A. Surveying

| | | |
|---|---|---|
| 1. | 1 transit w/tripod, carrying case and accessories | ($ 735) |
| 2. | 1 dumpy level | ( 200) |
| 3. | 1 surveyors reel and tape | ( 165) |
| 4. | 2 replacement tapes @ $130 | ( 260) |
| 5. | 4 hand levels @ $25 | ( 100) |
| 6. | 2 Brunton compasses @ $75 | ( 150) |
| 7. | 1 planimeter | ( 130) |
| 8. | 1 pantograph | ( 25) |
| 9. | 1 set drawing instruments | ( 30) |
| 10. | 1 proportional divider | ( 50) |
| 11. | Triangles, protractors, misc. surveying equipment | ( 50) |
| 12. | 1 precision surveying altimeter | ( 250) |
| 13. | 1 barometer | ( 150) |
| 14. | 1 maximum-minimum thermometer | ( 16) |
| | | ($2,311) |
| | | ₱17,332 |
| 15. | 1 pickup truck (supplied from Bicol Grant Project) | |

B. Forest Protection Support

| | | |
|---|---|---|
| 16. | 7 horses @ ₱2000 | 14,000 |
| 17. | 7 sets saddles, bridles, etc. @ ₱400 | 2,800 |
| | | ₱16,800 |

C. Office

| | | |
|---|---|---|
| 18. | 1 typewriter (manual) | 1,800 |
| 19. | 1 adding machine (manual) | 1,200 |
| 20. | 2 filing cabinest @ ₱800 | 1,600 |
| | | ₱4,600 |

Table G(3)-17 Continuation

Attachment B

D. Nurseries

| | | |
|---|---|---|
| 21. | 10 pails @ ₱22 each | ₱ 220 |
| 22. | 5 drums - 50 gal. capacity @ ₱80 each | 400 |
| 23. | 5 spading forks @ ₱45 each | 225 |
| 24. | 10 trowels @ ₱20 each | 200 |
| 25. | 5 sprinkling cans @ ₱35 each | 175 |
| 26. | 20 meters screen (1/2") @ ₱25 each | 500 |
| 27. | 2 wheelbarrows @ ₱150 each | 300 |
| 28. | 2 sprayers @ ₱800 each | 1,600 |
| 29. | 5 pruning scissors @ ₱100 each | 500 |
| | | 4,120 |
| 30. | Pipes, tank, etc. for watering system (1st year only) | 5,000 |
| 31. | 2nd year - 5th year: Allow for replacement of 20% of above | 825 |

E. Runoff & Sedimentation Studies

| | | |
|---|---|---|
| 32. | 1 barometer @ $150 | 1,125 |
| 33. | 1 maximum-minimum thermometer @ $16 | 120 |
| 34. | 2 current meters @ $300 = $600 | 4,500 |
| 35. | 2 sediment samplers @ $125 = $250 | 1,875 |
| 36. | 1 pocket altimeter @ $100 | 750 |
| 37. | 1 Parshall flume | 3,000 |
| 38. | 2 evaporation pans @ ₱150 | 300 |
| 39. | 4 runoff plots @ ₱1000 | 4,000 |
| | | ₱15,670 - Year 1 only |

F. Miscellaneous

| | | |
|---|---|---|
| 40. | 1 motorboat | 3,000 |
| 41. | 200 shovels @ ₱50 | 10,000 |
| 42. | 200 picks @ ₱50 | 10,000 |
| 43. | 100 digging bars @ ₱30 | 3,000 |
| 44. | Misc. tools | 5,000 |
| | | ₱31,00 - Year 1 only |

Attachment B

Table G(3)-18

Summary of Costs by Year
Project Management and Extension Services
Buhi-Lalo Agro-forestation/Watershed Development

| | Year No. 1 | 2 | 3 | 4 | 5 | TOTALS |
|---|---|---|---|---|---|---|
| Administration & Extension Salaries | 155,630 | 166,524 | 178,180 | 190,652 | 203,997 | 894,983 |
| Technical Services | 22,020 | 22,020 | 22,020 | 22,020 | 22,020 | 110,100 |
| Run-off & Sedimentation Studies | | | | | | |
| a) salaries | 24,074 | 25,759 | 27,562 | 29,491 | 31,555 | 138,441 |
| b) equipment maintenance | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 10,000 |
| c) supplies | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 6,000 |
| Operating Costs | 21,898 | 21,898 | 21,898 | 21,898 | 21,898 | 109,490 |
| | 226,822 | 239,401 | 252,860 | 267,261 | 282,670 | 1,269,014 |

Detailed Costs
Project Management and Extension Services
(Derivation of Costs)

Table G(3)-19 Buhi-Lalo Agro-forestation/Watershed Development

A. Administration and Extension
Salaries

| Item | Number | Position | Annual Salary | Total |
|---|---|---|---|---|
| 1 | 1 | Deputy Project Manager | ₱22,579 | ₱22,579 |
| 2 | 1 | Asst. Dep. Project Manager | 15,120 | 15,120 |
| 3 | 4 | Field foremen/extension agents | 8,803 | 35,212 |
| 4 | 1 | Surveyor | 8,328 | 8,328 |
| 5 | 1 | Draftsman | 6,916 | 6,916 |
| 6 | 2 | Survey aides | 6,110 | 12,220 |
| 7 | 1 | Payroll-Filing clerk/typist | 5,707 | 5,707 |
| 8 | 1 | Stenographer-typist | 5,707 | 5,707 |
| 9 | 1 | Driver/maintenance man | 6,916 | 6,916 |
| 10 | 1 | Utility man | 5,304 | 5,304 |
| | | | | 124,009 |
| 11 | | GSIS, Insurance, Medicare (9.5% of ₱124,009) | | 11,780 |
| 12 | | 13th month pay & vacation + sick leave (16% of ₱124,009) | | 19,841 |
| | | Year 1 Total (add 7% step increases for Years 2-5 incl.) | | ₱155 630 |

B. Tech. Svcs. (UPLB Upland Hydroecology Program Consultants)
Professional fees

| | | | |
|---|---|---|---|
| 1 | | Senior consultant - 36 mandays/yr @ ₱300/manday | ₱10,800 |
| 2 | | Junior consultant - 24 " " " ₱125/ " | 3,000 |
| | Per Diems | | |
| 3 | | Senior consultant - 36 mandays/yr @ ₱100/manday | 3,600 |
| 4 | | Junior consultant - 24 " " " ₱ 75/ " | 2,700 |
| | Transportation | | |
| 5 | | 24 roundtrip bus tickets @ ₱80 | 1,920 |
| | | Yearly total | ₱22,020 |

C. Runoff & Sediment Load Studies
Salaries

| | | | | |
|---|---|---|---|---|
| 1 | 1 | Hydrographer | ₱8,803 | ₱ 8,803 |
| 2 | 2 | Hydrographer aides | 5,304 | 10,608 |
| | | | | ₱19,411 |
| 3 | | GSIS, Insurance, Medicare (9.5% of ₱19,411) | | 1,558 |
| 4 | | 13th month bonus + vacation/sick leave (16% of ₱19,411) | | 3,105 |
| | | Year 1 Total (add 7% step increases for Years 2-5 incl) | | ₱24,074 |

Table G(3)-19 (Continued)

D. Operating Costs

Gasoline for vehicle

| | | |
|---|---|---|
| 1. | 6000 kms/yr ÷ 5 kms/liter x ₱1.71/liter | ₱ 2,052 |
| 2. | Lubricants - 15% of fuel | 308 |
| 3. | Tires - 5 tires/set x ₱250/tire x .75 sets (new set every 9 mos) | 938 |
| 4. | Spare parts - estimate ₱150/mo x 12 mos | 1,800 |
| | | (₱ 5,098) |
| 5. | Motorboat operations (estimate - ₱100/mo x 12 mos) | 1,200 |
| | | ₱ 6,298 |
| 6. | Misc. maintenance - buildings & tools | ₱ 6,000 |
| 7. | Office supplies & communications - ₱300/mo x 12 mos | 3,600 |
| 8. | Travel allowances - ₱300/mo x 12 mos | 3,600 |
| 9. | Managers discretionary allowance - ₱200/mo x 12 mos | 2,400 |
| | Cost per Year | ₱21,898 |

Table G(3)-20 Agro-forestation/Watershed Development
Start of Project Status by Area

| | Land Use Positive | Land Use Poor | | |
|---|---|---|---|---|
| Total Watershed Area (Buhi Lake) | | | | 10270 |
| A. Upland areas | | | 9400 | |
| 1. Virgin forest | 1500 | | (1500) | |
| 2. Marginal uplands | | | | |
| -agro-forestry (existing) | 100 | | ( 100) | |
| -abandoned land/shifting cultivation | | 3360 | (3360) | |
| 3. Permanently settled uplands | | | | |
| -agro-forestry (existing) | 270 | | ( 270) | |
| -terraces (existing) | 10 | | ( 10) | |
| -shifting cultivation | | 4160 | (4160) | |
| | 1880 | 7520 | 9400 | (9400) |
| B. Other Areas | ( 20%) | ( 80%) | | |
| 1. Lake Buhi lowland drainage areas | 870 | | | ( 870) |
| 2. Lake Buhi water surface area | 1600 | | | |
| 3. Contigous Lalo upland drainage area | | (800) | | |
| | | | | 10270 |

Table G(3)-21 End of Project Status by Area

| | Land Use Positive | Land Use Poor | | |
|---|---|---|---|---|
| Total Watershed area | | | | 10270 |
| A. Upland Areasl | | | 9400 | |
| 1. Virgin forest | 1500 | | (1500) | |
| 2. Marginal uplands | | | | |
| -agroforestry (existing) | 100 | | ( 100) | |
| -reforested areas | 600 | | ( 600) | |
| -natural regeneration (induced)1/ | 1000 | | (1000) | |
| -abandoned land/shifting cultivation | | 1760 | (1760) | |
| B. Permanently settled areas | | | | |
| -agro-forestry (existing) | 270 | | ( 270) | |
| - Terraces/Contouring (Existing) | 10 | | ( 10) | |
| - Agro-forestry (introduced)2/ | 1080 | | (1080) | |
| - Terraces (introduced)2/ | 270 | | ( 270) | |
| - reforestation | 200 | | ( 200) | |
| - shifting cultivation | | 2610 | (2610) | |
| | 5030 | 4370 | 9400 | (9400) |
| C. Other areas | | | | |
| 1. Lake Buhi lowland drainage areas | 870 | | | ( 870) |
| 2. Lake Buhi water surface area | 1600 | | | |
| 3. Contiguous Lalo upland drainage area | | 800 | | |
| | | | | 10270 |

1/ Natural regeneration resulting from improved biotic conditions by reforestation and prevention of shifting cultivation.

2/ Project funded improvements

## DERIVATION OF MAGNITUDE OF OUTPUTS[1/]

Non-forested hectarage on:

| | | |
|---|---|---|
| 10-30% slopes planted to Agro-forestry crops at SOPS | | 370 has. |
| 10-30% slopes planted by project | | 1080 |
| | TOTAL - EOPS | 1450 |
| 3-10% slopes either terraced or planted on contour at SOPS | | 10 |
| 3-10% slopes terraced by project | | 270 |
| | TOTAL - EOPS | 280 |
| 10-30% slopes not planted to agro-forestry crops at SOPS | | 3230 |
| 10-30% slopes planted by program | | 1080 |
| | TOTAL - EOPS | 2150 |
| 3-10% slopes neither terraced nor planted on contour at SOPS | | 290 |
| 3-10% slopes terraced by project | | 270 |
| | TOTAL - EOPS | 20 |

Non-forested percentage of:

| | | |
|---|---|---|
| of project area above 30% slope not forested at SOPS | | 4000 has. |
| of project area above 30% slope planted by project | 800 | |
| New areas of regenerated growth as a result of project (min. 1000; max. 3000) | 3000 | 3800 |
| Non-forested at EOPS | | 200 has. |

4000 has. ÷ 5500 has. (total of areas above 30%) 73% SOPS
200 has. ÷ 5500 has. (total of areas above 30%) 4% EOPS

Percentage of project area between 10-30% slope

| | |
|---|---|
| neither forested nor planted to agro-forestry crops at SOPS | 3230 has. |
| Agro-forestry area planted by project | 1080 |
| Not forested/planted at EOPS | 2150 has. |

Percentage of project area

neither forested nor planted to agro-forestry

3130 has. ÷ 3500 has. (total of areas above 30%) 89% SOPS
2150 has. ÷ 3500 has. (total of areas above 30%) 61% EOPS

Percentage of project area between 3-10% slope neither forested, planted to agro-forestry crops, nor terraced at SOPS 290 has.
Area terraced by project 270
Not forested, planted to agro-forestry crops nor terraced 20

290 has. - 300 has. (total of areas above 30%) 97% SOPS
20 has. - 300 has. (total of areas above 30%) 7% EOPS

1/ Backup to Section I.A.4 of Narrative; possibility of increasing bench terracing up to 30% grades as practiced in Korea will be tested in Phase I, over 1979-80 period.

**Table G(3)-23.** Affected Barangays and Households[1/]
Agro-forestation/Watershed Development Program
Buhi-Lalo Integrated Development Project

A. Lake Buhi Watershed[2/]

| | | |
|---|---|---|
| 1. | Burocbusoc | 150 |
| 2. | Cabatuan | 163 |
| 3. | De la Fe | 139 |
| 4. | Fatima (Ipil) | 119 |
| 5. | Ibayugan | 172 |
| 6. | Igbac | 135 |
| 7. | Iraya (Del Rosario) | 235 |
| 8. | Monte Calvario | 264 |
| 9. | Sagrada Familia | 331 |
| 10. | Sta. Cruz | 168 |
| 11. | Tambo | 316 |
| | Subtotal | 2192 |

B. Lalo Drainage Area[2/]

| | | |
|---|---|---|
| 1. | Cagmaslog | 85 |
| 2. | Del Rosario (Amlongan) | 60 |
| 3. | Gabas | 120 |
| 4. | Labawon | 90 |
| 5. | Macaangay | 84 |
| 6. | Namurabod | 31 |
| | Subtotal | 470 |
| | TOTAL | 2662 |

1/ All or portions of the identified barangays are immediately within the project area. On the average there are 6.2 persons per household and there are an average of 106.2 nuclear families per 100 households. Source: 1975 Integrated Census of the Population and Its Economic Activity, Volume I, Final Report, Phase I, Population: Camarines Sur, Republic of the Philippines, National Economic and Development Authority, National Census and Statistics Office, Manila

2/ All barangays listed are in Buhi municipality

# Agro-Forestation/Watershed Development Program
## Profit Projections - Agro-Forestation
## Buhi-Lalo Integrated Development Project

| | Page |
|---|---|
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| A. Farm Size and Practices | 1 |
| B. Yield Estimates | 2 |
| C. Financing, Marketing, Sales | 3 |
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| E. General | 4 |
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LIST OF SUPPORTING TABLES

| | | |
|---|---|---|
| Summary of Family Labor Requirements | | 5 |
| Cash Requirements Per Farm for Operations/Maintenance/ Subsidies for Development | | 6 |
| Projected Annual Cash Income | | 7 |
| Projected Net Returns" | Rice | 1 |
| | Ginger | 3 |
| | Gabi | 4 |
| | Ipil-ipil | 5 |
| | Pili | 6 |
| | Jackfruit | 8 |
| | Coffee | 10 |
| | Cacao | 13 |
| | Rambutan | 15 |
| | Lanzones | 17 |
| | Bamboo | 19 |

## Profit Projections - Agro-Forestation

Basic Assumptions:

A. Farm size and practices

Project assistance (financial/technical/seedlings/seeds) will enable each farm family to develop 1.5 hectares of land into a production unit that, when fully developed, will supply an operating cash income of $1,000 (₱7,500) per year, net of produce consumed on the farm and outside inputs (fertilizer, insecticides, marketing costs). Farming methods employed (terracing and multi-story, mixed-cropping agro-forestry) will prevent soil erosion and reduce rainfall run-off, thereby improving the watershed.

1. 3,000 square meters (.3 ha.) will be bench-terraced for rainfed rice production. One crop/yr. is projected with terraces left to fallow the rest of the year. All rice produced is consumed on the farm leaving no excess for sale and a negative balance in cash flow. Irrigation will be possible where terraces are located near small streams, but no projections are made for resulting increases in production.

2. One hectare (1.0 ha.) will be planted to fruit/nut/seed bearing trees and bamboo, using mixed cropping methods. Eighty-five (85) large and medium-sized trees/bamboo clumps will be planted on 9 m x 12 m centers:

| | |
|---|---|
| Pili (*Canarium ovatum*) | 50 trees |
| Jackfruit (*Artocarpus heterophylla*) | 10 trees |
| Lanzones (*Lansium domesticum gorrea*) | 10 trees |
| Rambutan (*Nephelium lappaceum*) | 5 trees |
| Bamboo (*Bambusa vulgaris*; *spinosa*; *Dendrocalamus spp.*) | 10 clumps |
| TOTAL | 85 |

Interplantings will consist of medium-sized trees:

| | |
|---|---|
| Coffee (*Caffea canephora* - "Robusta") | 100 trees |
| Cacao (*Theobroma cacao* - "Forastero" variety) | 100 trees |
| TOTAL | 200 trees |

Ground cover will be supplied by shade tolerant root crops grown under trees, leguminous covercrops and grass:

Gabi (*Xanthosoma* spp.) - 2500 hills (100 sq. m.)

Ginger (*Zingiber officinale*) - 400 hills (2000 sq. m.)

Covercrops & grass - all vacant areas under trees and not used for gabi or ginger.

3. 2,000 sq. m. (.2 ha.) will be planted to ipil-ipil (Leucaena leucocephala) at 1 m x 2 centers of 1000 trees.

Projected on-farm consumption of produce varies for each crop. Individual estimates appear on attached tables.

No inorganic fertilization costs are included. Due to the difficulty of hauling sacks of fertilizer into the mountains, plus cost of fertilizer, it is assumed that few farmers will use fertilizer. Man-days are allotted for production of compost to fertilize crops. Extension workers can teach farmers to employ this method. However, production yield estimates are kept at levels obtained in present practices without fertilization (inorganic or organic).

Pest control is projected to be applied through the use of non-polluting insecticides to avoid contamination of Lake Buhi (Carbamate based insecticides; e.g., Sevin and biological; e.g., Bactospiene). These insecticides are actively marketed in the Philippines. Mixed cropping by itself may eliminate the necessity of spraying coffee and cacao, however, these costs are included in estimates.

All permanent crops proposed are either indigenous (e.g., pili, jackfruit, lanzones, rambutan, bamboo) or successfully introduced species (coffee, cacao, ipil-ipil).

B. Yield Estimates

These are kept below DBP, BPI and "Philippine Recommends" projections, all of which presuppose higher levels of farm expertise than may be expected in the program area. In short, yields from improved traditional practices are used.

Maturity periods for lanzones, rambutan and pili are shorter than from traditional practices since grafted/budded/marcotted seedlings will be used. Program nurseries will supply these seedlings propagated from high yielding clonal scions. Grafting may be applicable to cacao at a later date when selected scions of Forastero become available, with resultant increases in yields.

Yields are expected to be relatively constant from ipil-ipil, bamboo, rice, gabi and ginger. Yields from trees will increase as they grow older. In this study, yields are expected to reach a peak level by year 10; however, in actual practice, there will be some increases in yields/tree even after the 10th year for pili, jackfruit, lanzones and rambutan. Projected yields are as follows:

| Crop | | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Ipil-ipil | Bundles of firewood per 250 trees harvested annually | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 |
| Pili | Nuts/tree/yr | - | - | - | - | 500 | 1000 | 2000 | 2500 |

| Crop | | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Jackfruit | Fruits/tree/yr | - | - | - | 5 | 10 | 15 | 20 | 20 |
| Coffee | Kgs/tree/yr | - | .25 | .50 | 1 | 1 | 1 | 1 | 1 |
| Cacao | Kgs/tree/yr | - | .50 | .75 | 1 | 1 | 1 | 1 | 1 |
| Rambutan | Kgs/tree/yr | - | - | - | - | 10 | 20 | 30 | 40 |
| Lanzones | Kgs/tree/yr | - | - | - | - | 10 | 15 | 20 | 25 |
| Bamboo | Stems/clump | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Rice | Tons/ha (Unmilled) | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 |
| Bagi | Tubers/Hill (Xanthosoma spp.) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Ginger | Tons/ha | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

C. Financing, Marketing, Sales

Presently, the farmer arranges his own credit by securing cash and materials advanced from middlemen. Produce is then sold to the middlemen at prices below the true market value. Except for program supplied inputs (seeds, seedlings, technical assistance and labor costs for farm development in excess of available family labor), it is assumed that this traditional method of financing cash requirements and marketing of produce will prevail. Value of sales are therefore projected at the reduced levels per comparison below:

| Crop | Present Value | Projected Value |
|---|---|---|
| Pili | ₱5.00/hundred nuts | ₱ 3.00 |
| Lanca | 3.00/fruit | 2.00 |
| Coffee | 14.00/kg | 10.00 |
| Cacao | 25-40.00/kg | 15.00 |
| Rambutan | 5.00/kg | 3.00 |
| Lanzones | 3.50/kg | 2.00 |
| Bamboo | 8-14.00/pc | 5.00 |

Cooprative financing and marketing, which the program will promote through farmer organizations, should, over time, improve sales values and financing arrangements.

Produce is assumed carried to Lake Buhi shore on carabao sleds over program constructed graded trails and transported by existing boat facilities to Buhi market.

D. Profitability

Inputs and sales per crop are contained in attached tables (Nos. 1 to 11). The projected cash income is reduced by 25% as contingency for one complete loss of all harvests every four years.

E. General

A number of variations of other mixed cropping schemes are possible. Farmer preferences must be taken into consideration. All crops suggested above are already growing in Bicol.

No value is given to vegetables usually grown by farmers which it is expected they will continue to plant and consume on the farm.

F. Attachments

1. Summary of family labor requirements/farm development, maintenance, operation.

2. Cash Requirements for Beneficiary Farm Operation/Maintenance/ Subsidies for Development

3. Projected Annual Cash Income from Agro-Forestry Crops Per Beneficiary Farm (1.5 hectares)

4. Crop Production Tables 1-11 for eleven different agro-forestry crops. p. 19

1. SUMMARY OF FAMILY SUPPLIED LABOR REQUIREMENTS/FARM DEVELOPMENT, MAINTENANCE, OPERATION
(WORKDAYS)

| | YEAR 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Rice | 9.75 (19.75) 1/ | 19.5 (39.5) | 19.5 (39.5) | 19.5 (39.5) | 19.5 (39.5) | 19.5 (39.5) | 19.5 (39.5) | 19.5 (39.5) | 19.5 (39.5) | 19.5 (39.5) |
| 2. Ginger | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| 3. Gabi | 32.5 | 32.5 | 32.5 | 32.5 | 32.5 | 32.5 | 32.5 | 32.5 | 32.5 | 32.5 |
| 4. Ipil-ipil | | | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| 5. Pili | | | 5 | 5 | 5 | 5 | 10 | 15 | 25 | 30 |
| 6. Lanca | | | 1 | 1 | 1 | 5.5 | 10 | 14.5 | 19 | 19 |
| 7. Coffee | | | 15 | 23.5 | 30.5 | 44.5 | 44.5 | 44.5 | 44.5 | 44.5 |
| 8. Cacao | | | 15 | 19 | 20.5 | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 |
| 9. Rambutan | | | .5 | .5 | .5 | .5 | 1.5 | 2.5 | 3.5 | 4.5 |
| 10. Lanzones | | | 1 | 1 | 1 | 1 | 3 | 4 | 5 | 6 |
| 11. Bamboo | | | - | - | 3 | 3 | 3 | 3 | 3 | 3 |
| 12. Crop Nos. 4-11(above) | | | | | | | | | | |
| a. Planting & replanting | 34 | | - | - | - | - | - | - | - | - |
| b. Maintenance | 7.5 | 22.5 | - | - | - | - | - | - | - | - |
| 13. Bench Terrace Construction 2/ | 187.5 | 187.5 | - | - | - | - | - | - | - | - |
| 14. Bench Terrace Maintenance | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| | 329.25 | 302.00 | 227.5 | 240 | 251.5 | 272 | 284.5 | 296 | 312.5 | 319.5 |
| | (339.25) | (322.00) | (247.5) | (260) | (271.5) | (292) | (304.5) | (316) | (332.5) | (339.5) |

1/ Includes 20 additional days for compost production.

2/ Assumes a two year construction period. If all terraces (3000 sq. m.) built in year 1, total family labor requirement 546 (566) days. This is feasible if there are three members of the family who are of working age. (e.g. farmer, wife and one child)

2. Cash Requirements for Beneficiary Farm Operation/Maintenance/Subsidies for Development
(pesos)

| Crop Year | Rice | Ginger | Gabi | Ipil-ipil | Pili | Lanca | Coffee | Cacao | Rambutan | Lanzones | Bamboo | Labor/Materials Subsidies | Seedlings | Total/ Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28.50 | 75 | 82 | | | | | | | | | (910 )1/ | (390)1/ | 185.50 (1300) |
| 2 | 47 | 75 | 82 | | | | | | | | | | | 204 |
| 3 | 47 | 75 | 82 | 283 | | | | | | | | | | 487 |
| 4 | 47 | 75 | 82 | 283 | | | 31 | 65 | | | | | | 583 |
| 5 | 47 | 75 | 82 | 283 | | | 31 | 67 | | | 10 | | | 593 |
| 6 | 47 | 75 | 82 | 283 | | | 114 | 67 | | | 10 | | | 678 |
| 7 | 47 | 75 | 82 | 283 | 23 | 13 | 114 | 67 | 8 | 16 | 10 | | | 738 |
| 8 | 47 | 75 | 82 | 283 | 48 | 25 | 114 | 67 | 16 | 24 | 10 | | | 791 |
| 9 | 47 | 75 | 82 | 283 | 98 | 38 | 114 | 67 | 24 | 32 | 10 | | | 854 |
| 10 | 47 | 75 | 82 | 283 | 123 | 38 | 114 | 67 | 32 | 36 | 10 | | | 907 |
| 11-20 | (Same as Year 10) | | | | | | | | | | | | | |

1/ Covers costs of subsidies for labor, planting materials and supplies advanced by program from Year 1 to Year 2. May be debited against the farmer and amortized during duration of loan agreement.

3. Projected Annual Net Cash Income from Agro-Forestry Crops
Per Beneficiary Farm (1.5 hectares)1/
(pesos)

| Crop Year | Rice | Ginger | Gabi | Ipil-ipil | Pili | Jackfruit | Coffee | Cacao | Rambutan | Lanzones | Bamboo | Net Cash Income | Allowance for crop failure 2/ 25% | Adjusted Net Cash Income |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | (28.50) | 1086 | 932 | | | | | | | | | 1989.50 | (427) | 1562.50 |
| 2 | (47) | 1386 | 1182 | | | | | | | | | 2521 | (630) | 1891 |
| 3 | (47) | 1386 | 1182 | 847 | | | | | | | | 3368 | (842) | 2526 |
| 4 | (47) | 1386 | 1182 | 847 | | | 69 | 460 | | | | 3897 | (974) | 2923 |
| 5 | (47) | 1386 | 1182 | 847 | | | 319 | 833 | | | 40 | 4560 | (1140) | 3420 |
| 6 | (47) | 1386 | 1182 | 847 | | | 736 | 1208 | | | 40 | 5329 | (1332) | 3997 |
| 7 | (47) | 1386 | 1182 | 847 | 652 | 87 | 736 | 1208 | 127 | 164 | 40 | 6359 | (1590) | 4769 |
| 8 | (47) | 1386 | 1182 | 847 | 1377 | 175 | 736 | 1208 | 254 | 246 | 40 | 7404 | (1851) | 5553 |
| 9 | (47) | 1386 | 1182 | 847 | 2827 | 262 | 736 | 1208 | 381 | 328 | 40 | 9150 | (2288) | 6862 |
| 10 | (47) | 1386 | 1182 | 847 | 3552 | 262 | 736 | 1208 | 508 | 414 | 40 | 10088 | (2522) | 7566 |
| 11-20 | (Same as Year 10) | | | | | | | | | | | | | |

1/ Net cash returns to farm family. Computed as volume of total harvest, less production retained for home consumption, plus gross sales value of production marketed, minus cash expenses and allowance for crop failure. See Tables Nos. 1 to 11 for details of each crop.

2/ 25% of net cash returns as contingency for one complete crop failure every four years.

# TABLE 1 - RICE

A. Farm Size and Planting Scheme

Rainy season crop on 3,000 sq. meters terraced land. Assume one crop per year although a second crop may be possible in some places depending on available water supply. One-half of the area (1,500 sq. meters) will be developed in the first year and the balance in the second year.

B. Farm Budgets

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 1 | Land Preparation - including repairs to terraces | 2 | | | |
| | Carabao hire - 1½ days @ ₱10.00 | | | ₱ 15.00 | |
| | Seed purchases - 3 kilos certified seeds @ ₱2.00/kg | | | 6.00 | |
| | Seed Preparation | .25 | | | |
| | Planting | 2 | | | |
| | Composting (optional) | (3)[1/] | | | |
| | Weeding and spraying | 2.75 | | | |
| | Insecticides - one 4 oz. bottle | | | 7.50 | |
| | Harvesting - 2500 kg palay (unmilled rice) or 50 cavans/ha @ 50 kg/cavan x .15 ha = 7.5 cavans harvested | 1 | | | |
| | Threshing, winnowing, sacking | 1.75 | | | |
| | | 9.75 (12.75) | | ₱ 28.50 | ( 28.50) |

Assume 100% Home Consumption

| Year | Production Inputs | Family Labor (No of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 2-20 | Land preparation including repairs to terraces | 4.0 | | | |
| | Carabao hire - 1½ days @ ₱10.00 | | | ₱30.00 | |
| | Seed purchase - 6 kilos certified seeds @ ₱2.00/kg | | | 12.00 | |
| | Seed preparation | .5 | | | |
| | Planting | 4.0 | | | |
| | Composting | (6.0)1/ | | | |
| | Weeding and spraying | 5.5 | | | |
| | Insecticides - one 8 oz. bottle | | | 15.00 | |
| | Harvesting | 2.0 | | | |
| | Threshing, sacking, winnowing | 3.5 | | | |
| | | 19.5 | | ₱47.00 | |
| | Harvest - 2500 kgs palay (unmilled rice) or 50 cavans/ha (at 50 kgs per cavan) x .3 has. =15 cavans | | | | |
| | Assume 100% home consumption | | | | (₱47.00) |

1/ Organic nitrogen can be produced on the farm at costs competitive to chemical fertilizer and applied at rates sufficient to increase rice production. A compost pile measuring 1 x 2 x 6 meters composed of soil, farm wastes, grass, manure and wood ash will weight approximately 12 tons when new and 3 tons when rotted and ready for use. Ipil-ipil leaves can be used as activator. Approximately 6 man days per year would be required for this. Compost will contain approximately .5% N or 15 kgs N per 3 metric tons compost.2/ On .3 has. this will be the equivalent of approximately 50 kg N/ha.

Comparative costs are: Compost - 6 man days @ ₱8.00/man day - ₱48.00
₱48.00 ÷ 15 kgs N = ₱3.20/kg N

Urea - 50 kg bag of 45% N = 22.5 kgs N/bag
₱85.00 cost/one bag ÷ 22.5 kgs N = ₱3.78/kg N

Program staff and line agency extension workers may train farmers in compost production and use. Valuable humus would be added to the soil and improve fertility of terraces. No cash costs would be involved since all materials would be gathered on the farm.

2/ Odum, Eugene P., 1971, Fundamentals of Ecology. 3rd Ed. W. B. Saunders Co. Philadelphia.

# TABLE 2 - GINGER

## A. Farm Size and Planting Scheme

Ginger to be planted between trees in agro-forestry area. 2,000 sq. meters used each year to allow a five year rotation on the one hectare area devoted to orchard crops. This would allow 4,000 hills at 1 meter x 50 cm spacing, each year.

## B. Farm Budgets:

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| Year 1 | Land preparation - cultivation of planting plots by hand between trees - 4,000 hills ÷ 200 hills/day | 20 | | | |
| | Purchase of seed pieces - 100 kgs x ₱3.00 | | | ₱ 300.00 | |
| | Seed piece preparation - 4,000 seed pieces ÷ 1,000/day | 4 | | | |
| | Planting - 4,000 plants ÷ 1,000/day | 4 | | | |
| | Mulching | 4 | | | |
| | Harvesting - (1,000 kg based on 5 tons/ha) | | | | |
| | - harvest 500 hills per day | 8 | | | |
| | - cleaning, drying, sacking | 8 | | | |
| | Marketing - (1,000 kg harvested - 26 kgs home consumption = 974 kg for sale) | | | | |
| | - purchase 30 sacks @ ₱1.50 | | | 45.00 | |
| | - transportation 30 sacks @ ₱1.00/sack | | | 30.00 | |
| | (Average marketing cost = ₱2.50/sack) | 48 | | 375.00 | |
| | Sale of 974 kg @ ₱1.50/kg | | 1,461 | | 1,086 |
| Year 2-20 | Land preparation, planting, mulching, harvesting, preparation for market (same as year 1) | 48 | | | |
| | Seed purchases | | | 0.00 1/ | |
| | Marketing - 30 sacks @ ₱2.50/sack | | | 75.00 | |
| | | 48 | | ₱ 75.00 | |
| | Sale of 974 kgs @ ₱1.50/kg | | 1,461 | | 1,386 |

1/ Seed material purchased only during the first year. In subsequent years farmer can use his own seed materials from previous year's crop.

# TABLE 3 - GABI

A. Farm Size and Planting Scheme

Gabi planted on 1,000 sq. meters consisting of 2,500 hills with 75 cm x 50 cm spacing.

B. Farm Budgets

| Year | Production Input | Family Labor (No. of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 1 | Land preparation - 2,500 hills @ 200 planting holes/day | 12.5 | | | |
| | Planting material - 2,500 setts @ ₱.10/sett | | | 250.00 | |
| | Planting - 2,500 hills @ 1,000 hills/day | 2.5 | | | |
| | Weeding & cultivation (hilling up) 2,500 hills @ 500 hills/day | 5 | | | |
| | Harvesting & cleaning (Xanthosoma species) (2,500 hills x 5 tubers/hill = 12,500 tubers ÷ 30 tubers/5 gal. can = 416 cans) - 2,500 hills @ 200 hills/day | 12.5 | | | |
| | Marketing - (416 cans harvested - 100 cans home consumption = 316 cans for sale) | | | | |
| | - purchase of 2 sacks (can be reused every week) @ ₱1.50/sack | | | 3.00 | |
| | - transportation of 79 sacks @ ₱1.00/sack | | | 79.00 | |
| | | 32.5 | | 332.00 | |
| | Sale of 316 cans @ ₱4.00/can | | 1,264 | | 932.00 |
| 2-20 | Land preparation, planting, weeding, cultivation & harvesting practices - same as year 1 | 32.5 | | | |
| | Planting Material | | | 0.00 1/ | |
| | Marketing costs | | | 82.00 | |
| | | 32.5 | | 82.00 | |
| | Sale of 316 cans @ ₱4.00 | | 1,264.00 | | 1,182.00 |

1/ Planting materials purchased only during first year. In subsequent years farmer can use his own planting materials from previous year's crop.

# TABLE 4 - IPIL-IPIL

A. Farm Size and Planting Scheme

Ipil-ipil planted on 2,000 sq. meters with 1 meter x 2 meter spacing. This allows for 1,000 trees. Production starts in the third year for firewood. Leaves are used in compost preparation for fertilization of other crops.

B. Farm Budgets

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 1-2 | Planting & maintenance **(capital inputs)** | | | | |
| 3-20 | Harvesting - (250 trees/yr @ 3 bundles/tree = 750 bundles/yr | | | | |
| | - felling - 20 trees/day | 12.5 | | | |
| | - skidding - 20 trees/day | 12.5 | | | |
| | - splitting & drying - 10 trees/day | 25 | | | |
| | - bundling - 750 bundles @ 25 bundles/day | 30 | | | |
| | Marketing - (750 bundles harvested - 185 bundles home consumption (½ bundle/family/day)=565 bundles for sale @ ₱.50/bundle transport cost to market | | | 282.50 | |
| | | 80 | | 282.50 | |
| | Sale of 565 bundles @ ₱2.00/bundle | | 1,130 | | 847.50 |

# TABLE 5 - PILI

A. Farm Size and Planting Scheme

Pili planted as part of one hectare agro-forestation scheme which allows for 50 trees. Production starts during the seventh year. Full production reached during tenth year.

B. Farm Budgets

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Return |
|---|---|---|---|---|---|
| 1-6 | Planting & maintenance **(capital inputs)** | | | | |
| 7 | Maintenance - 50 trees ÷ 10 trees/day | 5 | | | |
| | Harvesting - 25,000 nuts ÷ 5,000 nuts harvested/day (500 nuts/tree/yr) | 5 | | | |
| | Marketing - (25,000 nuts harvested - 2,500 nuts consumed per family/yr = 22,500 for sale) | | | | |
| | - purchase of 9 sacks @ ₱1.50 (say 2,500 nuts/sack) | | | 13.50 | |
| | - transportation of 9 sacks @ ₱1.00/sack | | | 9.00 | |
| | (marketing 22,500 nuts @ ₱22.50 = ₱1.00 per one thousand nuts) | | | | |
| | | 10 | | 22.50 | |
| | Sale of 22,500 nuts @ ₱.03/nut | | 675.00 | | 652.50 |
| 8 | Maintenance - same for all years | 5 | | | |
| | Harvesting - (1,000 nuts/tree/yr) 50,000 nuts ÷ 5,000 nuts per day | 10 | | | |
| | Marketing - (50,000 nuts harvested - 2,500 home consumption = 47,500 nuts for sale) | | | | |
| | - 47,500 nuts @ ₱1.00/ml | | | 48.00 | |
| | | 15 | | 48.00 | |
| | Sale of 47,500 nuts @ ₱.03/nut | | 1,425 | | 1,377 |

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Return |
|---|---|---|---|---|---|
| 9 | Maintenance - same for all years | 5 | | | |
| | Harvesting - 100,000 nuts @ 5,000/day (2,000 nuts/tree/yr) | 20 | | | |
| | Marketing - (100,000 nuts harvested - 2,500 home consumption = 97,500 for sale) - 97,500 nuts @ ₱1.00/m | | | 98.00 | |
| | | 25 | | 98.00 | |
| | Sale of 97,500 nut @ ₱.03/nut | | 2,925 | | 2,827 |
| 10-20 | Maintenance - same for all years | 5 | | | |
| | Harvesting - 125,000 nuts @ 5,000/day (2,500 nuts/tree/yr) | 25 | | | |
| | Marketing - (125,000 nuts harvested - 2,500 home consumption = 122,500 for sale) | | | 123.00 | |
| | | 30 | | 123.00 | |
| | Sale of 122,500 nuts @ ₱.03/nut | | 3,675 | | 3,552 |

# TABLE 6 - JACKFRUIT

## A. Farm Size and Planting Scheme

Jackfruit is planted as part of one hectare agro-forestation scheme which allows for 10 trees. Trees planted during first year. Production starts during the sixth year and full production reached during ninth year.

## B. Farm Budgets

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Return |
|---|---|---|---|---|---|
| 1-5 | Planting & Maintenance **(capital inputs)** | | | | |
| | Maintenance - (prunning, mulching, weeding, etc.) 10 trees @ 10 trees/day | 1 | | | |
| | Wrapping - 50 fruits (5 fruits/tree) ÷ 25 fruits/day | 2 | | | |
| | Harvesting - (10 trees @ 5 fruit/tree) 50 fruits @ 20 harvested/day | 2.5 | | | |
| | Marketing - (50 fruits harvested - 50 fruits home consumption)- no marketing costs this year, since no fruit sold | | | | |
| | | 5.5 | 0.00 | 0.00 | 0.00 |
| 7 | Maintenance - same for all years | 1 | | | |
| | Wrapping - 100 fruits (10 fruit/tree) ÷ 25 fruits/day | 4 | | | |
| | Harvesting - (10 trees @ 10 fruits/tree) 100 fruits @ 20 harvested/day | 5 | | | |
| | Marketing (100 fruits harvested - 50 home consumption = 50 fruits for sale) | | | | |
| | - purchase 5 sacks @ ₱1.50 (assume 10 fruit/sack) | | | 7.50 | |
| | - transportation 5 sacks @ ₱1.00/sack | | | 5.00 | |
| | (50 fruits marketed @ ₱12.50 = marketing cost ₱.25/fruit) | 10 | | 12.50 | |
| | Sale of 50 fruits @ ₱2.00/fruit | | 100.00 | | 87.50 |

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Return |
|---|---|---|---|---|---|
| 8 | Maintenance - same for all years | 1 | | | |
| | Wrapping - 150 fruits (15 fruits/tree) @ 25 fruits/day | 6 | | | |
| | Harvesting - (15 fruits/tree x 10 trees) 150 fruits @ 20 harvested/day | 7.5 | | | |
| | Marketing - (150 fruits harvested - 50 home consumption = 100 fruits for sale) 100 fruits @ ₱.25/fruit | | | | |
| | | 14.5 | | 25.00 | |
| | Sale of 100 fruits @ ₱2.00/fruit | | 200.00 | | 175.00 |
| 9-20 | Maintenance - same for all years | 1 | | | |
| | Wrapping - 200 fruits (20 fruits/tree) @ 25 fruits/day | 8 | | | |
| | Harvesting - (20 fruits/tree x 10 trees) 200 fruits @ 20 harvested/day | 10 | | | |
| | Marketing (200 fruits harvested - 50 home consumption = 150 fruits for sale) - 150 fruits @ ₱.25/fruit | | | 37.50 | |
| | | 19 | | 37.50 | |
| | Sale of 150 fruits @ ₱2.00/fruit | | 300.00 | | 262.50 |

# TABLE 7 - COFFEE

Coffee planted as part of one hectare agro-forestation scheme which allows for 100 coffee trees. Trees are planted during the first year, however production starts in the 4th year. Full production reached in the 6th year.

B. Farm Budget

| Year | Production Inputs | Family Labor (No.of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 1-3 | Planting and maintenance **(capital inputs)** | | | | |
| 4 | Manuring and composting - (refer to part C.) | 13 | | | |
| | Spraying - ½ day x 3 sprayings | 1.5 | | | |
| | (cost same for all years - refer to Part C.) | | | 28.30 | |
| | Maintenance - 100 trees @ 50 trees/day | 2 | | | |
| | Harvesting - (250 gm/tree x 100 trees = 25 kg.) | | | | |
| | 25 kg @ 12.5 kg harvested per day | 2 | | | |
| | Hand pulping and drying - 25 kg @ 5 kg/day | 5 | | | |
| | (Machine pulping may be used - refer to Part C.) | | | (20.00) optional | |
| | Marketing - (25 kgs harvested - 15 kgs for home consumption = 10 kgs for sale) | | | | |
| | 1 sack @ ₱1.50/sack | | | 1.50 | |
| | transportation of one sack @ ₱1.00 | | | 1.00 | |
| | (Average marketing cost = ₱2.50/sack) | | | | |
| | | 23.5 | | 30.80 | |
| | Sale of 10 kg coffee @ ₱10.00/kg[1/] | | 100.00 | | 69.20 |
| 5 | Manuring and composting | 13 | | | |
| | Spraying - ½ day x 3 sprayings | 1.5 | | | |
| | - cost same for all years | | | 28.30 | |
| | Maintenance | 2 | | | |
| | Harvesting - (500 gm/tree x 100 trees) | | | | |
| | 50 kg @ 12.5 kg/day | 4 | | | |
| | Hand pulping and drying - 50 kg @ 5 kg/day | 10 | | | |
| | (mechanical pulping) | | | (40.00) optional | |
| | Marketing - (50 kgs harvested - 15 kg home consumption = 35 kg for sale) one sack @ ₱2.50 | | | 2.50 | |
| | | 30.5 | | 30.80 | |
| | Sale of 35 kg coffee @ ₱10.00/kg | | 350.00 | | 319.20 |

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 6-20 | Manuring and composting | 13 | | | |
| | Spraying | 1.5 | | 28.30 | |
| | Maintenance | 2 | | | |
| | Harvesting - (1 kg tree x 100 trees); 100 kg @ 12.5 kg harvested/day | 8 | | | |
| | Hand pulping and drying (mechanical pulping) | 20 | | | |
| | Marketing - 2 sacks @ ₱2.50/sack | | | 20.00 | |
| | (100 kg harvested - 15 kg home consumption = 85 for sale) | | | 5.00 | |
| | | 44.5 | | 113.30 | |
| | Sales of 85 kg coffee @ ₱10.00/kg | | 850.00 | | 736.70 |

C. Production Practices (same for all years of production):

1) Manuring and composting

| | |
|---|---|
| - cutting and hauling 3 tons grass and vegetative farm waste (including fresh ipil-ipil leaves) | 3 |
| - gathering 300 kgs animal manure - 6 sacks | 2 |
| - collecting 300 kgs wood ash | 2 |
| - digging and hauling one ton soil to compost pile | 1 |
| | 1 |
| - turning and watering compost pile | 2 |
| - spreading compost - 10 kgs (1 five gallon can)/tree 100 trees @ 50 trees/day | 2 |
| | 13 |

2) Spraying

| | |
|---|---|
| - 1st spraying - 32,000 international units Bactospieme (Bacillus thuringiensis Berliner) in 32 liters of water @ ₱1.65 per 16,000 i.u. package | 3.30 |
| - 2nd spraying - 350 grams carbamate @ ₱43.00/500 grams | 19.80 |
| - 3rd spraying - 32,000 international units Bactospieme (Bacillus thuringiensis Berliner) in 32 liters of water @ ₱1.65 per 16,000 i.u. package | 3.30 |
| - all sprayings - 2 oz sticker/spraying @ ₱32.00/34 oz. bottle | 1.90 |
| | 28.30 |

| Year | Production Inputs | Family Labor (No.of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 3) | Pulping<br>- mechanical pulper may be used to obtain better quality at a cheaper price if co-operative formed to use mechanical pulper. Estimated cost is ₱.80/kg. Total cost changes depending on amount of production. This will be applied when full production is reached during 6th year. | | | .80/kg. | |
| 4) | Marketing costs<br>- purchase of one sack for each 50 kgs of coffee @ ₱1.50<br>- transportation of one sack @ ₱1.00 | | | 1.50<br>1.00<br>2.50 | for every sack |

1/ International coffee agreement floor price is ₱10.39/kg ($.63/lb). Present price is ₱14.00/kg.

# TABLE 8 - CACAO

A. Farm Size and Planting Scheme

Cacao planted as part of one hectare agro-forestation scheme which allows for 100 trees. Trees are planted during the first year. Production starts in the 4th year and full production is reached during the 6th year.

B. Farm Budgets

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 1-3 | Planting and maintenance<br>Planting materials (capital inputs) | | | | |
| 4 | Manuring and composting - same as coffee (refer to coffee Part C) | 13 | | | |
| | Spraying | | | 28.30 | |
| | Insecticides and sticker - same as coffee | | | | |
| | Fungicides - (25 gm/spraying x 3 sprayings | 1.5 | | | |
| | 75 gm @ ₱24.00/500 gm | | | 3.60 | |
| | Maintenance - 100 trees @ 50 trees/day | 2 | | | |
| | Harvesting - (500 grams/tree x 100 trees) 50 kg @ 25 kg harvested/day 1/ | 2 | | | |
| | Processing (opening pods, collecting seeds, fermenting, washing & drying 50 kg @ 100 kg/day | .5 2/ | | | |
| | - boxes and mats for processing | | | 30.00 | |
| | Marketing - (50 kg harvested - 15 kg home consumption = 35 kgs. for sale | (35) | | | |
| | - one sack (50 kg. capacity) @ ₱1.50 | | | 1.50 | |
| | - transportation for one sack @ ₱1.00/sack | | | 1.00 | |
| | (total marketing cost = ₱2.50/50 kg sack) | | | | |
| | | 19 | | 64.40 | |
| | Sale of 35 kg @ ₱15.00/kg 3/ | | 525.00 | | 460.60 |

| Year | Production Inputs | Family Labor (No. of days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 5 | Manuring and composting - same for all years | 13 | | | |
| | Spraying - same for all years | 1.5 | | 31.90 | |
| | Maintenance - same for all years | 2 | | | |
| | Harvesting - (750 grams/tree x 100 trees) 75 kg @ 25 kg harvested/day | 3 | | | |
| | Processing & materials | 1 | | 30.00 | |
| | Marketing (75 kg harvested - 15 kg home consumption = 60 kg for sale) 2 sacks @ ₱2.50/sack | | | 5.00 | |
| | | 20.5 | | 66.90 | |
| | Sale of 60 kg @ ₱15.00/kg | | 900.00 | | 900.00 |
| 6-20 | Manuring and composting - same for all years | 13 | | | |
| | Spraying - same for all years | 1.5 | | 31.90 | |
| | Maintenance - same for all years | 2 | | | |
| | Harvesting (1 kg/tree x 100 trees) 100 kg @ 25/harvested/day | 4 | | | |
| | Processing & materials | 2 | | 30.00 | |
| | Marketing (100 kg harvested - 15 kg home consumption = 85 kg for sale) 2 sacks @ ₱2.50/sack | | | 5.00 | |
| | | 22.5 | | 66.90 | |
| | Sale of 85 kgs @ ₱15.00 | | 1,275 | | 1,208.10 |

1/ 20 pods/tree x 100 trees = 2,000 pods
2,000 pods x 25 seeds/pod = 50,000 seeds
50,000 seeds ÷ 1,000 seeds/kg = 50 kg.

2/ Working full-time one man can actually handle up to 1000 kg. However, processing takes several days to complete. It is assumed that the production expected from 100 trees will require a few minutes of work each day. Therefore the allowance for ½ day/50 kg is actually an over-estimate.

3/ Present price is ₱30.00/kg. ₱15.00 used as a safety factor.

# TABLE 9 - RAMBUTAN

## A. Farm Size and Planting Scheme

Rambutan planted as part of one hectare agro-forestation scheme allows for 5 trees which are planted in first year. Production starts in seventh year. Full production reached during 10th year.

No fertilization or spraying assumed necessary because trees are not grown in a monoculture. Farming system used approximates natural growing conditions hence conservative but fairly constant yields assumed probable.

Grafted trees used as planting material. Indigenous (to Buhi area) stock used with "Maharlika" scion.

## B. Farm Budgets

| Year | Production Inputs | Family Labor (No of Days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 1-6 | Planting and maintenance planting material (capital inputs) | | | | |
| 7 | Maintenance - pruning, weeding, etc. | .5 | | | |
| | Harvesting - (10 kg/tree x 5 trees) 50 kg @ 50 kg harvested/day | 1.0 | | | |
| | Marketing - (50 kg harvested - 5 kg home consumption (10% of harvest) = 45 kg for sale) | | | | |
| | -2 baskets (kaing) with 25 kg capacity each @ ₱3.00 basket | | | 6.00 | |
| | -transportation of 2 baskets @ ₱1.00/basket | | | 2.00 | |
| | (Average marketing cost = ₱4.00/basket/25 kg fruit) | 1.5 | | 8.00 | |
| | Sale of 45 kg @ ₱3.00/kg[1/] | | 135.00 | | 127.00 |
| 8 | Maintenance - same for all years | .5 | | | |
| | Harvesting - (20 kg/tree x 5 trees) 100 kg @ 50 kg harvested/day | 2.0 | | | |
| | Marketing - (100 kg harvested - 10 kg home consumption (10% harvest) = 90 kg for sale) | | | | |
| | Marketing 4 baskets @ ₱4.00/basket | | | 16.00 | |
| | | 2.5 | | 16.00 | |
| | Sale of 90 kg @ ₱3.00/kg | | 270.00 | | 254.00 |

| Year | Production Inputs | Family Labor (No of Days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 9 | Maintenance - same for all years | .5 | | | |
| | Harvesting - (30 kg/tree x 5 trees) 150 kg @ 50 kg harvested/day | 3.0 | | | |
| | Marketing (150 kg harvested - 15 kg home consumption (10% harvest) = 135 kg for sale | | | 24.00 | |
| | Marketing 6 baskets @ ₱4.00/basket | 3.5 | | 24.00 | |
| | Sale of 135 kg @ ₱3.00/kg | | 405.00 | | 381.00 |
| 10-20 | Maintenance - same for all years | .5 | | | |
| | Harvesting - (40 kg/tree x 5 trees) 200 kg @ 50 kg harvested/day | 4.0 | | | |
| | Marketing - (200 kg harvested - 20 kg home consumption (10% harvest) = 180 kg for sale | | | 32.00 | |
| | | 4.5 | | 32.00 | |
| | Sale of 180 kg @ ₱3.00/kg | | 540.00 | | 508.00 |

1/ Selling price of ₱3.00 is approximately 37.5% of market price in Los Baños at Harvest time/₱8.00/kg.

# TABLE 10 - LANZONES

## A. Farm size and planting scheme

Lanzones planted as part of one hectare agro-forestation scheme. Allows for 10 trees which are planted during first year. Production starts in the 7th year and full production is reached during the 10th year.

No fertilization and spraying assumed necessary since trees not grown in a monoculture. Farming system approximate natural growing conditions, hence conservative but fairly constant yield assumed probable.

Grafted trees will be used as planting material.

## B. Farm Budgets

| Year | Production Inputs | Family Labor (No of Days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 1-6 | Planting and maintenance<br>Planting materials (capital inputs) | | | | |
| 7 | Maintenance - pruning, weeding, etc. | 1.0 | | | |
| | Harvesting - (10 kg/tree x 10 trees)<br>100 kg @ 50 kg harvested/day | 2.0 | | | |
| | Marketing (100 kg harvested - 10 kg home consumption (10% of harvest) = 90 kg for sale) | | | | |
| | -4 baskets (25 kg capacity kaing) @ ₱3.00/basket | | | 12.00 | |
| | -transportation of 4 baskets @ ₱1.00/basket | | | 4.00 | |
| | (average marketing cost = ₱4.00/basket/25 kg fruit) | | | | |
| | | 3.0 | | 16.00 | |
| | Sale of 90 kg @ ₱2.00/kg[1/] | | 180.00 | | 164.00 |
| 8 | Maintenance - same for all years | 1.0 | | | |
| | Harvesting (15 kg/tree x 10 trees)<br>150 kg @ 50 kg harvested/day | 3.0 | | | |
| | Marketing - (150 kg harvested - 15 kg home consumption (10% of harvest) = 135 kg for sale | | | 24.00 | |
| | -marketing 6 baskets @ ₱4.00/basket | | | | |
| | | 4.0 | | 24.00 | |
| | Sale of 135 kg @ ₱2.00/kg | | 270.00 | | 246.00 |

1/ Selling price of ₱2.00/kg is 40% of market price in Laguna (₱5.00) at harvest time.

| Year | Production Inputs | Family Labor (No of Days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 9 | Maintenance - same for all years | 1.0 | | | |
| | Harvesting (20 kg/tree x 10 trees) 200 kg @ 50 kg harvested/day | 4.0 | | | |
| | Marketing - (200 kg harvested - 20 kg home consumption (10% of harvest) = 180 kg for sale -marketing 8 baskets @ ₱4.00/basket | | | 32.00 | |
| | | 5.0 | | 32.00 | |
| | Sale of 180 kg @ ₱2.00/kg | | 360.00 | | 328.00 |
| 10-20 | Maintenance - same for all years | 1.0 | | | |
| | Harvesting (25 kg/tree x 10 trees 250 kg @ 50 harvested/day | 5.0 | | | |
| | Marketing (250 kg harvested - 25 kg home consumption (10% of harvest) = 225 kg for sale -marketing of 9 baskets @ ₱4.00/basket | | | 36.00 | |
| | | 6.0 | | 36.00 | |
| | Sale of 225 kg @ ₱2.00/kg | | 450.00 | | 414.00 |

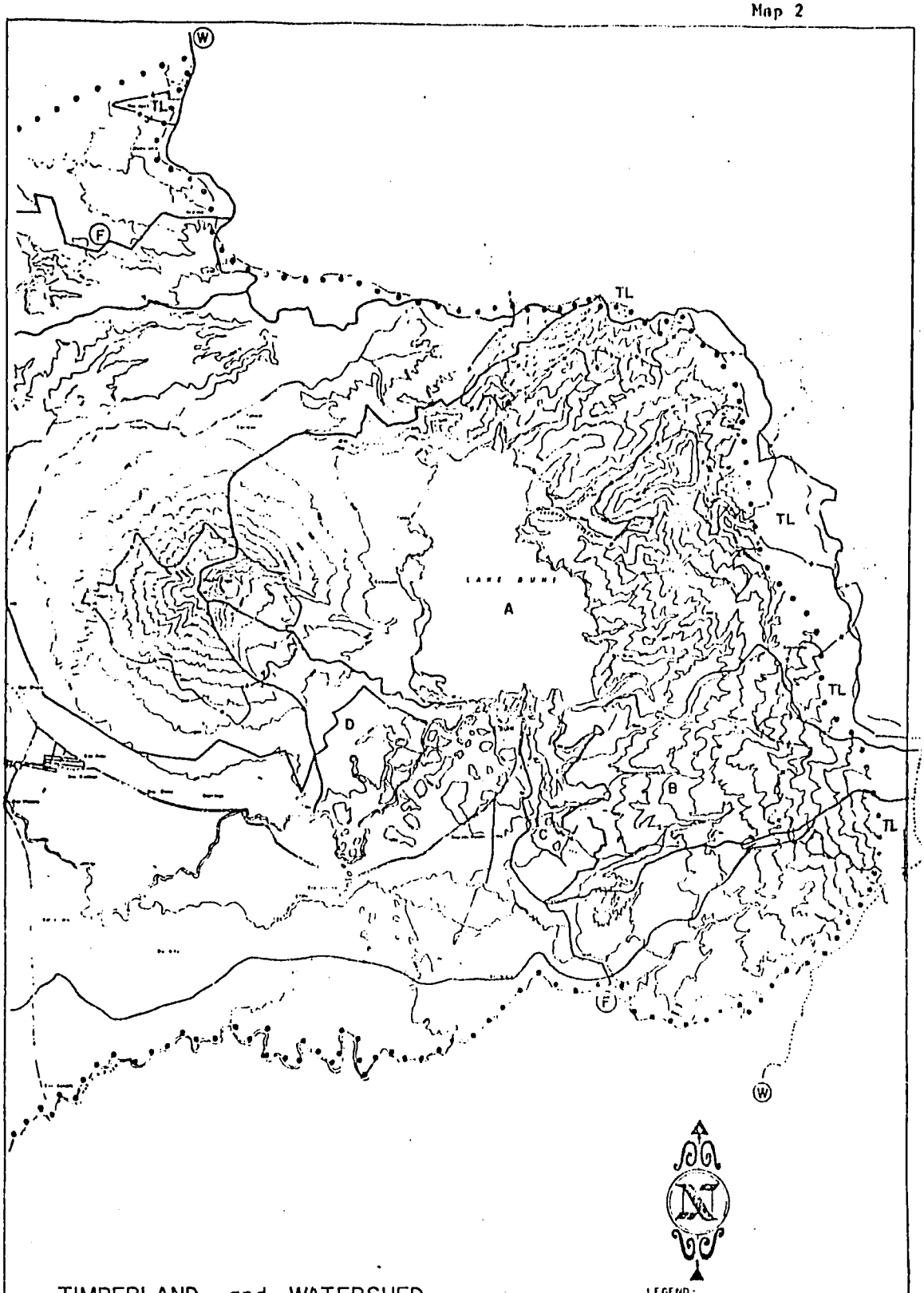
TABLE 11 - BAMBOO

A. Farm Size and Planting Scheme

Bamboo planted as part of the agro-forestation scheme. Allows for 10 clumps. Yields are constant after 5th year. No maintenance, spraying or fertilizer necessary.

B. Farm Budgets

| Year | Production Inputs | Family Labor (No of Days) | Sales | Production Costs | Net Returns |
|---|---|---|---|---|---|
| 1-4 | Planting<br>Planting materials (capital inputs) | | | | |
| 5-20 | Harvesting (2 stems/clump x 10 clumps)<br>20 stems @ 10 stems harvested/day | 2.0 | | | |
| | Marketing (50% of production for home consumption = 10 stems for sale)<br>- hauling stems to market | 1.0 | | | |
| | - carabao hire @ ₱10.00 | | | ₱10.00 | |
| | | 3.0 | | ₱10.00 | |
| | Sale of 10 stems @ ₱5.00/stem | | ₱50.00 | | ₱40.00 |




## TIMBERLAND and WATERSHED

| | | |
|---|---|---|
| | A | Primary Buhi Watershed |
| | B | Secondary Buhi Watershed |
| | C | Drainage area for B |
| | D | Breach watershed (affects power plant) |
| ——— | (W) | Adjusted watershed ridgeline |
| ——— | (F) | Boundary Agro-Forestry area of concern |
| -·-·- | TL | Timber Land |
| | (S) | Baao watershed boundary |
| | (X) | Bato watershed boundary |

NOTE: Map base and watershed boundaries traced from 1953 Topographic Map. Timberland traced from Forest Resources Map of 1969; BFD

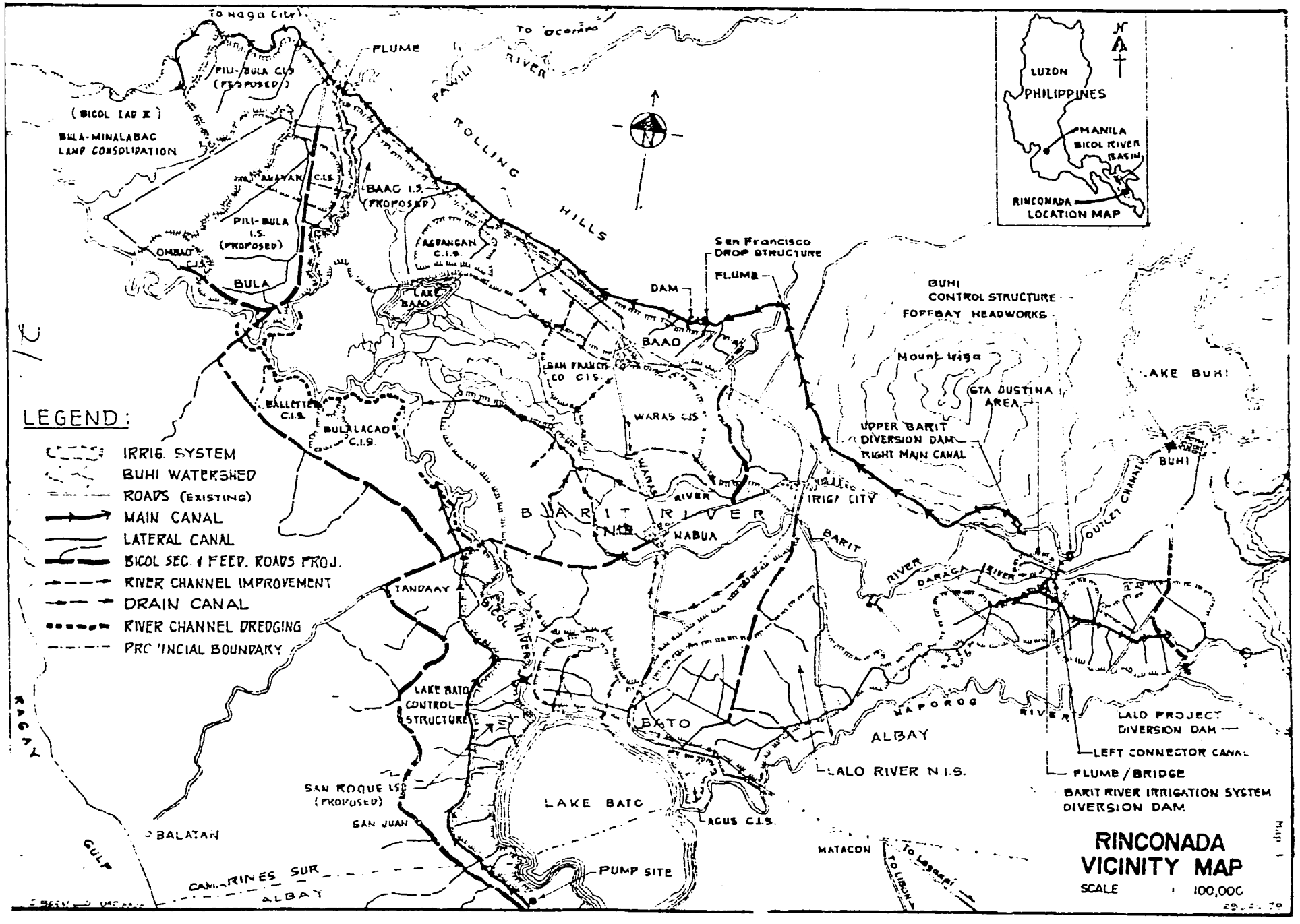
LEGEND:

- BASIN BOUNDARY
- IDA BOUNDARY
- RAILROAD
- MUNICIPAL BOUNDARY
- ROAD
- RIVER/CREEKS

SCALE 1 : 50,000 M

RINCONADA IDA

IDA — III




ANNEX G(3)
Map 3