# PROJECT REPORT ON THE ESTABLISHMENT OF REGIONAL RICE PRODUCTION CENTERS IN THE PHILIPPINES

JANUARY 1968

OVERSEAS TECHNICAL
COOPERATION AGENCY
GOVERNMENT OF JAPAN

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# Preface

The first preliminary survey team was dispatched to the Republic of the Philippines in September of 1966 to study agricultural development, particularly in the field of the food production to be increased in the country. The survey team presented its report recommending increased rice production based on irrigation. Upon examination of the report made by the first preliminary survey team, the Philippine Government requested that a second survey; for the increased production of rice be made. The Overseas Technical Cooperation Agency was delegated by the government to conduct this second preliminary survey.

The second phase survey team consisisted of 10 members led by Mr. Shiro Sasaki, councillor of the Agricultural Land Bureau, Ministry of Agriculture and Forestry, conducted a field survey for about 40 days, from April 12, 1966 in the three regions of Naujan on Mindro Island, San Miguel-Alangalang on Leite Island, and Titai Valley.

The purpose of the survey was to clarify factors necessary for planning the project by collecting basic data such as agricultural conditions, hydrology, climate and topography in each of the above districts.

On the basis of the results of the field survey, regional rice production centers each with an irrigation system as its core were planned for respective districts and are to be presented here in the form of a report.

Presenting the present report, we sincerely hope this will help to increase rice production in the Republic of the Philippines and will contribute in fostering friendly ties as well as better economic relations between the Republic of the Philippines and Japan.

At the end, I would like to express our acknowledgement to Vice President Ropes of the Republic, Vice Minister Umari of the Department of Agriculture and Natural Resources and other authorities concerned in the Republic who extended full support and cooperation to the survey, as well as to the members of the Japanese Embassy in Manila who assisted us, to the Foreign Ministry and the Agriculture and Forestry Ministry that helped us to dispatch the survey team. I would like to express my appreciation at this opportunity to the members of the survey team as well.

October 1967

Shinichi Shibusawa
Director General
Overseas Technical Cooperation Agency
Government of Japan

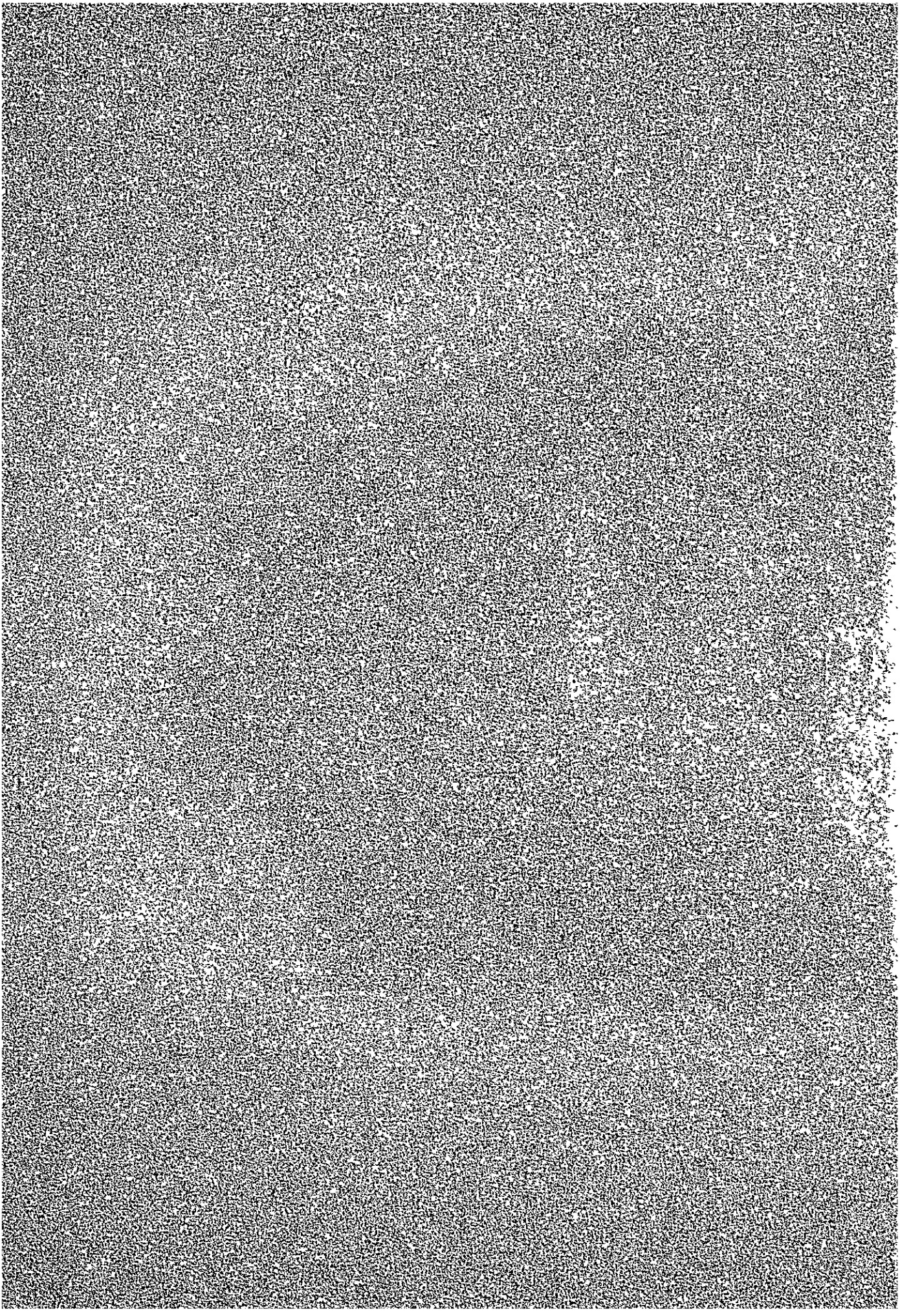
C O N T E N T S

APPENDIX

## A LIST OF SYMBOLS AND ABBREVIATIONS

| | | | |
|---|---|---|---|
| | mm | : | milli-meter |
| | cm | : | centimeter |
| | m | : | meter |
| - 120 - | km | : | kilometer |
| - 121 - | g | : | gram |
| - 122 - | kg | : | Kilogram |
| - 110 - | t | : | metric ton |
| - 167 - | sec | : | second |
| - 105 - | hr | : | hour |
| | l | : | liter |
| | $m^3$ | : | cubic meter |
| | PS | : | metric horse power |
| | ha | : | hectare |
| | Cav | : | Cavan ( = 44 kg. of unhulled rice) |
| | p | : | Peso |
| | $ | : | U.S. dollar (in this report 1 $ is equivalent to 3.9 P) |

# 1 Introduction



# INTRODUCTION

As a part of the Food Production Increase Drive in the Philippines, the Japanese Government conducted a Preliminary Survey for Rice Production Increase in the Philippines in September of 1966. The purpose of the survey was to study general agricultural conditions of the Republic, with the most emphasis on irrigation, inclusive of rice milling, to examine feasibility two governments agreed to plan the project 'Rice Production Centers for Increased Rice Production' inclusive of rice milling rsearch by experts, as necessary step.

The present survey which is 'The Second Phase Survey for Rice Production Increase in the Philippines' was conducted following the preliminary survey of September 1966. This preliminary survey was a comprehensive survey in agriculture practised in the Philippines in general, while the second phase survey is a more specific and technical survey for the irrigation project in particular districts.

The Government of the Philippines had prepared 10 districts as proposed sities for rice production centers, of which 3 were later decided as sites for rice production centers by the Government, after consultation with the Japanese Government Survey Commission.

The survey plan covered the following 3 districts which were selected as sites for rice production centers.

1. Naujan District ... Luzon Region, Mindro Island, Oriental Mindro
2. San Miguel-Alangalang District ... Visaya Region, Leyte, Leyte der Norte
3. Titay Valley District ... Mindanao Region, Mindanao, Zamboanga der Sur

On the basis of the second phase survey, an outline of the agricultural development project with an irrigation system as;its core was formed for each of the three districts. As shall be explained later, the development project for Titay Valley was left unformed for the technical feasibility of the project in the valley was not proved satisfactorily by the present survey. As mentioned above, the present report is only the outline of the project and does not prove details and detailed designs of the project. The main purpose of the present survey was to form the basic policy which the rice production centers whould be built on as well as to examine the technical and economic feadsibility of the project. In order to materialize the project, we have to proceed to the next step, which is detailed design. At this step, facilities of the project are to be designed in detail in order to realize the project.

A separate survey was organized and conducted for the improvement of rice milling machine contrary to the survey for the rice production center, the survey was not limited to a specific district but covered villages in the rural area around Manila. The result of the survey on rice milling and storing in these villages was in line with the trend pointed out in the preliminary survey.

Due to a limited schedule and staff, the survey and its report are limited in nature and might not be satisfactory in all respects.

The following are the itenerary of the survey; and the names of the survey mission as well as of people in the Philippines who cooperated actively with the mission.

A List of The Survey Mission Members

| | |
|---|---|
| Mr. Shiro Sasaki Chief of the Mission | Councilor, Agricultural Land Bureau, Ministry of Agriculture and Forestry. April 12 - April 21. |
| Mr. Kensaku Takeda, Assistant Chief of the Mission | Civil Engineer (Irrigation & Drainage Works) Acting Chief of the Design Section Construction Department, Agricultural Land Bureau Ministry of Agriculture and Forestry. April 12 - April 19. |
| Dr. Shinjiro Chikubu, Member of the Mission | Rice Milling Expert Chief of Grain Inspection Laboratory, Food Research Institute, Ministry of Agriculture and Forestry. April 12 - April 28 |
| Mr. Hideo Tabata, Member | Agriculture Economist Acting Chief of Economics Section, Department of Planning, Agricultural Land Bureau, Ministry of Agriculture and Forestry. April 12 - April 19 |
| Mr. Sadao Hatta, Member | Agronomist, Technical Liaison Service Central Agricultural Experimental Station, Ministry of Agriculture and Forestry. April 18 - May 2 |
| Mr. Seiei Sakaue, Member | Civil Engineer (Irrigation & Drainage Works), Design Section Construction Department, Agricultural Land Bureau Ministry of Agriculture & Forestry. April 12 - May 19 |
| Mr. Shigetake Taniyama | Civil Engineer (Irrigation & Drainage) Reclamation Section, Construction Department, Agricultural Land Bureau, Ministry of Agriculture & Forestry. April 12 - May 19. |
| Mr. Yoshiyasu Oka, Member | Civil Engineer (Irrigation & Drainage Works), General Affairs Section, Agricultural Land Bureau, Ministry of Agriculture & Forestry. April 12 - May 19 |
| Mr. Muneo Hyodo, Member | Agronomist, Resources Section, Agricultural Land Bureau, Ministry of Agriculture & Forestry. April 12 - May 19 |
| Mr. Yoshio Yoshida, Member | Coordinator, Overseas Technical Cooperation Agency. April 12 - May 19 |

## INDIVIDUALS WHO HELPED AND COOPERATED ACTIVELY WITH THE JAPANESE SURVEY MISSION

(1) Survey team which will conduct a survey on the model area for increased rice production.

FILIPINO COUNTERPART COMMITTEE

1. Mr. Felix N. Regalado . . . . . Chairman
   Irrigation Engineer
   National Irrigation Administration
   Member, ECPCC Technical Staff

2. Mr. Francisco B. Tetangco . . . . . Co-Chairman
   Plant Research Coordinator, Planning
   Staff, and Acting Chief. Research
   Division, Bureau of Plant Industry
   Member, RCPCC Technical Staff

3. Mr. Jorge Barrantes . . . . . Member
   Agricultural Engineer
   Irrigation Service Unit
   Dept. of Public Works and
   Communication

4. Mr. Jesus Rojas . . . . . Member
   Agricultural Economist
   Bureau of Agricultural Economics
   Dept. of Agriculture and Natural Resources

5. Mr. Teodomero Yniguez . . . . . Member
   Supervising Soil Technologist
   Bureau of Soils, Department of
   Agriculture and Natural Resources

6. Mr. Patricio Hora . . . . . Member
   Technical Assistant
   Agricultural Productivity Commission
   Office of the President

7. Mr. Benjamin Gaon . . . . . Member
   Instructor, Agricultural Economics
   U.P. College of Agriculture

OFFICE OF THE UNDERSECRETARY FOR AGRICULTURE, DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES

1. Dr. Dioscoro L. Umali
   UUndersecretary for Agriculture, Concurrently
   Dean, College of Agriculture and Vice-President
   University of the Philippines

2. Dr. Pedro R. Sandoval
Associate Professor of Agric. Economics,
U.P. College of Agriculture, and Member of
Technical Staff, Undersecretary Umali

RCPCC

1. Mr. Teofilo T. Azada
Deputy Executive Director

2. Mr. Pascual Matulac
Regional Director, Bureau of Soils
Member, Technical Staff

OFFICE OF THE PRESIDENT

1. Mr. Jose J. Leido, Jr.
Assistant Executive Secretary

2. Mr. Fermin Alviz
Technical Adviser
Secretary Leido's Office

RICE AND CORN ADMINISTRATION

1. Col. Osmundo Mondonedo
Chairman-General Manager

2. Mr. Mateo B. de Dios
Director of Plans and Programs

3. Atty. Mariano V, Asuncion, Jr.
Chief of Public Information Office

Note : Those people from the Phillippins who aided us in carrying out our survey are listed in the Appendix.

(2) Survey team which conducted a survey on rice milling.

Member of the Rice Mill Committee

1) Mr. Julian Bulanadi, BPI Chairman

2) Dr. Dante de Padua, UPCA Co-Chairman

3) Mr. J.R. Arboleda., UPCA "

4) Mr. Enrique Villanueva, DANR Member

5) Mr. Presciliano D.Evangelista, RICOB Member

6) Mr. Herculano A. Sabas, ACA "

7) Mr. Dominador Jarabelo, ACA Member

8) Mr. Deogracias Lerma Jr., RCA Member

The others

1) Mr. Benito C. Gonzalo, B.P.I.

2) Mr. Sebastian V. Quintoma, Jr., B.P.I.

3) Mrs. G.R. Montenegro, A.C.A.

4) Mr. B D. Pereds U.P.C.A.

## Itinerary of The Survey Mission

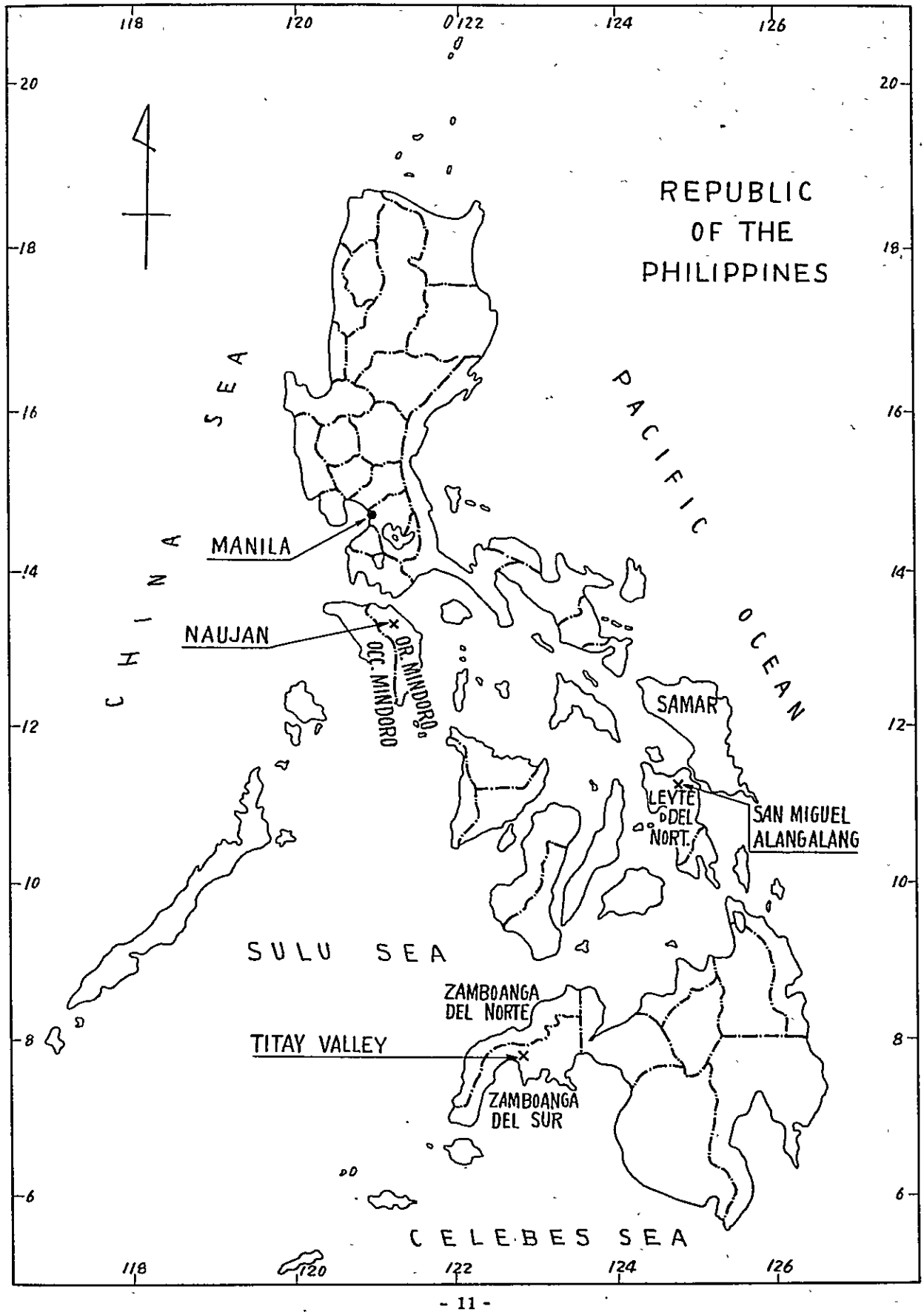
(1) Regional Rice Production Center Survey Team

| | | |
|---|---|---|
| 1967 - April 12. | Wednesday | Leave Tokyo - Arrive in Manila |
| April 13. | Thursday | Visit RCA and RCPCC |
| April 14. | Friday | Meeting on Survey Policy at RCPCC.<br>Interview with Mr. Umali, Undersecretary of the Department of Agriculture and Natural Resources at BPI |
| April 15. | Saturday | Sorting and Filing of Data |
| April 16. | Sunday | |
| April 17. | Monday | Interview with Vice President Lopez at RCPCC<br>Meeting on Survey Policy in the afternoon. |
| April 18. | Tuesday | Leave Manila<br>Arrive at Calapan on Mindro Island<br>Meeting with Local Personnals Concerned<br>General Reconnaissance work |
| April 19. | Wednesday | Field Work |
| April 30. | Sunday | |
| May 1. | Monday | Leave Calapan<br>Arrive at Tacloban in Leyte Island<br>Meeting with Loca personnel concerned |
| May 2. | Tuesday | Field Work |
| May 5. | Friday | |
| May 6. | Saturday | Leave Tacloban<br>Arrive at Zanboanga in Mindanao Island<br>Meeting with local personnel concerned |
| May 7. | Sunday | Leave Zamboanga<br>Arrive at Ipil<br>Meeting at Titay, general reconnaisance |
| May 8. | Monday | Field work |
| May 9. | Tuesday | |
| May 10. | Wednesday | Field Work in the morning<br>Leave Ipil in the afternoon and arrive at Zamboanga |
| May 11. | Thursday | Sorting and Filing of Data |
| May 12. | Friday | Leave Zamboanga<br>Arrive at Manila |
| May 13. | Saturday | Observation of Angat Dam and Angat River Irrigation System |
| May 14. | Sunday | Preparation of Interim Report |
| May 15. | Monday | |

| | | |
|---|---|---|
| May 16. | Tuesday | Collection of additional data |
| May 17. | Wednesday | Visit RCPCC, present the interim report and exchange views |
| May 18. | Thursday | Preparations for returning home |
| May 19. | Friday | Leave Manila<br>Arrive in Tokyo |

(2) Rice Milling Survey Team

| | | |
|---|---|---|
| April 12. | Tuesday | Leave Tokyo<br>Arrive in Manila |
| April 13. | Wednesday | Visit RCA and RCPCC |
| April 14. | Friday | Interview with Mr. Umali, Undersecretary of the Department of Agriculture and Natural Resources, Meeting with Rice Mill Committee, respectively at BPI |
| April 15. | Saturday | Meeting on procedure and policy of the survey, preparation for survey |
| April 16. | Sunday | |
| April 17. | Monday | Survey of rice milling factories and warehouses in St. Rosa, Laguna Province and other places |
| April 18. | Tuesday | Survey on siloes and rice milling factories at San Jose, Nueva Ecija Province. Visit Central Luzon State University in Munoz |
| May 19. | Wednesday | Survey of rice milling factories and warehouses at Pasig in Rizal Province |
| May 20. | Thursday | Survey on rice milling factories and steampowered drying machines at Pulilan in Bulacan State. Visit a factory manufacturing Cono-type rice milling machine in the same state |
| May 21. | Friday | Visit Puraza Polishing Plant where imported rice is repolished under government supervision |
| May 22. | Saturday | Visit IRRI at Los Banos, Laguna State |
| May 23. | Sunday | Leave Los Banos. Arrive in Manila |
| April 24. | Monday | Conference at RICOB<br>Survey of loading and unloading work at the port, warehouses and retail stores in Manila |
| April 25. | Tuesday | Conference at ACA. Visit the Bureau of Statistics and the Statistic Center at Philippine University |
| April 26. | Wednesday | Sorting and filing of data collected, and the result of the survey |
| April 27. | Thursday | Meeting with the Rice Mill Committee at BPI |
| April 28. | Friday | Explain the result of the survey to Under-Secretary Umali<br>Leave Manila and arrive in Tokyo |


REPUBLIC
OF THE
PHILIPPINES
CHINA SEA
PACIFIC OCEAN
SULU SEA
CELEBES SEA
MANILA
NAUJAN
OR. MINDORO
OCC. MINDORO
SAMAR
LEYTE
DEL NORT.
SAN MIGUEL
ALANGALANG
ZAMBOANGA
DEL NORTE
TITAY VALLEY
ZAMBOANGA
DEL SUR
118
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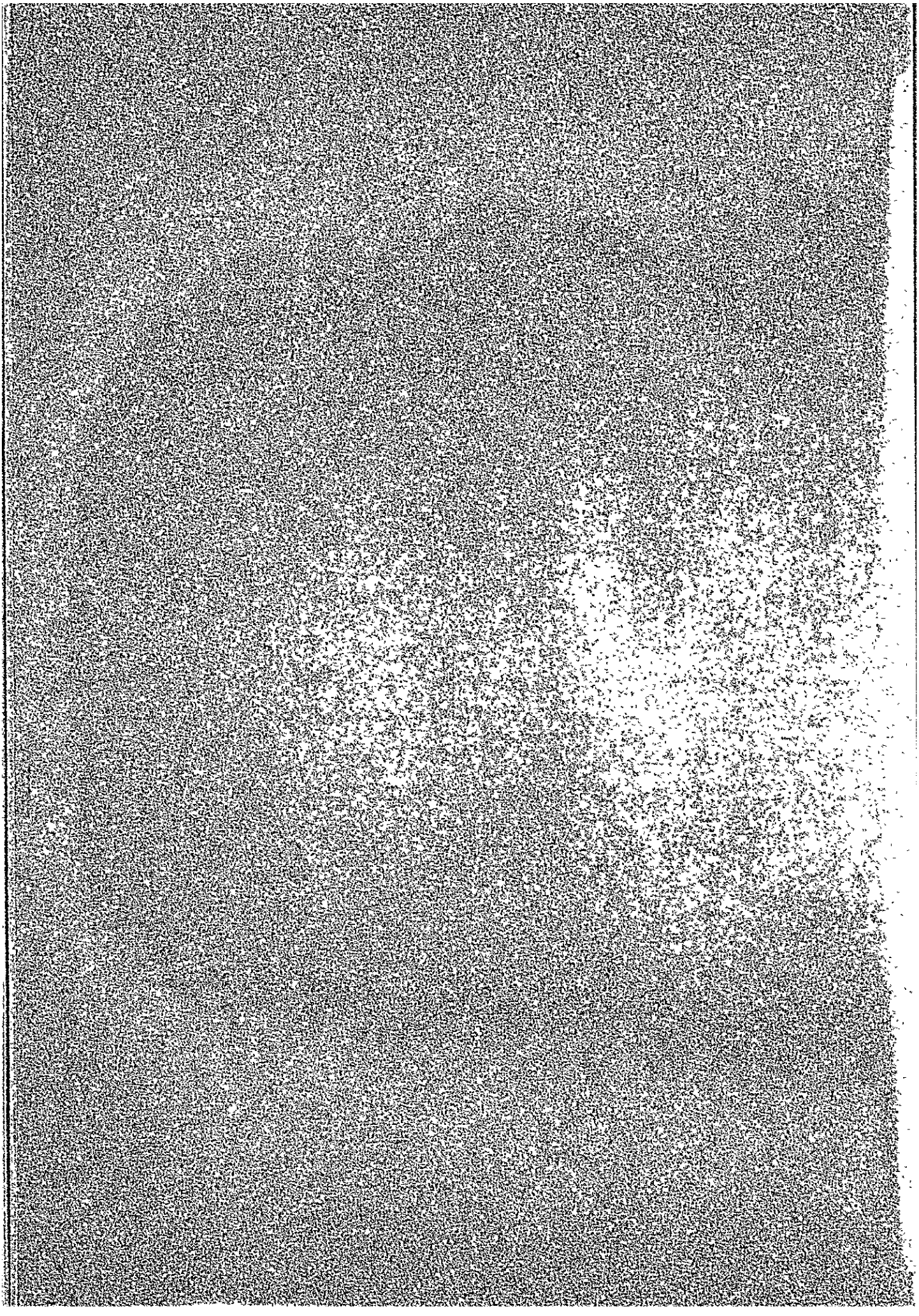
6

# II Conclusion



## II Conclusion

(1) In the Philippines at present, only 30% of the total rice fields are irrigated. It has been acknowledged that irrigated areas should be expanded as far as possible as the most relevant and effective means of helping to increase the food production of the country. As an effective measure to expand irrigated areas rice production centers have been planned. According to said plan, rice production centers are to be set up in chosen areas within the Philippines as a model, in which irrigation farming is promoted by the effort of native farmers, to help extend the method all over the country. This is the objective of the plan.

The present survey examined the basic frame of the plan as well as technical feasibility of the centers in proposed areas, prior to setting up the rice production centers.

(2) It should be noted, however, that all the items in the present report cannot be applied intact to other parts of the Philippines. The report presents only production center plans based on natural, social and economic conditions of Mindro, and Leyte Islands a and other represented areas respectively. The plan covers only a small portion of the vast land of the Republic. The project, after it as such is warranted, would be followed by similar projects for other parts of the country, which are planned and implemented in the due course of time.

(3) The following is the result of the survey on 3 areas proposed as rice production centers.

| Project | Area to be covered | Area for Irrigation | Purpose | Cost (U.S. Million $) Stage 1, | Stage 2, | Total | Major Facility |
|---|---|---|---|---|---|---|---|
| 1. Naujan | 1,200ha | 1,080ha | Supplementary irrigation | 2.15 | 1.41 | 3.56 | Pumping Station |
| 2. San Miguel Alangalang | 1,100ha | 712ha | Reclamation | 1.33 | 0.85 | 2.18 | Diversion Dam |
| 3. Titay Valley: | Further study is required for water resource discharge. | | | | | | |
| Note: | As for demacation of stages 1 & 2, explanation is given (4) in the following. | | | | | | |

Titay Valley, in spite of its location favorable to agriculture, we were compelled to withhold the actual working out of a plan due to insufficient water resource discharge which is a decisive factor, as explained later. The Naujan District is utilized

as lowland paddy fields, it was presumed, therefore, that its development would be easier and its effect greater. San Miguel Alangalang District is a dry field area, its geographical conditions render its development difficult as well. On account of these conditions which are elaborated in the attached paper, it is recommended to take up the Naujan District as the initial plan in implementation.

(4) Following are recommendations for the rice production center project as a whole.

(a) In setting up a rice production center, the construction work should be divided into 2 stages.

Under the plan, the entire work planned is divided into two and carried out respectively in Stages 1 & 2. In the first stage, the basic part of the system such as intake facilities and main canals are to be completed, while Lateral canals and others are to remain unlined, also field readjustment and farm road construction are not covered at the stage 1 level. These parts are to be completed in stage 2. Such a procedure is taken to obtain the advantage of irrigation at the minimum cost. It is judged more practical to enter the second stage after stable farming takes root through the above procedure.

(b) The content and objective of the project should be understood thoroughly by each and every farmer concerned with the rice production center.

Contact with the farmers of the project districts and confirmation of the above principle were not sufficient in the present survey, due to limited time and schedule. For successful implementation of such a project, however, special consideration should be given to this point. Orientation and extension of the objective should be known to the people at least before the plans are put into action.

(c) Effective organizations for carrying out these plans, operation and maintenance of the facilities should be established.

These facilities constructed as a measure for increased food production are semi-permanent construction involving a sizable inv estment and special techniques.

The operation and maintenance are, therefore, to be conducted in such a way that its function in utilized fully. The benefit of the facilities is to reach all the farmers. For these purposes, farmers receiving their benefits should be organized to fulfill the following functions.

(1) Operation and maintenance of the irrigation system.

(2) Guidance and extension service for further improvement of farming.

(3) Supply of farming materials and financial aid.

(4) Storing and selling of the products.

(d) In sufficient basic information, indispensable for the project planning, not only causes much waste in time but endangers the planning itself. In working out the present project planning, available data was extremely limited. Consequently, only the basic frame of the project was formulated, the plan remained at the basic framework level.

leaving accurate and detailed content unfilled. This will, inturn, affect economical as well as efficient implementation of the construction. During the detail design stage, the following information is vital.

(1) Accurate topographical map (1/5,000 scale: 0.5 to 1.0 meter interval between contour lines)

(2) Rivers to be used as water resources, river bed slope, cross-section, discharge, and river-bed condition at the intake of the rivers.

(3) Survey of foundation soil of structures.

(4) Soil (surface) survey for land readjustment.

(5) Research for grouping, exchange and consolidation of farmland.

(5) After the construction of rice production centers, care should be exercised in the education of farmers and the extension service as follow-up measures to increase rice production steadily. The present project gives special consideration to the integrated procedure of production, storing and selling of rice. As already mentioned, effective management and operation as well as improved farming should accompany the construction of facilities as indispensable requirements. In this respect, dispatching of agricultural experts from Japan as well as the members of Japan Youth Overseas Cooperation Units can be considered.

(6) The present project is planned as that of a rice production center and the effect is not limited only to economy but rather the extention of increased rice production should be evaluated higher and more efforts should be made in that direction. However, such a project should be carried out economically. In view of this, tentative economic analysis was given for respective districts. The result of the analysis of both districts proved the plans to be economically feasible.

(7) In regard to rice milling, replacement of the conventional Kiskisan-type mill by the Japanese rubber roller rice mill would lessen broken rice, consequently results in a higher recovery of total rice milled. Durability of rubber rollers, however, should be examined further.

Cono-type mills, are able to process rice without serious defects, provided the quality of milled rice is remains the same as that presently allowed in the Philippines.

In storing, grain protectants are used for prevention of insect pests. In the future, how ever, use of fumigants should be studied. The drying of paddies during rainy season poses a serious problem and this should be solved by use of a thermal dryer.

(8) On the basis of the above conditions, detailed design of the plan should be worked out, following the second stage survey. In designing, this task should be carried out during the dry season.

# III Report on Regional Rice Production Centers

# III—A Naujan (Oriental Mindro)

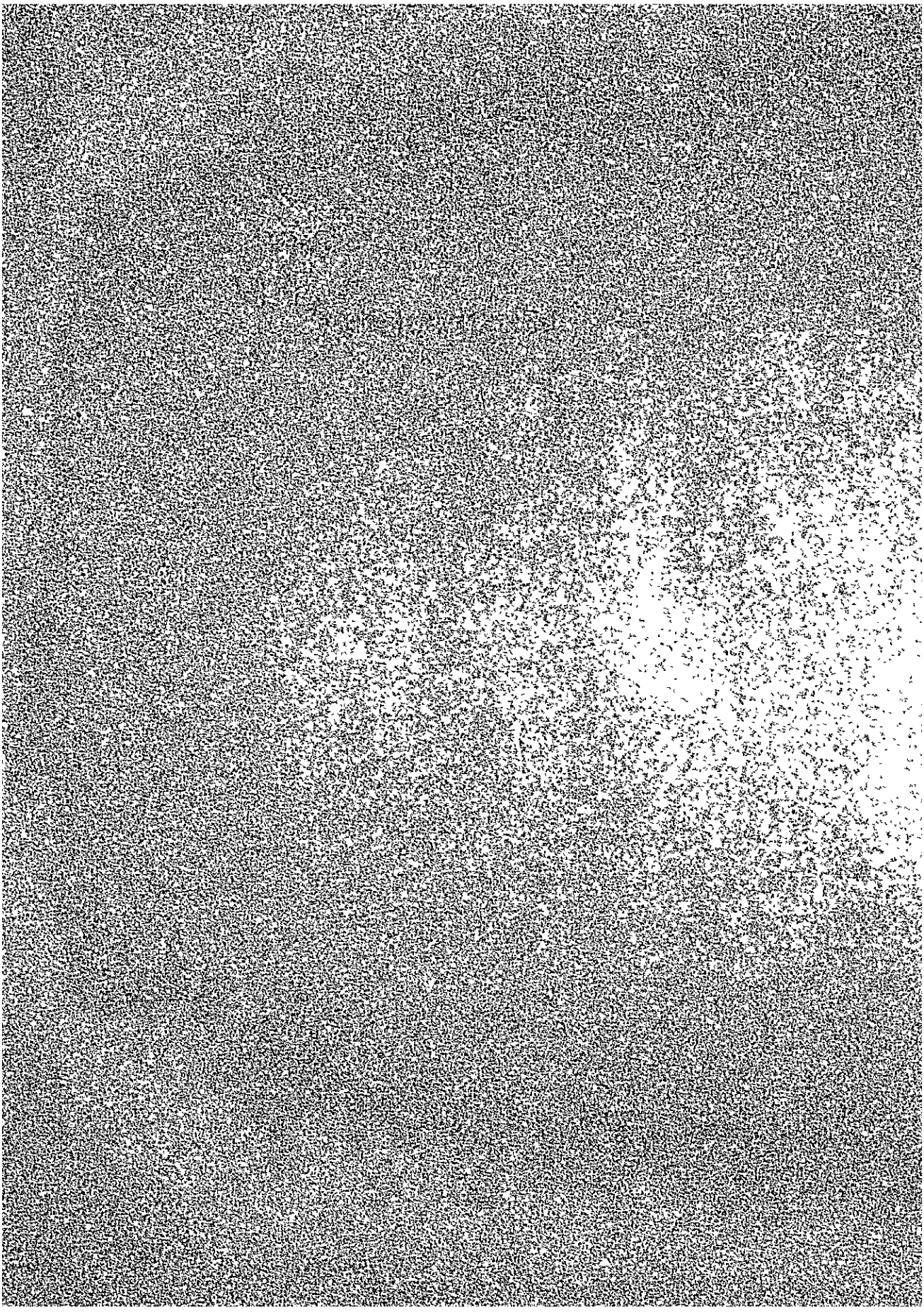
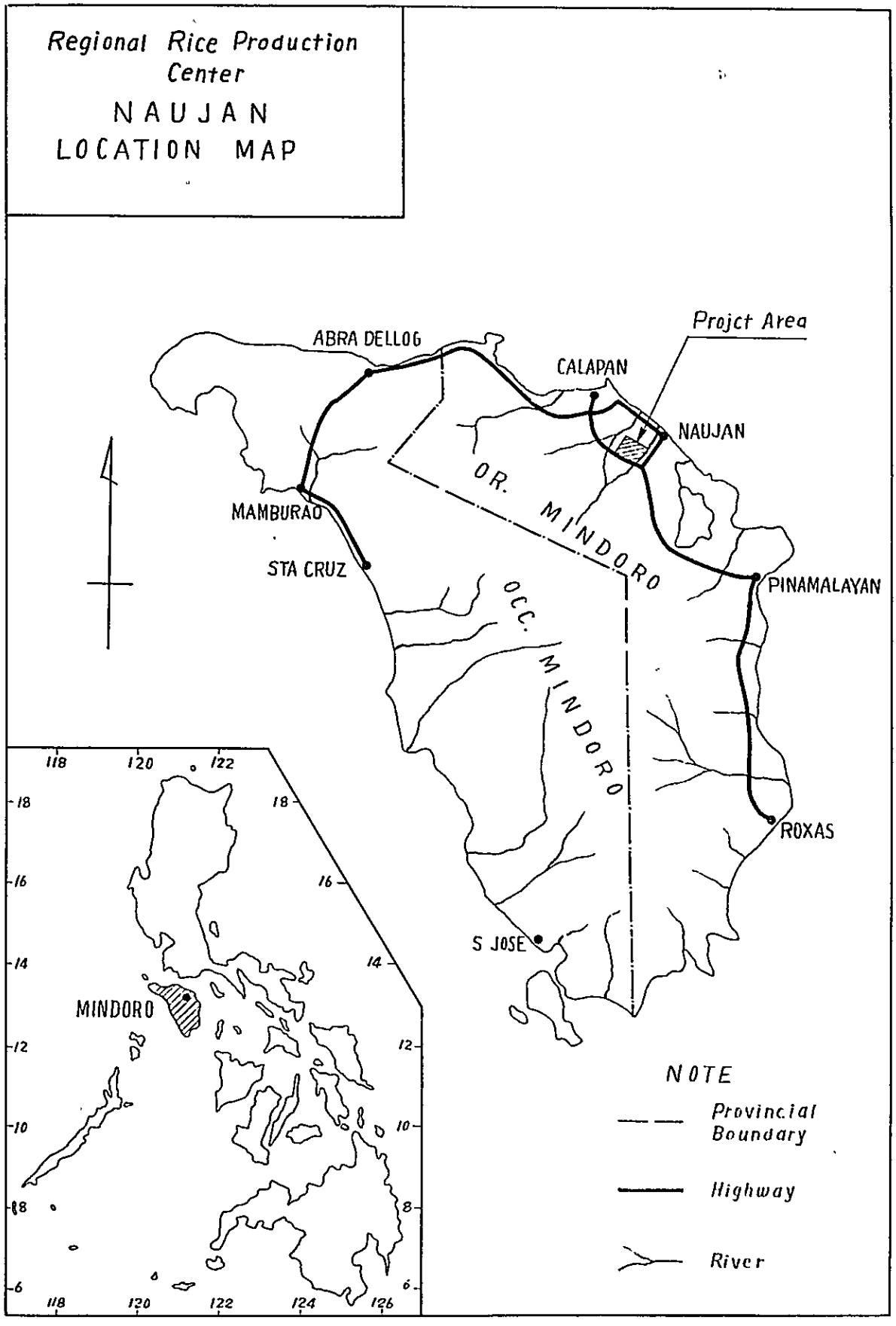


Fig. A-1


Regional Rice Production Center
NAUJAN
LOCATION MAP
Project Area
ABRA DELLOG
CALAPAN
NAUJAN
OR. MINDORO
MAMBURAO
STA CRUZ
OCC. MINDORO
PINAMALAYAN
ROXAS
S JOSE
MINDORO
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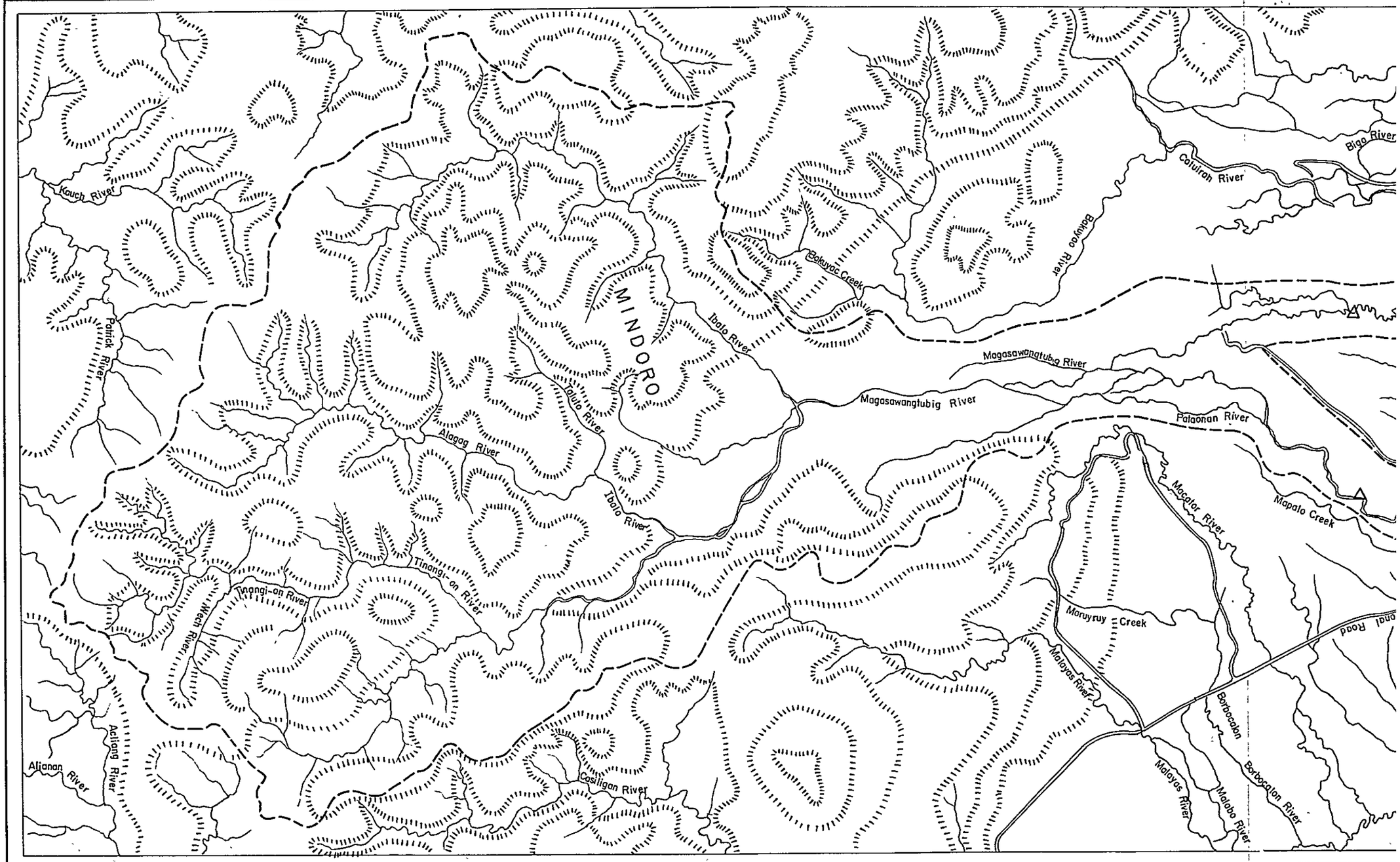
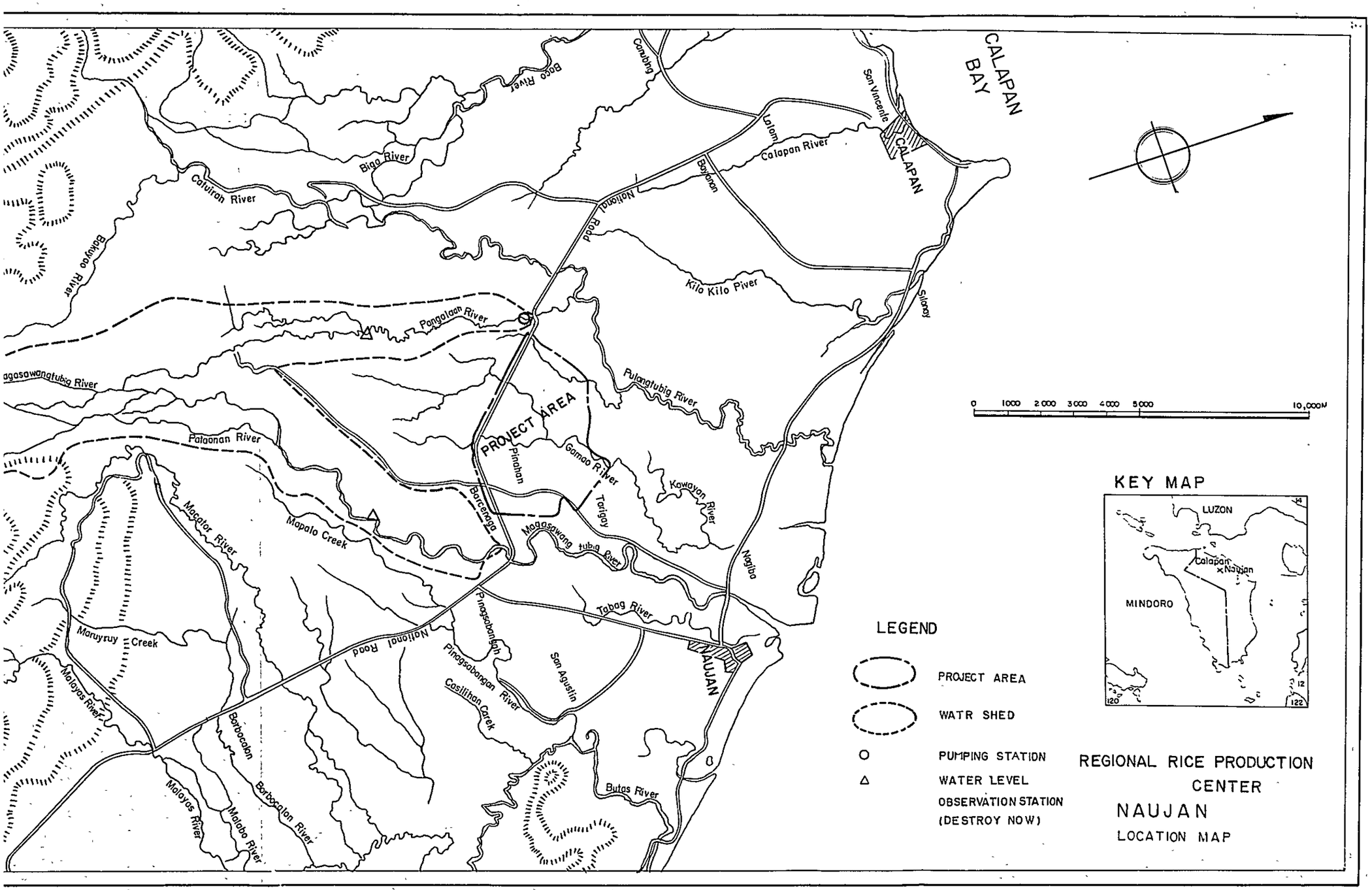
NOTE
Provincial Boundary
Highway
River

Fig A-2


Kauch River
Patrick River
MINDORO
Alagag River
Tabulo River
Tibato River
Tinangi-on River
Tinangi-on River
Mech River
Aciliang River
Alionan River
Casiligon River
Ibato River
Bakuyac Creek
Bayugo River
Magasawangtubig River
Magasawangtubig River
Catuiran River
Biga River
Palaonan River
Macalor River
Mapalo Creek
Maruyruy Creek
Malayas River
Malayas River
Malabo River
Barbocalon
Barbocalon River
onal Road


CALAPAN BAY
San Vincente
Lolam
Calapan River
CALAPAN
Boyboran
National Road
Bigo River
Bago River
Canubng
Calutcan River
Badugue River
Kilo Kilo River
Silonay
Pangalaan River
Pulangtubig River
PROJECT AREA
Pinahan
Gamao River
Kawayan River
Barcenaga
Tarigay
Maggagawang tubig River
Nagiba
Tabag River
Pinagsabangan
Pinagsabangan River
San Agustin
NAUJAN
Castilhan Carek
Butas River
Palaonan River
Macator River
Mapalo Creek
Maruyruy Creek
Malayas River
Barbacalan
Barbacalan River
Malabo River
0 1000 2000 3000 4000 5000 10,000M
KEY MAP
LUZON
Calapan
Naujan
MINDORO
LEGEND
PROJECT AREA
WATR SHED
PUMPING STATION
WATER LEVEL OBSERVATION STATION (DESTROY NOW)
REGIONAL RICE PRODUCTION CENTER
NAUJAN
LOCATION MAP

## III - A Naujan ( Oriental Mindro )

### A. 1. General Description of the Project area

#### A. 1. 1. Location

The area is a stretch of land with an area of 1,200 ha. situated between the Municipality of Calapan and the Municipality of Naujan in the northeastern part of Mindro Island, along the southeastern side of the Calapan-Pinamalayan National Highway. The District is a distance of 15-20 km. from Calapan on the National Highway.

The district was selected and demarcated within the region covering 2,850 ha. proposed at the initial stage, on the basis of the following advantages.

(1) As the district is along the National Highway, demonstration effect would be higher.

(2) Better access to water resources (River).

(3) Relatively less danger of flood damage.

#### A. 1. 2. Topography

The district is an alluvial plain on the gentle northward slope between the Magasawang Tubig River in the east and the Pulang-Tubig River in the west respectively running north. Land surface is generally smoothe.

#### A. 1. 3. Soil

The soil of the district is recent alluvial deposits, which, according to the Soil Map issued by the Bureau of Soils, is sub-divided into 4 categories by respective land surface soil : Sandy loam, loam, silt loam, and clay loam.

A Soil cross-section survey disclosed the presence of sand or sandy loam at the lower layers. This plays a vital role in the behaviour of the underground water. In terms of percolation of water presumed from the above soil cross-section as well as of land use, the land can be divided into two as in the following, sandy and loam along the Magasawang-Tubig Silt loam and clay loam in the west.

(a) San Manuel Sandy Loam and San Manuel Loam.

Due to sand that consists of the lower layer, the land has good internal drainage. The low land paddy field to be developed, however, needs a larger water requirement due to the same factor. The land is presently used as cocoanut gardens, pasture, and an upland paddy field. The low land paddy field is limited to a small portion of land at a hollow.

As San Manuel sandy loam has a very thin sandy loam surface layer, care should be taken for land readjustment. After reclamation, additional quantities of fertilizer or its division should be considered.

(b) San Manuel Silt loam and San Manuel clay loam

High groundwater level of the land gives an advantage to the land in irrigation, forming a prospective low land paddyfield. Internal drainage is poor at present due to an abundant supply of underground water.

As the lower layer consists of sandy soil, however, the land would be improved relatively easily by establishing and repairing drain canals.

It should be added that the soil of the land is fertile.

A. 1. 4. Climate

1.4.1. Precipitation

(a) Data Used

Reports of the National Calapan Meteorological Observatory for the last 10 years, from 1957 to 1966 were used. Calapan is about 10 km. northwest from the benefit receiving district. The observatory there is the one nearest to the district as well as the one which is reliable.

(b) Annual Precipitation

For the last 10 years, from 1957 - 1966, average annual precipitation is 1,981 mm., the maximum is 2,511 mm., of 1958 and the minimum is 1,355 mm. of 1963 (see the table A-1. 4-a). Maximum annual precipitation on the basis of 10 year probability is 2,109 mm., while the maximum on the basis of 100 year probability is 2,255 mm.

(c) Maximum Daily Precipitation

For 10 years from 1957 to 1966, the maximum daily precipitation is 178.0 mm., while the minimum is 54.8 mm. The Maximum daily precipitation based on 10 year probability is 191.5 mm, while that based on 100 year probability is 290.4 mm.

(d) Precipitation Analysis

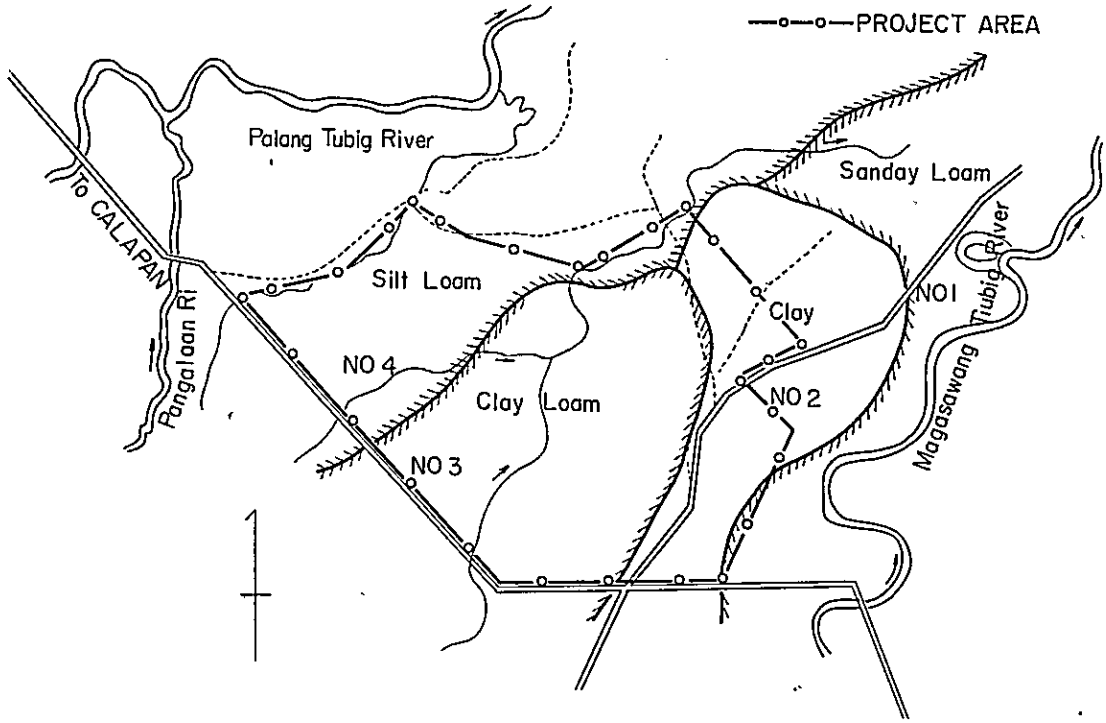
Relative proportions of wet and dry seasons are different every year. On the average, however, precipitation decreases during the 3 months from February to April (See the table A-1.4-b).

If we set monthly precipitation of 2.4 inch (about 60 mm.) as criterion to demarcate the two seasons, only the month of March falls in the dry season in its strict sense. Therefore, climate classification generally used in the Philippines is the second type of the climate of which dry season is for form one to three months

Even in rainy season, however, consecutive dry days of which daily precipitation below 5 mm. is regarded non effectual cover a sizable portion of the season, as in table A-1. 4-b.

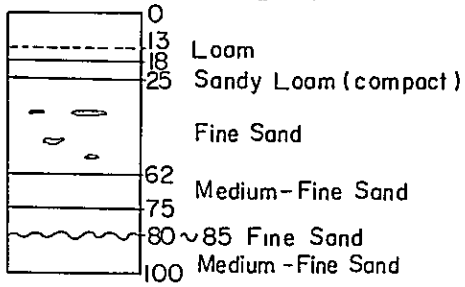
Fig. A - 1.3 - a

SOIL MAP

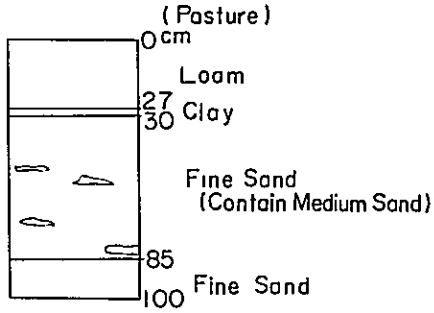



SOIL PROFILE

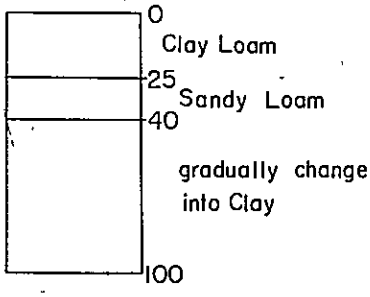
NO 1 San Manuel Sandy Loam
( Low Land )




NO.2 San Manuel Loam
( Pasture )




NO3 San Manuel Clay Loam
( Low Land )




NO4 San Manuel Silt Loam
( Low Land )

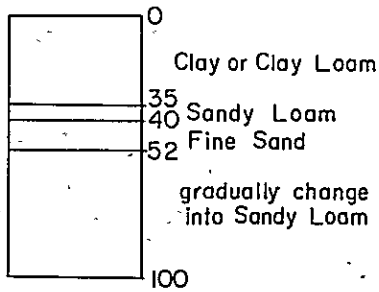


Table A-1. 4-a Yearly Precipitation and Maximum Daily Precipitation

| Year | Yearly Precipitation | Maximum Daily Precipitation Precipitation | Date |
|---|---|---|---|
| 1957 | 1,509 mm | 164.6 mm | 1- 1 |
| 58 | 2,511 | 118.9 | 10-21 |
| 59 | 1,800 | 73.9 | 9-27 |
| 60 | 2,265 | 169.7 | 1- 1 |
| 61 | 1,959 | 147.3 | 5-14 |
| 62 | 1,970 | 127.5 | 9- 5 |
| 63 | 1,355 | 54.8 | 8-13 |
| 64 | 2,450 | 178.0 | 11-27 |
| 65 | 1,965 | 112.0 | 5-20 |
| 66 | 2,022 | 97.5 | 5-17 |
| Average | 1,981 | | |

Recorded by the National Clapan Observatory

Table A-1 4-b Monthly Precipitation and Constructive Dry Days

| Month | Monthly Precipitation Average | Maximum | Minimum | Consecutive Dry Days Average | Minimum |
|---|---|---|---|---|---|
| 1 | 128.2 mm | 240.1 mm | 73.3 mm | 12 days | 19 days |
| 2 | 76.4 mm | 196.7 mm | 17.6 mm | 19 | 45 |
| 3 | 57.7 mm | 122.5 mm | 0 | 24 | 53 |
| 4 | 82.0 mm | 160.5 mm | 21.1 mm | 16 | 30 |
| 5 | 191.3 mm | 467.6 mm | 47.1 mm | 13 | 29 |
| 6 | 153.9 mm | 345.4 mm | 24.1 mm | 12 | 29 |
| 7 | 193.0 mm | 289.7 mm | 22.0 mm | 10 | 21 |
| 8 | 238.2 mm | 335.3 mm | 25.5 mm | 13 | 26 |
| 9 | 198.4 mm | 484.6 mm | 61.6 mm | 14 | 21 |
| 10 | 226.4 mm | 556.3 mm | 105.9 mm | 8 | 12 |
| 11 | 267.2 mm | 915.1 mm | 58.2 mm | 11 | 18 |
| 12 | 168.3 mm | 417.8 mm | 57.3 mm | 13 | 20 |

Recorded by the National Observatory at Calapan (1957-1966)

Note: Daily precipitation below the level of 5 mm is considered ineffective precipitation in calculation.

1. 4. 2. Temperature and Humidity

Meteorological observation data in Calapan recorded 28.3 C in May as the maximum monthly average temperature, and 25.3 C in January as minimum. The yearly variance is as small as 3 C. Monthly average of daily variance is 6.7 C - 8.8 C. Variance between August, the maximum month, and December, the minimum month, is very small.

The monthly average of relative humidity is 77% - 84% and drops somewhat during the dry season. Seasonal variance is very small.

Therefore, paddy cultivation is possible throughout the year. As the meteorological factors to be considered in cropping determination, precipitation which was explained in the above and tropical cyclons are more significant than temperature and humidity.

1. 4. 3. Tropical Cyclon

The Philippine Weather Bureau Scientific Papers were studied for data on the tropical cyclon season for the last 4 years (1961 - 1964). Among the tropical cyclons approached the Philippines, those which swept near or through Calapan are concentrated in the month of November and September as in the following.

Therefore, cropping season for paddy should be selected in such a way that the paddy would not ear in the Typhoon Season. As typhoons often bring heavy rain the low land is likely to get inundated, the paddier should be grown up enough by the reason to receive damage by inundation.

Table A-1. 4-C Frequency of Tropical Cyclon Approached Calapan

| | Jan. | Feb. | Mar. | Apr. | May. | Jun. | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Typhoons which Swept, within 200 miles of Calapan | ---------- | | | | 1 | 2 | 2 | 2 | 3 | 3 | 6 | 3 |
| Typhoons which Swept, within 100 miles of Calapan | ---------- | | | | 1 | 1 | 1 | 1 | 3 | - | 2 | 1 |

(Philippine Weather Bureau Scientific Papers, Typhoons of 1963 - 1964)

A. 1. 5. Hydrology (Water Resources)

1. 5. 1. Water resources (river) and the Data Used.

The district is demarcated by the Magasawang Tubing River at the north western end and by the Pangaalaan River at the soutneastern end. Therefore, one of the two rivers should be selected as a water resource.

The Pangalaan River is derived from the upper Magasawantubing, making the dividing point a flood plain. After every flood, the proportional amount of the two

rivers cnanges. As the divident ratio changes estimation of maximum flood discharge as well as minimum discharge of the two rivers is difficult. Consequently, selection of a river as water resource is difficult. On the basis of available data given in the following, however, the Pangalaan River was selected as the main source of irrigation. The pumping station is about 300 m. above the point where the Calapan-Pinamalayan National Highway crossess over the Pangalaan River.

Discharge survey of the Pangalaan River is being conducted at the point 5 km. above the stream from the bridge by the Ministry of Public Works. We could use data for 8 years during 1954 - 1961 collected by the Ministry. No major jointing point nor dividing point was observed between the survey point in the above and pumping station point planned. Discharge at survey point is, therefore, equal to that of pumping point to some extent.

On the other hand the discharge survey of the Magasawang Tubing, which is the main stream, has been conducted at the spot about 7 km. down the stream from the diving point. We could use the data for 5 years from 1957 - 1961.

1. 5. 2. Rivershed

The Magasawang Tubing River, the main stream, the total length is 50 km. originating from the backbone mountains of the island and running into the Calapan Bay, is a big river in Mindro Island. The upper valley of the river up to point where the Pangalaan separates is mostly forest area, while in the lower basin coconut gardens, uncultivated land, and lowland paddy field are found. The total river shed inclusive of the Pangalaan River is about 430 $km^2$

River Gradient is 1/17 in mountainous area at the upper stream, 1/75 at the transitionary point from the mountainous area to the plain, and about 1/210 in the plain. Therefore, the stream itself is quite rapid. Little has been done for river improvement of the valley so far. Therefore, in the plain, flood damage occurs once or twice every year, during the typhoon season. The flood cause vast flood plain at the dividing point of the Magasawang Tubing River and the Pangalaan River, bringing a heavy deposit. After every flood, the divident ratio of flow of the Magasawang Tubing River and The Pangalaan River changes. Thus the two rivers are unstable.

1. 5. 3. Flood Discharge and Minimum Discharge.

(a) Pangalaan River

The Maximum Discharge.

The Maximum value on the 8 year record from 1954 to 1961 is 496.5 $m^3$/sec. of 1954 and 1955. (See Table A-1.5-a)

The Minimum Discharge.

Yearly variation of the minimum discharge for 8 years from 1954 to 1961 is as in the table A-1.5-a, the minimum on which is 4.90 $m^3$ sec. of 1959

(b) The Magasawang Tubig River

The maximum discharge during the 5 years from 1957 to 1961 is 829.4 m/sec. (See Table A-1.5-a)

The Minimum Discharge

Yearly variation of the minimum discharge for the 5 years from 1957 to1961 is as in the A-1.5-a. The minimum during the period is 0.36 m/sec. The minimum discharge is reached during May to June, but this does not coincide with that of the Pangalaan River.

Table A-1.5-a Yearly Maximum and Minimum Discharge

| River | Year | Maximum Discharge | Date | Minimum Discharge | Date |
|---|---|---|---|---|---|
| Pangalaan | 1954 | 496.50 $m^3$/sec | | 8.50 $m^3$/sec | |
| | 55 | 496.50 | | 15.20 | |
| | 56 | 460.00 | | 21.00 | |
| | 57 | 265.00 | 1-1 | 5.00 | 6-22 |
| | 58 | 460.00 | 10-22 | 5.00 | 7-13 |
| | 59 | 460.00 | 11-17 | 4.90 | 7-6 |
| | 60 | 460.00 | 10-7 | 8.50 | 4-16 |
| | 61 | 244.00 | 12-7 | 5.80 | 4-29 |
| Magasang Tubing | 1957 | 829.00 $m^3$/sec | 1-8 | 0.36 $m^3$/sec | 6-22 -27 |
| | 58 | 192.00 | 6-3 | 0.76 | 5-20 -24 |
| | 59 | 179.00 | 11-30 | 0.76 | 5-4 |
| | 60 | 533.00. | 10-8 | 1.52 | 6-9 |
| | 61 | 370.00 | 8-23 | 1.31 | 5-4 |
| Pang + Mag | 57 | 1,075.00 $m^3$/sec | 1-8 | 5.36 $m^3$/sec | 6-22 -27 |
| | 58 | 538.80 | 10-22 | 7.36 | 5-21 -24 |
| | 59 | 521.00 | 11-17 | 9.66 | 5-4 |
| | 60 | 640.00 | 10-8 | 11.28 | 4-16 |
| | 61 | 464.00 | 8-23 | 9.34 | 4-29 |

1. 5. 4. Determination of the Main Source of Irrigation.

The Pangalaan River was determined as the main source of irrigation due to the following reasons.

1. The smallest annual minimum discharge of the river for 8 years from 1954 to 1961, is 490 $m^3$ As for probability calcuration, 4.6 $m^3$/sec on the basis of 10 year

probability, and about 5.2 m/sec on the basis of 5 year probability. From these figures, we could expect the river to support the irrigation system of the district.

2. The Distance from the river to the district is as short as that from the other river to the district.

3. The river provides a site suitable for a pumping station.

Note: In the interim report, the Magasawang-Tubig River was recommended as the main source. The river was, however, found later by careful examination of discharge data to have smaller minimum discharge which is insufficient to irrigate the area of the proposed district. (See 1. 5. 3 (b)) Due to the above reason, the Pangaalang River was selected.

## A. 1. 6. General Description of Agriculture Practised at Present

### 1. 6. 1. Land Utilization and Cropping Pattern

Most of the land of the district is plain and used as lowland rice fields while the portion along the Magasawang-Tubig is elevated in the form of natural levee, with sandy soil that provides good drainage, is used as upland ricefield and coconut gardens. Exploiting the abundant supply of underground water, double cropping began on the lowland from around 1959 or 1960. At present, Palagad planting is exercised over a considerable area of land.

As for cropping pattern in the upland field, upland rice cultivation is the most dominant. The core of farming in the district is, thus, rice cultivation. The land utilization rate of the district is high, leaving only 10% of its arable land lying idle.

### 1. 6. 2. Rice Productivity

The result of a yield survey in the district shows high yield for Palagad crop as shown in the next table. The nature of the survey subjects, which are the field of upper strata farmers, on top of that, with irrigation facility, seems to account for the high yield. The result of the survey, therefore, implies that with an irrigation system high rice yield can be obtained by application of fertilizer and better means of cultivation. Some wealthy farmers have introduced advanced agricultural means and techniques such as agricultural machines, new improved varieties of crop, fertilizer and agricultural chemicals, while the bulk of the farmers are still adherent to conventional method of agriculture. Straight row planting of paddies has not even been practised widely. The average yield for the last 3 years (1964 - 1966) of Southern Tagalog, Rejion which is part of the district by the Department of Agricultural Natural Resource statistics is 30 cav/ha. (1.34 ton/ha.) for lowland 1st crop, 32 cav/ha. (1.44 ton/ha.) for 2nd crop, and 16 cav/ha. (0.70 ton/ha.) for upland paddies. These figures are more or less the same or somewhat lower than the national average for the same figures, except the case of lowland 2nd crop, of which the average yield in the district is higher than the national average.

1. 6. 3. Land Tenure

Land tenure in the Municipalities of Calapan and Naujan in which the project district is located was studied in terms of a breakdown of total households by land holding patterns. The result is as follows, tenant accounts for 57%, full owner and part owner farmers account for 33% and 10% respectively. Compared to the national figures for the tenant 40%, 45% for full owner, 14% for part owner, the district shows higher a proportion of tenant farmers.

As for farmland area proportion, the area of farmland cultivated by tenant farmers is as high as 42%, while the national figure is 26% for the same item. Landloard-tenant contracts are dominant practised on the share of produce basis. A few tenants are paid in cash or fixed amount of produce. Share of produce presently practised is 50% - 50% or 70% - 30%.

Table A-1.6-a The result of Lowland Rice Yield Survey

| Variety | N | $P_2O_5$t | $K_2O$ | Spacing | Sampled Area | Wt.of Paddy | Wt. of Straw | Paddy to Straw Ratio | Yield | |
|---|---|---|---|---|---|---|---|---|---|---|
| | kg/ha | kg/ha | kg/ha | hills/m | m | gr. | gr. | %. | ton/ha | cav/ha |
| IR-8 | 91 | 19 | 19 | 16.0 | 3.75 | 2,958 | 3,997 | 74 | 7.96 | 180.9 |
| BPL-76-1 | 58 | 13 | 13 | 12.2 | 3.71 | 1,608 | 1,914 | 84 | 4.34 | 98.6 |
| C-18 | 51 | 6 | 6 | 12.3 | 3.65 | 1,421 | 2,001 | 71 | 3.89 | 88.4 |
| Peta | 19 | 0 | 0 | 12.6 | 3360 | 1,675 | 1,971 | 85 | 4.68 | 106.4 |
| Peta | 0 | 0 | 0 | 12.6 | 3.58 | 1,242 | 1,656 | 75 | 3.46 | 78.6 |
| Tapukoy | 0 | 0 | 0 | | 3.00 | 820 | 976 | 84 | 2.73 | 62.0 |

i) Weight of straw was presumed from ratio of paddy to straw (sampling survey for 3 hills
ii) Varieties other than Tapukoy are cultivated on irrigated lowland field.

1. 6. 4. Farming Scale

The Size of Land Cultivated. per farming household in the district is larger with the per household farmland of 4.3 ha. and cultivated land of 3.6 ha., compared to the national average which is 3.6 ha. for farmland and 2.5 ha. for cultivated land. A breakdown of total farm land by strata shows a concentration of farmers on somewhat between 1.0 ha. - 10 ha. While a very few farm land smaller than 1.0 ha.

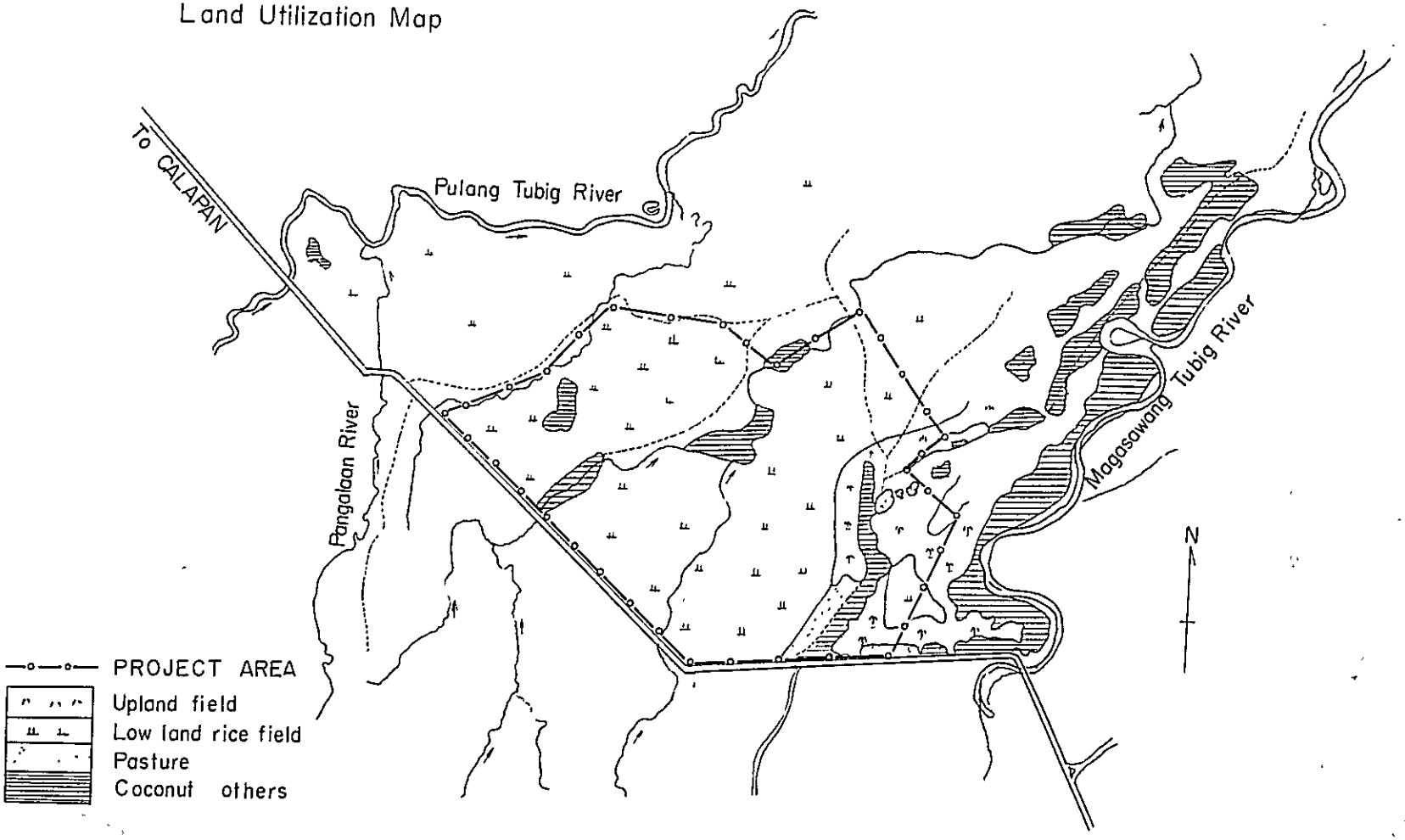
The average area of land cultivated for each category of land holding is 5.6 ha. for full ownership, 5.2 ha. for part ownership, and 3.2 ha. for tenant farmer.

1. 6. 5. Production Cost of Rice

Animal labor (Caravao) is the main means of rice production in the region, with the exception of some advanced farmers, farmers dont buy fertilizer, on insect control.

Fig. A-1.6-a

Land Utilization Map



The Cost of rice production for an average farmer in the region calculated on the basis of data from the Bureau of Agricultural Economics, the Government of the Philippines, is 245 ₱ (63 U.S.$) per ha. of upland rice, while that of lowland rice (nonirrigated) is estimated as 395 ₱ (101 U.S.$) ..... (See Appendix E-11-a)

Required labbor input for upland rice cultivation is 50 man days and 14 days of cattle labor, while for uopland rice 90 man days and about 30 days of cattle labor are required.

1. 6. 6. Market Condition

The project district is situated along the Calapan-Naujan National Highway, at approximately the halfway point from either town.

Calapan where agricultural products are collected and distributed, farming materials are procured, is about 20 km. further up the highway.

The village of Baranaga (Barrio) near the middle of the district a little closer to Naujan is the center for the procurement of food and daily necessities, the village is the center of economic activities of the region.

Calapan is the center of commodity distribution of the Oriental Mindro as well. Its harbor, though small, provides easy access to Manila and other parts of the country. (Regular ferry service is provided between Calapan and Batangus, the southern tip of Luzon Island, twice a day).

## A. 2. Plan

### A. 2. 1. Outline

As mentioned in the "Present Condition of the Region" most of the paddy fields of the district have no irrigation systems and depends mostly on natural precipitation. The main purposes of the project are to increase yield per unit hectare and to enable double cropping by introduction of irrigation system so throughout the whole area.

The frame of the project is as follows.

(1) The plan proposed to cover 1,080 ha. of paddy fields by the irrigation facilities. There is no geographical or topographical limitations on the selection of the acreage, range and site, as the landform in this region is even. In this case, therefore, the site of the river and its flow are determinants.

(2) For the main source of irrigation, the Pangalaan river, which runs eastward through the northern part of the area was selected. The reason for the selection is that the river has a larger minimum flow compared with the other river in the district, the Magasawang-Tubig. The acreage of 1,080 ha. was decided upon after considering the minimum flow as well as the required amount of water for the district.

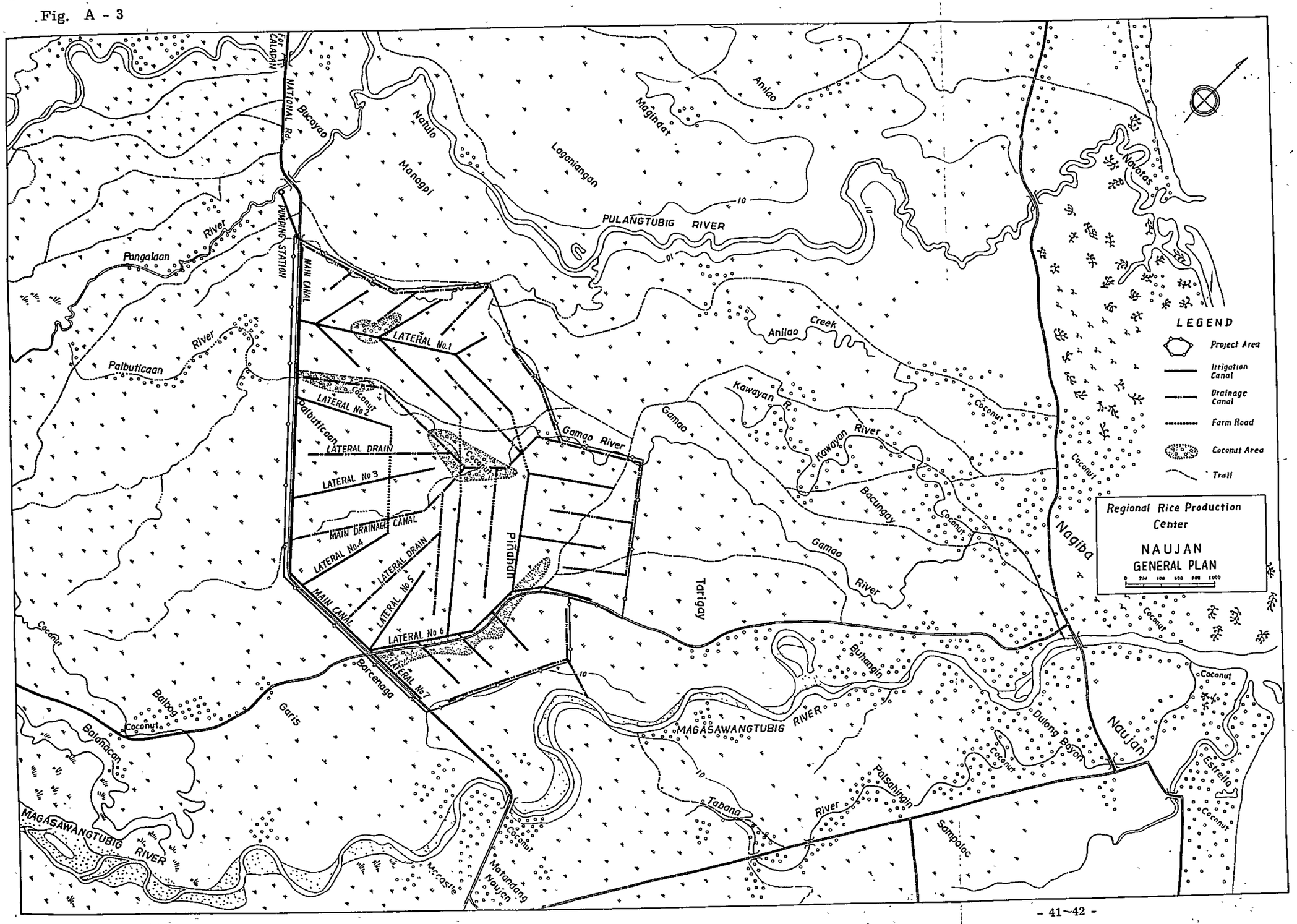
(3) In drawing water from the river, pumps are to be employed. In view of the balance between the water level of the Pangalaan river, the main source, and the elevation of the project district, a pump-up method is considered more feasible than drawing of water by the gravity irrigation method from a remote point.

(4) For conveyance of water from the pumping point to the district, pipe lines are used for the main canals. In view of topographical conditions of the district, the main canal is set up (along the) east side of the highway. In the light of the design of the main canal, construction work operation and maintenance in the future, pipe lines are considered more feasible than an open channel.

(5) The distribution network consists of the main canal, 7 laterals and 13 sub-laterals. The network is laid out in such a way that water directly supplied by canals reaches as far as about 20 ha. at the end of the field, while the rest of the land is irrigated by water overflown, plot to plot. By this system the canals do not reach every field, but the area as a whole is irrigated. At the first stage of construction, lateral and sub-laterals are not to be lined with concrete. The purpose of the first stage of the project is to obtain irrigation effect at a construction cost as low as possible.

(6) The second stage of the project is composed of farmland readjustment, (standard unit acreage is 1 ha.) and provisions for drainage as well as irrigation ditches in each field. Consequently the irrigation and drainage system are to be completely separated. In addition to this, a network of farmroads is to be added and all canals are to be lined with

Fig. A - 3


For CALAPAN
NATIONAL Rd.
Bucayao
Natulo
Manogpi
Laganiangan
Maginaat
Anilao
5
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01
PULANGTUBIG RIVER
Navotas
PUMPING STATION
MAIN CANAL
Pangalaan River
Palbuticaan River
LATERAL No.1
Anilao Creek
Coconut
LATERAL No 2
Palbuticaan LATERAL DRAIN
LATERAL No 3
Gamao River
Kawayan R.
Kawayan River
Gamao
Bacungay
MAIN DRAINAGE CANAL
LATERAL No.4
LATERAL DRAIN
LATERAL No 5
MAIN CANAL
LATERAL No 6
LATERAL No 7
Pinagbanan
Tarigay
Gamao River
Nagiba
Naujan
Coconut
Barcenaga
Balbog
Garis
Balonacan
MAGASAWANGTUBIG RIVER
Buhangin
Dulong Bayan
Estrella
Tabang
Palsahingin River
Sampoloc
Mcrasie
Matandang Naujan
LEGEND
Project Area
Irrigation Canal
Drainage Canal
Farm Road
Coconut Area
Trail
Regional Rice Production Center
NAUJAN
GENERAL PLAN

concrete. This is for perfect utilization of land and water. The second stage requires large investment, but is for the attainment of the most desirable pattern of irrigation in all respects inclusive of water control as well as farm management.

(7) Construction of irrigation systems enables stabilized double-cropping. In this instance for harvesting which falls during the rainy season, artificial drying is required. Further, in view of rice selling at its optimum period and quality improvement, facilities for drying, threshing and the storing of rice should be constructed.

(8) Required construction cost in the first stage is estimated as approximately $ 2,150,000. An additional $ 1,410,000 is required for the second stage, pushing the total cost to $ 3,560,000.

(9) The farming program, improved variety (BPI-76-1) is to be introduced along with advanced production methods such as fertilizer and agricultural chemicals. Double cropping of rice is to be extended over the whole district. In addition, in the field of agricultural labor, machines are to be introduced first in weeding to save human labor, and it is planned to be used in harvesting and threshing in the future when land readjustment is enforced.

(10) Yield per hectare, in view of the above farming program, the process of gradual increase, rather than that of radical steps toward high yield is the aim. For about 5 years after the completion of stage 1 construction (phase 1), the goal for total paddy yield for a year is to be around 4.0 t (90 cav.) per ha. After this period, the goal would be increased to 7.5 t (170 cav.) per hectare.

(11) To help the implementation of new irrigation farming, the establishment of an extension service center (experiment and demonstration farm) is advised. To facilitate this plan, the dispatchment of agricultural experts for guidance and assistance for a given period would be effective.

A. 2. 2. Major Civil Works

2. 2. 1. Irrigation Facilities

(a) Water Requirement

Evapo-Transpiration

According to data on evapo-transpiration measurement of lowland rice in the Philippines for 1963 - 1965 by the International Rice Research Institute which was available, the figures of maximum daily evapo-transpiration, except a record maximum of 10.6 mm/day, are all below 8 mm/day. The monthly average calculated, utilizing a correlation formula among evapo-transpiration, temperature anf relative humidity with temperature substituted by that of Calapan, and figures below 5 mm/day were obtained. The average temperature and relative humidity in Los Banos where IRRI is, and Calapan are most or less the same, evapo-transpiration at its peak is decided as 8 mm/day.

Percolation

Percolation measurement conducted on San Manuel sandy loam showed 25 mm/day as the stablefigure, while water level outside the wooden frame showed percolation as much as 50 mm/day. Water level within the frame seems to have undergone greater change than in plot condition in the lowland paddy fields, in actual lowland paddy field condition, the soil will become saturated and percolation would be smaller.

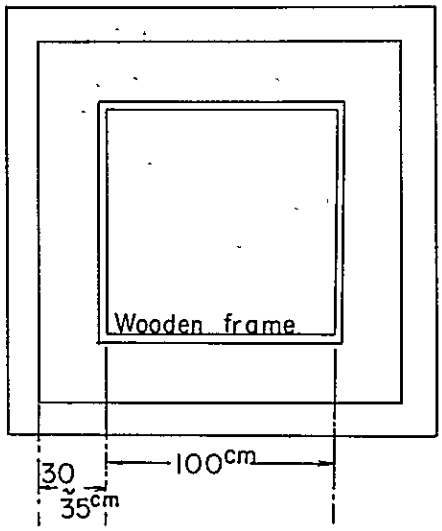
After consideration of the above figures, crossections of the two categories of soil formation were studied, for comparision showing the following figures for estimated percolation.

| | |
|---|---|
| San Manuel Sandy Loam, Loam | 20 mm/day |
| SanManuel Clay Loam, Silt Loam | 15 mm/day |

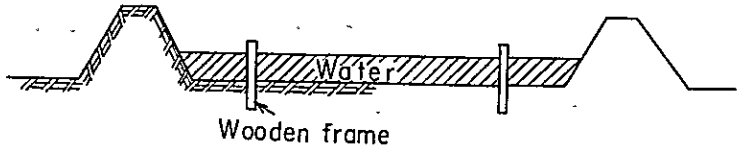
Water Requirement in Depth

On the basis of evapo-transpiration and percolation, water requirement in depth was determined as follows.

| | |
|---|---|
| San Manuel Sandy Loam, Loam | 28 mm/day ≒ 30 mm/day |
| San Manuel Clay Loam, Silt Loam | 23 mm/day ≒ 25 mm/day |




Data on Actual Percolation Example




| Date of Measurement | Waterlevel Change(mm) Within Frame (A) | Outside | Precipitation ET(B) (mm) | Percolation (A+B)=C (mm) | Percolation mm/day |
|---|---|---|---|---|---|
| Apr. 21-22 | 15 | 28 | -47 | 62 | 62 |
| 22-24 | 83 | - | -10 | 73 | 37 |
| 24-25 | 35 | 58 | -2 | 33 | 33 |
| 25-26 | 26 | 52 | -2 | 24 | 24 |
| 26-27 | | | | | |
| 27-28 | 32 | 55 | -7 | 25 | 25 |

(b) Pumping Capacity

Maximum pumping capacity designed for the Pangalaan river is 4.52 m/sec. Pumping capacity was calculated on the basis of the following formula.

$d_s$; water requirement in depth in sandy loam, loam = 30 mm/day

$a_s$, Area of sandy loam, loam 146 ha.

$d_c$; water requirement in depth in clay loam, silt loam 25 mm/day

$a_c$ : Area of clay loam and silt loam ..... 934 ha

r; water ratio loss 0.15

Hours the pumps is to be in operation daily : 20

Water requirement in depth classified by soil types is accounted for in (a)

The maximum pumping capacity thus planned is somewhat smaller than the minimum water flow on a 10 year probability basis of the Pangalaan River. Therefore, under the normal conditions, stabilized pumping capacity can be presumed.

(c) Pumping Station

Outline of the pumping station facilities is as follows.

| | |
|---|---|
| Intake sluice | Width 2m, height 1.5 m. 4 units made of steel |
| sand trap | Width 10m. length 20 m. in depth, in reinforced concrete |
| Pumping Station | Pumping capacity Q max $4,52^3$ m/mm |
| building | $16^m \times 13^m$ light steel frame, roof covered with slate |
| Suction pool | $5^m \times 12^m$ depth 9m. made of reinforced concrete |
| Pump | 4 units (same type and capacity) |
| Type | Vertical mixed flow type |
| Head | Actual head 8.0 m. total head 9.5 m. |
| Pumping Capacity | $1.13 m^3/sec$ (per unit) |
| Delivary diameter | 700 m/m. |
| Engine | 4 units (same type and capacity) |
| | 220 PS diesel engine |

Outline of structure is in the chart A-2. 2-a.

Location of Intake Sluice

On the right bank about 300 m. up the stream of the Pangalaan River from the National Highway bridge.

Number of Pumps to be installed

Fewer units of pumps means less cost. Considering the following, however, 4 units of pumps of the same type and capacity were to be installed.

(1) Effective operation is feasible even when irrigation requirements are small. This leads to effective supplementary irrigation during the rainy season.

(2) It means a smaller unirrigated area when a pump is damaged.

(3) Interchangeable parts of pumps facilitates easier operation and maintenance.

Flood Control

H. W. L. Around the pumping station along the Pangalaan River is estimated to be about 1 m. above the ground surface. Therefore, in order to avoid water damage to engines during a flood, the engine base should be about 1 m. above the present H. W. L.

(d) Irrigation Canals

A locations of irrigation canals are as in the chart A-2. 2-b. The length of canals, and standard cross section, are in charts A-2. 2-b.

Fig. A - 2.2 - a

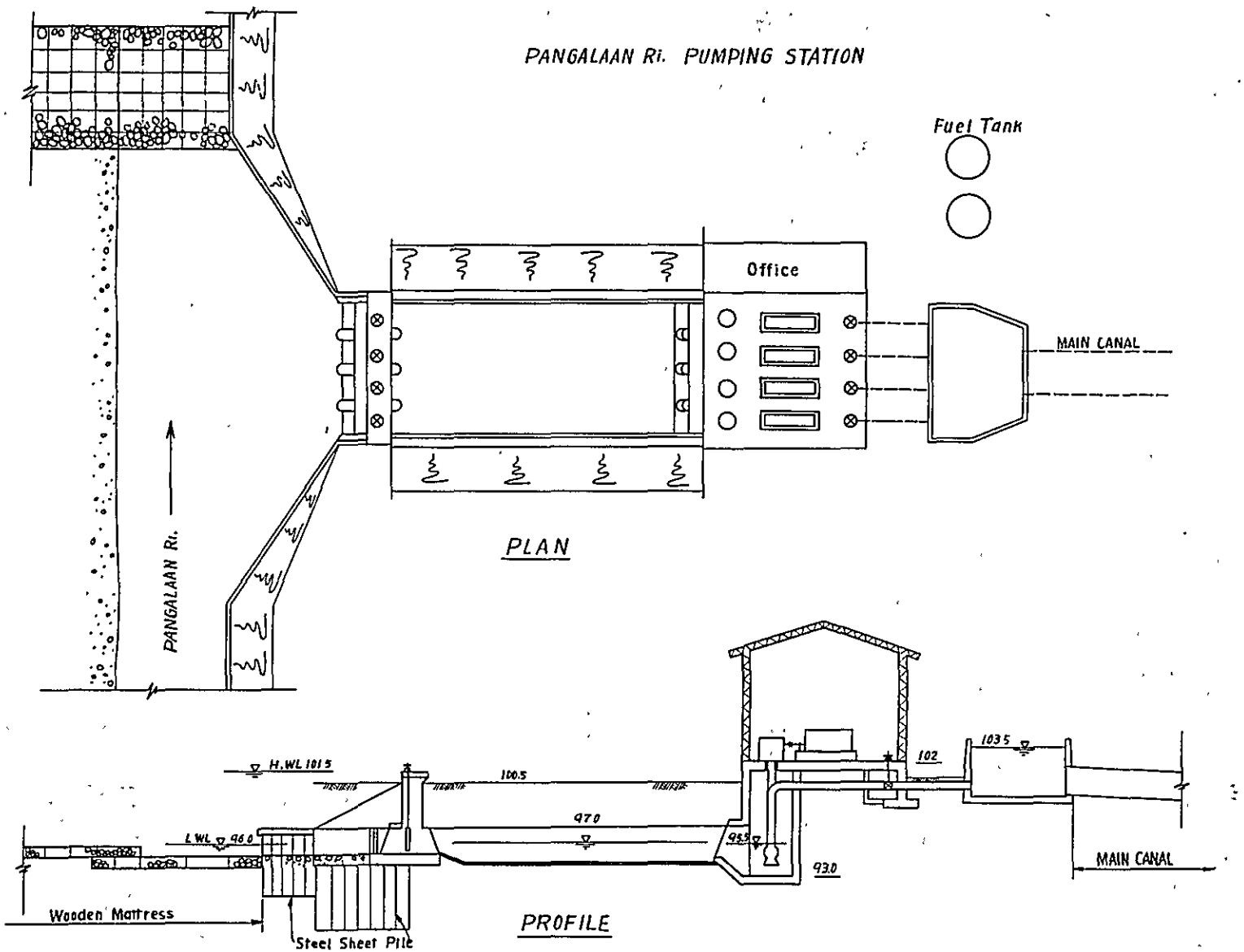
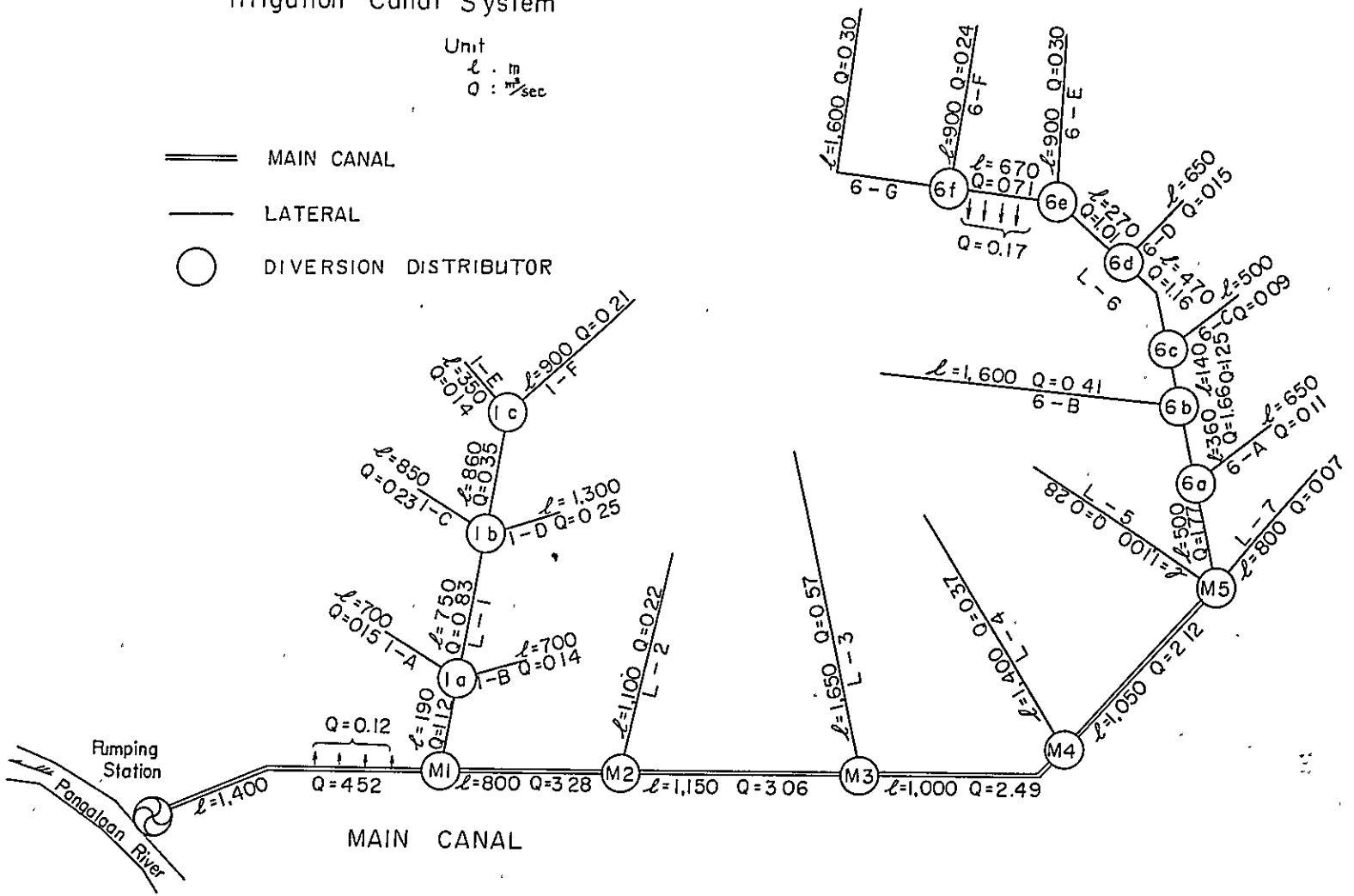

PANGALAAN Ri. PUMPING STATION
Fuel Tank
Office
MAIN CANAL
PANGALAAN Ri.
PLAN
H.WL 101.5
100.5
97.0
L.WL 96.0
95.5
93.0
102
103.5
MAIN CANAL
Wooden Mattress
Steel Sheet Pile
PROFILE

Fig. B-2·2-b

# 用水系統図

## Irrigation Canal System



Irrigation canal network layout

The irrigation network was laid out under the following conditions.

(1) Irrigation canals and Drainage are to be separated completely.

(2) In view of farmland readjustment and construction of lateral irrigation canal in the future, minimum network required for "plot to plot irrigation" is planned at this stage.

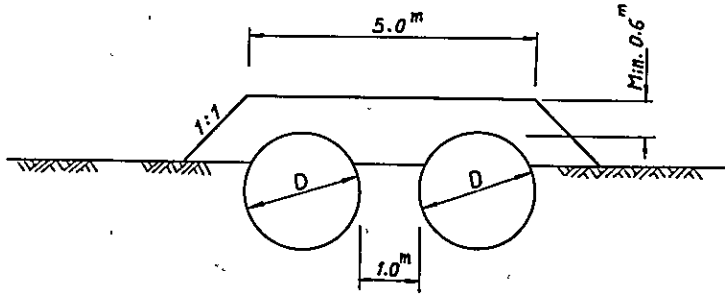
Structure of Main Canals

To control damage by farm animals, to lessen water waste, and for the convenience of operation and maintenance, pipeline canal is planned.

A too big diameter pipe is not practical. Therefore, 2 sets of pipes with equal disc harge are to be used. For easy installation and low cost, corrugated pipes are to be used.

Table A-2, 2-a Length and Standard Crossection of Main Canal

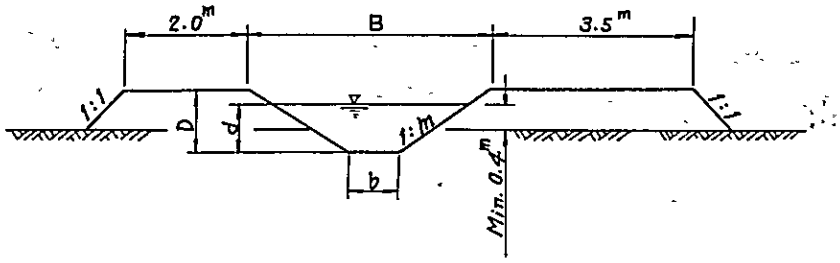
| Section | Area under its supply | Area under its direct supply | Length | Discharge | Hydranlic Gradient | Structure | D |
|---|---|---|---|---|---|---|---|
| | ha | ha | m | $m^3$/sec | | | mm |
| Starting point -- (M1) | 1,080 | 30 | 1,400 | 4.52 | 1/3,500 | Corugated pipe 2 | 2,250 |
| (M1) -- (M2) | 775 | | 800 | 3.28 | " | " | 2,000 |
| (M2) -- (M3) | 720 | | 1,150 | 3.06 | " | " | 1,900 |
| (M3) -- (M4) | 580 | | 1,000 | 2.49 | " | " | 1,800 |
| (M4) -- (M5) | 489 | | 1,050 | 2.12 | " | " | 1,600 |
| Sum | | 30 | 5,400 | | | | |




Standard Crossection of Main Canal

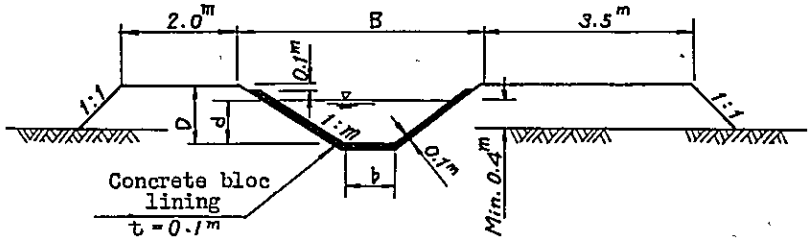
Table A-2. 2-b Length & Standard Crossection of Lateral

| Name | Area (ha) Under its Supply | Area (ha) Under its Direct Supply | Length | Discharge $m^3$/sec | Canal Gradient | Cross Section 1st Stage | Cross Section 2nd Stage |
|---|---|---|---|---|---|---|---|
| L-1 | 274 | 274 | 6,600 | | | | |
| M1-1a | 274 | | 190 | 1.12 | 1/1000 | III | 3 |
| 1a-1b | 202 | | 750 | 0.83 | " | " | " |
| 1b-1c | 84 | | 860 | 0.35 | " | II | 2 |
| 1-A | 37 | 37 | 700 | 0.15 | " | I | 1 |
| 1-B | 35 | 35 | 700 | 0.14 | " | " | " |
| 1-C | 56 | 56 | 850 | 0.23 | " | II | 2 |
| 1-D | 62 | 62 | 1,300 | 0.25 | " | " | " |
| 1-E | 34 | 34 | 350 | 0.14 | " | I | 1 |
| 1-F | 50 | 50 | 900 | 0.21 | " | II | 2 |
| L-2 | 55 | 55 | 1,100 | 0.22 | 1/1000 | II | 2 |
| L-3 | 140 | 140 | 1,650 | 0.57 | " | III | 3 |
| L-4 | 91 | 91 | 1,400 | 0.37 | " | II | 2 |
| L-5 | 68 | 68 | 1,100 | 0.28 | " | " | " |
| L-6 | 408 | 408 | 9,250 | | | | |
| M3-6a | 408 | | 540 | 1.77 | 1/500 | III | 3 |
| 6a-6b | 385 | | 360 | 1.66 | " | " | " |
| 6b-6c | 285 | | 140 | 1.25 | " | " | " |
| 6c-6d | 267 | | 470 | 1.16 | " | " | " |
| 6d-6e | 236 | | 270 | 1.01 | " | " | " |
| 6e-6f | 175 | 43 | 670 | 0.71 | 1/1000 | " | " |
| 6-A | 23 | 23 | 650 | 0.11 | " | I | 1 |
| 6-B | 100 | 100 | 1,600 | 0.41 | " | II | 2 |
| 6-C | 18 | 18 | 500 | 0.09 | " | I | 1 |
| 6-D | 31 | 31 | 650 | 0.15 | " | " | " |
| 6-E | 61 | 61 | 900 | 0.30 | " | II | 2 |
| 6-F | 59 | 59 | 900 | 0.24 | " | " | " |
| 6-G | 73 | 73 | 1,600 | 0.30 | " | " | " |
| L-7 | 13 | 13 | 800 | 0.07 | 1/1000 | I | 1 |
| Total | | 1,049 | 21,900 | | | | |




Standard Crossection of Lateral
(1st Stage)

| Cross-section | B | b | D | d | m |
|---|---|---|---|---|---|
| | m | m | m | m | |
| I | 1.60 | 0.40 | 0.60 | 0.40 | 1.0 |
| II | 2.20 | 0.60 | 0.80 | 0.60 | 1.0 |
| III | 3.80 | 0.80 | 1.00 | 0.80 | 1.5 |




Standard Crossection of Lateral
(2nd Stage)

| Cross-section | B | b | D | d | m |
|---|---|---|---|---|---|
| | m | m | m | m | |
| I | 1.60 | 0.30 | 0.50 | 0.30 | 1.0 |
| II | 2.20 | 0.50 | 0.70 | 0.50 | 1.0 |
| III | 3.80 | 0.70 | 1.00 | 0.70 | 1.5 |

Laterals

In the first stage, canals supplying irrigation water to the lowland paddy fields are not to be lined. In the second stage, the canals are to be lined with concrete blocks. The top of either banking along lateral canals is widened to have a 3.5 m. width and is to be used for maintenance work of the canals and agricultural purposes.

Accessory Facilities

Water diversion devices are planned on 14 sites. The method for water diversion, a human operated gate or valve is to be used. To facilitate cultivation and maintenance of canals, a pipe culvert for road is to be laid across laterals every 200m. The width of the road is to be 3.5 m.

2. 2. 2 Drainage Facilities

Creeks conventionally used in the district are to be used as the main drainage Canals, to which drainage lateralls are connected to form a drainage network.

Crossection and the s treamlining of conventional creeks are to be improved for better drainage capacity. A network of drainage canals is shown in chart A-2. 2-c and a standard cross section of the drainage canal is in table A-2. 2-C.

In this district, drainage within the district is managed by existing creeks. Therefore, construction of drainage facilities is to be conducted in the second stage.

2. 2. 3 Farm Road

The top of the banking of irrigation canal is utilized for roads that will lead to the national and municipal highways. In addition, a communication road of 3 km. in total length is planned to combine major canal roads. The width of the proposed road is 3.5 m. and road is to be completed during the first stage.

2. 2. 4 Land preparation for paddy field

About 200 ha. of land is presently used as upland fields, and grass land is to be leveled and provided with borders and used as paddy field.

2. 2. 5 Land Readjustment

Considering the future farming plan, landholding pattern, the size of cultivation by the farmers of the district, efficiency of mechanized agricultural labor, geographical conditions, water use conditions including irrigation and drainage operation, and process of land development, the layout and structure of the standard farm lot (200 m. x 50 m.) and standard parcel (200 m x 400 m.), fecder road, farm road, lateral and sub-lateral canals and drainage canals are planned as shown in chart A-2. 2-d.

The plan is standard and its uniform application is of course not expected.

Division and exchange of land is required in implementing land readjustment as planned. However, this is a very difficult task. It should be noted also that implementation of the plan thinking only for the future benefit without giving due regard to the present condition is too far sighted an investment and would bring loss. Consequently overall land readjustment is to be carried out in the second stage.

Fig A－2·2－C

排　水　組　織

Drainage Canal System

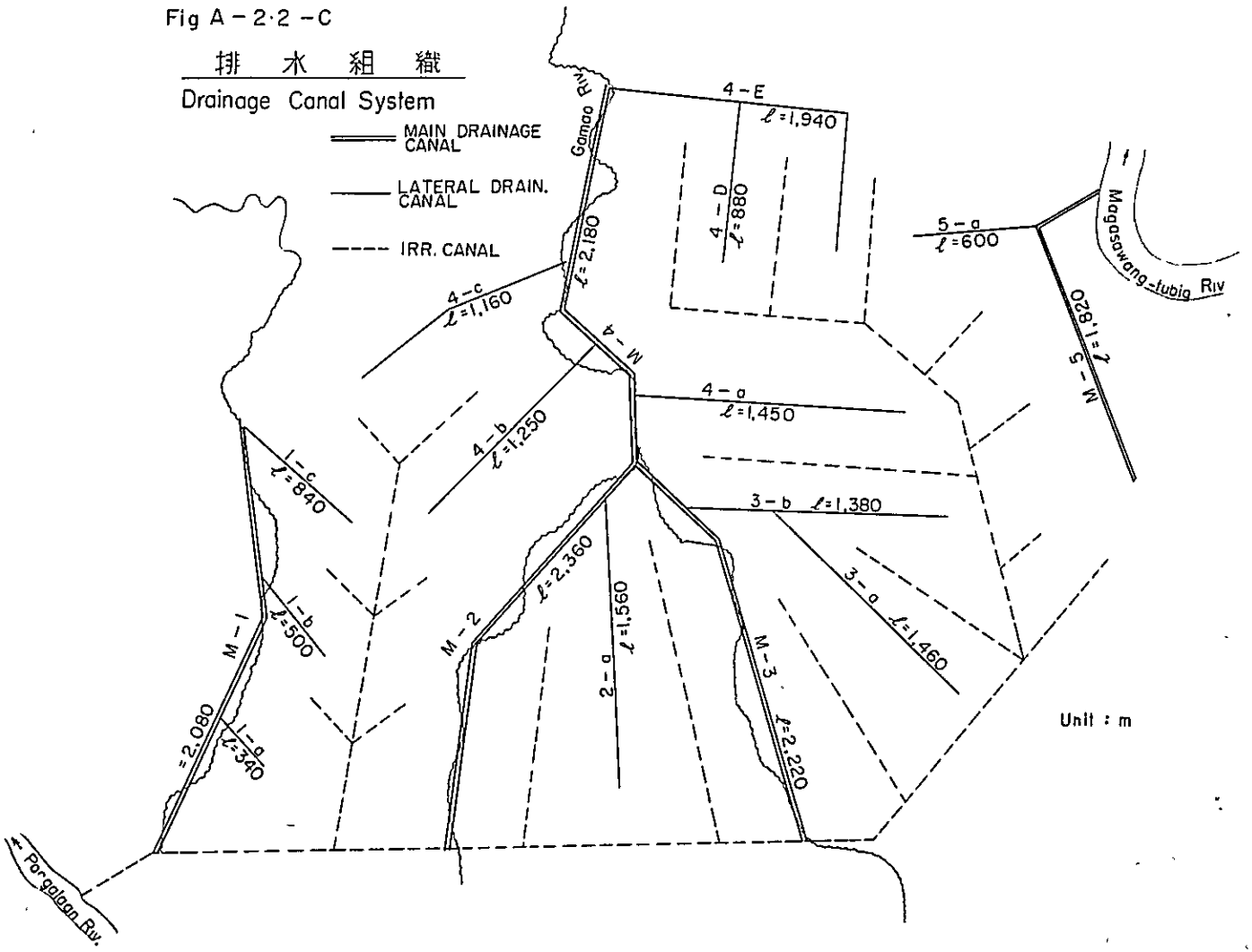
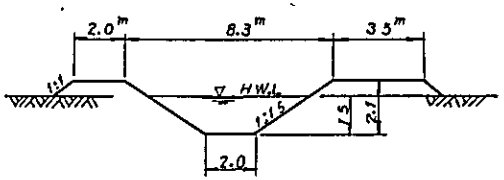
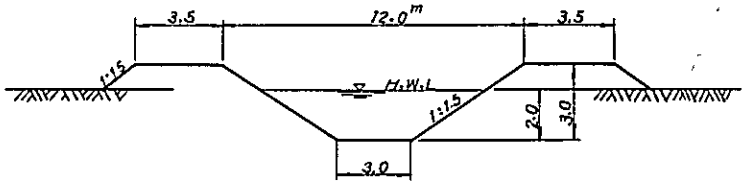


Table A-2. 2-C. Length and Standard Cross Section of The Drainage Canal

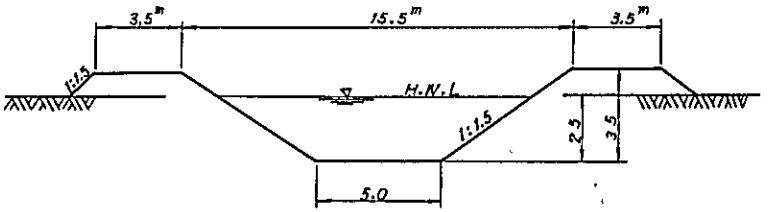
| Name | Length | Gradient | Structure | Crossection type |
|---|---|---|---|---|
| M-1 | 2,080 | 1/500 | Earth Canal | II |
| 1-a | 340 | 1/1000 | " | I |
| 1-b | 500 | " | " | " |
| 1-c | 840 | " | " | " |
| M-2 | 2,360 | 1/500 | Earth Canal | III |
| 2-a | 1,560 | 1/1000 | " | I |
| M-3 | 2,220 | 1/500 | Earth Canal | II |
| 3-a | 1,460 | 1/1000 | " | I |
| 3-b | 1,380 | " | " | " |
| M-4 | 2,180 | 1/500 | Earth Canal | IV |
| 4-a | 1,450 | 1/1000 | " | I |
| 4-b | 1,250 | " | " | " |
| 4-c | 1,160 | " | " | " |
| 4-d | 880 | " | " | " |
| 4-e | 1,940 | " | " | " |
| M-5 | 1,820 | 1/500 | Earth Canal | II |
| 5-a | 600 | 1/1000 | " | I |
| Main Drainage C. Total | 10,660 | | | |
| Lateral Drainage C. Total | 13,360 | | | |
| Total | 24,020 | | | |




Type I Section




Type II Section




Type III Section

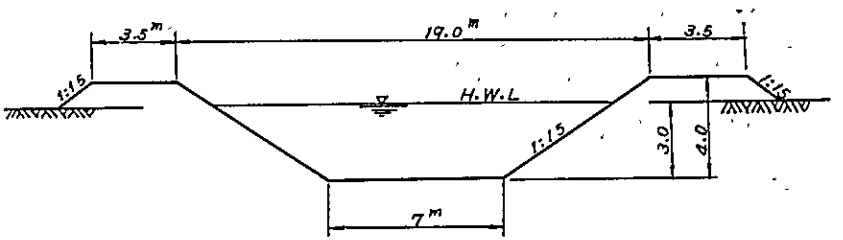
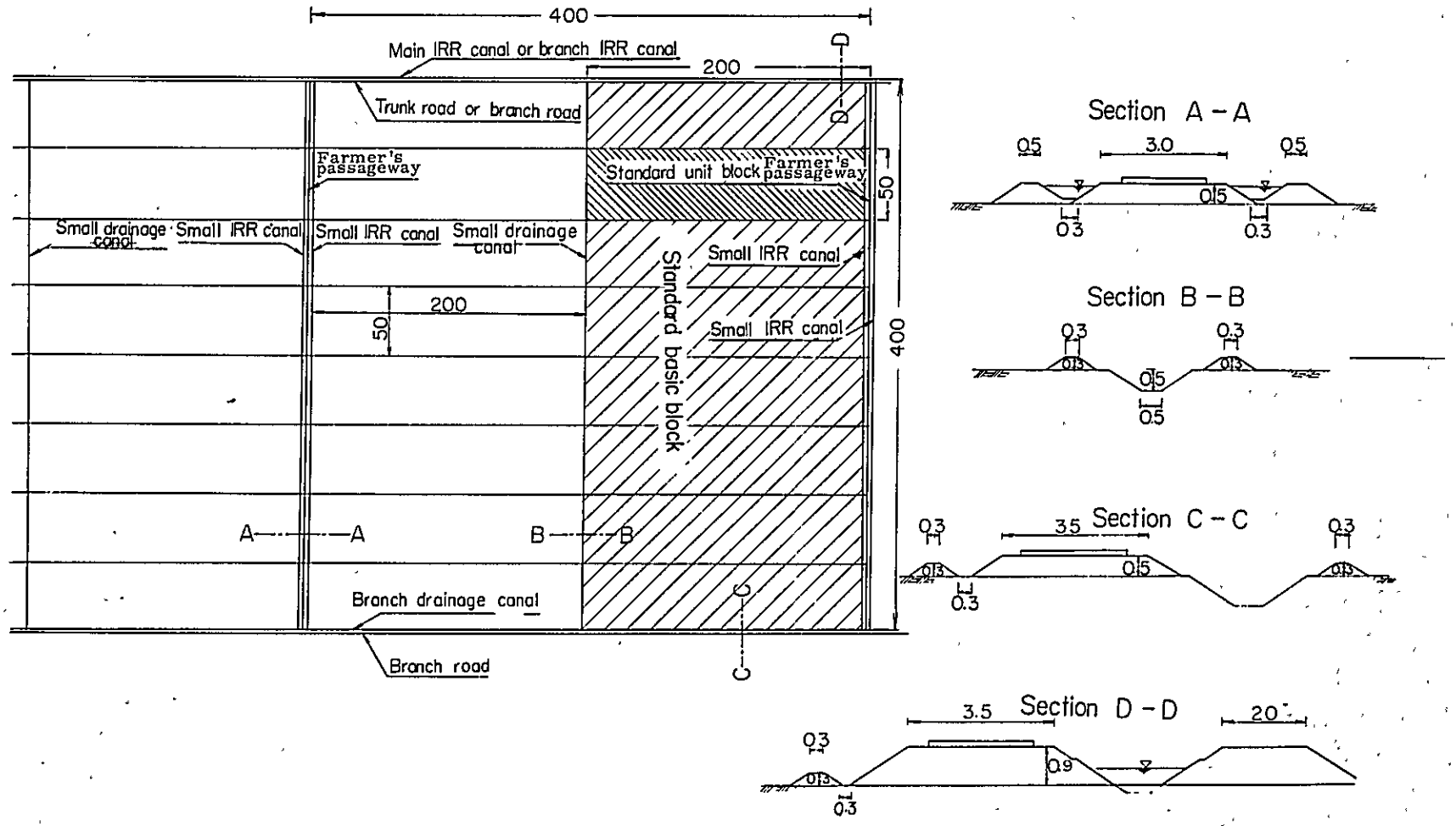


Fig. A-2-2-d Rice field arrangement standard drawing (MINDORO)



About 900 ha. of land presently are used as lowland paddyfields, though the land is not ideal in terms of land-plotting, area and bordering, it can be used in irrigation farming, which is the immediate purpose. In view of difficulties concerning division and exchange of land, the land is to be kept as such as in the first stage.

2. 2. 6 Rice Center

The Construction of irrigation systems enables stabilized double-cropping. However, it is impossible to set the harvesting of both during dry season. Increased rice production, high temperature and humidity of the region necessitates quick drying of the paddy, otherwise the paddy will be deteriorated or degraded.

Moreover, in view of the selling of rice at its optimum period as well as improvement of its quality, facilities for drying, threshing and storing of the paddy are required.

The size of the facilities should be commensurate with the amount of rice to be produced, facilities are to be built up in line with production increase on the basis of the production plan explained in 2.3 concerning the farming plan. The outline of planned facilities are as in table A-2.2-d, A-2. 2-e.

According to our calculation, process charge for 1 cavan paddy is 1.6 ₱ when the interest rate for facility construction is 5%, and is 1.8 ₱ when the interest rate is 8%.

Table A-2.2-d Production quantities & Sales amount of Paddy
(Cavan)

| phase 1 | 1st Crop | 2nd Crop | Total | Remarks |
|---|---|---|---|---|
| Productions | (2,200 ton)<br>49,140 | (2,200 ton)<br>49,140 | (4,400 ton)<br>98,280 | |
| Consumptions | 7,080 | 7,080 | 14,160 | Seed & Food |
| Sales quantity | (1,850 ton)<br>42,060 | (1,850 ton)<br>42,060 | (3,700 ton)<br>84,120 | |

| phase 2 | 1st Crop | 2nd Crop | Total | Remarks |
|---|---|---|---|---|
| Productions | (3,800 ton)<br>86,400 | (4,300 ton)<br>97,200 | (8,100 ton)<br>183,600 | |
| Consumption | 7,080 | 7,080 | 14,160 | Seed & Food |
| Sales quantity | (3,500 ton)<br>79,320 | (4,000 ton)<br>90,120 | (7,500 ton)<br>169,440 | |

Table A-2. 2-e

| | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sept. | Oct. | Nov. | Dec. | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harvesting | | | Mar.10 | 2nd Crop 75 days (90 days) | May 25 | Jun.10 | | | Sep.10 | 1st Crop 90 days | | Dec. 10 | |
| Drying | | | | 75 days (90 days) | | | | | | 90 days | | | |
| Milling | | | | | 175 days | (Max.) | | | | | 175 days | (Max.) | |
| Storing | | | | | 175 days | (Max.) | | | | | 175 days | (Max.) | |
| Shipping | | | | | 175 days | (Max.) | | | | | 175 days | (Max.) | |

Basic Specifications

| | Phase 1 | Phase 2 |
|---|---|---|
| 1. Amount of crop paddy received | 2,200 ton (14% Dry paddy) | 4,300 ton (14% Dry paddy) |
| 2. Receiving Period (Actual receiving duration) | During 90 days<br>60 days | 75 - 90 days<br>60 days |
| 3. Amount of paddy received | 37 ton/day | 72 ton/day |
| 4. Number of varieties received | 3 | 3 |
| 5. Drying | Moisture content in paddy 24%-14% within 24 hrs. | Same as phase |
| 6. Milling | 3 ton/hr. about 100 days | 5 ton/hr. about 100 days |
| 7. Amount stored | about 70% of 1,900 ton (Dry paddy) | about 70% of 4,000 ton (Dry paddy) after the subtraction of the producer's consumption |
| 8. Type of storing | Packed milled rice or paddy | Same as phase 1 |
| 9. Shipping period hing | Sept. 15 - Mar. 10 within 175 days | Mar. 15 - Sept. 10 |
| 10. Type of shipment | Packed milled rice | Same as phase 1 |

A. 2. 3 Farming Program

2. 3. 1 Plan for Land Utilization

The total area of the land in the district, except a portion planted with permanent crops, is to be utilized as lowland paddy fields with irrigation systems, the area includes 20 ha. of land presently used as pasture. As the productivity of the pasture is so low that it could be converted into a paddy field without causing much inconvenience to the community.

Table A-2, 3-a Land Use Plan (Area Under Cultivation)

| Kind of Field | At present | | Planned | |
|---|---|---|---|---|
| Lowland paddy field | 1,000 ha. | (900 ha.) | 1,080 ha. | (1080 ha.) |
| Upland field | 180 | (160) | | |
| Grass land | 20 | (20) | 120 | |
| River side sandy land | | | 120 | |
| Total | 1,200 | (1080) | 1,200 | (1080) |

Figure in parenthesis is the area actually planted.

Acreage under actual cultivation was calculated on the estimation that 90% of arable land is actually cultivated, on the basis of the 1960 census result reporting on average of 10% of arable land is lying idle.

The planned acreage for lowland paddys field is 10% smaller than the present acreage of arable land, allowing 10% for canals and roads. A breakdown of proportional ratio of the arable land by crops is projected on the basis of field work result:

2. 3. 2 Production Plan

(a) Cropping Pattern

Double cropping of lowland paddy is planned for the whole area under the irrigation plan. Cropping periods were decided after considering the following conditions.

1. Earing of paddy should not fall in the month of November which is typhoon season.

2. Harvesting in the period during many rainy days shall be avoided as much as possible.

3. A radical change from cropping periods conventionally practised would cause contingencies such as a concentration of insect and blight damages, therefore should be aboided.

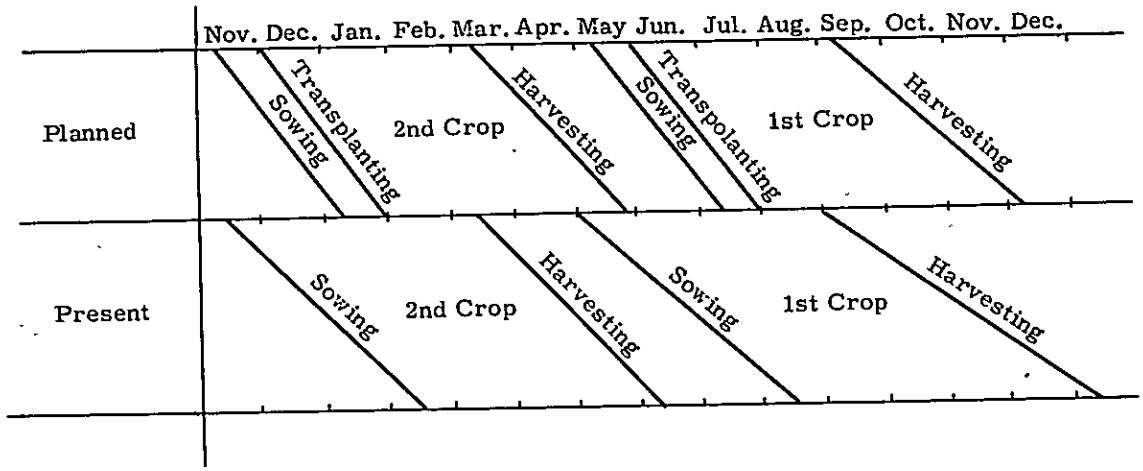
The duration required for growth of different cropping periods:

| | |
|---|---|
| 1st cropping | 120 - 150 days |
| 2nd cropping | 120 - 140 days |

Period of irrigation the following should be taken into consideration. For a certain period of time (5 years after the completion of construction work), ploughing should be started as soon as the seeds in the nursery are sown, and be repeated once every other week 3 times (the working method presently used can be followed.) for weed control. However, as pumps are used for irrigation, for economical operation of the machines, irrigation should be started as soon as possible, that is, before transplanting paddies. For this reason, application of weedicide should be considered, though continuous use of land by double cropping would prevent weeds from thriving.

The terminating period of irrig ation, water is to be drawn back a little bit earlier, during 25 - 30 days before havesting. This is to economize the operational cost of pumps. It is most desirable, therefore, that irrigation is continued up to 2 - 3 weeks before harvesting.

Table A-2. 3-b Cropping Pattern




(b) Cultural Method

Variety .. Varieties that give yield as high as 4-5 ton/ha. without large production cost, recomended varieties such as BPI-76-1 etc, are selected to be used.

After achieving the yield goal of 4-5 ton ha. (90 - 101 cav/ha.) using these varieties, high-yielding varieties such as IR-8 are to be introduced for attainment of a yield goal of 6 ton/ha. (136 cav/ha.) and over. Fertilizer. Considering the result of surves as well as appendix, the following was desided. For San Manuel Sandy loam and San Manuel loam, however, additional amount of fertilizer or its application for a number of times should be considered on account of sandy soil.

| | | |
|---|---|---|
| Base Fertilizer | N | 35 kg. /ha. |
| | $P_2O_5$ | 20 - 30 |
| | $K_2O$ | 20 - 30 |
| Fertilizer for Head dressing | N | 25 |

Agricultural Chemical

Agricultural Chemicals.... In order to secure increased yield caused by fertilizer application, insect and pest control become indispensable. Sufficient use of agricultural chemicals are required to meet this end.

Table A.2.3-C Plan for Agricultural Chemical Use

| Name of Chemical | Amount Spread | Insector Blight | Period of Application |
|---|---|---|---|
| BHC-r | 2 kg/ha | Stem barer | 20-30 days after transplanting |
| BHC-r | 3 kg/ha | Stem barer | 50-60 days after transplanting |
| Sevin | 2 kg/ha | Leaf Hopper | 7-10 days after transplanting |

Farm Labors straight row planting and dense planting are exercised along with the introduction of hand-operated weeders. The Buffalo plough, which is the most common means of ploughing. is to be used for a certain period after construction, but in the future mechanization in ploughing. leveling. harvesting and threshing is to be used as much as possible.

(c) Target Yield

As I have mentioned in relation to rice productivity. the result of the yield survey in the district shows clear possibility of achieving a yield over 4 ton/ha. by introduction of improved varieties as well as the application of fertilizer and agricultural chemicals. The subjects of the survey were, however, without exception upper strata farmers. And before bringing the yield standard of the local farmers as a whole up to the level of 4 ton/ha., there are many difficult problems, such as supply of production material and financing of capital, to be overcome.

Considering the above points, the yield goal with the use of nitrogen as much as 60 kg. /ha. is 4 ton/ha (90 cav/ha.) - as in phase 2. The above problems should be solved within 5 years of the completion of the first stage of construction work. During that period, the yield about a half of the former 2 ton/ha. (45 cav/ha.) - phase 1 - is the aim.

Due to an insufficient number of dry days and bad weather such as typhoons during the growing period. During regular season the yield is less than that of the Palagad season is the goal. In short, during phase 1 (5 years after the completion of construction work) the total yield of a paddy for 1 year on a double cropping basis is 4.0 ton/ha. while that in phase 2 is 7.5 ton/ha.

(b) Table Output

Table A - 2.3 - d. Rice Output

( ton )

| | Planted area (ha) | | Yield (ton/ha) | | | Production (ton) | | | Increased production | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Present | Phase 1 & 2 | Present | Phase 1 | Phase 2 | Present | Phase 1 | Phase 2 | Phase 1 | Phase 2 |
| Palay Lowland Regular | 900 | 1,080 | 1.34 | 200 | 3.50 | 1,206 | 2,160 | 3,780 | 954 | 2,574 |
| " Palaged | 540 | 1,080 | 1.44 | 200 | 4.00 | 778 | 2,160 | 4,320 | 1,382 | 3,542 |
| Up land | 171 | | 0.70 | | | 120 | | | 120 | 120 |

Basis of Calculation

1. Low land palagad palay - planted area ..... Low land Regular palay 60% report on the preliminary study and selection sites for Rice Production Centers in Oriental Mindoro - Phillipine RCPCC
2. Upland palay - planted area ..... As the upland crops other else than palay, such as corn, are smaller in proportion palay was used as representative, in calculation. On the basis of census Naujan 1960, the ratio of the gross area of upland planted was calculated using the equation below and was multiplied by the area of upland.

$$\text{Upland} = \frac{\text{Planted Area of Uplandpalay, Corn and Abaca}}{\text{Planted Area of Temporary Crops-Planted Area of Lowland 1st palay}}$$

$$= \frac{1,429+147+2}{10,071 - 8,595} = 1.07$$

3. Present yield ..... 3 year (1964 - 1966) average (DANR) in Southern Tagaloy Region

2. 3. 3 Agricultural Product in MonetaryTable

(a) Production Cost of Rice

According to the plan, the production cost of rice increases due to intensive labor in field plot, fertilizer application, insect and pest control. Production cost per ha. for one crop is estimated as 480 P (123 U.S.$) in phase 1, and 840 P (215 U.S.$) in phase 2. Labor, 110 man days and 33 days of abimal labor in phase 1, and 123 man days and 35 days of cattle labor in phase 2 (Attached Document E-12-a) are needed.

The present production cost for lowland crop is estimated as 395 P (101 U.S.$). Therefore, an increase in production cost is 85 P in Phase 1, while in Phase 2 it is 445 P. (However, the production cost is not inclusive of water charge. See Appendix for Details)

Total production cost required for thr project district is as follows:

| Present | Acreage under cultivation | Production cost | Total production cost |
|---|---|---|---|
| Lowland 1st crop | 900 ha. | 395 per ha. | 355, 500 |
| Lowland 2nd crop | 540 | 395 | 233, 300 |
| Upland crop | 171 | 245 | 41, 895 |
| TOTAL | | | 630, 695 |
| | | | (161, 717) U.S.$ |
| Planned (Phase 1) | | | |
| Lowland 1st crop | 1,080 | 480 | 518, 400 |
| Lowland 2nd crop | 1, 080 | 480 | 518, 400 |
| TOTAL | | | 1. 036, 800 |
| | | | (265, 846) |
| Planned (phase 2) | | | |
| Lowland 1st crop | 1, 080 | 840 | 907, 200 |
| Lowland 2nd crop | 1, 080 | 840 | 907, 200 |
| TOTAL | | | 1. 814, 400 |
| | | | (465, 230) |

(b) Gross Product Value of Rice

Total output of rice in the project district is estimated to be 47, 720 Cavan as at present, (2, 100 ton) and 98, 240 cavan (4. 320) ton in Phase 1 and 183, 600 cavan (8, 100 ton) in Phase 2. The set price of unhulled rice as 16 P (4. 1 U.S.$) per cavan and gross product value was calculated as follows.

| Present | Output cavan | Price of Rice per cavan P | Gross Product Value |
|---|---|---|---|
| lowland 1st crop | 27,450 | 16.00 | 439,200 P |
| lowland 2nd crop | 17,550 | 16.00 | 280,800 |
| upland crop | 2,719 | 16.00 | 43,504 |
| TOTAL | 47,719 | | 763,504 |
| | | | (195.770 U.S.$) |
| Planned (Phase 1) | | | |
| lowland 1st crop | 49,120 | 16.00 | 785,920 |
| lowland 2nd crop | 49,120 | 16.00 | 785.920 |
| Total | 98,240 | | 1,571,840 |
| Planned (Phase 2) | | | (403.040) |
| lowland 1st crop | 86.400 | 16.00 | 1,382.400 |
| lowland 2nd crop | 97.200 | 16.00 | 1,555.200 |
| TOTAL | 183,600 | | 2,937,600 |
| | | | (753.230) |

(c) Net Profit of Rice

According to the plan, yearly an increase of net Profit is as in the following 402,231 P (103,137 U.S.$) in the phase 1, and 990,391 P (253,943 U.S.$), setting present as standard.

| | Gross Product | Production Cost | Net Profit | U.S.$ |
|---|---|---|---|---|
| Present | 763,504 | 630,695 | 132,890 | (34,053) |
| Planned | | | | |
| Phase 1 | 1,571,840 | 1,036,800 | 535,040 | ( 137,190) |
| Phase 2 | 2,937,600 | 1,814,400 | 1,123,200 | ( 288.000) |
| Increase in Money | | | | |
| Present | | | | |
| Phase 1 | 808,336 | 406,105 | 402,231 | (103.137) |
| Phase 2 | 2,174,096 | 1,183,705 | 990,391 | (253.947) |

2. 3. 4. Extension Service

Even after the completion of the irrigation system, if the same techniques are employed, the same variety of paddy, cultivation method, fertilizing, and measures against insect and blight that are conventionally used are followed, high yield cannot be expected. Consequently, the district cannot fulfill its planned role as the rice production center.

Experimental research institutes of the Philippines have already achieved a high level of experiment as result, while some quarters of the upper strata farmers have adopted advanced techniques and are producing a high yield, as mentioned before. Such movements imply that advanced techniques can be successfully extended and accepted, when local agricultural technique consultants are capable enough and conditions on the part of recipient farmers are ripe enough. Therefore, the significant aim of the rice production center proposed here is to introduce advanced agricultural techniques not only to special quarters of farmers but to all strata of the farmers. To fulfill this aim, therefore, extension of production techniques, readjustment of environment for production, and development of farmers' organizations were planned.

To realize the plan, intensive guidance by agricultural experts (for example, experts working for BPI and APC) should be institutionalized. The contents of guidance given to farmers in Rice Production Centers are as varied as follows.

1. Guidance on advanced production technique
2. Guidance on readjustment of environment for production
3. Guidance on maintenance and operation techniques of land improvement facilities
4. Guidance on the establishment of the farmers' organizations

Out of the above production technique and the farmer's organization are elaborated below.

(a) Extension and Guidance of Advanced Production Techniques

A farming household is selected for every Barrio to give intensive and thorough guidance on production techniques, and all the farmers of the Barrio are to meet regularly in the paddy field of the intensive guidance subject farmer to receive guidance from experts.

Meanwhile, a demonstration field is set aside within the district for demonstration of the following items.

1. Demonstration of fertilizing effect
2. Demonstration of agricultural chemical effect
3. Demonstration of varieties

For these purposes, a demonstration field of about 2 ha. is required along with the necessary agricultural tools and machines and a business office and a work shop.

(b) The Farmers' Organization

The rice production increase is promoted most when required measures are taken and implemented systematically.

In the Rice Production Center planned here, along with the establishment of the irrigation system, a farmers' organization should be formed to extend new production techniques, to secure farming funds, and to store and sell agricultural products.

As the above functions are supposed to be fulfilled sufficiently by FACOMA of which formation is underway throughout the country, the FACOMA branch for the Rice Production Center district only, should be considered.

Maintenance and operation of irrigation facilities after the major diversion points and water control at field level should be taken up by FACOMA in view of preventing duplication of similar organizations and streamlining the movement.

A. 2. 4. Operation and Maintenance

2. 4. 1. Organization for Operation and Maintenance

Operation and maintenance of the irrigation systems are under the operation and maintenance organization consisting of the government agency in the locality and the beneficiaries.

The government agency stationed there is in charge of operation and maintenance of principal facilities as well as of water control at major diversion points.

Beneficiaries are to form a body in charge of operation and maintenance of irrigation facilities at field level as well as of water control after the major diversion points.

A coordinating agency is to be organized by the delegates of both bodies for smoothe communication between the two and for the better operation of the system.

The government agency stationed there is organized in line with the present NIA plan. As a large scale pumping station is planned for the district, experts for handling the pumps should be secured.

2. 4. 2. Water Charge

Expenses required for operation and maintenance of the facilities are in principle levied on the beneficiaries of the irrigation system.

Required expenses for the district would vary as operation hours of the pump vary. The result of the examination on various factors such as precipitation in the past, the the figure of 140,000 P (35,897 U.S.$) per year inclusive of fuel expences, personnel expenses and repairment expenses for canals was estimated. This is equivalent to 130 P (33.3 U.S.$) per ha. for 2 crops. (For further detail, see Appendix E-13)

A. 3. Cost Estimation

A. 3. 1. The Method of Estimation

The cost of the project was estimated, considering estimated construction cost on the basis of standard crosssection chart, structure frame chart, and assumed ground height' referring to an example of cost estimation by the National Irrigation Project of the Philippines as well as Japanese examples. The unit price, wage and unit price of supplies and materials in the Philippines. The following are prerequisities for cost estimation.

(1) The period of construction is divided into two, Phase 1 & 2, respectively for 2 years.

(2) The construction work is carry out by contract

(3) Heavy equipments are to be employed for civil works

(4) Facilities for agricultural extension service are to be established in parallel with the first stage civil works.

(5) In parallel with the first stage construction, the rice center. facilities about a half of the scale at the time of completion is to be constructed and shall be expanded, as required, to achieve the planned scale and function within 5 years of completion of the first stage of

A. 3. 2 Estimated Construction Cost

3. 2. 1 Total Construction Cost

Table A-3. 2-a

| | Phase 1 | | Phase 2 | | Total | |
|---|---|---|---|---|---|---|
| Items | ₱ | $ | ₱ | $ | ₱ | $ |
| Civil Works | 6,900,000 | 1,769,200 | 5,500,000 | 1,410,300 | 12,400,000 | 3,179,500 |
| Extension Service Facilities | 200,000 | 51,300 | 0 | 0 | 200,000 | 51,300 |
| a sum | 7,100,000 | 1,820,500 | 5,500,000 | 1,410,300 | 12,600,000 | 3,230,800 |
| Rice Center | 1,300,000 | 333,300 | 0 | 0 | 1,300,000 | 333,300 |
| TOTAL | 8,400,000 | 2,153,800 | 5,500,000 | 1,410,300 | 13,900,000 | 3,564,100 |

Convertion rate : 1 $ = 3.9 ₱

The breakdown of the total Construction Cost is as in the table A-3.2-b

Table A-3. 2-b Breakdown of Total Construction Cost

| Item | Phase 1 | | | | |
|---|---|---|---|---|---|
| A. Civil Works | Scale | Capacity | ₱ | Equivalent U.S.$. |
| 1. pumping facility | | | 6,900,000 | 1,769,200 |
| pumping station | $16_m \times 13_m$ Iron frame steel. Intake & Sedimentation basin | | 1,356,000<br>526,000 | 347,700<br>134,900 |
| pump | 700 m/m $220P_S$ 4 units Q max 4.52 $m^3$/sec | | 830,000 | 212,800 |
| 2. Irrigation Canals | | 27,300 | 4,310,000 | 1,105,100 |
| main canal | Q max 4.52 - 2.49 $m^3$/sec 2 steel pipes | 5,400 m | 3,379,000 | 866,000 |
| lateral | unlined earth canal | 21,900m | 876,000 | 224,600 |
| accessories | diversion devices 14 spots crossing pipes 110 | | 55,000 | 14,100 |
| 3. Drainage Canals | | | 0 | 0 |
| main drainage | | | 0 | 0 |
| lateral | | | 0 | 0 |
| accessories | | | 0 | 0 |
| 4. Farm road | | | 100,000 | 25,600 |
| communication road | width of 3.5m | 3,000m | 60,000 | 15,400 |
| accessories | creek crossing b ridge | | 40,000 | 10,200 |
| 5. Land preporation for paddy field | | 200 ha. | 100,000 | 25,600 |
| 6. Land Readjustment | bordering of upland | | 0 | 0 |
| 7. Componsation payment | | | 63,000 | 16,100 |
| irrigation canal | | 20 ha | 60,000 | 15,300 |
| drainage canal | | | 0 | 0 |
| road | | 1 ha | 3,000 | 800 |
| 8. Supervising | period of 2 years | | 415,000 | 106,400 |
| barracks | business office 1 block warehouse 1 block | $300m^2$ | 90,000 | 23,100 |
| automobiles | | 2 | 25,000 | 6,400 |
| supervising | 5% of (1+2+3+4+5+6+7) | | 300,000 | 76,900 |
| 9. Contingencies | about 10% of (1-6) | | 556,000 | 142,700 |
| B Extension Service Facility | | | 200,000 | 51,300 |
| Business office | 1 block | $100m^2$ | 30,000 | 7,700 |
| Garage and warehouse | 1 block | 200 | 40,000 | 10,200 |
| Office and employee's housing utilities | 3 blocks | 300 | 120,000 | 30,800 |
| Water supply | | | 10,000 | 2,600 |
| C Rice Center | | | 1,300,000 | 333,300 |
| Drying Facility | 4t/day x 18 | | 440,000 | 112,800 |
| Storing | $1000m^2$ | | 330,000 | 84,600 |
| Milling | 3t/hr, 2t/hr each one | | 260,000 | 66,700 |
| Building | $800m^2$ | | 270,000 | 69,200 |
| TOTAL PROJECT COST | | | 8,400,000 | 2,153,800 |

| Scale | Capacity | Phase 2 ₱ | Phase 2 Equivalent U.S. $. | TOTAL ₱ | TOTAL Equivalent U.S. $ |
|---|---|---|---|---|---|
| | | 5,500,000 | 1,410,300 | 12,400,000 | 3,179,500 |
| | | 0 | 0 | 1,356,000 | 347,700 |
| | | 0 | 0 | 526,000 | 134,900 |
| | | 0 | 0 | 830,000 | 212,800 |
| | | 1,422,000 | 364,600 | 5,732,000 | 1,469,700 |
| | | 0 | 0 | 515,000 | 132,000 |
| | | 0 | 0 | 2,864,000 | 734,400 |
| Concrete lining | 21,900m | 1,422,000 | 364,600 | 2,298,000 | 589,200 |
| | | 0 | 0 | 55,000 | 14,100 |
| | | 1,211,000 | 310,500 | 1,211,000 | 310,500 |
| Farth canal | 12,600m | 775,000 | 198,700 | 775,000 | 198,700 |
| -ditto- | 11,420 | 286,000 | 73,300 | 286,000 | 73,300 |
| Crossing pipes at 170 spots | | 150,000 | 38,500 | 150,000 | 38,500 |
| | | 0 | 0 | 100,000 | 25,600 |
| | | 0 | 0 | 60,000 | 15,400 |
| | | | | 40,000 | 10,200 |
| | | 0 | 0 | 100,000 | 25,600 |
| | 1,080ha | 2,000,000 | 512,800 | 2,000,000 | 512,800 |
| | | 69,000 | 17,700 | 132,000 | 33,800 |
| | | 0 | 0 | 60,000 | 15,300 |
| | 23 | 69,000 | 17,700 | 69,000 | 17,700 |
| | | | | 3,000 | 800 |
| | | 350,000 | 89,800 | 765,000 | 196,200 |
| | $300m^2$ | 90,000 | 23,100 | 180,000 | 46,200 |
| | 2 unit | 25,000 | 6,400 | 50,000 | 12,800 |
| | | 235,000 | 60,300 | 535,000 | 137,200 |
| | | 448,000 | 114,900 | 1,004,900 | 257,600 |
| | | | | 200,000 | 51,300 |
| | | | | 30,000 | 7,700 |
| | | | | 40,000 | 10,200 |
| | | | | 120,000 | 30,800 |
| | | | | 10,000 | 2,600 |
| | | | | 1,300,000 | 333,300 |
| | | | | 440,000 | 112,800 |
| | | | | 330,000 | 84,600 |
| | | | | 260,000 | 66,700 |
| | | | | 270,000 | 69,200 |
| | | 5,500,000 | 1,410,300 | 13,900,000 | 3,564,100 |

Table A-3.2-c A Breakdown of Construction Cost of Rice Center

| | Phase 1 | | | Additional Facility | | | Total (Phase 2) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Scale Capacity | P. | U.S.$ | Scale Capacity | P. | U.S.$ | Scale Capacity | P. | U.S.$ |
| Drying Facility | 4t/day x 9 units | 220,000 | 56,400 | 4t/day x 9 units | 220,000 | 56,400 | 4t/day x 18 units | 440,000 | 112,800 |
| Storing | 500 $m^2$ | 165,000 | 42,300 | 500 $m^2$ | 165,000 | 42,300 | 1,000 $m^2$ | 330,000 | 84,600 |
| Milling | 3t/hr x 1 unit | 150,000 | 38,500 | 2t/hr x 1 unit | 110,000 | 28,200 | 3t/hr x 1, 2t/hr x 1 | 260,000 | 66,700 |
| Building | 500 $m^2$ | 165,000 | 42,300 | 300 $m^2$ | 105,000 | 26,900 | 800 $m^2$ | 270,000 | 69,200 |
| Total | | 700,0000 | 179,500 | | 600,000 | 153,800 | | 1,300,000 | 333,300 |

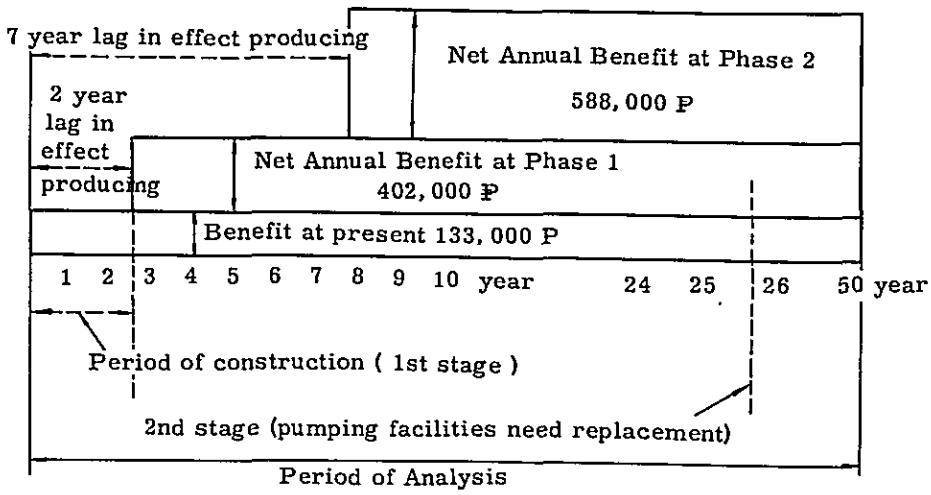
Note. 1. Phase 1 of the construction is to be carvial out parallel with the first stage of civil works.

2. Additional facilities are not to be consrried within a 5 year period after the completion of the first stage of civil works.

A. 4. Economic Analysis

Economically usefulness of the life of major facilities to be constructed under the project, a period of 50 years is estimated for economic analysis and economic efficiency of the project is calculated in terms of benefit/cost ratio, to give the following.

A. 4. 1 Development Schedule




A. 4. 2 Total Cost

Facilities in the district are to be constructed in line with the following schedule.

The 1st stage

Principal Facilities:
- Pumping facilities
- Irrigation Canals ..... laterals are not to be lined
- Road
- Land Readjustment .... leveling and bordering of the land presently used as upland fields.
- Extension service facilities.

Period of Construction: 2 years

The 2nd Stage

Principal Facilities:
- Irrigation Canals ..... Lateral and sublateral canals are to be lined with concrete.
- Drainage canals — Drainage canals.
- Land Readjustment ... for 1,080 ha. of lowland.

Starting Period of Construction: 25 years after the 1st stage is started.

Pump Replacement: Overall replacement of pumping facilities (25 years after the facility construction started )

Expenses required for implementation of the above is as follows.

| | |
|---|---|
| 1st Stage | 7,100,000 ₱ (1,820,500 U.S.$) |
| 2nd Stage | 5,500,000 (1,410,300) |
| Total | 12,600,000 ( 3,230,800) |
| Pump Replacement | 830,000 (212,800) |

Note. The Rice Center Construction, which is a part of the project, is considered not to be in the range of the present economic analysis of production process, being facilities of the distribution process. Therefore, the rice center is to be analysed separately. Cost for drying of husks and temporary storing is normally included in production cost in a farming household. In view of the nature of the above production cost which are generaly required expenses for production, the item was included.

A. 4. 3 Annual Cost

For benefit/cost ratio calculation, depreciation cost of the construction cost given in the above is calculated and maintenance and operation cost is added to give annual cost. Future investments for the 2nd stage constructon and pump replacements are to be discounted at the starting point of the 1st stage of construction work. Interest rate (r) for this as well as interest rate (r) for depreciation are respectively 5%, 6%, 7%, and 8%.

| | $r$ = 5% | | $r$ = 6% | | $r$ = 7% | | $r$ = 8% | |
|---|---|---|---|---|---|---|---|---|
| Constraction | 1,000 ₱ (1.000 U.S.$) | | | | | | | |
| 1st Stage ($7100000₱ \times \frac{r(1+r)^{50}}{(1+r)^{50}-1}$) | 389 | (99.7) | 450 | (115.4) | 514 | (131.8) | 580 | (148.7) |
| 2nd Stage ($5500000₱ \times \frac{1}{(1+r)^{25}} \times \frac{r(1+r)^{50}}{(1+r)^{50}-1}$) | 89 | (22.8) | 81 | (20.8) | 73 | (18.7) | 66 | (16.9) |
| Pump Replacement ($830000₱ \times \frac{1}{(1+r)^{25}} \times \frac{r(1+r)^{50}}{(1+r)^{50}-1}$) | 13 | (3.3) | 12 | (3.1) | 11 | (2.8) | 10 | (2.6) |
| A sum | 491 | (125.9) | 543 | (139.2) | 598 | (153.3) | 656 | (168.2) |
| Operation and Maintenace of Facilities | 140 | (35.9) | 140 | (35.9) | 140 | (35.9) | 140 | (35.9) |
| Total | 631 | (161.8) | 683 | (175.1) | 738 | (189.2) | 796 | (204.1) |

A. 4. 4 Annual Benefit

Benefits obtained from the project is increased by net profit caused by increased rice production (For further detail, see A. 2. 3. 3). If we take the year which the construction work started as the basis of calculation, increased yield is enjoyed with a full of two years

during Phase 1, and of 7 years during Phase 2, the construction period of two years is included.

If we convert this into an average annual benefit throughout the analysis period, it would be as in the following. Calculation of the discount of annual benefit from the stating point of construction is to be done for respective interest rates of 5%, 6%, 7% and 8%.

| | 1.000 p | $5\%=\gamma$ (1,000 U.S.$) | $6\%=\gamma$ | | $7\%=\gamma$ | | $8\%=\gamma$ | |
|---|---|---|---|---|---|---|---|---|
| Phase 1 (2 year lull of effect enjoyment) | 361 | (92.6) | 355 | (91.0) | 349 | (89.5) | 343 | (87.9) |
| $423{,}000₱ \times \sum_{n=3}^{n=50} \frac{1}{(1+\gamma)^n} \Big/ \sum_{n=1}^{n=50} \frac{1}{(1+\gamma)^n}$ | | | | | | | | |
| Phase 2 (7 year lull of effect enjoyment) | 402 | (103.1) | 380 | (97.4) | 358 | (91.8) | 336 | (86.2) |
| $568{,}000₱ \times \sum_{n=8}^{n=50} \frac{1}{(1+\gamma)^n} \Big/ \sum_{n=1}^{n=50} \frac{1}{(1+\gamma)^n}$ | | | | | | | | |
| Total | 763 | (195.7) | 735 | (188.4) | 707 | (181.3) | 699 | (174.1) |

A. 4. 5 Benefit/Cost Ratio

On the basis of annual benefit and annual cost given above, benefit/cost ratio corresponding to interest rate ( ) is calculated as below.

| | $5\%=\gamma$ | | $6\%=\gamma$ | | $7\%=\gamma$ | | $8\%=\gamma$ | |
|---|---|---|---|---|---|---|---|---|
| | ₱1,000 | U.S.$1,000 | ₱1,000 | U.S.$1,000 | ₱1,000 | U.S.$1,000 | ₱1,000 | U.S.$1,000 |
| Annual benefit (A) | 763 | (195.7) | 735 | (188.4) | 707 | (181.3) | 679 | (174.1) |
| Annual cost (B) | 631 | (161.8) | 683 | (175.1) | 738 | (189.2) | 796 | (204.1) |
| Benefit/Cost Ratio (A/B) | 1.21 | | 1.08 | | 0.96 | | 0.85 | |

## III—B San Miguel – Alangalang (Leyte del Norte)

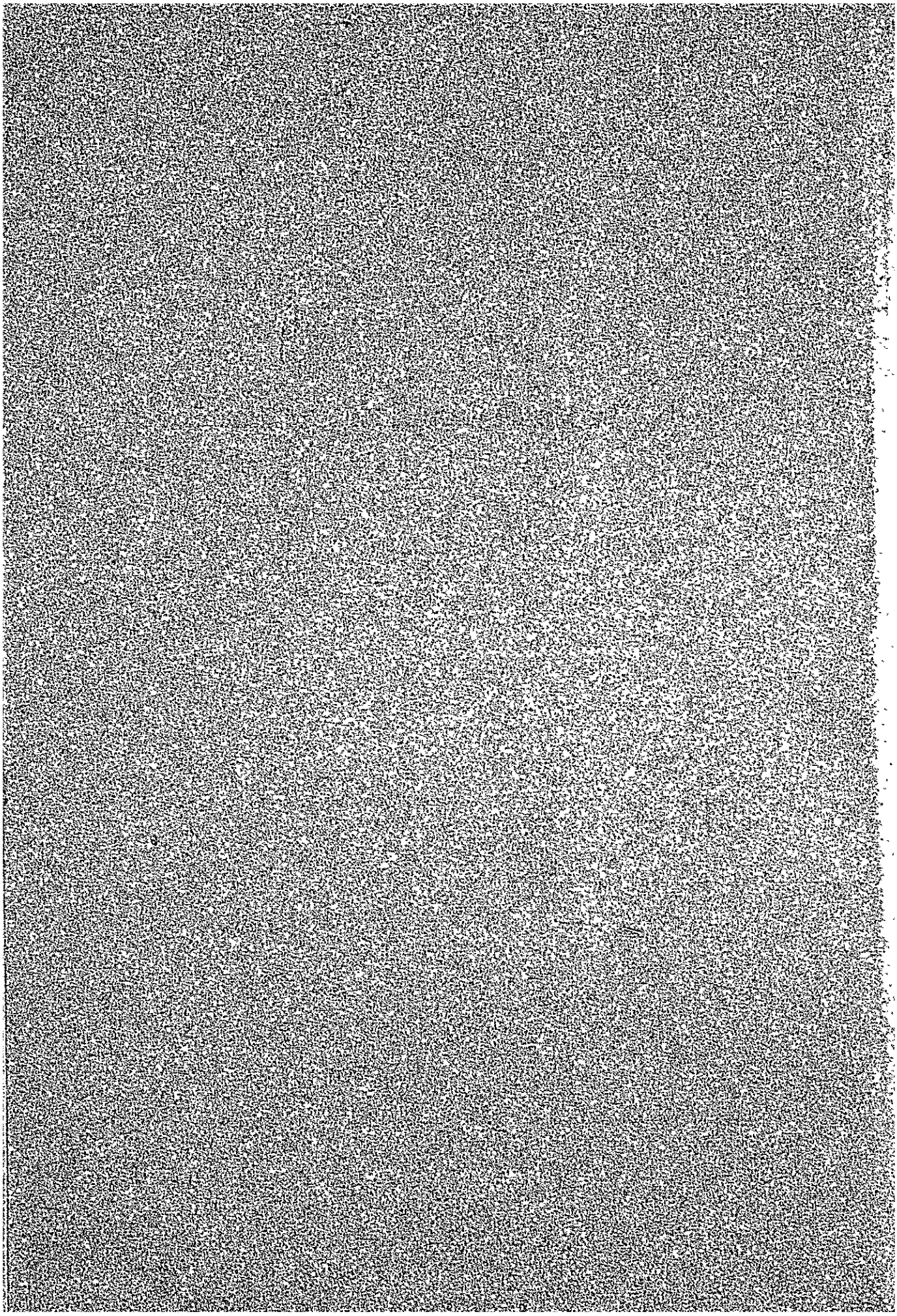


Fig. B - 1

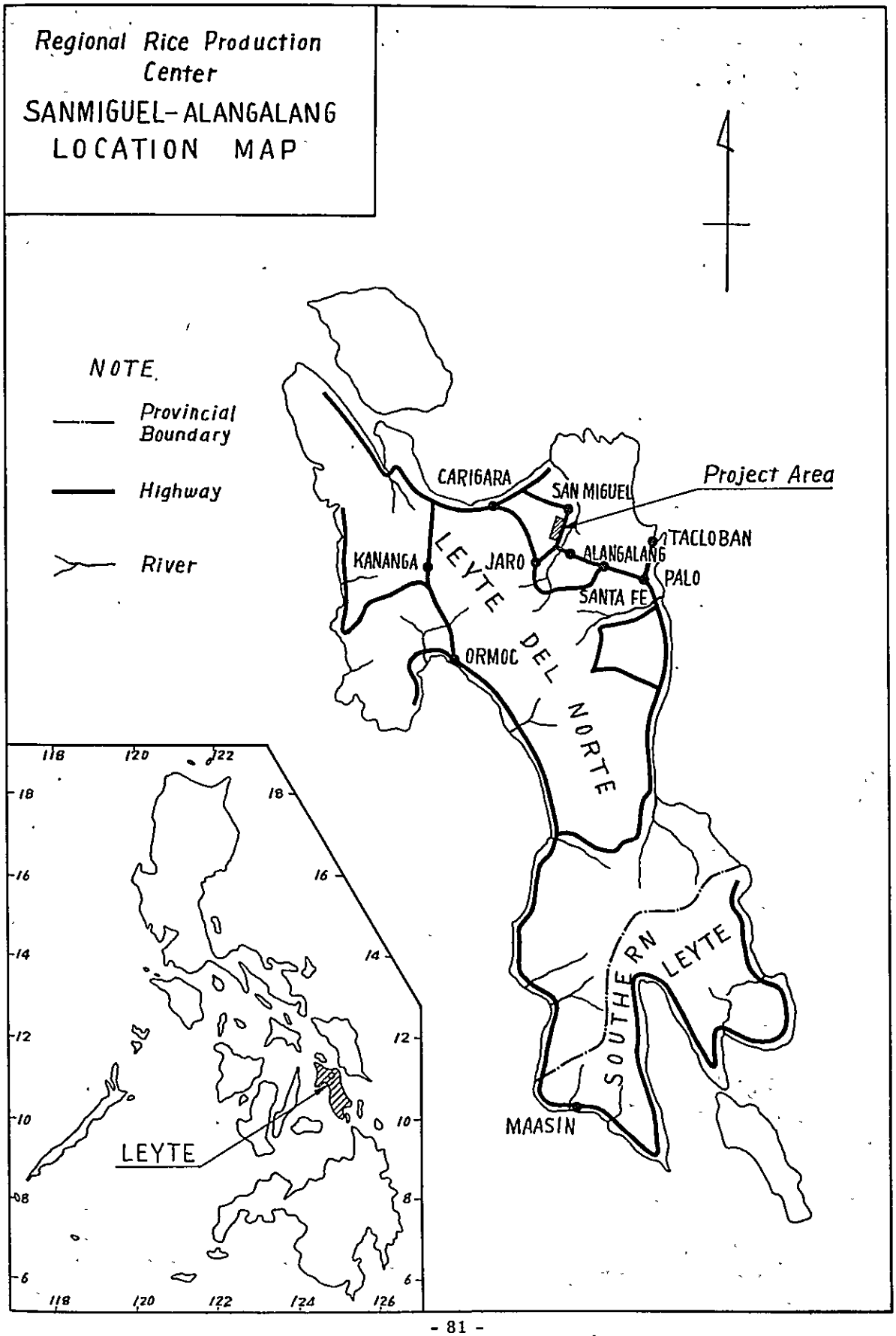
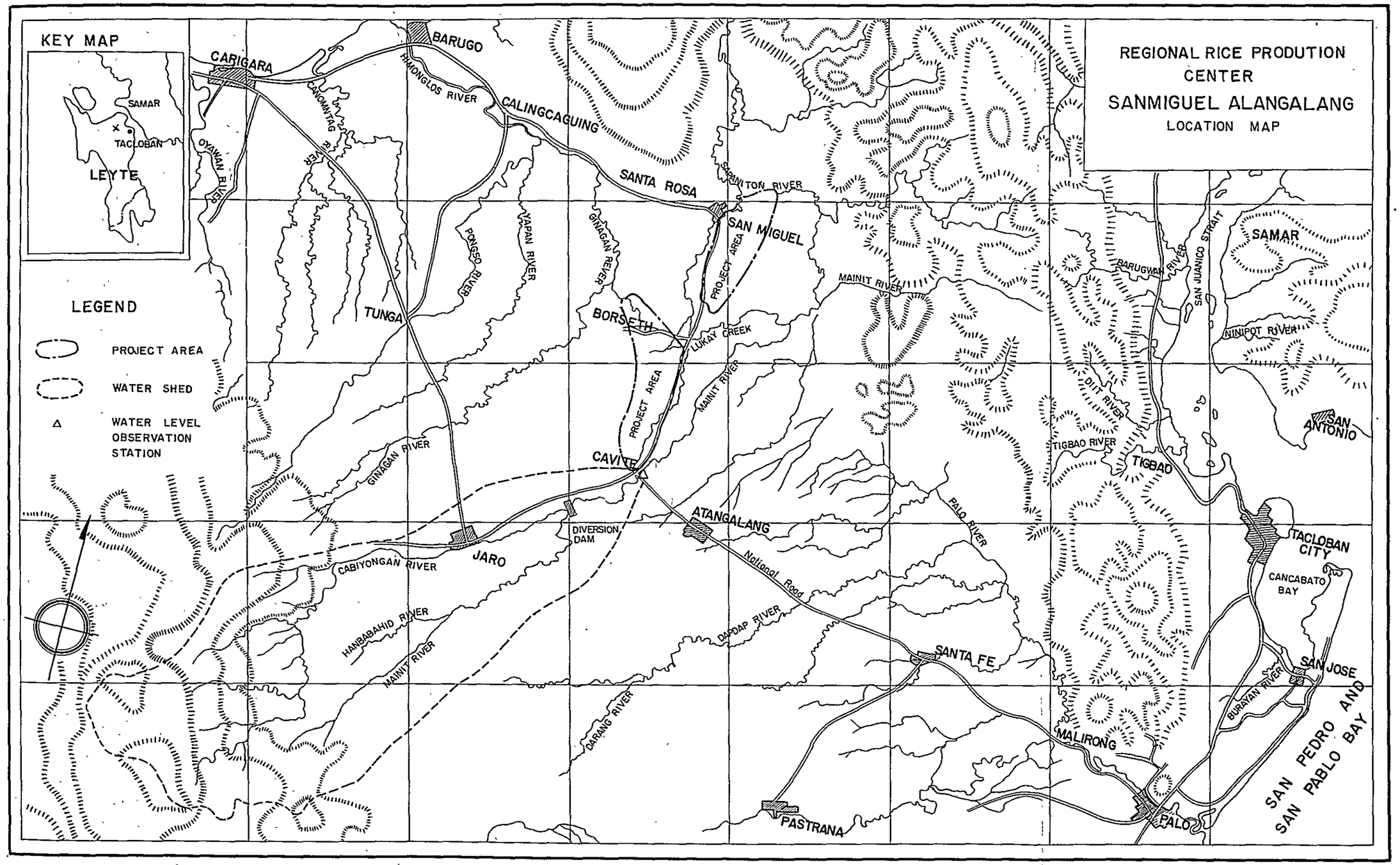

Regional Rice Production Center
SANMIGUEL-ALANGALANG
LOCATION MAP
NOTE
Provincial Boundary
Highway
River
CARIGARA
SAN MIGUEL
Project Area
TACLOBAN
KANANGA
JARO
ALANGALANG
PALO
SANTA FE
LEYTE
DEL NORTE
ORMOC
SOUTHERN LEYTE
MAASIN
LEYTE
118
120
122
124
126
18
16
14
12
10
8
6

Fig B-2


KEY MAP
SAMAR
TACLOBAN
LEYTE
LEGEND
PROJECT AREA
WATER SHED
WATER LEVEL OBSERVATION STATION
REGIONAL RICE PRODUTION CENTER
SANMIGUEL ALANGALANG
LOCATION MAP
CARIGARA
BARUGO
HIMONGLOS RIVER
CALINGCAGUING
SANTA ROSA
SARINITON RIVER
SAN MIGUEL
OYAWAN RIVER
CANOMTAG RIVER
PONSOG RIVER
YAPAN RIVER
GINAGAN RIVER
PROJECT AREA
MAINIT RIVER
TUNGA
BORSETH
LUKAY CREEK
SAMAR
BARUGWAN RIVER
SAN JUANICO STRAIT
NINIPOT RIVER
DIIT RIVER
SAN ANTONIO
TIGBAO RIVER
TIGBAO
CAVITE
GINAGAN RIVER
DIVERSION DAM
ATANGALANG
PALO RIVER
TACLOBAN CITY
CANCABATO BAY
CABIYONGAN RIVER
JARO
National Road
HANBABAHID RIVER
MAINIT RIVER
DAPDAP RIVER
SANTA FE
SAN JOSE
BURAYAN RIVER
DARANG RIVER
MALIRONG
SAN PEDRO AND SAN PABLO BAY
PASTRANA
PALO
10,000
6,000
5,000
4,000
3,000
2,000
1,000
0

III - B San Miguel-Alang along (Leyte del Norte)

B - 1 General Description of the Project area

B. 1. 1. Location

The project district lies along the left bank of the Minit river about 40 km. to the southeast of Tacloban city, northeast of the Leyte island. Tacloban-Carigara National Highway via Palo runs across the Mainitriver, at the northeastern part of the Municipalty of Alangalang, where the provincial highway to San Miguel Separates from the national highway, running through the middle of the district proposed.

The total area of the district, which is divided into two compounds due to topographical reasons, is about 1,100 ha. The district was selected and demarcated within the proposed area covering about 3,650 ha. on the basis of the following factors.

(1) As the district is along the provincial highway, demonstration effect would be begger.

(2) Better acess to water source ( River )

(3) Relatively less danger of flood damage

(4) The land capable of receiving irrigation is relatively composite.

B. 1. 2. Topography

The Mainit River runs south to north on the eastern side of the district. In the district, there are many creeks carving quite deeply the ground and forming valleies in the district which run into the Mainit river. Between creeks, coconut gardens and somewhat flat upland field are observed. The district is on the northward slope with an inclination of 1/300 to 1/500. The surface of the earth is generally flat.

B. 1. 3. Soil

The soil of the district is recent alluvial deposits, which according to the Soil Map issued by the Bureau of Soils, is subdivided into San Manuel silt loam and Palo clay loam. The former is found along the Mainit River as well as the portion of district downstream of the river, while the latter is found is the higher portion of the district.

(a) San Manuel Silt Loam

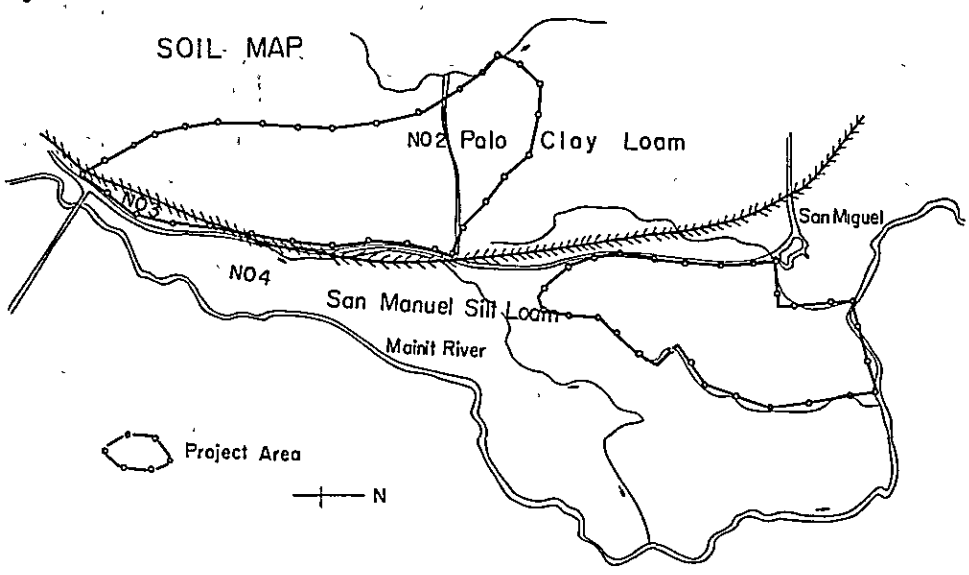
The soil in the upper portion of the district along the river of Mainit has a particularly thin surface layer. Consequently, percolation in the reclaimed field would be very large. As for the residual portion, water requirement is also supposed to be large, due to the fact that the lower strata consists totally of sandy soil and a level of underground water, Except for a hollow used as a lowland paddy field, most of the land in the district is used as coconut fields and upland fields.

(b) Palo Clay Loam

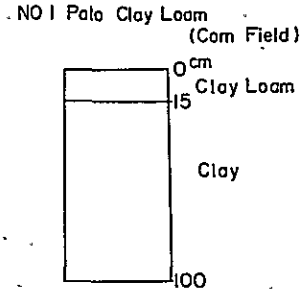
The soil is in a higher portion of the district than that of San Manuel Silt Loam,

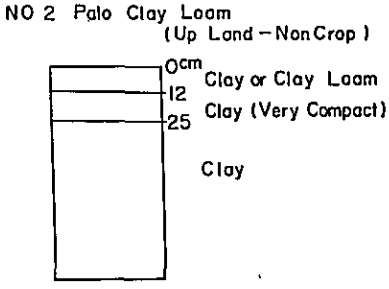
with appropriate inclination. Consequently, in spite of the nature of the soil, the area has good drainage and the level of underground water is very low. Due to the above advantages, the land has been used as coconut fields and upland fields without a single utilized as lowland fields than upland fields, in terms of convenience for farm work.

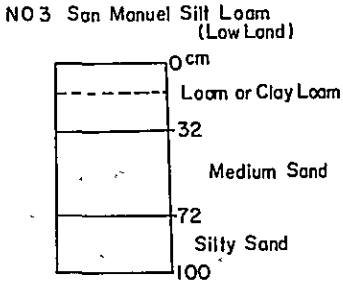
Fig.B－1·3－a

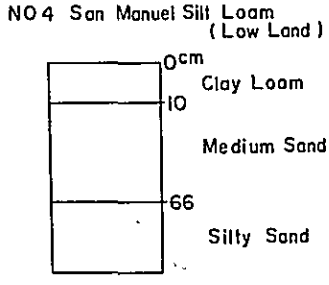



Soil Profile



B. 1. 4. Climate

1. 4. 1. Precipitation

(a) Data Used

Reports of the National Tacloban Meteorological Observatory for the last 10 years from 1957 to 1966 were used. Tacloban is about 20 km. east of the district. The observatory there is the one nearest to the district as well as the one which is most reliable.

(b) Annual Precipitation

For the last 10 years from 1957 - 1966 the average annual precipitation has been 2,014 mm., the maximum is 2,456 mm of 1965, and the minimum 1,827 mm. of 1957 (See Table B - 1. 4. a). Annual precipitation on the basis of 10 year probability is 2,330 mm., while the same on the basis of 100 year probability is 2,834 mm.

(c) Maximum Daily Precipitation

For 10 years from 1957 to 1966, the maximum daily precipitation is 326. 1 mm., while the minimum is 64. 8 mm. (See Table B-1. 4. a). The maximum daily precipitation based on 10 year probability is 248. 8 mm., while the same based on 100 year probability is 534. 8 mm..

(d) Precipitation Analysis

Monthly precipitation is evenly distributed throughout the year. There is no conspicuous dry season as such. Precipitation during the months from November through February is relatively greater. (See Table B-1. 4. b)

Table B-1. 4-a Yearly Precipitation and the Maximum Daily Precipitation

| Year | Yearly Precipitation | Maximum Daily Precipitation | |
|---|---|---|---|
| | | Precipitation | Date |
| 1957 | 1,826.9 mm | 648 mm | 1-5 |
| 58 | 2,045.6 | 192.8 | 12-6 |
| 59 | 2,059.3 | 326.1 | 5-2 |
| 60 | 2,049.2 | 83.6 | 11-22 |
| 61 | 1,837.4 | 77.2 | 10-17 |
| 62 | 2,019.1 | 84.1 | 1-11 |
| 63 | 1,912.8 | 106.7 | 8-12 |
| 64 | 2,009.5 | 127.5 | 11-19 |
| 65 | 2,456.5 | 96.1 | 12-15 |
| 66 | 1,928.1 | 152.2 | 5-15 |
| Average | 2,014.4 | | |

Table B-1. 4-b Monthly Precipitation and Consecutive Dry Days

| | Monthly Precipitation | | | Consecutive Dry Days | |
|---|---|---|---|---|---|
| Month | Average | Maximum | Minimum | Average | Maximum |
| 1 | 177.6 mm | mm | 99.2 mm | 10 days | 18 days |
| 2 | 220.6 | 377.9 | 125.0 | 8 | 16 |
| 3 | 123.4 | 233.4 | 61.7 | 10 | 17 |
| 4 | 123.8 | 189.5 | 33.6 | 11 | 19 |
| 5 | 167.0 | 434.0 | 62.0 | 11 | 18 |
| 6 | 120.7 | 174.1 | 32.8 | 11 | 19 |
| 7 | 152.4 | 242.7 | 95.1 | 10 | 20 |
| 8 | 141.1 | 303.4 | 50.0 | 12 | 19 |
| 9 | 126.2 | 247.7 | 65.0 | 12 | 18 |
| 10 | 158.2 | 278.6 | 49.3 | 9 | 15 |
| 11 | 255.4 | 357.8 | 132.6 | 8 | 16 |
| 12 | 247.8 | 543.3 | 66.6 | 8 | 13 |

1. 4. 2. Temperature and Humidity .

Meteorological observation data in Tacloban recorded 28.4 c in August as the maximum monthly average temperature, and the monthly average between April and September are somewhat within the range of 28.0 c to 28.4 c showing little fluctuation. The minimum monthly average recorded is 26.2 c in January. Yearly fluctuation is very small. That monthly average of daily fluctuation of the temperature is as little as 6.0 c to 7.4 c. Seasonal fluctuation is almost non existent.

The monthly average of relative humidity is 79 - 85 % with higher humidity on the days with much precipitation. Just like temperature, seasonal fluctuation is small. The district records higher temperature and humidity than Calapan, while yearly as well as daily fluctuation in temperature is much smaller.

B. 1.4.3. (Tropical Cyclon)

The Data for the last 4 years ( 1961-1964 ) were studied in terms of tropical cyclon season, giving the month of November as the month with an unproportionate number of cyclons, as in the table below. .In November, cyclons have swipt through within 100 miles of Tacloban at the rate of once a year.

Therefore, cropping season for paddies should be selected in such a way that paddies will not ear in the month of November, and if possible, harvesting will be completed by the end of October.

Table B-1. 4-c Frequency of Tropical Cyclon Approached Tacloban

| | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyclon swept through within 200 miles from Tacloban | - | - | - | - | 2 | 2 | 5 | 2 | 4 | 2 | 5 | 4 |
| Cyclon swept through within 100 miles from Tacloban | - | - | - | - | 1 | 1 | - | 2 | - | - | 4 | - |

(Philippine Weather Bureau Scientific Papers, Tropical Cyclons of 1961 - 1964)

B. 1. 5. Hydrology (Water Resources)

B. 1. 5. 1. Water Resources (river) and the data used

The main source of irrigation for the project is the Mainit river. The intakes station is about 1,500 m. up the stream from the point where Tacloban-Carigara National Highway crosses over the Minit river. Irrigation water is drawn by gravity method with diversion dam. A discharge survey of the Mainit river has been conducted at the point straight under the bridge that connects the national highway, near the left bank of the river, by the Ministry of Public Works. No major jointing point nor dividing point was observed between the survey point in the above and intake point of water planned. Discharge at survey point is, therefore, equal to that of intake point to some extent. The survey has been conducted since 1957, we could use data for 5 years from 1957 to 1961.

1. 5. 2. Rivershed

The Mainit river, the main source of irrigation, with a total length of about 45,000 m. originates in Mount Jonagdam and runs into Carigara Bay. At the lower part of the stream the river is called the Spiniton River. River gradient is about 1/12 in the mountainous area at point of the stream, about 1/75 in the plain up to the intake point. Therefore, The waterched is forest and wood-land, while in the plain most of land is used for coconut fields with somelowland paddy fields.

B. 1. 5. 3. Flood Discharge

The maximum value on the 5 year record from 1957 to 1961 is 404 $m^3$/sec. Flood discharge, 10 year probability was estimated on the basis of the above 5 year records giving 404 m/sec. as the result.

1. 5. 4. Minimum Discharge

The minimum discharge for 5 years from 1957 to 1961 is recorded and given in table b-1-5. a The minimum discharge is 2.56 $m^3$/sec. On the basis of 5 year probability and 2.36 $m^3$/sec on 10 year probability.

Table B-1. 5-a Yearly Maximum and Minimum Discharge (Mainit River)

| Year | Maximum Discharge | Maximum Date | Minimum Discharge | Minimum Date |
|---|---|---|---|---|
| 1957 | 404.00 $m^3$/sec | 1 - 6 | 2.70 $m^3$/sec | 9 -29 |
| 58 | 134.00 | 12 - 6 | 3.20 | 7 - 15<br>25 |
| 59 | 329.00 | 12 - 18 | 3.20 | 9 - 17<br>18 |
| 60 | 244.00 | 4 - 22 | 3.20 | 8 - 26<br>28 |
| 61 | 204.10 | 11 - 20 | 2.25 | 9 - 12 |

B. 1. 6. General Description of Agriculture Practised at present

1. 6. 1. Land Utilization and Cropping Pattern

Most of the land of the district is utilized as coconut fields and upland fields, with the exception of some lowland fields at a lower point along the Mainit River. Therefore, with coconut and upland crops as the core of agriculture, many farmers are possibly without the experience of lowland paddy farming.

Double cropping of lowland paddies have been attempted only by farmers with irrigation facilities of their own.

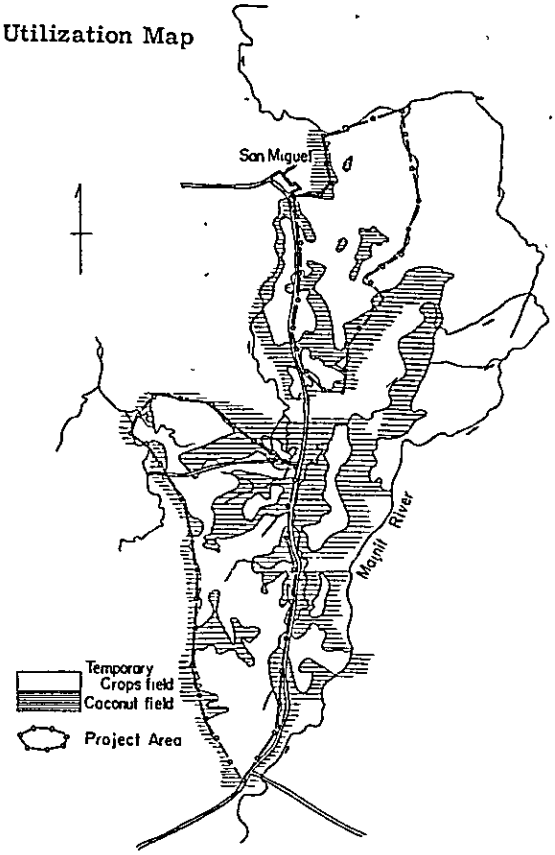
Staple crops on upland fields are corn and camote. Coconut fields and up - land fields are interlocked. This would provide some difficulties in reclamation work. Newly planted coconut fields are almost non existent, however, without recent change in the area planted with coconuts. Therefore, this would not be a difficult obstacle.

1. 6. 2. Rice Productivity

According to the statistics issued by the Department of Agricultural Resources, the average yield of rice in the Eastern Visayas Region, of which the project district is a part, for the last three years, is 19 cav/ha. (0.84 ton/ha) for the 1st crop, and 17 cav/ha. ( 0.76 ton/ha. ) for the 2nd crop, respectively for lowland paddies, while that of upland paddies is as low as 14 cav/ha. ( 0.61 ton/ha. ).

The result of the yield survey in the district shows a high yield, as in the following table, in spite of no application of fertitizer. The result can be attributed to the fact that the field selected was a relatively new field, consequently with new soil, and that the field plots were owned by upper strata farmers who had started somewhat intensive farming, using improved varieties as well as agricultural chemicals. Therefore, the yield shown as the result of the survey is not a representative yield of the district.

Fig. B-1.6-a Land Utilization Map




B-1.6.a. The result of lowland Rice Yield Survey

| Variety | Fertillizer | Spacing | Average No. of stems per hill | Yield | |
|---|---|---|---|---|---|
| Peta | non | 20 cm x 30 cm | 7.1 | 2.9 ton/ha. | 65.9 cav/ha. |
| IR8 | non | 25 x 25 | 14.6 | 4.5 | 102.3 |
| EPI-16-1 | non | 30 x 30 | 19.0 | 5.0 | 113.6 |
| BPI-16-1 | non | 30 x 30 | 16.4 | 4.3 | 97.7 |
| BPI-76-1 | non | 30 x 30 | 13.4 | 3.5 | 79.5 |

Note: Yield was estimated from the Spacing and Average No. of Stems per hill, along with the survey result at Naujan.

Very few farmers have introduced agricultural machines and fertilizer as well as agricultural farming to their farms and most are resorting to conventional methods of farming. The conventional farming method of the region is characterized by harvesting method of cutting the heads of paddies off. This method is dubious in terms of efficiency, but is significant in view of conversion of organisms to soil.

1. 6. 3. Land Tenure

Land tenure in the Municipalities of San Miguel and Alangalang in which the project district is located was studied in terms of a breakdown of total households

by land holding patterns. The result shows as high as 62% as tenants, while showing 27 % and 11 % respectively for full ownership, and part ownership giving 38 % as a sum total for the two categories.

Tenant contracts are practised dominantly on the share of produce basis. At present, share ratio is 50 % - 50 % or 70 % - 30 %.

1. 6. 4. Farming Scale

The average size of land cultivated per farming household in the district is 3.3 ha. of farmland and 2.8 ha. of cultivated land per household, which is more or less the same as the national average of the Philippines, 3.6 ha. of farm land and 2.5 ha. of cultivated land. The size of cultivation in the district is, therefore, a standard size.

A breakdown of total households by strata based on land holding shows a concentration of farmers in the range between 1.0 ha. to 3.0 ha.

The local distribution with approximately 1/2 of the total households in the above range is very similar to the national distribution.

1. 6. 5. Production Cost of Rice

Animal (Caravao) labor is the main means of rice production in the region. Except for a small number of advanced farmers, farmers do not buy fertilizers, or take control measures against insects and blight.

The cost of rice production for a standard farmer in the region, calculated on the basis of data issued by the Bureau of Agricultural Economics, the Goverment of Philippines, is 230 P (59 U.S. $) per ha. for lowland rice (nonirrigated) at present.

Required labor is the same is 53 man days and 19 days of Animal labor. ( Appendix E-11-b )

1. 6. 6. Market Conditions

The project district spreads along San Miguel-Alangalang Provincial Highway, which is again connected at Alangalang to the National Highway to Tacloban. Agricultural products of the region are collected and farming materials and supplies are procured at Tacloban. Tacloban is about 40 km. from the project district along the Nationsl Highway. Access to Manila and other parts of the country are easily obtained via Tacloban, which is the largest city and port on the island of Leyte.

B - 2 Plan

B. 2. 1. Outline of the plan

As was mentioned in the Present Condition of the District;, most of the area of the project district is upland field. The main purposes of the project are to increase paddy fields, and to enable double cropping by introduction of irrigation to the whole area, which would convert the whole area into paddy fields. The frame of the project is as follows.

(1) The area to be irrigated in the project district covers about 712 ha.. The determinant in the selection of are was water discharge for the main source of irrigation. The area to be irrigated is divided as in the attached chart ( a general plan chart ), due to the location of diversion point and discharge.

(2) The main source of the planned irrigation is the Mainit river. Considering the minimum discharge and water requirement for irrigation, the area of 712 ha. was selected. The area was divided into two compounds for the most effective use of water discharge from the Mainit river.

(3) Water is drawn by the gravity irrigation method using a diversion dam. Considering the construction cost and expenses for operation and maintenance, this method is judged to be more feasible than the pumping method.

(4) The device to draw water from the diversion point to the project district a main canal is to be an open channel with a concrete block lining, except for the part of the Old Mainit River and the Siphon part across the National Highway.

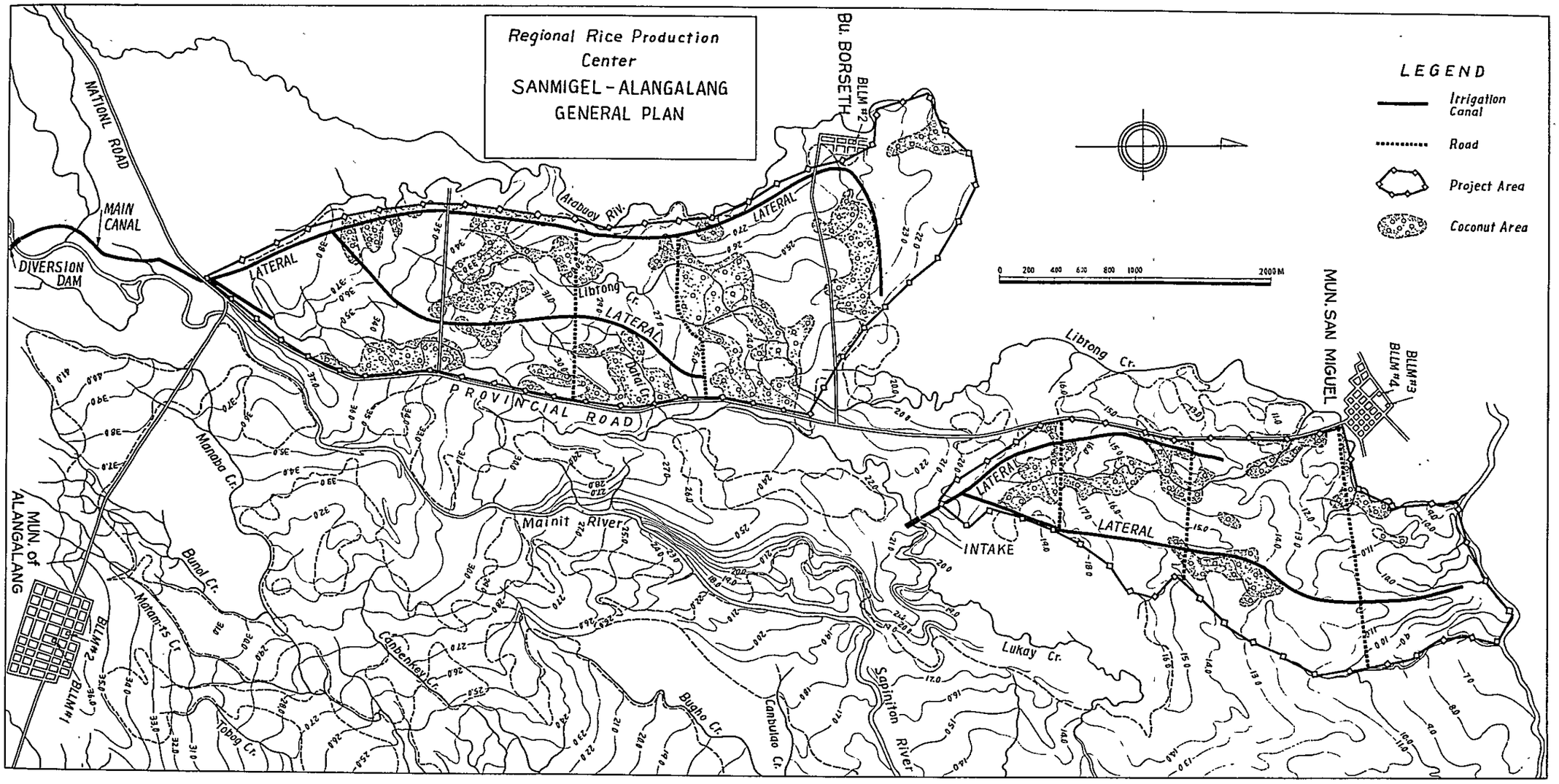
(5) 5 laterals are to be provided with the main canal, to distribute water to respective fields in the district. The water supply to the northern block of the project district, water is drawn from the main canal and flows into Lucky Creek, which leads to the intake gate to down stream distribution. In the first stage, water is fed by the free flooding method from laterals, flowing from plot to plot. At this stage, laterals need not be lined with concrete, with the exception of that part which guides water to Lucky Creek.

(7) The upland field which is the bulk of the land under the project is to be leveled and provided with borders for irrigated rice cultivation. Inreclamating fields, a land read justment plan, in the future, should also be considered.

The construction work up to this stage is to be called stage. The first stage of the construction work is aimed at realization of the effect of irrigation at a cost as low as possible.

(8) The 2nd stage of construction work consists of readjustment of the land into standard units each with 60 ha., provisions for drainage and irrigation ditches for each standard plot for the complete separation of irrigation and drainage systems. In addition to these, a network of farm roads is provided and laterals are to be lined with concrete. The plan aims at the perfect utilization of land and water. This stage, which requires

Fig. B - 3


Regional Rice Production Center
SANMIGEL - ALANGALANG GENERAL PLAN
LEGEND
Irrigation Canal
Road
Project Area
Coconut Area
0 200 400 600 800 1000 2000 M
NATIONL ROAD
MAIN CANAL
DIVERSION DAM
LATERAL
Arabuoy Riv.
Libtong Cr.
LATERAL
PROVINCIAL ROAD
Manaba Cr.
Mainit River
Bunol Cr.
Matam-is Cr.
Tobog Cr.
Canbenhen Cr.
Bugho Cr.
Canbulao Cr.
Sapinitan River
Lukay Cr.
INTAKE
LATERAL
LATERAL
Libtong Cr.
MUN. SAN MIGUEL
BLLM#2
BLLM#1
BLLM#3
BLLM#4
Bu. BORSETH
MUN. of ALANGALANG

a large investment, is for attainment of the most desirable pattern of irrigation farming in every respect including water control as well as farming labor.

(9) The irrigation system thus constructed enables stable double-cropping For harvesting which falls during the rainy season, which is often the case, paddies should be artificially dried. For the selling of rice at its optimum period and improved quality, facilities for drying, threshing and storing of paddy are to be constructed.

(10) To help the implementation of new irrigation farming, the setting up of an extension center ( experiment and demonstration farm ) is advisable. Dispattchiments of agricultural experts for guidance and assistsnce for a given period is effective.

(11) Required expense for the first stage construction is approximately U.S.$ 1,330,000 and additional U.S.$ 850,000 is required for the second stage. Therefore, a sum total of U.S.$ 2,180,000 is required.

(12) In the sphere of the farming program, improved variety ( BPI-76-1 ) is to be introduced along with advanced production methods such as fertilizer and a gricultural chemicals. With the introduction of such new techniques dou le cropping of rice is to be practiced all over the district. Moreover, in the field of farm labor, machines are to be introduced, first in weeding to save human labor. Machines would be used in the future in harvesting and threshing parallel to land readjustment.

(13) Rice yield per ha., for the period of 5 years after the completion of construction ( Phase 1 ), the goal for two crops combined is around 3.0 t ( 68 cav. ), and in the future ( Phase 2 ) 7.5 t ( 170 cav ) per ha.. The goals are decided on the basis of practical farming program atming at gradual increase rather than a rush to a higher yield.

B. 2. 2. Major Civil Works

2. 2. 1. Irrigation Facilities

(a) Water Requirement

Evapo-transpiration

Seasonal monthly temperatures and relative humidity at Los Banos and at Tacloban do not coincide with each other, while maximum and minimum values for the monthly average are similar. Like Naujan, the value of 8 mm/day was set, therefore, for evapo-transpiration of the district.

Percolation

San Manuel silt loam, with its lower layer composed of medium sand and lower groundwater level, has much percolation.

Percolation in Polo clay loam would be much smaller, owing to the lower layer consisting of clay, in spite of the low ground water level.

Considering the result of measurement in Naujan, percolation was estimated respectively for the two soil categories below.

| | |
|---|---|
| San Manuel Siltloam | 25 mm/day |
| Palo clay loam | 10 |

water Requirement in Depth

On the basis of estimated evapo-transpiration, and percolation, water requirement in depth was determined as follows.

| | | |
|---|---|---|
| San Manuel Silt Loam | 33 mm/day | ≒ 35 mm |
| Palo clay Loam | 18 | 20 |

(b) Pumping Capacity

Maximum intake capacity designed from the Mainit river is 2.56 m/sec.. Intake capacity was calculated on the basis of the following formula.

$$Qmax = \frac{(ds \times as + d_c \times a_c) \times 10}{(1-r) \times (24\ hr \times 60\ mm \times 60\ sec)} \quad m^3/sec$$

ds; water requirement in depth in silt loam 35 mm/day

$a_s$; area of silt loam 310 ha

$d_c$; water requirement in depth in clay loam 20 mm/day

$a_c$; area of clay loam 402 ha.

r ; water loss ratio 0.15

The maximum intake capacity thus planned is more or less equivatent to the minimum water flow on a 5 year probability basis of the Mainit river. Except for a possible crisis once every few years, a stabilized water supply is expected.

(c) Pumping Station

The scale of the diversion dam is briefed as follows.

Fixed Dam : A concrete structure which is 89 m. long and 2 m high with the width of 10 m. including an apron in the lower stream

Scouring sluice A steel structure which is 4 m. wide, 1.5 m. high. 2 sluices, the height of the pier is 7.5 m.

Intake Gate: A steel structure which is 3 m. wide and 1 m. high. 2 gates.

Sand trap tion Basin : width 7 m., length 20 m., made of reinforced concrete.

Floor Protection : Width 15 m., length 102 m. domustrem of the dam

For the Dam site and its structure, see charts B-2.2-b and B-2.2-c respectively.

Dam Site

A site about 1.7 km. on the stream above the National Highway Bridge was selected. The site roughly coincides with the planned dam site under NIA, but before establishing the site as such, the portion down from the site should be investigated. The water of the Old Mainit River that joins the Mainit river about 500 m. down the dam site cannot be used under the present plan. The Old Mainit splits away from the Cabiyongan River ( which joins the Mainit above the dam site ) at about 3 km. above the joining point. When an unnegligible amount of the minimum discharge of the Cabiyongam

Fig. B - 2.2. - a MAINIT RI. DIVERSION DAM
MAIN CANAL
GENERAL LA-OUT

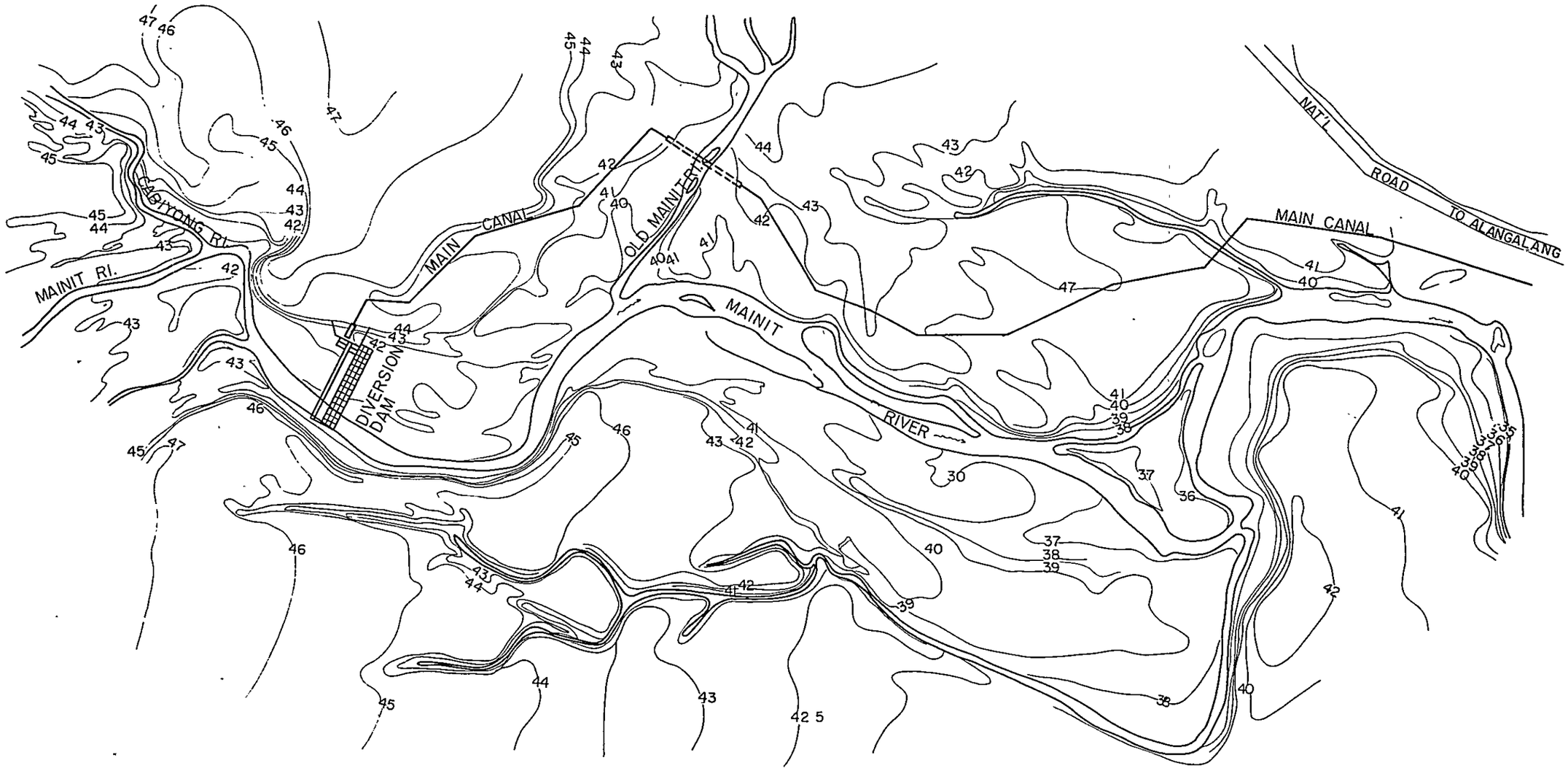
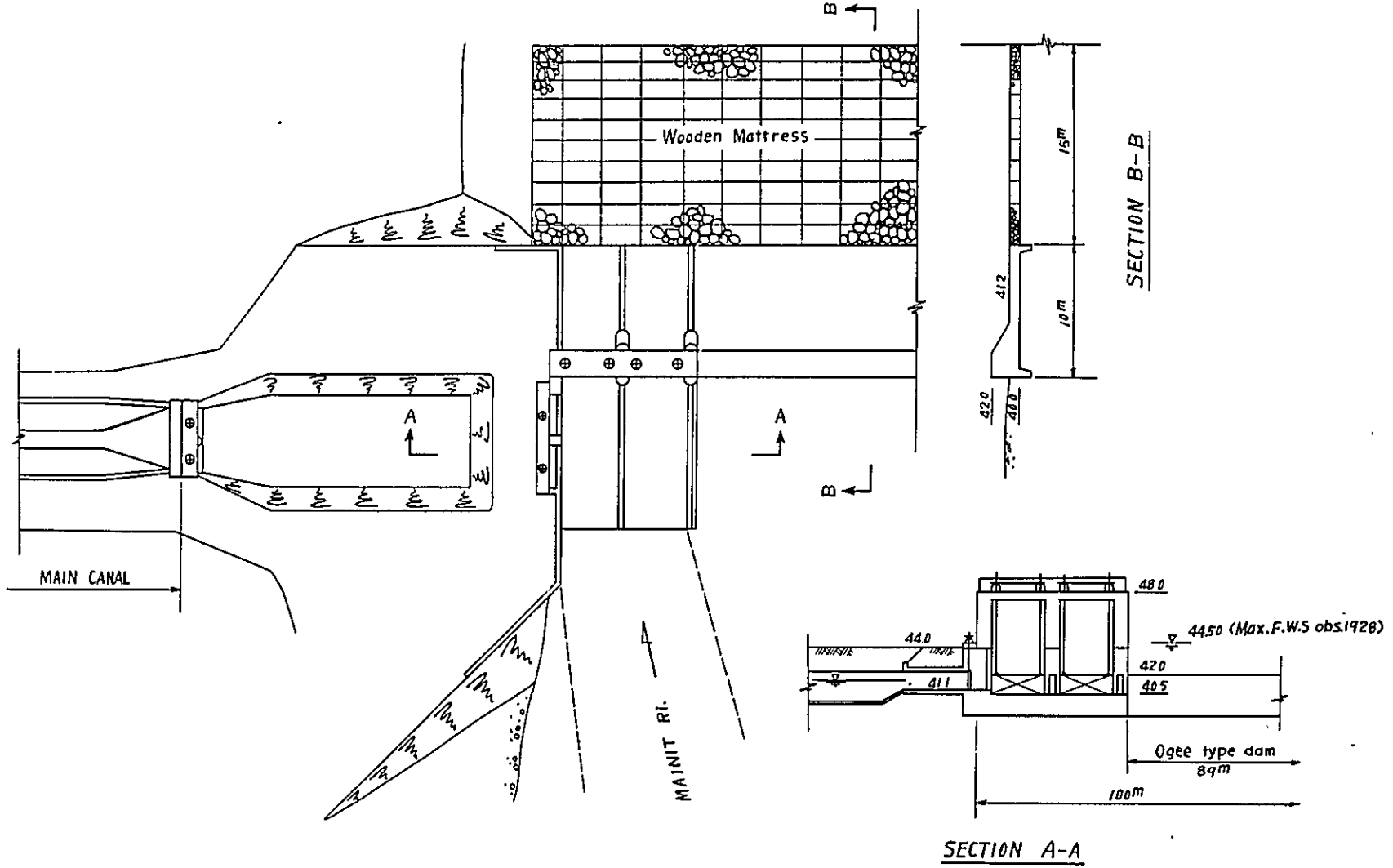


Fig A－22－b

MAINIT Ri. DIVERSION DAM



river is flowing into the Old Mainit, the establishment of a facility that would close the Old Mainit during droughty periods or the shift of the dam site to a site down the joining point of the Old Mainit and the Mainit is considered.

(d) Irrigation Canals

The layout of the canal system is as in chart B-22-a. The total length and standard cross-section of the canal system are as in table B-22-a. Water required for the northern district is diverted from the main canal to Lukay Creek and supplied through an intake sluice at about 5 km. from the discharge point.

Irrigation Canal Network Layout

The Irrigation network was laid after considering the following conditions.

(1). Irrigation canal and drainage canal are to be completely separated.

(2). In view of land redjustment and construction of lateral irrigation canals in the future, a minimum network required for the free flooding method is planned at this stage.

Main Canal

The canal site roughly coincides with that of the Mainit River Irrigation Plan by the NIA. Except for backstream syphoning across the Old Mainit as well as the National Highway, the canal is to be lined with concrete.

Structure of Lateral Canals

In the first stage, unlined laterals are to be used to supply water to the fields. In the second stage, the laterals are to be lined with concrete blocks. The lateral canal that diverts water to the Lukay Creek, due to rapid stream, concrete block lining is provided especially during the first stage. The top of either bank of the irrigation canal is expanded to a width of 3.5 m. and used as road for waterway conservation and farm labor.

Accessory facilities

Water diversion devices are planned at 3 sites. The method of water diversion used will be a man-operating gate or valve.

To facilitate cultivation and maintenance of canals, a pipe culvert for road is to be constructed across laterals for every 200 m.. The width of the road in effect is to be 3.5 m..

2. 2. 2. Drainage Facilities

Due do the presence of many creaks within the district, drainage in the district is relatively good. Therefore, the creeks are to be used continuously as drainage canals and no drainage canals as such are planned.

2.2. 3. Farm Road

The Main road of 5 m. width and 6,500 m. length, which runs from east to west within the district is to be established and will be connected to the National Highway. The main road is to be used for construction purpose.

2. 2. 4. Land Preparation for Paddy Field

Land leveling and construction of borders are to be conducted over 630 ha. of land presently used as dry land and converted to lowland paddy fields.

2. 2. 5. Land Readjustment

Considering future farming plan, landholding patterns as well as the size of the cultivated land of the farmers in the district, efficiency of michanized agricultural labor, geographical conditions, water usage conditions including irrigation and drainage operation, and process of land development, the layout and structure of standard farm lot, standard parcel, feeder road, farm road, lateral and sublateral irrigation canals and drainage canals are planned as in chart B-22-c.

The plan is a standard and its uniform application is of course not expected.

Division and exchange of land is required in implementing land readjustment as it is planned, however, this is a very difficult task. It should be noted also that implemention of the plan thinking only of the future benefit without giving due regard to the present condition is too far sighted an investment and would be a waste. Consequently, over all land readjustment is to be carried out during the second stage.

2. 2. 6. Rice Center

Construction of irrigation systems enables stabilized double-cropping. However, it is impossible to set the harvesting of both crops during dry season. Increased rice production and high temperature and humidity of the region necessitates the quick drying of paddies, otherwise paddies would be deteriorated or degraded.

Moreover, in view of the selling of rice at its optimum period as well as of the improvement of its quality, facilities for drying, threshing, and storing of paddies are required.

The size of the facilities should be commensurate with the amount of rice to be produced. Facilities are to be built up in line with production increase on the basis of the production plan in 2.3. concerning the farming plan. An outline of planned facilities is in table A-2.2.e..

According to our calculation, process charge for cavn paddy is 1.6 ₱, when the interest rate for facility construction is 5%, and is 1.8 ₱ when the interest rate is 8%.

Fig. B - 2.2 - c.

# 用 水 系 統 図

## Irrigation Canal System

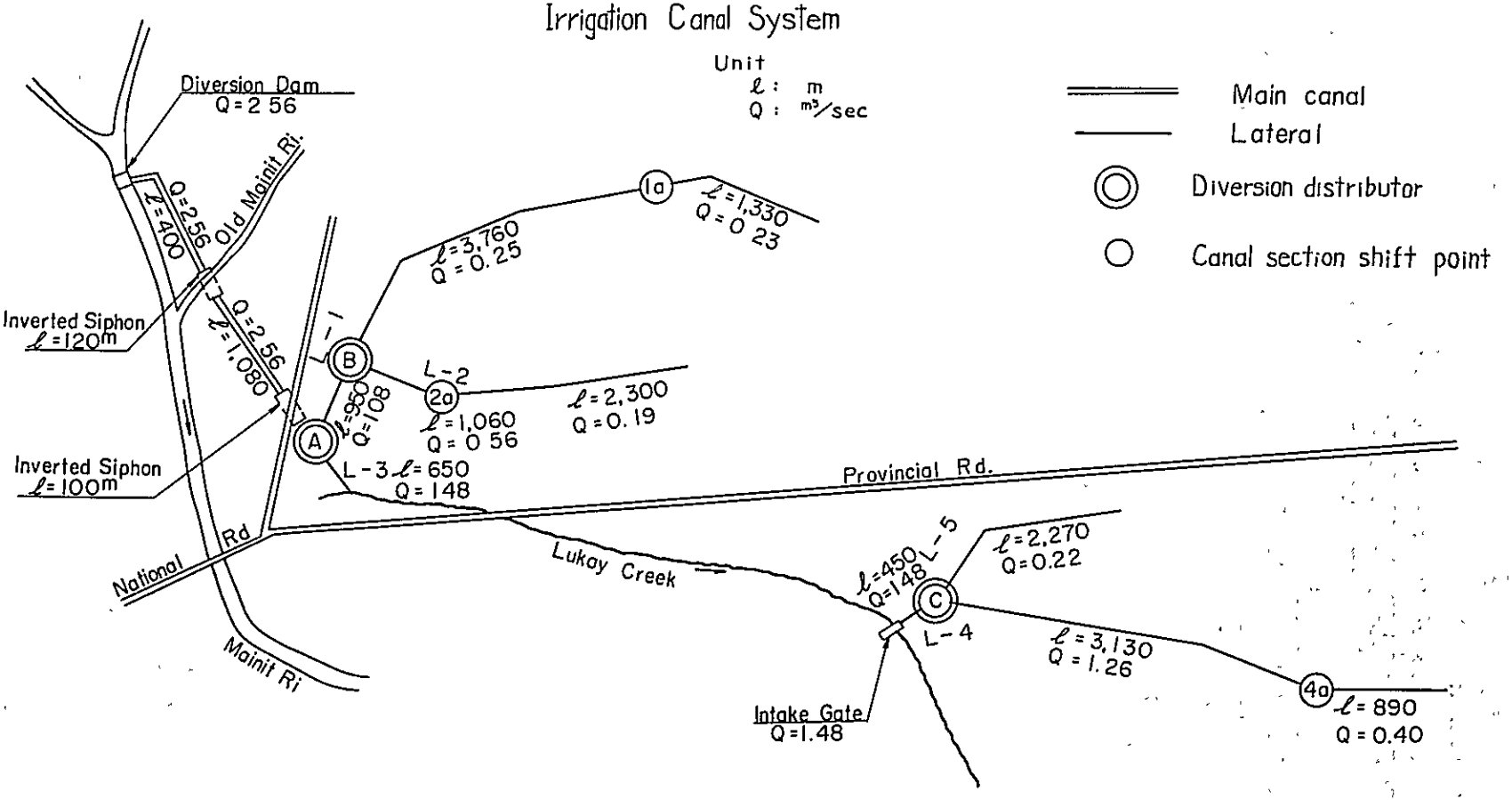
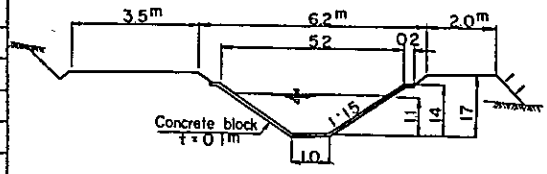


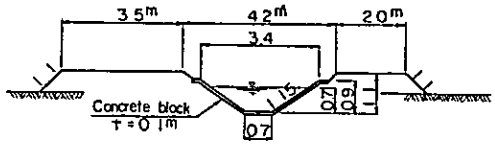
Fig B-22-d

Extension and standard section of irrigation canal

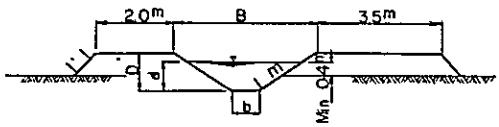
| NAME | Irrigation control area | Direct irrigation area | Extension | Flux | Slope irrigation canal | Type of section for first phase construction | Type of section for second phase construction |
|---|---|---|---|---|---|---|---|
| | ha | ha | m | $m^3/sec$ | | | |
| Main Canal | 712 | | | | | | |
| Open Canal | | | 1,480 | 2.56 | 1/2000 | Concrete block lining | — |
| Siphon (2) | | | 220 | 2.56 | | Reinforced concrete 1.2m × 1.2m | — |
| | | | | | | | |
| Total | 712 | | 1,700 | | | | |
| | | | | | | | |
| Lateral | | | | | | | |
| L-1 | (191+211) 402 | 191 | 6,040 | | | | |
| Ⓐ ~ Ⓑ | 402 | | 950 | 1.08 | 1/800 | IV | 4 |
| Ⓑ ~ ⑩ | 191 | 106 | 3,760 | 0.52 | 1/320 | II | 2 |
| ⑩ ~ Ⓔ | 85 | 85 | 1,330 | 0.23 | 1/320 | I | 1 |
| | | | | | | | |
| L-2 | 211 | 211 | 3,360 | | | | |
| Ⓑ ~ ②ⓑ | 211 | 141 | 1,060 | 0.56 | 1/270 | II | 2 |
| ②ⓑ ~ Ⓔ | 70 | 70 | 2,300 | 0.19 | 1/270 | I | 1 |
| | | | | | | | |
| L-3 | 310 | | 650 | 1.48 | 1/270 | Concrete block lining | — |
| | | | | | | | |
| L-4 | (265+45) 310 | 265 | 4,470 | | | | |
| Ⓑ ~ Ⓒ | 310 | | 450 | 1.48 | 1/800 | V | 5 |
| Ⓒ ~ ④ⓒ | 265 | 181 | 3,130 | 1.26 | 1/430 | III | 3 |
| ④ⓒ ~ Ⓔ | 84 | 84 | 890 | 0.40 | 1/430 | II | 2 |
| | | | | | | | |
| L-5 | 45 | 45 | 2,270 | 0.22 | 1/350 | I | 1 |
| | | | | | | | |
| Total | 712 | 712 | 16,790 | | | | |
| | | | | | | | |
| Grand total | 712 | 712 | 18,490 | | | | |




Main irrigation canal standard section

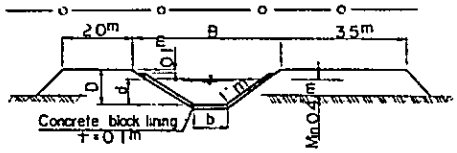



Branch irrigation canal L-3 standard section




Branch irrigation canal standard section(First phase)

| Type of section | B | b | D | d | m |
|---|---|---|---|---|---|
| | m | m | m | m | m |
| I | 1.6 | 0.4 | 0.6 | 0.4 | 1.0 |
| II | 1.9 | 0.5 | 0.7 | 0.5 | 1.0 |
| III | 3.7 | 0.7 | 1.0 | 0.7 | 1.5 |
| IV | 4.0 | 0.7 | 1.1 | 0.8 | 1.5 |
| V | 4.3 | 0.7 | 1.2 | 0.9 | 1.5 |




Branch irrigation canal standard section(Second phase)

| Type of section | B | b | D | d | m |
|---|---|---|---|---|---|
| | m | m | m | m | m |
| 1 | 1.6 | 0.3 | 0.5 | 0.3 | 1.0 |
| 2 | 1.9 | 0.4 | 0.6 | 0.4 | 1.0 |
| 3 | 3.7 | 0.5 | 0.9 | 0.6 | 1.5 |
| 4 | 4.0 | 0.5 | 1.0 | 0.7 | 1.5 |
| 5 | 4.3 | 0.6 | 1.0 | 0.7 | 1.5 |

Fig.B-2·2-e Rice field arrangement standard drawing

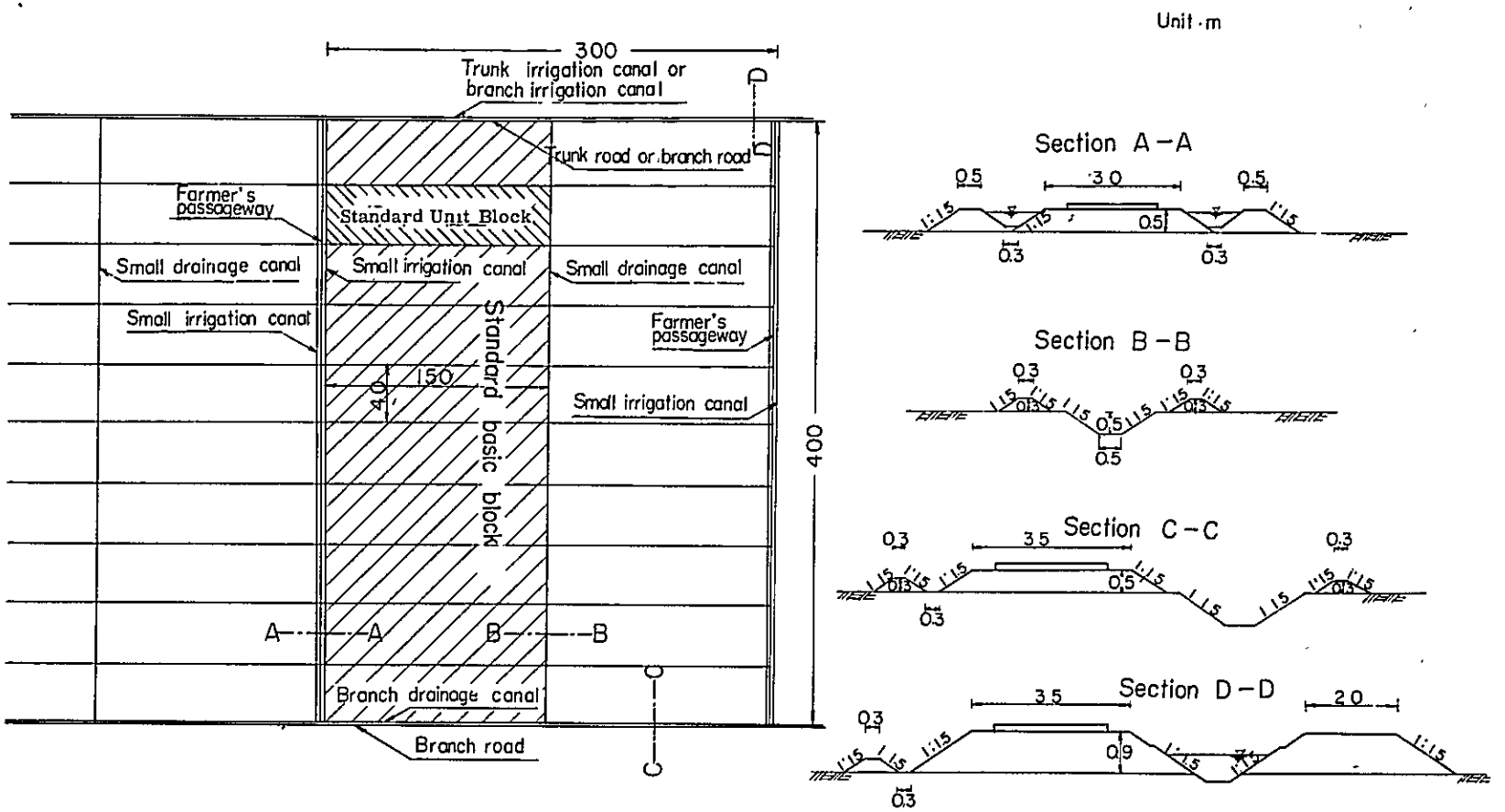


Table B-2. 2-a Paddy Output and Amount Sold

Unit : cavan

| | Phase 1 | | | | Phase 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st Crop | 2nd Crop | Total | Remarks | 1st Crop | 2nd Crop | Total | Remarks |
| | (1,070 ton) | (1,070 ton) | (2,140 ton) | | (2,500 ton) | (2,820 ton) | (5,320 ton) | |
| Output | 24,279 | 24,279 | 48,558 | | 56,960 | 64,080 | 121,040 | |
| Amount Consumed at producer's household | 4,912 | 4,912 | 9,824 | Seeds and Provision | 4,912 | 4,912 | 9,824 | Seeds and Provision |
| | (850 ton) | (850 ton) | (1,700 ton) | | (2,300 ton) | (2,600 ton) | (4,900 ton) | |
| Amount Sold | 19,367 | 19,367 | 38,734 | | 52,048 | 59,168 | 111,216 | |

Table B - 2. 2-b

| | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sept. | Oct. | Nov. | Dec. | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature(C) | 26.2 | 26.5 | 27.0 | 28.0 | 28.2 | 28.2 | 28.1 | 28.4 | 28.2 | 27.9 | 27.3 | 26.5 | Tacloban |
| Rain fall (mm) | 178 | 222 | 123 | 125 | 167 | 125 | 152 | 141 | 126 | 158 | 238 | 248 | " |
| Ra | 8.5 | 8.6 | 7.2 | 7.4 | 6.1 | 6.0 | 6.8 | 7.0 | 7.3 | 8.1 | 11.1 | 9.8 | " |
| Relative hunidity | 85 | 84 | 82 | 81 | 82 | 82 | 81 | 79 | 81 | 82 | 85 | 85 | " |
| Harvesting | | | Mar. 10 | | May 25 | Jun. 10 | | | Sept. 10 | | | Dec. 10 | |
| | | | 2nd Crop | | | | | | | 1st Crop | | | |
| | | | 75 days - 90 days | | | | | | | 90 days | | | |
| Drying | | | 75 days - 90 days | | | | | | | 90 days | | | |
| Milling | | | | 175 days (Max.) | | | | | | 175 days(Max.) | | | |
| Storing | | | | 175 days(Max.) | | | | | | 175 days(Max.) | | | |
| Shipping | | | | 175 days(Max.) | | | | | | 175 days(Max.) | | | |

Basic Specifications

| | Phase 1 | Phase 2 |
|---|---|---|
| 1. Amount of 1 crop paddy received | 1,070 ton(14% Dry paddy) | 2,820 ton(14% Dry paddy) |
| 2. Receiving Period | 90 days | 75 days - 90 days |
| 3. (Actual Receiving duration) | 60 days | 60 days |
| 3. Amount of paddy received | 18 ton/day | 47 ton/day |
| 4. Number of varieties received | 3 | 3 |
| 5. Drying | Moisture content in Paddy 24% - 14% within 24 hrs. | Moisture content in Paddy 24% - 14% within 24 hrs. |
| 6. Milling | 2 ton/hr. about 100 days | 4 ton/hr. about 100 days |
| 7. Amount stored | About 70% of 850 ton(dry paddy) after the subtraction of the producer's consumption | About 70% of 2,600 ton(dry paddy) after the subtraction of the producer's consumption |
| 8. Type of staring | Packed milled rice or paddy | Packed milled rice or paddy |
| 9. Shipping Period | Sept. 15 - Mar. 10 within 175 days | Mar. 15 - Sept. 10 within 175 days |
| 10. Type of Shipment | Packed milled rice | Packed milled rice |

B. 2. 3. Farming Program

2. 3. 1. Plan for Land Utilization

Of 1,100 ha. of land in the district, 790 ha. are to be utilized as lowland paddy fields, leaving the rest planted with pereneal crops.

Table-B-2.3.a Land Utilization Plan

| Kinds of field | present (ha) | planned (ha) |
|---|---|---|
| lowland paddy field | 157 (142) | 712 ( 712 ) |
| upland field | 633 ( 570 ) | |
| Canal and Road | | 78 |
| total | 790 ( 712 ) | 790 ( 712 ) |

figures in ( ) show are under cultivation .

Acreage under actual cultivation was estimated to be actual acreage minus its 10 %. ( 1960 census recorded the average area lying idle as more than 20%. However, 10 % was taken, as the high proportion of idle land seems to be concentrated in the lowland.) The are under the project is 90 % of the present area, leaving 10 % for roads and canals. A breakdown of the area of the district by its use patterns was calculated on the premise that 20 % is lowland paddy fields.

2. 3. 2. Production Plan

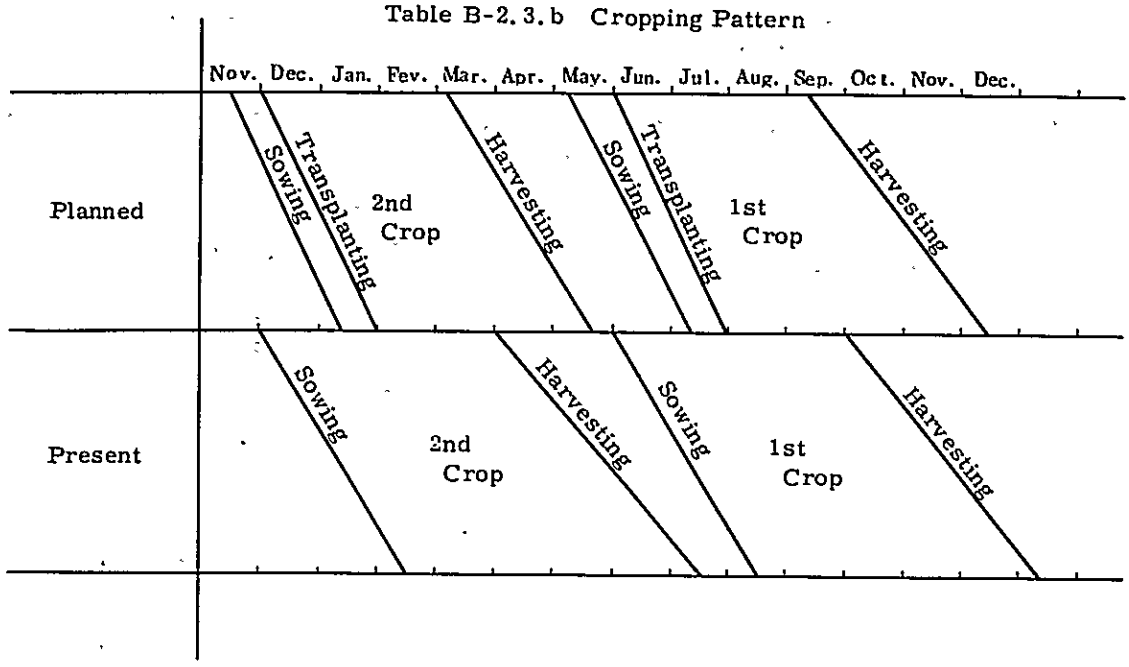
(a) Cropping Pattern

Double cropping of lowland paddies is planned for the whole area. Cropping periods were decided upon consideration of the following conditions.

1. Earing of paddies should not fall in the month of November at time tropecal cyclons are existent.
2. Harvesting in a period with many rainy days shall be avoided whenever possible.
3. Radical change from cropping periods conventionally practised would cause contingencies such as a concentration of insects and pests, therefore should be avoided.
4. The duration required for growth of different cropping periods.

| | |
|---|---|
| 1st cropping | 120 - 150 days |
| 2nd cropping | 120 - 140 days |

Table B-2.3.b Cropping Pattern




(b) Cultural Method

Variety... varieties that give a yield as high as 4-5 ton/ha. without high production cost, recomended varieties such as BPI-76-1 etc. have been selected to be used. After achieving the yield goal of 4-5 ton/ha. ( 90 - 101 cav/ha. ) using these varieties, high-yielding varieties such as IR-8 are to be introduced for attainment of a yield goal of 6 ton/ha. (136 cav/ha.) and over.

Fertilizer... Considering the result of the survey as well as the Appendix, the following was decided. San Manuel Silt loam, needs an additional amount of fertilizer, or its application a number of time should be consedered because of the presence of sandy soil at the lower strata.

| | | |
|---|---|---|
| Base Fertilizer | N | 35 kg/ha |
| | $P_2O_5$ | 20-30 |
| | $K_2O$ | 20-30 |
| Fertilizer for Head Dressing | N | 25 |

Agricultural Chemical... In order to secure an increased yield fertilizer application, insect and pest control become indispensable. Sufficient use of agricultural chemicals is also required.

Table B-2. 3-c Plan for Agricultural Chemical Use

| Name of Chemical | Amount Spread | Pest and insect | Period of application |
|---|---|---|---|
| BHC-r | 2kg/ha | Stem borer | 20 - 30 days after transplanting |
| " | 3kg/ha | " | 50 - 60 days after transplanting |
| Sevin | 2kg/ha | Leaf hopper | 7 - 10 days after transplanting |

Farm Labor... Buffalo ploughs are to be used as they have been, but straight row planting and dense planting are exercised along with introduction of the hand-operated weeder. In the future mechanization in ploughing, leveling, and harvesting and threshing will be used as much as possible. For this purpose, the method which has been the conventional method of harvesting, should be changed to the low cutting method.

(c) Target Yield

As mentioned in 1.5.2. the result of the yield survey in the district shows that some farmers are producing nearly 4 ton/ha. without application of fertilizer, by introduction of improved varieties and adoption of straight row and dense planting techniques. Such a high yield is attributed, however, to new soil on which double cropping has been tried recently. Maintenance of this high a yield for a longer period without application of fertilizer is very difficult. Therefore, with 60 kg./ha. of nitrogen as fertilizer, 4 ton/ha. ( 90 cav/ha. ) is set for the palagad season. Due to unsuitable weather conditions such as an insufficient number of dry days during the growing period, normal yield of regular crops is smaller than that of the palagad season. Thus, 3.5 ton/ha. ( 90 cav/ha ) is set as a yield goal during the season. ( Phase 2 ) For the period of 5 years after the completion of construction work, production techniques are extended and conditions for better production such as financing of farming funds are to be arranged. During this period, 1.5 ton/ha., less than a half of the above yield goal, is expected. In short, during phase 1 ( 5 years after the completion of construction work ) total yield of a paddy for 1 year on a double cropping basis is 3.0 ton/ha, while that in phase 2 is 7.5 ton/ha..

(d) Total Output

Table B-2. 3-d Rice Output

(ton)

| | Planted Area(ha) | | Yield (ton/ha) | | | Production (ton) | | | Increased Production | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Present | Phase 1.2 | Present | Phase 1 | Phase 2 | Present | Phase 1 | Phase 2 | Phase 1 | Phase 2 |
| Palay Lowland Regular | 142 | 712 | 0.84 | 1.50 | 3.50 | 119 | 1,068 | 2,492 | 949 | 2,373 |
| Palagad | 11 | 712 | 0.76 | 1.50 | 4.00 | 8 | 1,068 | 2,848 | 1,060 | 2,840 |
| Corn | 488 | - | 0.66 | - | - | 322 | - | - | 322 | 322 |
| Camote | 88 | - | 3.00 | - | - | 264 | - | - | 264 | 264 |

Basis of calculation

1. Lowland Palay-Planted area ...estimated as 8% of low land palay. (1960 census - San Mijuel Alangalang.) Regular/Palagad ratio.
2. Corn, Camate Planted area ... Caltivated upland area was obtained from 1960 sensus - San Miguel and Alangalang by the following formula, weighted of different crops, which is again subtracted by the upland. field area.

Upland area ratio for crops

$$\frac{\text{Planted area of Corn, Camote and other upland Crops}}{\text{Planted area of temporary Crops - Planted area of Lowland 1st palay}} = \frac{2,262 + 408 + 230}{6,528 - 3,652} = 1.01$$

Palay ..... Average for 3 years (1964 - 1966) in Eastern Visayas
Corn ..... Philippines 50 year average
Camote.... Estimated on the basis of 1960 Census and Interviewies in the district

2. 3. 3. Agricultural Product in Monetary Value

(a). Production Cost of Rice

According to the plan, the production cost of rice increase due to intensive labor in field plot, fertilizer application, and insect and pest control. Production cost per ha. for one is estimated at P 380 ( U.S.$ 97.4 ) in phase 1, and ₱ 710 ( U.S.$ 182.1 ) in phase 2. Labor: 100 man days and 28 animal days in phase 1, and 118 man days and 30 days of animal labor are needed in phase 2. (The production cost, however, is not inclusive of water charge. For further details, see Appendix E-12-b).

The going production cost for lowland crop is estimated at 230 P ( 59 U.S.$ ). Therefore, an increase in production cost is 150 P in phase 1, while in phase 2 it is ₱ 480. As the district shows traditional preference for corn and camote, which are to replaced by paddies under the project, the expenses on the part of farmers for crop production would undergo substantial change.

Total Required production cost required for the project district is as follows.

| Present | Acreage under cultivation | Production cost (per ha ₱) | Total production cost |
|---|---|---|---|
| Palay lowland | | | |
| 1st crop | 142 ha | 230 | 32,660 ₱ |
| 2nd crop | 11 | 230 | 2,530 |
| Corn | 488 | 160 | 78,080 |
| Camote | 88 | 200 | 17,600 |
| Total | | | 130,870 (33,556U.S.$) |
| Plan (Phase 1) | | | |
| Lowland 1st crop | 712 | 380 | 270,560 |
| Lowland 2nd crop | 712 | 380 | 270,560 |
| Total | | | 541,120 (138,749) |
| Plan (Phase 2) | | | |
| Lowland 1st crop | 712 | 710 | 505,520 |
| 2nd crop | 712 | 710 | 505,520 |
| Total | | | 1,011,040 (259,241) |

(b) Gross Product Value of Rice

Total output of rice in the project district is estimated to be 2,902 caven ( 127 ton ) at present, while that for corn is 5,661 caven (322 ton ) and for camote 264 ton. The total product after the district is turned into an overall rice producing district, is estimated to be 48,558 cavan 2,136 ton in pnase 1, while

the same for phase a is estimated at 121,040 cavan (5,340 ton). The set price of a paddy per cavan as 16₱ (4.1 U.S.$), gross product value was calculated as follows.

| Present | Outo put | Price of Rice (per cavan ₱) | Cross Product Value | |
|---|---|---|---|---|
| Palay Lowland 1st crop | 2,712 cavan | 16.00 | 43,392 ₱ | |
| Lowland 2nd crop | 190 | 16.00 | 3,040 | |
| Corn Corn | 5,661 | 14.00 | 79,254 | |
| Camote | 264(t) | 100.00 (p/t) | 26,400 | |
| | | | | U.S $ |
| Total | | | 152,086 | (38,996) |
| Plan (Phase 1) | | | | |
| Lowland 1st crop | 24,279 | 16.00 | 388,464 | |
| 2nd crop | 24,279 | 16.00 | 388,464 | |
| Total | 48,558 | | 776,928 | (199,212) |
| Plan (Phase 2) | | | | |
| Lowland 1st crop | 56,960 | 16.00 | 911,360 | |
| Lowland 2nd crop | 64,080 | 16.00 | 1,025,280 | |
| Total | 121,040 | | 1,936,640 | (496,574) |

(c) Net Profit of Rice Production

According to the plan, a yearly increase of the net profit is as follows, approximately 186,000 ₱. in phase 1 and 847,000 ₱. in phase 2.

| | | | | |
|---|---|---|---|---|
| Present | 152,086₱ | 130,870 ₱ | 21,216 ₱ | U.S.$ (5,440) |
| Planned | | | | U.S.$ |
| Phase 1 | 776,928 | 541,120 | 235,808 | (60,463) |
| Phase 2 | 1,936,640 | 1,011,040 | 925,600 | (237,333) |
| Increase in money | | | | |
| Present-Phase 1 | 624,842 | 410,250 | 214,592 | (55,023) |
| Present-Phase 2 | 1,784,554 | 880,170 | 904,384 | (231,893) |

2. 3. 4. Extension Service

Even after the completion of the irrigation system, if the same techniques are employed, the same variety of paddy, cultivation method, fertilizer and measures of insect and pest control used conventionally are followed, high yield cannot be expected. Consequently, the district cannot fulfill its planned role as a Rice Production Center.

Experimental research institutes in the Philippines have already achieved a high level of experiment result, while some of the upper strata farmers have adopted advanced techniques and are producing a high yield, as mentioned before. Such movements imply that advanced techniques can be successfully extended and accepted, when local agricultural technique consultants are capable enough and conditions on the part of recipient farmers are ripe enough. Therfore, the significant aim of rice production center proposed here is to introduce advanced agricultural techniques not only to a special agment of farmers but to farmers of all strata. To fulfill this aim, extension of production techniques, readjustment of enviroment for production, and development of farmers organizations were planned.

In realizing the plan, intensive guidance by agricultural experts ( for example, experts working for BPI and APC ) should be institutionalized.

The contents of guidance given to farmers at the Rice Production Center are as varied as follows.

1. Guidance in advanced production technique
2. Guidance in readjustment of enviroment for production
3. Guidance in maintenance and operation techniques of land improvement facility
4. Guidance in the establishment of the farmers' organizations

Out of the above, production techniques and the farmers' orgawizations are elaborated below.

(a) Extension and guidance in advanced production techniques

A farming household is selected for every Barrio for intensive and thorough guidance in production techniques, and all farmers of the Barrio are to meet regularly in the paddy field of the intensive guidance subject farmer to receive guidance trom experts.

Meanwhile, a demonstration field is set aside within the distirct for demonstration of the following items.

1. demonstration of fertilizing effects
2. demonstration of agricultural chemical effects
3. demonstration of carieties

For these purposes, a demonstration field of about 2 ha. is required along with necessary agricultural tools and machines, a business office, and a work shop.

As many farmers in the district are not acquainted with lowland paddy cultivation, a large team of instructors should be sent to teach from the biginning.

(b) The Farmers' Organization

The rice production increase is promoted most when required measures are taken and implemented systematically.

In the Rice Production Center planned here, along with the establishment of

the irrigation system, a farmers' organization should be formed to extend new production techniques, to secure farming funds, and to store and sell agricultural products.

As the above functions are supposed to be fulfilled sufficiently by FACOMA, of which the formation is underway throughout the country, the FACOMA branch for the Rice Production Center district only should be considered.

Maintence and operation of irrigation facilities after the major diversion point and water control at field level should be taken up by FACOMA in view of preventing duplication of similar organizations and streamlining the movement.

B. 2. 4. Maintenance and Operation Plan

2. 4. 1. Organization for Operation and Maintence

Operation and maintence of the irrigation systems are under the operation and maintence opganization consist of the goverment agency in the respective locality and the beneficiaries.

The goverment agency stationed there is in charge of the operation and maintenance of principal facilities as well as of water control at major diversion points.

Beneficiaries are to form a body in charge of operation and maintenance of irrigation facilities at field level as well as water control after the major diversion points.

A coordinating agency is to be organized by the delegates of both bodies for smoothe communication between the two and for better operation of the system.

The goverment agency stationed there is organized in line with the present NIA plan.

2. 4. 2. Water Charge

Expenses required for operation and maintence of the facilities are in principle levied on the beneficiaries of the irrigation system.

Required expenses for the district is estimated at 25,000₱ (6,410 U.S.$) inclusive of maintenace and repairment expenses for canals and diversion dam, and personal expenses, for one year. This is equivalent to 35 ₱ (8.9 U.S.$) per ha. for 2 crops. ( For further details, see Appendix E-13 ).

B.- 3 Cost Estimation

B. 3. 1. Methods of Estimation

The cost of the project was estimated, after considering estimated construction cost on the basis of a standard cross section chart, structure frame chart, and the assumed ground height, referring to an example of cost estimation by the national irrigation Project of the Philippines as well as Japanese examples. Unit price: wage and unit price of supplies and materials in the Philippines are taken into consideration. The following are prerequisites for cost estimation.

(1). The period of construction is divided into two, Phase 1 & 2, respectively in 2 years.

(2). The construction work is subconstructed

(3). Heavy equipments are to be employed for civil works.

(4) Facilities for agricultural guidance and extention service are to be established parallel with the first stage of civil works.

(5), Parallel with the first stage of construction, the rice production center facilities about half of the scale at the time of completion is to be constructed and shall be expanded, as required, to achieve the planned scale and function within 5 years after completion of the first stage of construction.

B. 3. 2. Estimated Cost

3. 2. 1. Total Construction Cost

Table B-3. 2-a

| | Phase 1 | | Phase 2 | | Total | |
|---|---|---|---|---|---|---|
| Item | ₱ | $ | ₱ | $ | ₱ | $ |
| Civil Works | 4,000,000 | 1,025,600 | 3,300,000 | 846,200 | 7,300,000 | 1,811,800 |
| Extension Service Facilities | 200,000 | 51,300 | 0 | 0 | 200,000 | 51,300 |
| a sum | 4,200,000 | 1,076,900 | 3,300,000 | 846,200 | 7,500,000 | 1,923,100 |
| Rice Center | 1,000,000 | 256,400 | 0 | 0 | 1,000,000 | 256,400 |
| Total | 5,200,000 | 1,333,300 | 3,300,000 | 846,200 | 8,500,000 | 2,179,500 |

Conversion rate : $1 = ₱. 3. 9

Table B-3. 2. b shows a breakdown of total construction cost.

Table B-3. 2 - b A breakdown of total construction cost

| Item | Scale | Phase 1 Capacity | Phase 1 ₱ | Phase 1 Equivalent U.S.$ | Scale | Phase 2 Capacity | Phase 2 ₱ | Phase 2 Equivalent U.S.$ | Total ₱ | Total Equivalent U.S.$ |
|---|---|---|---|---|---|---|---|---|---|---|
| A. Civil Works | | | 4,000,000 | 1,025,600 | | | 3,300,000 | 846,200 | 7,300,000 | 1,871,800 |
| 1. Intake Facility | | | 780,000 | 200,000 | | | 0 | 0 | 780,000 | 200,000 |
| Diversion Dam | Height 2m Length 100m with Sand trap Qmax=2.56m$^3$/sec | | 780,000 | 200,000 | | | 0 | 0 | 780,000 | 200,000 |
| 2. Irrigation Canal | | 18,490 m | 1,407,000 | 360,700 | | | 777,000 | 199,300 | 2,184,000 | 560,000 |
| Main Canal | Qmax=2.56m$^3$/sec concrete lining | 1,700 m | 507,000 | 130,000 | | | 0 | 0 | 507,000 | 130,000 |
| Laternal | Earth (unlined) canals | 16,790 m | 724,000 | 185,600 | Concrete block lining | 16,140 | 777,000 | 199,300 | 1,501,000 | 384,900 |
| Lukay Creek Intake | 3m height 25m length Qmax=1.48m$^3$/sec | | 116,000 | 29,700 | | | z 0 | 0 | 116,000 | 29,700 |
| Accessories | Diversion devices 3 crossing pipes 84 | | 60,000 | 15,400 | | | 0 | 0 | 60,000 | 15,400 |
| 3. Farm Road | | 22,640 | 375,000 | 96,200 | | | 0 | 0 | 375,000 | 96,200 |
| Main Road | Width 5m | 6,500 m | 325,000 | 83,400 | | | | | 325,000 | 83,400 |
| Accessories | A bridge across creek | 6 | 50,000 | 12,800 | | | 0 | 0 | 50,000 | 12,800 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4. Land Preparation for paddy field | | 630ha | 800,000 | 205,100 | | | 0 | 0 | 800,000 | 205,100 |
| 5. Land Readjustment | | | 0 | 0 | | 712ha | 2,000,000 | 512,800 | 2,000,000 | 512,800 |
| 6. Compensation payment | | 24ha | 48,000 | 12,300 | | | 0 | 0 | 48,000 | 12,300 |
| Irrigation canal | | 18ha | 36,000 | 9,200 | | | 0 | 0 | 36,000 | 9,200 |
| Farm Road | | 6ha | 12,000 | 3,100 | | | | | 12,000 | 3,100 |
| 7. Supervising | | | 255,000 | 65,400 | | | 225,000 | 57,700 | 480,000 | 123,100 |
| Barracks | A business office. 1 block Ware house & garage/block | $200m^2$ | 60,000 | 15,400 | | $200m^2$ | 60,000 | 15,400 | 120,000 | 30,800 |
| Automobile | | 2 | 25,000 | 6,400 | | 2 | 25,000 | 6,400 | 50,000 | 12,800 |
| Supervising | 5% (1+2+3+4+5+6) | | 170,000 | 43,600 | 5% | | 140,000 | 35,900 | 310,000 | 79,500 |
| 8. Contingencies | | | 335,000 | 85,900 | | | 298,000 | 76,400 | 633,000 | 162,300 |
| B. Extension Service Facility | | | 200,000 | 51,300 | | | | | 200,000 | 51,300 |
| Business office | 1 block | $100m^2$ | 30,000 | 7,700 | | | | | 30,000 | 7,700 |
| Garage & warehouse | | $200m^2$ | 40,000 | 10,200 | | | | | 40,000 | 10,200 |
| Officer and employee's housing | | $300m^2$ | 120,000 | 30,800 | | | | | 120,000 | 30,800 |
| Water Supply | | | 10,000 | 2,600 | | | | | 10,000 | 2,600 |
| C Rice Center | | | 1,000,000 | 256,400 | | | | | 1,000,000 | 256,400 |
| Drying facilities | 4t/day x 12 | | 330,000 | 84,600 | | | | | 330,000 | 84,600 |
| Storing | $700m^2$ | | 250,000 | 64,100 | | | | | 250,000 | 64,100 |
| Milling | 2t/hr x 2 | | 220,000 | 56,400 | | | | | 220,000 | 56,400 |
| Building | $600m^2$ | | 200,000 | 51,300 | | | | | 200,000 | 51,300 |
| Total | | | 5,200,000 | 1,333,300 | | | 3,300,000 | 846,200 | 8,500,000 | 2,179,500 |

Table B-3. 2 -c A breakdown of Rice Center Expenses

| Facility | Phase 1 | | | Additional Facility | | | Total (Phase 2) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Scale & Capacity | ₱ | U.S.$ | Scale & Capacity | ₱ | U.S.$ | Scale & Capacity | ₱ | U.S.$ |
| Drying Facility | 4t/day x 6 units | 165,000 | 42,300 | 4t/day x 6 units | 165,000 | 42,300 | 4t/day x 12 units | 330,000 | 84,600 |
| Storing | 250m$^2$ | 90,000 | 23,100 | 450m$^2$ | 160,000 | 41,000 | 700m$^2$ | 250,000 | 64,100 |
| Milling | 2t/hr x 1 unit | 110,000 | 28,200 | 2t/hr x 2 units | 110,000 | 28,200 | 2t/hr x 1 | 220,000 | 56,400 |
| Building | 350m$^2$ | 135,000 | 34,600 | 250m$^2$ | 65,000 | 16,700 | 700m$^2$ | 200,000 | 51,300 |
| Total | | 500,000 | 128,200 | | 500,000 | 128,200 | | 1,000,000 | 256,400 |

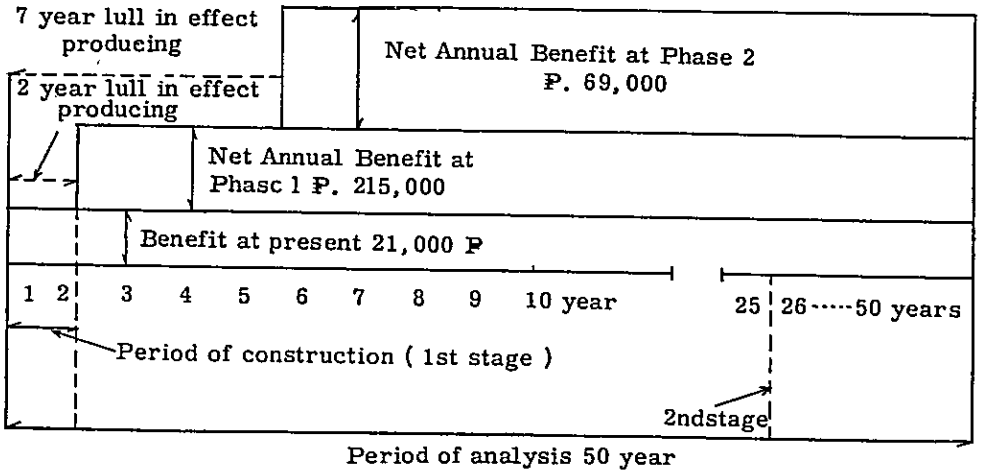
Note 1. Phase 1 construction is to be carried out in paralal with the first stage of civil works.

2. Additional facilities are to be constructed with in 5 years after the completion of the first stage of civil works.

B - 4 Economic Analysis

Considering economical usefulness of the lives of major facilities to be constructed under the project, a period of 50 years is taken for economec analysis, and economic efficiency of the project is calculated in terms of benefit / cost ratio, to give the following.

B. 4. 1. Development Schedule




B. 4. 2. Total Cost

Facilities in the district are to be constricted in line with the following schedule.

The 1st Stage

Principal Facilities : Deversion Works
Irrigation Canals... laterals are not be lined
Road
Land Readjustment ... leveling and bordering
Extension Service facilities

Period of Construction 2 years

The 2nd stage

Principal Facilities:: Irrigation Canals ... laterals are to be lined.
Land readjustment ... drainage ditches, road inside the district, allotment of plot

Starting point of Construction : 25 years after the 1st stage began.

Expenses required for implementation of the above is as follows.

| | | |
|---|---|---|
| The 1st stage | 4, 200, 000 ₱ | ( 1, 076, 900 U.S. $ ) |
| 2nd stage | 3, 300, 000 | ( 846, 200 ) |
| total | 7, 500, 000 | ( 1, 923, 100 ) |

Note; The construction of Rice Center, which is a part of the project, is considered not to be in the range of the present economic analysis of

production process, being a facility of the distribution process. Therefore, the rice center is to be analysed separately. Cost for the drying the paddy and temporary storing is normally included in production cost in a farming household. In view of the nature of the above product on cost which is generally required expenses for production, the item was included.

B. 4. 3. Annual Cost

For benefit/cost ratio calculation, depreciation cost of the construction cost given in the above is calculated maintenance and operation cost an added to the annual cost. Future investments for the 2nd stage construction is to be discounted at the starting point of the 1st stage construction work. Interest rates (r) for this purpose as well as for depreciation are respectively 8 %, 9 %, 10 %, and 11 %.

| | $r = 8\ \%$ | $r = 9\ \%$ | $r = 10\ \%$ | $r = 11\ \%$ |
|---|---|---|---|---|
| 1st stage construction | | | | |
| $4{,}200{,}000₱ \times \frac{r(1+r)^{50}}{(1+r)^{50}-1}$ | 1,000 ₱1,000 US$<br>343 ( 87.9) | 383 ( 98.2) | 424 (108.7) | 465 (119.2) |
| 2nd stage depreciation cost | | | | |
| $(3{,}000{,}000₱ \times \frac{1}{(1+r)^{25}} \times \frac{\alpha(1+r)^{50}}{(1+r)^{50}-1})$ | 39 ( 10.0) | 35 ( 9.0) | 31 ( 7.9) | 27 ( 6.9) |
| Sum total | 382 ( 97.9) | 418 (107.2) | 455 (116.6) | 492 (126.1) |
| Operation and Maintenance of facilities | 25 ( 6.4) | 25 ( 6.4) | 25 ( 6.4) | 25 ( 6.4) |
| Total | 407 (104.3) | 443 (113.6) | 480 (123.0) | 517 (132.5) |

B. 4. 4. Annual Benefit

The benefit obtained from the project are increased net profit caused by increased rice production ( For further detail, See B-2.3.3. ) If we take the year in which the construction work started as the basis of calculation, increased yield is enjoyed with a lull of two years during Phase 1, and of 7 years during Phase 2, the construction period of two years is included. If we convert this into an average annual benefit throughout the analysis period, it would be as in the following. Calculation of discount of annual benefit to the starting point of construction is to be done for respective interest rates of 8 %, 9 %, 10 %, and 11 %.

| | $r = 8\ \%$ | $r = 9\ \%$ | $r = 10\ \%$ | $r = 11\ \%$ |
|---|---|---|---|---|
| Phase 1 (2 year lull effect enjoyment) | | | | |
| $215{,}000\ ₱ \times \sum_{n=3}^{n=50} \frac{1}{(1+r)^n} \Big/ \sum_{n=1}^{n=50} \frac{1}{(1+r)^n}$ | 1,000 ₱1,000 US$<br>184 ( 47.2) | 181 ( 46.4) | 177 ( 45.4) | 174 ( 44.6) |
| Phase 2 (7 year lull of effect enjoyment) | | | | |
| $690{,}000\ ₱ \times \sum_{n=8}^{n=50} \frac{1}{(1+r)^n} \Big/ \sum_{n=1}^{n=50} \frac{1}{(1+r)^n}$ | 396 (101.5) | 373 ( 95.6) | 351 ( 90.0) | 330 ( 84.6) |
| Total | 605 (148.7) | 554 (142.0) | 528 (135.4) | 504 (129.2) |

B. 4. 5. Benefit/cost Ratio

On the basis of the annual benefit and annual cost given above, benefit/cost ratio corresponding to interest rates (r) is calculated below.

| | $r = 8\ \%$ | $r = 9\ \%$ | $r = 10\ \%$ | $r = 11\ \%$ |
|---|---|---|---|---|
| Annual benefit | 1,000 ₱1,000 US$<br>580 (148.7) | 554 (142.0) | 528 (135.4) | 504 (129.2) |
| Annual cost | 407 (104.3) | 443 (113.6) | 480 (123.0) | 517 (132.5) |
| Benefit/cost ratio | 1.43 | 1.25 | 1.10 | 0.97 |

# III—C Titay Valley (Zamboanga del Sur)

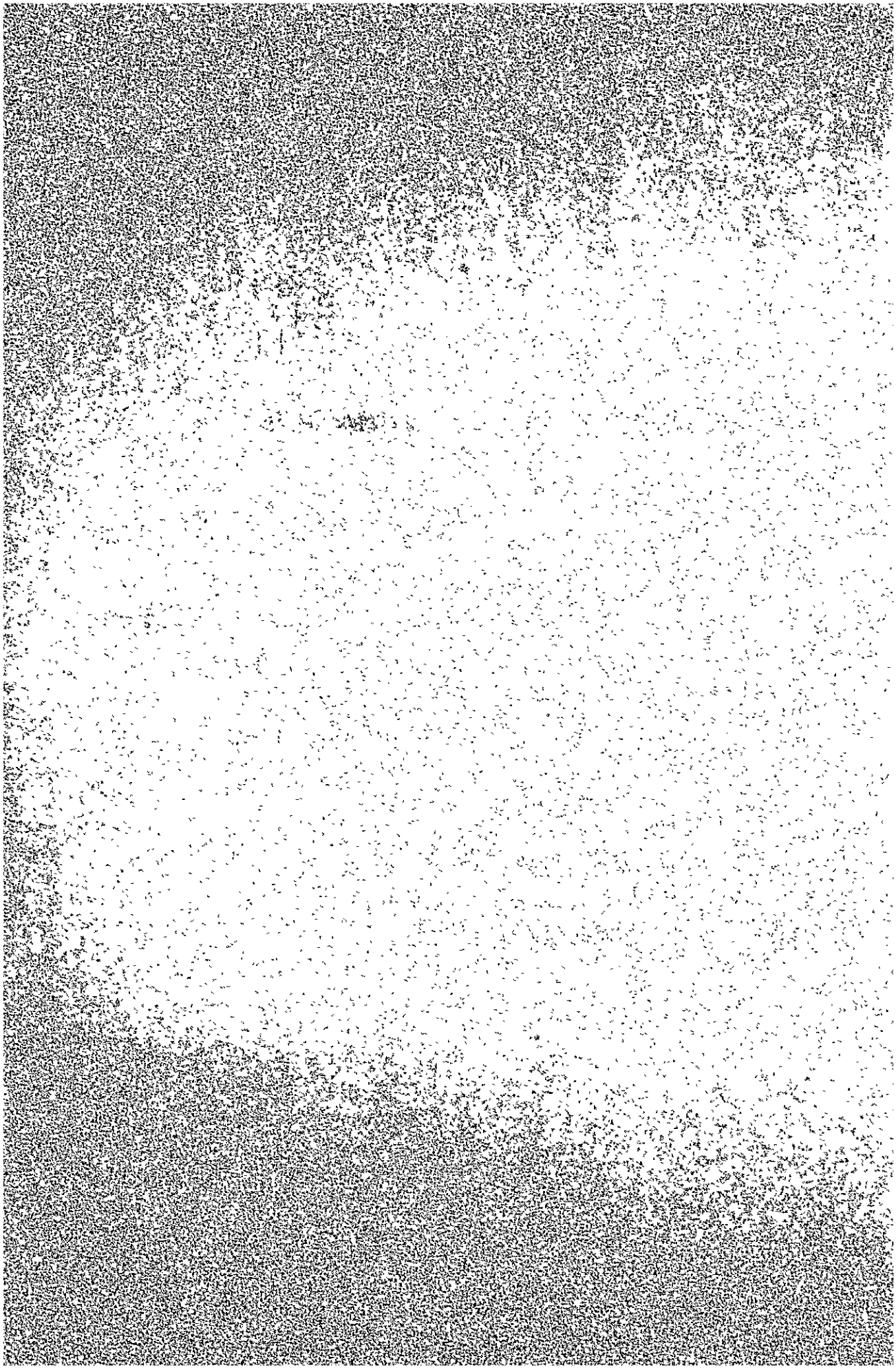


Fig. C - 1

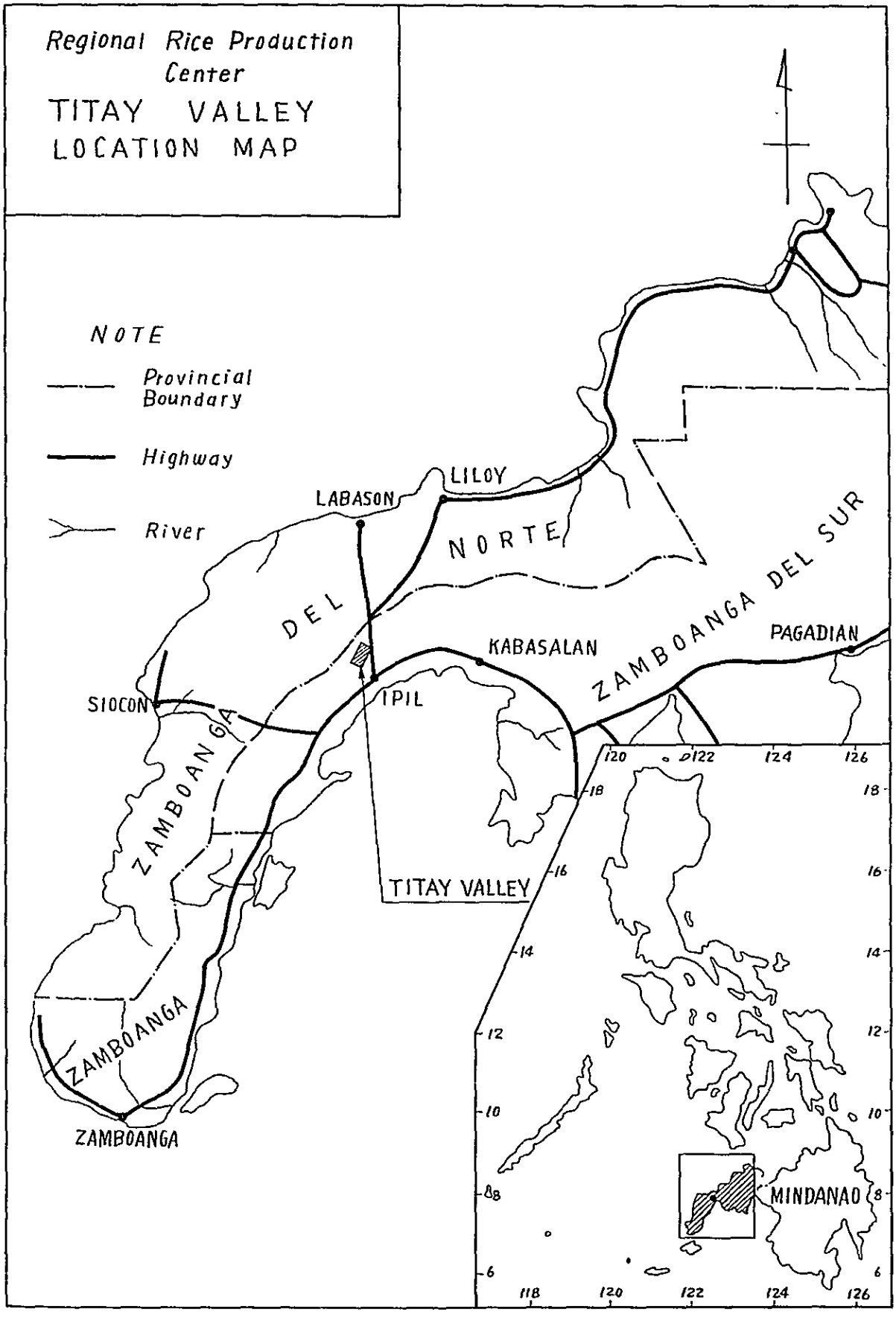
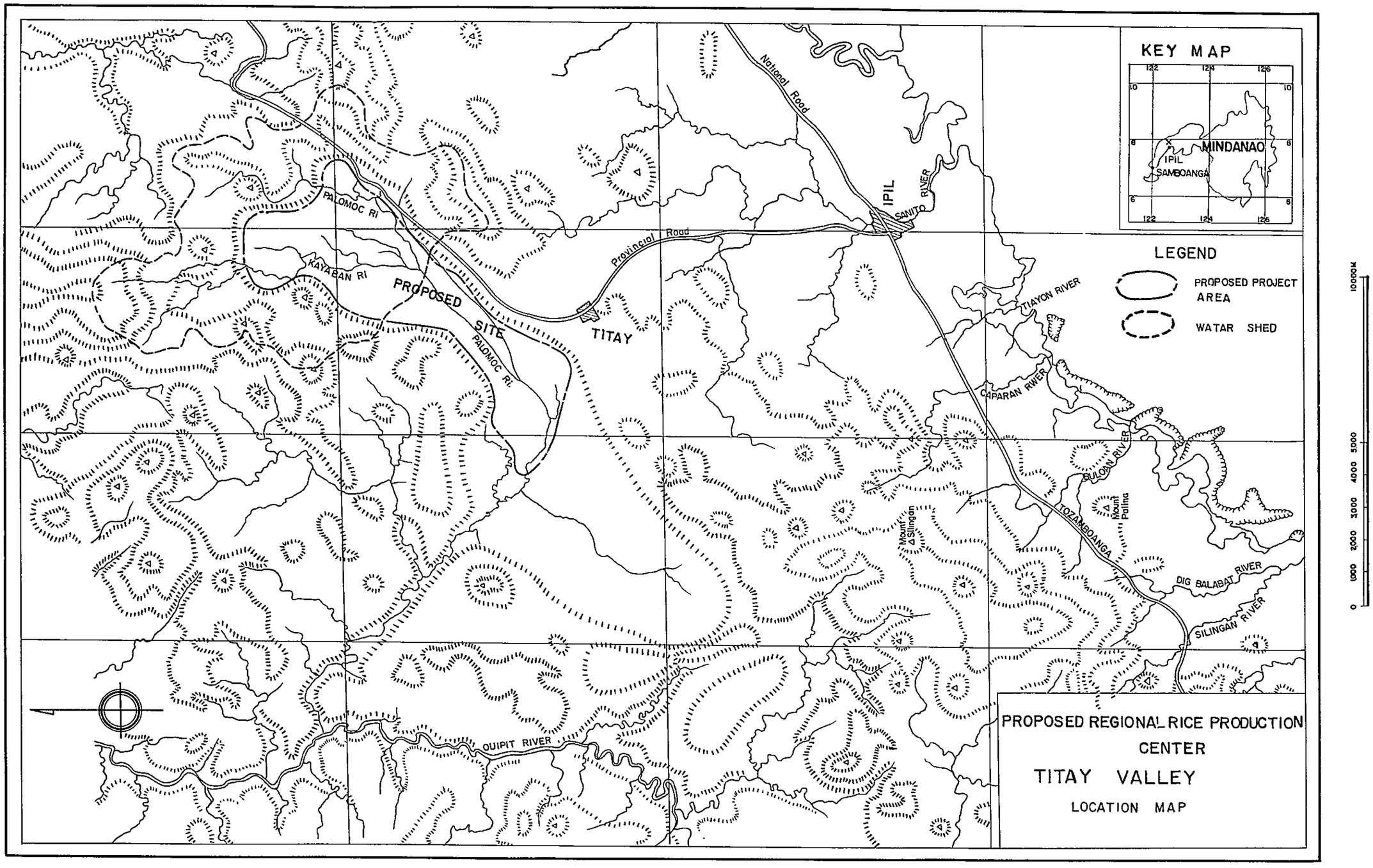

Regional Rice Production Center
TITAY VALLEY
LOCATION MAP
NOTE
Provincial Boundary
Highway
River
LABASON
LILOY
DEL NORTE
ZAMBOANGA DEL SUR
PAGADIAN
KABASALAN
SIOCON
IPIL
ZAMBOANGA
TITAY VALLEY
ZAMBOANGA
ZAMBOANGA
MINDANAO
118
120
122
124
126
18
16
14
12
10
8
6

Fig C-2


KEY MAP
122
124
126
10
8
6
MINDANAO
IPIL
SAMBOANGA
LEGEND
PROPOSED PROJECT AREA
WATAR SHED
National Road
IPIL
SANITO RIVER
PALOMOC RI
KAYABAN RI
PROPOSED SITE
Provincial Road
TITAY
TIAYON RIVER
CAPARAN RIVER
BULOAN RIVER
TOZAMBOANGA
Mount Palina
Mount Silingan
DIG BALABAT RIVER
SILINGAN RIVER
QUIPIT RIVER
0
1000
2000
3000
4000
5000
100000M
PROPOSED REGIONAL RICE PRODUCTION CENTER
TITAY VALLEY
LOCATION MAP

## III - C Titay Valley (Zamboanga del Sur)

### C.- 1 General Description of the Project Area

#### C. 1. 1. Location

This area lies 15 kilometers to the north of Ipil, where it is about 150 km, east of Zamboange city on the southwestern tip of Mindanao Island.
150 km. further east of the town of Ipil, is Pagadian, where the provincial goverment office is located. The highway from Ipil to northern Liloy via the town of Titay runs through the southeastern part of the district.

#### C. 1. 2. Topography

The district is 4,000 ha. of land in the valley surrounded by mountains with an altitude of 200-600m. The palomoc river runs in the middle of the district from northeast to south west, but the area is generally flat.

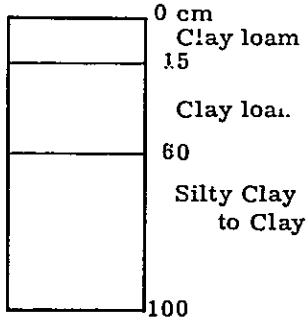
#### C. 1. 3. Soil

The whole of Titay valley consisting of alluvial deposits is categorized into Titay clay loam, of which the surface soil is clay loam with viscosity appearing at lower levels of the strata. High underground water level provides poor internal drainage. Consequently, the district is totally lowland fields. The poor internal drainage cannot be improved by provision of drainage canals alone.

Though the layers below 60 - 70 cm. contain pebbles, this presents no farming difficulty.

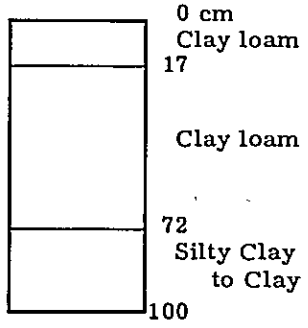
No. 1

Titay Clay loam




No. 2

Titay Clay loam



C. 1. 4. Climate

1. 4. 1. Precipitation

(a) Data Used

Survey Data recorded at Kabasalan for the past 11 years (1956 - 1966) was used. Kabasalan is the town 25km. east of Titay valley, the planned benefit receiving district. The data is the nearest to that of the benefit receiving district and is reliable.

(b) Annual Precipitation

The average for the 11 years from 1956 to 1966 is 2,782 mm., while the maximum is 3,226 mm. in 1960 and the minimum is 2,430.3 mm. in 1965.

(c) Maximum Daily Precipitation

The highest figure for the maximum daily precipitation in 11 years, from 1956 to 1966, is 139.4 mm. in 1958 (Table C.-4-a). Precipitation on the basis of 10 year probability is 123.3 mm. while 100 year probability is 151.2 mm.

(d) Precipitation Analysis

Monthly precipitation as in Table C-1.4-a presents no marked time for dry a season of which precipitation is below 24 inches and no conspicuous rainy season. Continuous drought days are relatively dominant during January - April. ( Table C-1.4-b )

Table C-1.4-a Yearly Precipitation and Consecutive Dry Days by Year

| Year | Year Precipitation | Max. daily Precipitation | |
|---|---|---|---|
| | | Precipitation | Date |
| 1956 | 3,156.1 | 92.7(6) | 12.27 |
| 57 | 2,464.7 | 89.7(8) | 1.27 |
| 58 | 2,909.7 | 139.4(1) | 6.26 |
| 59 | 2,972.2 | 108.7(3) | 5.11 |
| 60 | 3,226.0 | 95.5(5) | 3.25 |
| 61 | 2,580.1 | 67.8(10) | 10.8 |
| 62 | 2,694.2 | 87.6(9) | 5.14 |
| 63 | 2,778.3 | 90.4(7) | 3.22 |
| 64 | 2,683.6 | 118.4(2) | 6.20 |
| 65 | 2,430.3 | 49.5(11) | 4.29 |
| 66 | 2,702.6 | 101.6(4) | 12.23 |
| Average | 2,781.6 | | |

Table C-1.4-b Monthly Precipitation and Consecutive Dry Days by Month

| Month | Average | Monthly Precipitation | | Consecutive Dry Days | |
|---|---|---|---|---|---|
| | | Max. | Min. | Average | Max. |
| 1 | 115.8 | 174.8 | 47.2 | 13 | 27 |
| 2 | 97.3 | 165.5 | 37.6 | 14 | 26 |
| 3 | 116.8 | 277.9 | 45.1 | 11 | 29 |
| 4 | 181.5 | 243.8 | 55.9 | 10 | 20 |
| 5 | 287.3 | 423.7 | 162.0 | 7 | 15 |
| 6 | 288.2 | 382.1 | 96.5 | 5 | 9 |
| 7 | 294.2 | 479.4 | 134.6 | 6 | 12 |
| 8 | 317.0 | 434.7 | 154.2 | 6 | 14 |
| 9 | 279.4 | 451.6 | 154.1 | 6 | 14 |
| 10 | 253.9 | 419.9 | 102.0 | 8 | 16 |
| 11 | 267.9 | 392.6 | 119.2 | 6 | 12 |
| 12 | 231.3 | 473.2 | 152.6 | 8 | 14 |

1. 4. 2. Temperature and Humidity

The survey data in Zamboanga city recorded 27.1°C in April and May as the maximum temperature, and 26.3°C. in January as minimum, showing very small annual fluctuation.

The monthly average for relative humidity is 81 - 86 % which is considered to be of high range.

Titay valley is located in the inland part of the island, while Zamboanga city is on the peripheral part. Therefore, survey data at Zamboanga city cannot be applied justly. Humidity and temperature do not cause any difficulty in paddy cultivation at any rate.

1. 4. 3. Tropical Cyclon

Except some northern parts of Mindanao Island, typhoons present no problem in the region. Therefore, the Titay valley as far as typhoon is concerned, favorable land for agriculture.

C. 1. 5. Hydrology ( Water Resources )

The Palomoc and Kayaban Rivers which run through the middle of Titay valley are considered as the main source of irrigation for the district. The two rivers join at a point above the Titay valley. A possible diversion point is thought downstream from this joining point.

Consecutive survey on the discharge of the two rivers have not been conducted at all. However, discrete surveys respectively in both the rainy and dry season have been conducted, as shown in the table below.

| Rivers & places surveyed | Date of Survey | Discharge |
|---|---|---|
| Palomoc River and Kayaban River | 1959 - 2 - 12 | 0.347 $m^3$/sec |
| (below Junction) | 1961 - 10 - 4 | 2.700 " |
| " | 1965 - 6 - 25 | 2.105 " |
| " | 1967 - 5 - 8 | 1.900 " |

As shown clearly in the above results, in the dry season, the Palomoc River have not enough discharge to irrigate the whole valley of Titay, it's river basin of 57$km^2$. is quite small, and judging from the specific discharze, the minimum discharge on the basis of 10 year probability could be well below 33 m/sec. The width of the river is not wide and banking of any form is nonexistent. If a diversion dam or pumps, canals and roads are constructed in the area without giving any measures, their maintenance would be very difficult, due to flood damage. Therefore, for the development of the district, establishment of a reservoir dam in the up stream part of the

river to help solve the problem of insufficient of minimum discharge of the rivers and for flood control, as well as diversion technique from an adjacent rivershed, should be examined.

C. 1. 6. General Description of Agriculture Practised at Present

1. 6. 1. Land Utilization and Cropping Pattern

1,500 ha. out of the total 400 ha. of land in Titay valley is now utilized as lowland paddy fields. Double cropping of paddies which was started in 1957 is now practiced in only 70% of the total area.

Land in the surrounding hills are utilized as coconut fields and upland fields. Slash-and-burn farming is practiced over some portions of the upland field.

1. 6. 2. Rice Productivity

According to the statistics issued by the Department of Agricultural and Natural Resource, the average yield for the last three years in Southwestern Mindanao, where the project district is, was 30 cavan/ha. ( 1.32 ton/ha. ) for the lowland's 1st crop. 28 cavan/ha. (1.23 ton/ha.) for the 2nd crop, 20 cavan/ha. ( 0.90 ton/ha. ) for the upland, which is some what below the national average.

As the surrounding hills are inhabited by rats, Titay valley is exposed to damage by rats which in some years amounts to a loss of half of the total yield. The area is also subjected to periodical floods over a considerable part of the area due to topographical conditions. Elon-Elon which is a paddy variety with longer than average growing period is, cultivated. The district seems to receive insect and pest damage as well.

On the surrounding hills and in the vicinity, slash-and-burn farming is practiced under this method, a very high yield such as 50 cavan/ha. is obtained in the first year. Upland yield which used to be equal to that of the lowland paddy yield and is still higher than the same in other districts can possibly be attributed to this slash and burn farming.

1. 6. 3. Land Tenure

Majority of the farmers in the district are full owners of the land. Farmers holding full ownership accounts for 2/3 of the farms of the region.

The remaining area is divided into tenant farms which is 10 %, and part owners which is 9% of the whole. Tenant farmers in the strict sense, are only 10%.

1. 6. 4. Farming Scale

The average size of cultivation in the district is 7.9 ha. in farm land areas and 3.8 ha. in ultivated land. Compared with the national average which are 3.6 ha. and 2.5 ha. respectively, the district averages are much higher.

As showing in the large discrepancy between the area of farmland and that cultivated land, as much as 3.2 ha. of farmland are on the average is left idle.

Household distribution in terms of the size of cultivation shows a 53% of farmers have 5 to 10 ha. and only 26% have less than 5 ha.

1-6-5 Market Condition

The center of trade in the region is Ipil, which is about 150 km. east of Zamboanga, an important port city located on the southwestern tip of Mindanao Island, Pagadian where the Procincial Government Office is, is about 150km. to the east of Ipil, making Ipil half way between the two cities. The National Highway which connects these cities is wide but not paved. The town of Ipil is presently developing rapidly, however, it has not been developed to an extent which would be sufficient to provide good market condition.

C. 2 Irrigation Plan and Problems

This area has favorable conditions in terms of topography, climate, soil, diligent farmers, majority of farmers with full ownership, and with a larger area per household, for a project area. The water resource of the area, which is the most fundamental factor, is however not sufficient for stable double cropping of the rice as mentioned earlier. The district is exposed to flood damage every year.

To develop such a district, construction of a storage dam in the upper stream for the provision of irrigation water as well as for flood control and a diversion dam and canals in the lower stream should be planned along with river training as basic procedure. The water diversion plan from the adjacent river basin should be considered.

However, such a plan requires long term investigation and research prior to planning. Therefore, at the outset of development, the following should be understood.

a. Paddy is planted on a one crop basis, avoiding dry season. After the paddy harvesting, upland field crops such as corn could be cultivated as a secondary cropping in the farming plan.

b. In view of flood damage, development should start with an elevated area below the joining point of the Palmoc and Kayaban rivers.

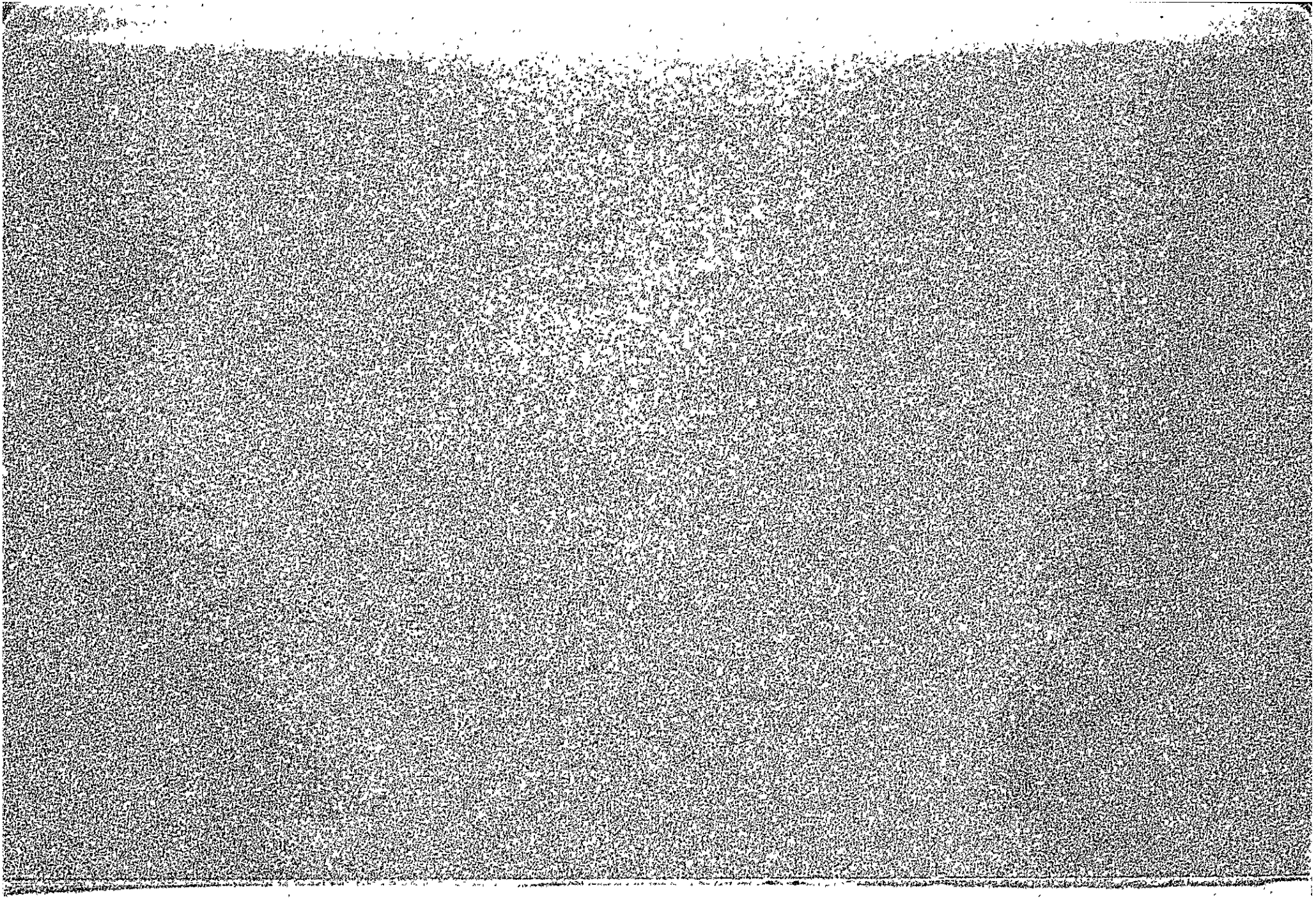
c. Below the joining point of the Palomoc and Kayaban rivers, a diversion dam for drawing water and canal system for water distribution up to field level are to be constructed.

d. The main road which connects the provincial highway and farm road along the irrigation canal and field is to be constructed.

An accurate map with villages, roads, rivers and contour lines should be prepared and observatories for precipitation, discharge, and water level surveys should be established within the river basin to produce reliable basic data.

On the basis of the accurate map prepared and basic data collected, a more careful survey should be conducted in the future for provision of water for irrigation.

# IV Improvement of Rice Milling Faciltities



## IV Improvement of Rice Milling Facilities

### IV—1 Outline

#### 1-1 Requests on the Part of the Philippines for Improvement of Rice Milling Facilities

The following is a summary of the requests presented at the meeting with the Rice Mill Commitee of the Philippine Government in Manila.

There are two types of rice mills currently in use in Philippines, namely the Kiskisan type used commonly in rural area and the Cono type used mainly by commercial rice millers. More grain is broken by the Kiskan milling process, reducing total milling recovery. For these reasons, the concerned are hoping to replace the Kiskan mills with more efficient mills. According to tests conducted by the Philippine Goverment, rubber roller rice mills give higher recovery of total milled rice and better quality rice grain. One of the drawbacks of the machine is that the rubber roller has to be changed quite frequently. Owing to this, the Phillippine Government has reserved sanction of the replacement of the Kiskan type up to the present. In order to carry out more tests, the concerned with the following:

(1). Purchase of 100 units: of the rubber roller rice mill recommended by Japan, which would be distributed to proper places in the republic for field test. An assistance of $300,000 is required for this purpose.

(2). The dispatchment of 4 rice milling specialists for technical training in assembly, operation and repairment of the rubber roll rice mill for 3 - 6 months in Japan with the assistance of the Japanese Goverment. ₱30,000 is required for this purpose.

#### 1 - 2 Comments as a Result of the Survey conducted on Rice Milling Facilities ETC..

(1). The Kiskisan type rice mill is similar to the Cylindrical friction type and is not quite appropriate for Philippine rice which is rather long in shape. Moreover, if does husking and milling simultaneously in the same cylinder, thus adding more pressure on the rice grain, causing more broken rice. Use of the rubber roller rice mill such as Satake SB-2B is considered to lessen the broken rice and thus give higher recovery of total milled rice, which contributes to an overall increase in the total quantity of milled rice distributed throughout the Philippines. More research should be conducted, concerning the durability of rubber rollers.

(2). The conotype rice mill is similar to those used in Thailand, Burma, and other countries in South East Asia. No problems were readily found on this type, judging from the quality of milled rice presently being consumed in the Philippines.

(3). In the Philippines, at present, three companies including Schmid &Oberly Co. Inc. manufacture Kiskisan type rice mills, while eight manufacturers including Jose Barnabe & Sons Inc. produce the Cono type mills. It is presumable that repercussions on the part of these manufacturers are being given to the Goverment which intends to introduce Japanese rice mills.

(4). With regard to storing facilities, so far as we have observed and studied in Central Luzon and Southern Tagalog, the majority of the storage facilities are wooden buildings with tin roofs or concrete buildings of one story. Paddy and milled rice are packed in gunny bags and piled up in the Chinese style. Gamma-BHC and Malathion are used for prevention of insect pests. Fumigation is not practiced. Bulk storage of paddy in silos is not practiced.

(5). The drying of paddy during the rainy season poses a large problem on which Dr. D. L. Umari, Undersecretary of Agriculture personnaly expressed his view. No exact judgement was made as the survey was conducted during the dry season. Application of the heat dryer should be given due attention concering this problem.

IV - 2 Distribution Situation

The transaction unit of a paddy is normally 44kg. in a gunny sacks., But this is not practiced uniformally in all regions ( for example, RCA purchases paddy in 46kg. gunny bags). Milled rice is handled in 56 kg. sacks. According to the report by Stanford Institute, 55% of the total paddy produced in the Philippines is held and marketed locally and 44% is sold definitely to rice dealers. Distribution mechanism of rice is as in chart 1.

In chart 1, the distribution channel to the consumer from the farmer is roughly divided into two, namely, a commercial channel composed of collectors or millers, and a public channel through FACOMA (Farmer's Co-operation Marketing Association) and RCA, which is a government agency. Rice import is under the RCA totally while only 10% and under of the domestic paddy sold by land lords or farmers are sold through them. FACOMA handles only 2% of the paddy sold. It could be presumed therefore that the bulk of the paddy are under the commercial dealers. Until NARIC (National Rice and Corn Corporation), which is a predecessor of RCA, was founded in 1963, oversea Chinese merchants were monopolizing every fielf of rice distribution, namely collection of rice, storing, milling and retailing. It could be presumed they still possess influencial power in the distribution channel.

According to the result of the study by scholars including B. D. Peredo in. Nueva Ecija province on the distribution system of rice, that could be sold by farmers and landlords are handed to local dealers and retailers before being supplied to short-term dealers, retailers, and millers in the city. In another words, rice for paddys are handled by intermediaries who have the same function, causing an unnecessary

complication of the system. In some portion of the distribution channel, transaction cost is multiplied in this way, causing higher a consumerl rice of rice.

During manths of low distribution of paddy harvests, prices are high and vice-versa during months of high distribution. Considerable fluctuation of paddy price according to monthly demand changes is shown in chart 6. Farmers sell paddy in 1 - 4 months after harvest to pay debts or for needed cash. They often sell a paddy before its harvest. As paddy are apparently short throughout the year, the price of paddy might possibly go quite high in the months of poor harvest. But the farmers, because of their financial condition, are not able to reserve paddy by such a month. Therefore, by the arrival of such a month, most of the paddy are hoarded by middlemen.

Duplicated functions in distribution channels was already mentioned. When paddy are in peak supply, many short-term dealers come into the distribution system As the price of rice generally goes upward from the month of peak supply to short supply, they are sure of profit to some extent. As a consequence of their intervention, the distribution channel benome complicated as well as out of order and the discrepancy between producer's price and consumer's price becomes greater. Under this condition supply cannot meet demand effectively, seasonal fluctuation of the amount of crops sold gives rise to undersirable results as shown above. According to the survey by the National Economic Council, which set the required amount of rice for the whole population per month as 4031,000 sacks, the months from October through January are surplus, while the others are deficit months.

## IV - 3 Rice Milling

Rice mills in the Philippines are concentrated in crop producing areas and very few are in consuming area. The type milling machines, twe types of are used, the Kiskisan, and the Cono. According to the report of the Stanford Institute, of rice hoarded, sold, or consumed in the rural areas (56% of the total rice product), 38% are hand pounded, 53% are milled by the Kiskisan, and 9% by the Cono. 44% of the rice in the Commercial channel are supposedly milled by the Cono. The recent tendency is an increase of Cono milled rice, while rice pounded by hand is decreasing. In terms of the milled rice market, the cono type is more important than the Kiskisan type, for the most of rice in the market are processed by the Cono type. However, of the total supply of milled rice in distribution, a considerable amount is still processed by Kiskisan mills and hand pounded. By improving this condition, we could expect to bring an increase in total supply of milled rice.

### 3. 1.. Kiskisan Mill

The Kiskisan mill ( Photograph 1 ) seems to be a similar to the Engelberg type mill in the U.S.A. and resembles the cylindrical friction type of our country. The machine consists of a fluted cylinder roll of 0.5 feet diameter, that rotates within a hollow cylinder of 2 feet in length 0.7 feet in diameter. The hollow cylinder is composed of 2 parts and can

be opened as in the photograph. The characteristic of the machine is built-in threshing device in this part of the machine. The movable huller blade has an adjustable clearance with the cylinder roll. The rotation of the roll is about 400 rpm.
Paddy are poured through the mill once for threshing and whitening, and bran is separateted through the perforation of the screen, while the milled rice goes out at the outlet end.

The Kiskisan mill is used singly and the average milling capacity is 45 sacks of paddy per 12 hours. Kiskisan mills are more common in the area where crops produced are consumed internally or not sufficient rather than the rice producing areas such as Central Luzon or Western Visayas where rice is abundant. In the above areas Kiskisan mills process small quantity of rice brought to local markets as well as rice consumed in the farmers' households. The Kiskisan mill that I surveyed (Photograph 2) was owned by a small landlord in St. Rosa, Laguna Province.
Laguora Province.

3. 2. Cono Mills

The Cono mill is similar to the mills found in Thailand and Burma. The system is an arrangement of the following machines in a series. Paddy is milled through the processing system. Average milling capacity 150 -200 sacks of paddy per 12 hours. Compared to Kiskisan mill, its performance is 3 to 4 times more. The working process of the Cono mill system is shown in chart 7.

(a) Preliminary cleaning sieve ( photograph 3 )
Sand, pebbles, raveling of the bags are eliminated by this very simple le flat sieve. Some factories use a slightly more complex type of machine for the same purpose.

(b) Huller ( Photograph 4 )

The machine is composed of two discs made of iron plates covered with emery powder, set horizontally. The upper disc is fixed so as paddy is hulled by friction of the two discs when the lower disc is put into motion. The diameter of the mill is 2 to 4 feet. It moves at 450 rpm.

(c) Aspirator ( Photograph 5 )

An aspirator is a device to eliminate light substance from the other end. Husks are removed by this process.

(d) Paddy Separator ( Phtograph 6 )

It is a structure of 4 to 6 feet a rectangular-shaped box with feet. A sliding plate inside the box is compartmentalized by triangle wood tips fixed on its surface at an equal distance. With vertical vibration given to the plate ( 70 to 80 returns / minute), paddy being heavy, pushed up the plate and gathered in an upper groove while brown polished rice goes down the plate and gathers downward.

(e) Cone ( Photograph 7 )

A cone body coated with emery powder is covered by a steel iron casing with l

special steel wirecloth. The casing is lined with rubber buffer plates at six spots. The casing is surrounded by the other steel one. The diameter of the body is 2 to 3 feet and smaller than that of the huller while it is higher with the height of 2.5 feet. Brown rice is put between the body and the internal casing and whitened by moving body (750 rpm.). Bran is discharged through a net of small holes of the internal casingly and aspired by a fan and gathered at a place by cyclon ( photograph 8 ). Milling performance can be controlled by adjustment of a gap between the body and internal casing by vertical motion of the body.

(f) Aspirator

In some factories, milled rice right out of a Cone is measured and packed. But in some factories, rice is put through the Aspirator before being measured and packed.

3. 3. Distribution and Utilization of Mills

Distribution of milling machines is as in table 1, with 7,180 units of Kiskisan mills and 1,670 units of Cone mills.

Table 1.

| | Philippines | Metropolitan Manila | Ilocos | Cagayan Valley | Central Luzon | Southern Tagalog |
|---|---|---|---|---|---|---|
| Kiskisan | 7,180 | 2 | 914 | 719 | 979 | 1,118 |
| Cono | 1,670 | 15 | 37 | 57 | 535 | 216 |
| | | Bicol | Western Visayas | Central and Eastern Visayas | Southern Mindanao and Sulu | Northern Mindanao |
| Kiskisan | | 601 | 944 | 440 | 1,136 | 327 |
| Cono | | 91 | 204 | 192 | 214 | 109 |

Facts and Figures about the Philippines (1963)

Details are not known as to private mill ownership. As for Cono factories under FACOMA are 104 as of 1962 as in the table 2. Average milling capacity is 234 sacks of paddy per 12 hours. The factories are more common in Luzon than in Visayas or Mindanao.

During the four years following 1956, 48 units of Satake Milling machines were installed by FACOMA, their average milling capacity was 90 sacks/12 hours.

RCA operates 159 Cono milling factories as of 1964. But 84 % of the machines were rented from private mills. 80% of the factories are in Luzon and the residual 20 % are in Visayas and Mindanao. The average milling capacity in the Luzon district is 170 - 185 sacks 12 hours, while in Visayas and in Mindanao it is 232-255 sacks/12 hours.

The latter shows a larger scale of the factory than the former.

The utilization of mills is greatly affected by seasonal fluctuation of paddy supply. Take the example of research results in Nueva Ecija Province by B.D. Peredo and team, factories 60 % is in operation. Intensive utilization of the factories was observed from December to March, as in chart 8 and 9. Rice mills under FACOMA and RCA are in a somewhat similar situation, showing intensive utilization from December to April ( chart 10 ) and from September to January ( chart 11 ). As for the utilization of the Kiskisan rice mill, much is not known.

Table 2. Factories under FACOMA utilizing the CONO rice milling machines

| Area | Number of factories | Average 12 hour milling capacity in "sacks" | Quantity of rice milled for one year | Utility ratio (%) |
|---|---|---|---|---|
| Ilocos, Cagayan Valley | 44 | 295 | 17,603 | 21 |
| Central Luzon, Southern Tagalog, Bicol | 39 | 183 | 8,293 | 16 |
| Eastern Visayas, Western Visayas | 16 | 211 | 7,619 | 13 |
| N&W Mindanao, S&E Mindanao | 3 | 174 | 2,846 | 6 |
| Philippines | 104 | 234 | 10,446 | 16 |

Papers and Reviews "Rice and Related Statistics" (1965)

3. 4. Price of Mills

The following, chart 3 shows a price list of mills based on the data presented by RICOB.

Table 3. Price of the Kiskisan and Cono rice milling machines

| Kiskisan type | | | Cono type | | |
|---|---|---|---|---|---|
| 10 hour milling capacity in "sacks" | Price (Peso) | Yen Conversion | 10 hour milling capacity in "sacks" | Price (Peso) | Yen Conversion |
| 40 | 1,200 | 108,000 | 80 - 100 | 8,000 | 720,000 |
| 50 | 1,400 | 125,000 | 100 - 120 | 12,000 | 1,080,000 |
| 60 | 1,600 | 144,000 | 150 - 180 | 14,000 | 1,260,000 |
| 80 | 2,000 | 180,000 | 200 - 250 | 22,000 | 1,980,000 |

Note: It is required 5HP by 50 sacks/10 hr capacity of Kiskisan type, 200 sacks/ 10 hr of Coco type and excluded a motor from the above price.

3. 5 Quality of Milled Rice

Shape of rice grain, which is long is dominant. (Wag wag. Elon elon, BPI-76 Raminad are received favorably in the market.

RCA has set a criteria for ratinalization of rice dealings snd standardization of quality of milled rice. They are (1) the extent of mixed broken rice, (2) glass and whole rice (3) degree of mixed stone, pebbles, and foreign matter, (4) the extent of mixed paddy, damaged grain, chalky grain, (5) mixed other variety, (6) general appearance. The first grade rice is long in shape, highly milled rice with an allowance of 10% of broken rice. The second grade is long in shape, highly milled rice with an allowance of a few other variety mixed, and broken rice of up to 25%. The third grade is highly milled rice of long or intermediate shape kinds, with an allowance of 30 - 50% of broken rice. The fourth grade is the lowes quality of milled rice or those without glass pounded by hand. The extent of broken rice or other variety mixed is comparatively. This grade of rice is consumed by the farmers themselves in producing area and does not normally on the milled rice market. The general consumer is purchasing rice of the second or third grade generally.

Milled rice is sold generally by volume at retail stores. 1 ganta (3 liter) measure is a standard. From our observation at markets in Manila, Wag wag (1st grade) is 2.4 peso/ 1 ganta, Intan ( 2nd grade ) is 1.8-1.9 peso/ 1 ganta, and two kinds of so-called RCA rice released by RCA are respectively 1.6 peso/ 1 ganta and 1.4 peso/ ganta. Most of the people it has been observed buy rice of which quality is 1.8 - 1.9 peso/ ganta. Compared to the milled rice in Japan, the quality of these rice is much lower. We learned also that the local consumer show a tendency to prefer old rice which swells when cooked, showing a considerable difference in preference from the Japanese consumer who prefer the new rice of Japonica.

3. 6. Request on the part of the Philippines for the improvement of milling machines

This is the request expressed at the meeting with the Rice Mill Committee, the Goverment of the Philippines in Manila, and is identical to that of the part 2. Improvement of Rice Milling Facility in the Agricultural Project Proposals for Japanese Assistance. The following is the summary of the request.

There are two types of rice mills currently in use in the Philippines, the Kiskisan mill which is used commonly in the rural area and the Cono mill which is used mainly by commercial rice millers, More rice is broken in Kiskisan milling, resulting in low total milling recovery. The concerned are hoping to replace the Kiskisan mills with more efficient machines. According to tests conducted by the Philippine Goverment, rubber roller rice mills give higher recovery of total milled rice and better quality rice bran, as shown in table 4. One of the drawbacks of the machine is that the rubber roller has to be replaced quite frequently. Due to this, the Philippine Goverment has reserved its sanction up to now. The Goverment of the Philippines is to allocate a budget to test efficiency of representative Japanese rubber roller rice mill at the rice milling laboratory of the College of Agriculture, University of the Philippines. In implementation of the of the above plan, the government request the assistance from Japan on the following items.

(1). Purchase of 100 units of the rubber roller rice mill recommended by Japan which would be distributed to proper places in the country for field test. Assistance of $300,000 is requested for this purpose.

(2). Dispatch of 4 rice milling specialists for technical training in assembly, operation and repairment of the rubber roller rice mill for 3 - 6 months in Japan. ₱30,000 are requested for this purpose.

Table 4. A performance comparison of the Kiskisan and rubber roller type of rice milling machines.

| Type of Machine | Vatiety of rice | Percentage of the hulled rice compared with the unhulled rice. | | Percentage of undamaged rice collected. | Hourly milling rate in Sacks (%) |
|---|---|---|---|---|---|
| | | Weight (%) | Quantity (%) | | |
| Kiskisan | Dinalaga | 62.5 | 44.9 | 16.6 | 2.25 |
| | Intan | 66.9 | 50.0 | 24.5 | 3.47 |
| | Wagwag | 65.0 | 50.2 | 38.2 | 2.91 |
| | | 64.8 | 48.4 | 26.4 | 2.88 |
| Satake SB-2B | Dinalaga | 67.2 | 49.0 | 38.0 | 4.10 |
| | Intan | 71.5 | 54.0 | 52.5 | 3.56 |
| | Wagwag | 68.1 | 54.4 | 52.4 | 3.30 |
| | | 68.9 | 52.4 | 47.6 | 3.65 |

D. B. de Padua "Performance of Low Capacity Rice Mills" GAMI Times

IV - 4 Storing

Warehouses are most important facilities for dealers for long-term storage of a large amount of rice. According to statistics, distribution of rice storage in the Philippines is shown in table 5, It amounts to 1,337 in all.

As for the size of the storage and the amount of rice stored, complete information was not available. As for FACOMA, as in table 6, from 1952 to 1962, 210 warehouses were built and their average capacity was 22,711 sacks of paddy. FACOMA utilized attached storehouses of rice milling factories for keeping rice. From 1954 to 1959, there were 135 factories of that sort with the average capacity of 175 sacks of rice. The number and the size of the storage under FACOMA are correlated with the production area of rice. Construction of warehouses was very active up to 1955 but declined thereafter. Construction of :

RCA recorded the use of 245 warehouses in 1964, 82% of among which were rented from private dealers. As in the case of warehouses under FACOMA, the warehouses under RCA are distributed over the rice producing areas.

Warehouse: the research in Nueva Ecija by B.D. Peredo and others on dealers shows imperfect utilization of facilities. Only 32% of the designed capacity of the ware house of dealers are utilized and that of the rice millers, 43%. Seasonal change in the utilization of storage is as shown in Fig. 12 - 15. These warehouses are utilized more fully in their capacity only during the peak of the supply season as well as the harvesting time of the paddy. Warehouses under FACOMA and RCA are not utilized to the full extent like these of dealers. The warehouses under the three categories seem to be more than actually required.

Farmers are selling a relative small quantity of rice. As mentioned before, they sell rice shortly after harvesting. So they don't need storages. Retailers sell a smaller amount of rice per unit of time, that means a smaller amount of rice in the shop. The two are dependent upon the dealers for rice storage.

Table 5. Distribution of Store Houses for Rice and other Agricultural Products.

| Sort \ Regions | Philippines | Metropolitan Manila | Ilocos | Cagayan Valley | Central Luzon | Southern Tagalog |
|---|---|---|---|---|---|---|
| Unhulled & milled rice or other agricultural products | 1,337<br>758 | 3<br>2 | 2<br>72 | 137<br>55 | 402<br>58 | 161<br>62 |
| | Bicol | | Western Visayas | Central and Eastern Visayas | Southern Mindanao and Sulu | Northern Mindanao |
| Unhulled & milled rice or other agricltural products | | 113<br>10 | 89<br>91 | 102<br>55 | 245<br>285 | 83<br>68 |

Source: Facts and Figures about Philippines (1963)

Table 6. Number and capacity of store houses under FACOMA and RCA

| | FACOMA | | | | RCA | |
|---|---|---|---|---|---|---|
| | Store houses | | Store houses attached to milling factories. | | Store houses | |
| Area | Number | Average capacity by sacks | Number | Average capacity by sacks | Number | Average capacity by sacks. |
| I | 40 | 31,125 | 28 | 198 | 84 | 43,672 |
| II | 110 | 22,515 | 74 | 181 | 98 | 31,724 |
| III | 37 | 19,065 | 19 | 165 | 20 | 34,600 |
| IIII | 23 | 15,426 | 14 | 104 | 45 | 28,204 |
| Philippines | 210 | 22,771 | 135 | 175 | 245 | 35,437 |

Note : Area 1 : Ilocos, Cagayan Valley
" 2 : Central Luzon, Southern Tagalog, Bicol
" 3 : Eastern Visayas, Western Visayas
" 4 : N & W Mindanao, S & E Mindanao
* Number of store houses built or purchased 1952 - 1962
** Numbers 1954-- 1959
*** Numbers in 1964
Papers and Reviews "Rice and related Statistics(1965)

Further, as far as observed in Central Luzon and Southern Tagalog, the majority of the storage facilities are wooden buildings with tin roofs or concrete building of one storey. Paddy and milled rice are packed in gunny sacks and piled in the Chinese style. Gamma-BHC and Melathion are used for prevention of insect pest. Fumigation is not practiced. Bulk storage of paddy in silos is not practiced.

- 5 Transportation

Paddy and milled rice transportation in the Philippines is done by means of automobil, snip, and railway. Tracks (Photograph 10) are used generally in Lugon and Mindanao, and Steamboats are used in Visayas. All dealers cannot afford trucks. However, of 58 wholesalers that F.A. Tiongson interviewed in Manila, Cabanatuan and Bulacan while in research, 50% were resorting to trucks for paddy transportation. The survey by Peredo in Nueva Ecija, reported that of the 79 dealers, 11 owned trucks and of the 18 millers, 15 operated their own trucks. Loading capacity of the trucks of the dealers was 118 sacks, while that of millers was 114 sacks. Moreover, by virtue of its high mobility, they can conduct purchase of paddy at a cheaper rate.

FACOMA purchased 85 trucks from 1952 to 1962, to station at rice producing area along with 44 already supplied in Ilocos and Cagayan Valley. According to the RCA report, RCA used 662 trucks from May 1964 to December of the same year. 77 % of these trucks were privately owned, while 15 % were from the armed forces, and only 8 % were owned by the RCA. During 1964, about 1,500,000 sacks of rice were transported by truck by the RCA.

Farmers resort to carts pulled by cattle for rice transportation. The means retailers resort to has a smaller capacity. Both categories depend upon dealers in terms of transportation, just as in storage.

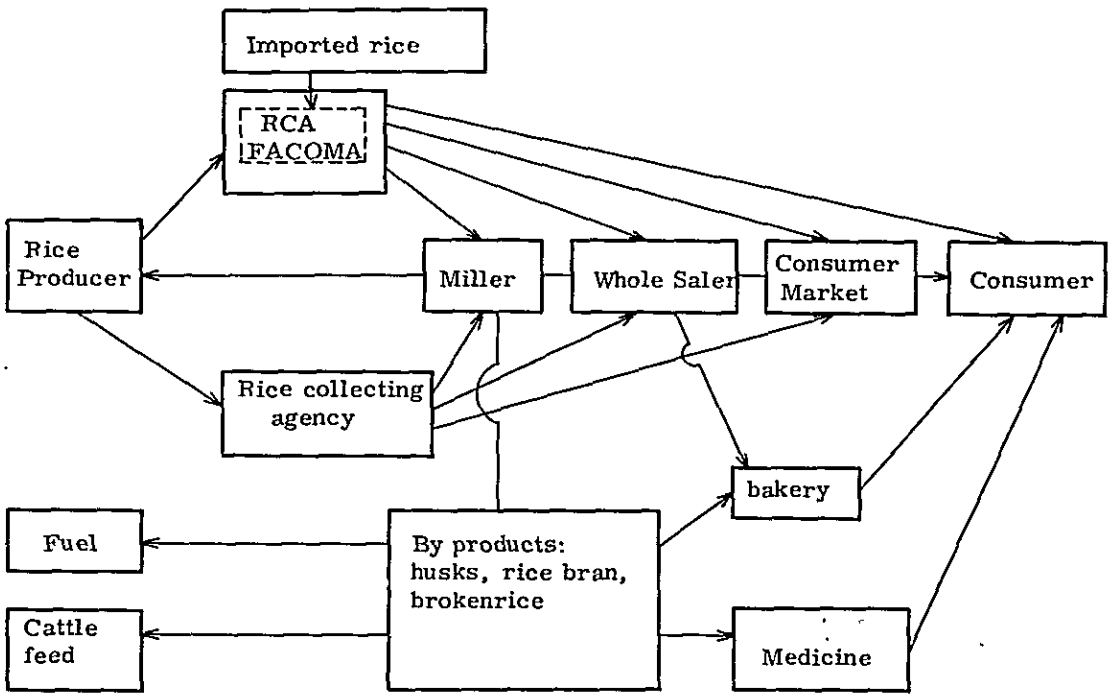
Data on the perspective study of rice movements in the Philippines was not available. A tendency in movements can be observed in chart 16. As for RCA operation in rice movements, 73% of the rice imported by RCA in 1964 was unloaded in Manila, 12% in Cebu. Eurther, distribution of rice sold through RCA is as shown in table 7, which gives Manila, Central Luzon and South & West Mindanao as the main districts. 64% of the rice sold in these three districts.

Table 7. Sales Circumstances, for Rice of RCA

| Districts | Inported Rice | Home-grown Rice | Total |
|---|---|---|---|
| Total (56kg - bay of milled rice) | 4,136,519 (%) | 2,384,312 (%) | 6,520,831 (%) |
| Manila | 47.61 | 6.48 | 32.57 |
| Ilocos | 1.62 | 0.02 | 1.03 |
| Cagayan Valley | 4.87 | 9.88 | 6.70 |
| Central Luzon | 13.98 | 30.10 | 19.89 |
| Southern Tagalog | 6.37 | 3.07 | 5.17 |
| Bicol | 2.80 | 13.05 | 6.53 |
| Eastern Visayas | 7.88 | 6.87 | 7.51 |
| Western Visayas | 5.89 | 6.72 | 6.19 |
| North & East Mindanao | 1.73 | 5.16 | 2.99 |
| North & West Mindanao | 7.25 | 18.65 | 11.42 |

Rice and Corn Administration ( 1965 )

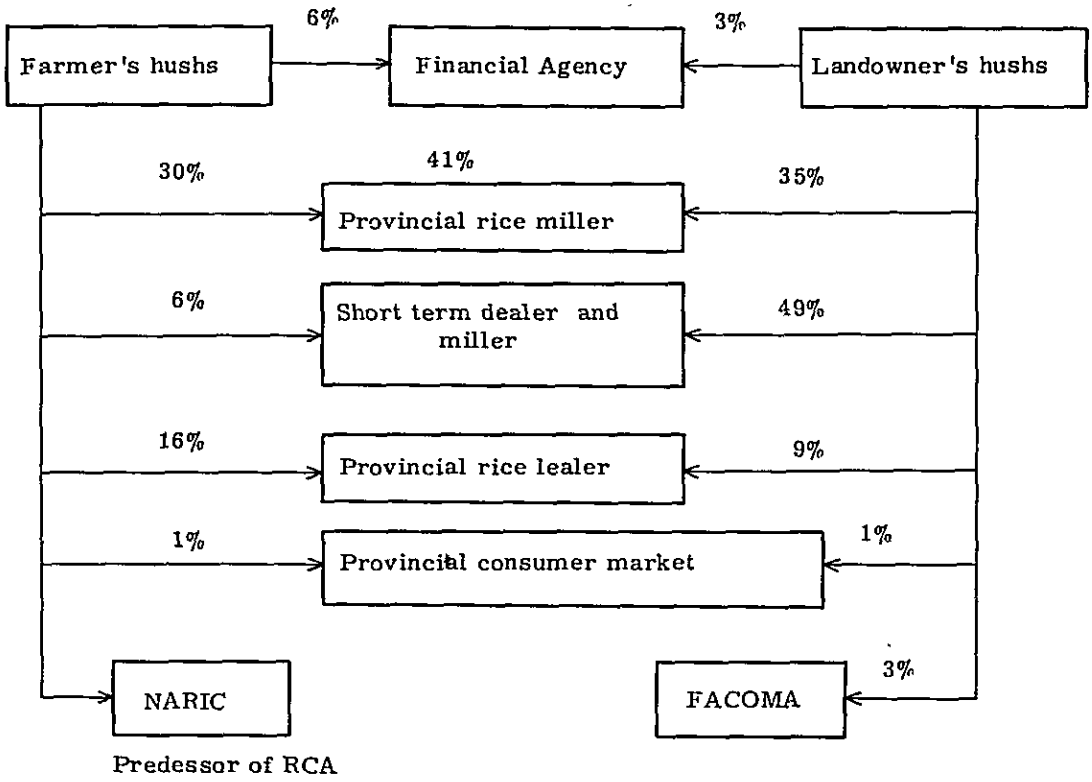
Fig. 1. Rice Distribution Mechanism in the Philippines




Jose Gutierrez, Econmic Research Journal Vol. 3 No. 3 ( 1965)

( Fig. 2 Sales Source of landlord and farmers in Nueva Euja Province

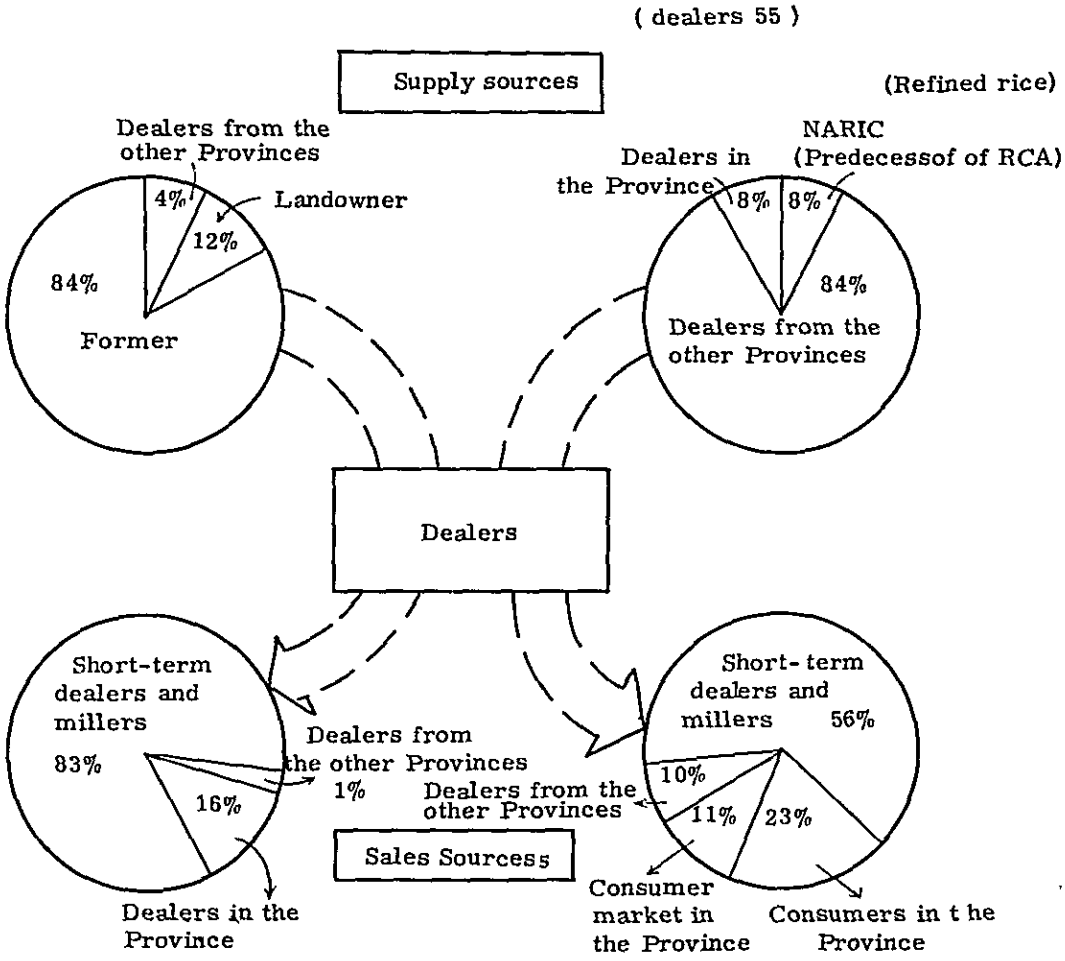
( Farmers 16 landlord 79 )




Predessor of RCA

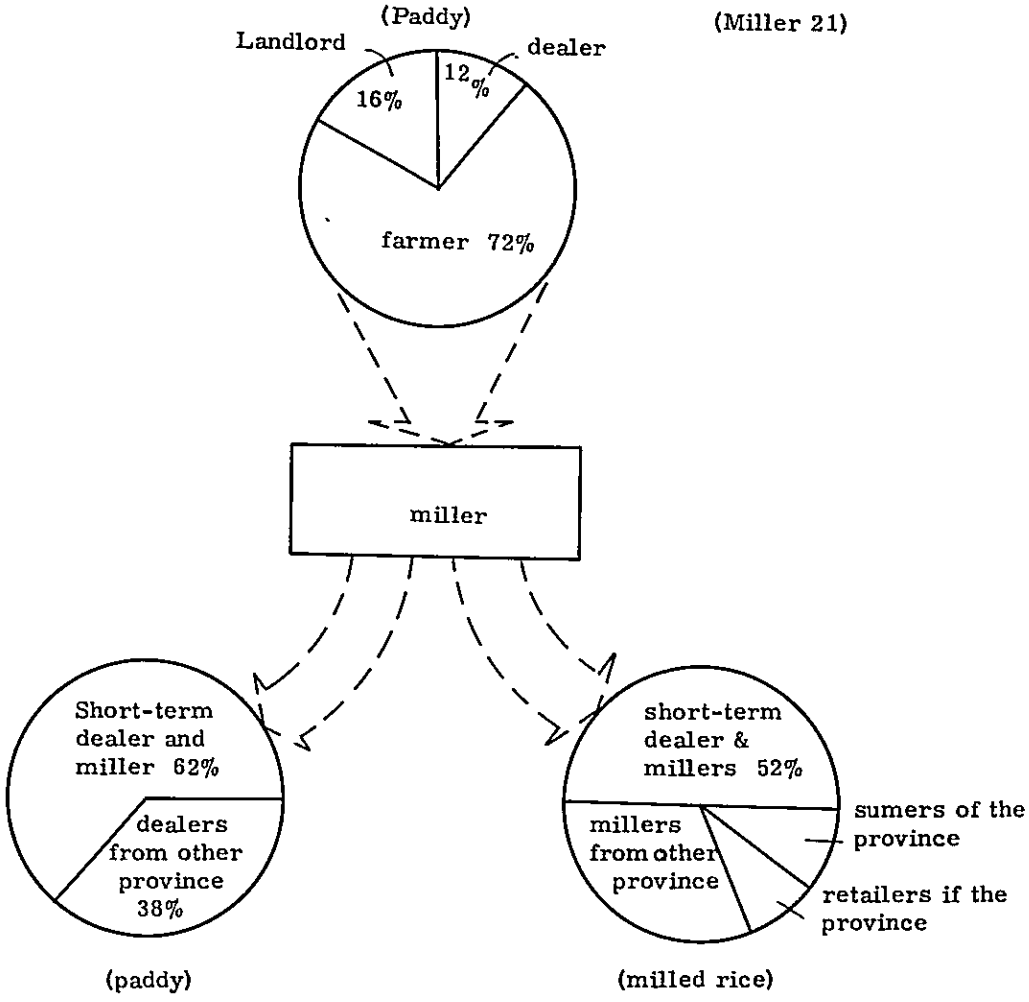
Data From: Mr. B.D Peredo and thers, "Cost of Marketing Palay and Rice in Nueva Ecija." U.P.C.A (1961 - 1962)

Fig. 3 Sales and Supply Sources of Rice Dealers in Nueva Euja Province



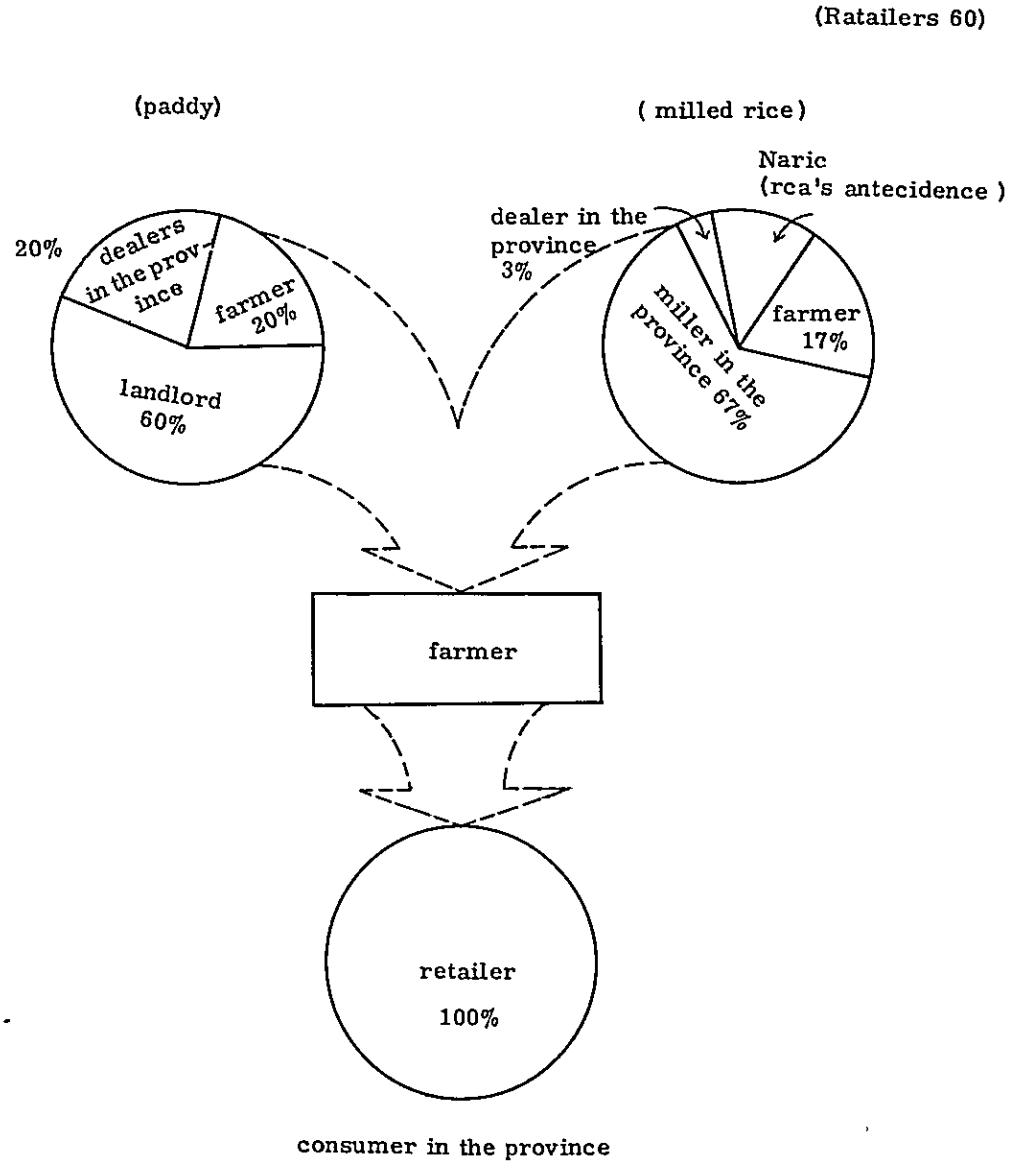

Data From: Mr. B.D. Perdo and others, "Cost of Marketing Palay and Rice in Nueva Ecija " U.P.C.A (1961 - 1962)

Fig. 4 Supply and Sales Sources of Millers in Nueva Euija Province



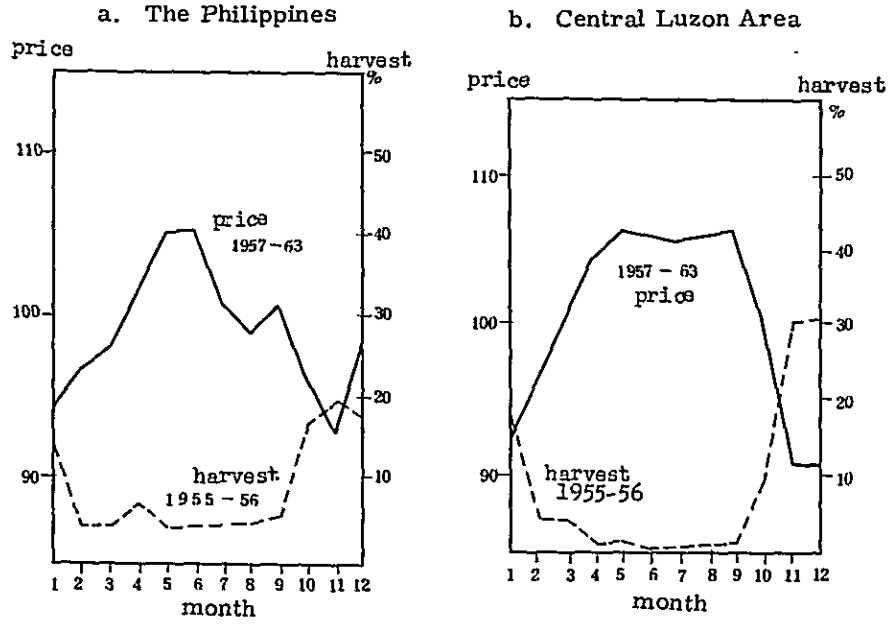

Data From: Mr. B.D. Peredo and others, "Cost of Marketing Palay and Rice in Nueva Ecija, "U.P.C.A. (1961 - 1962)

Fig. 5 Supply and Sales Sources of Retailers in Nueva Euja Province




Data From: Mr. B.D. Peredo and others "Cost of Marketing Paday and Rice in Nueva Ecija. "U.P.C.A. (1961 - 1962)

Fig. 6




M. Mangahas "The Response of Philippine Rice Farmers to Price"
IRRI (Preliminary data)

Fig 7 Arrangement of Cono Machines in a milling factry

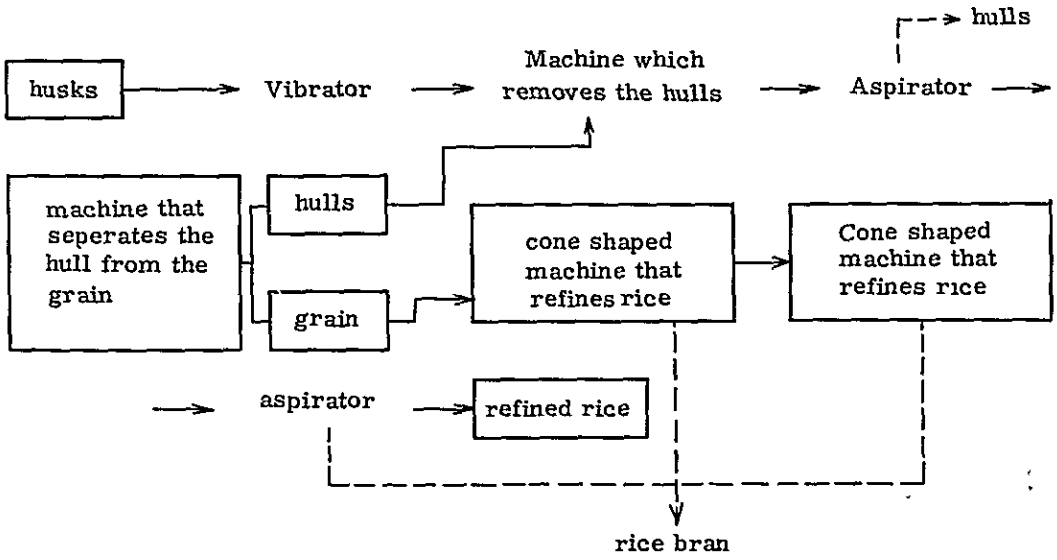
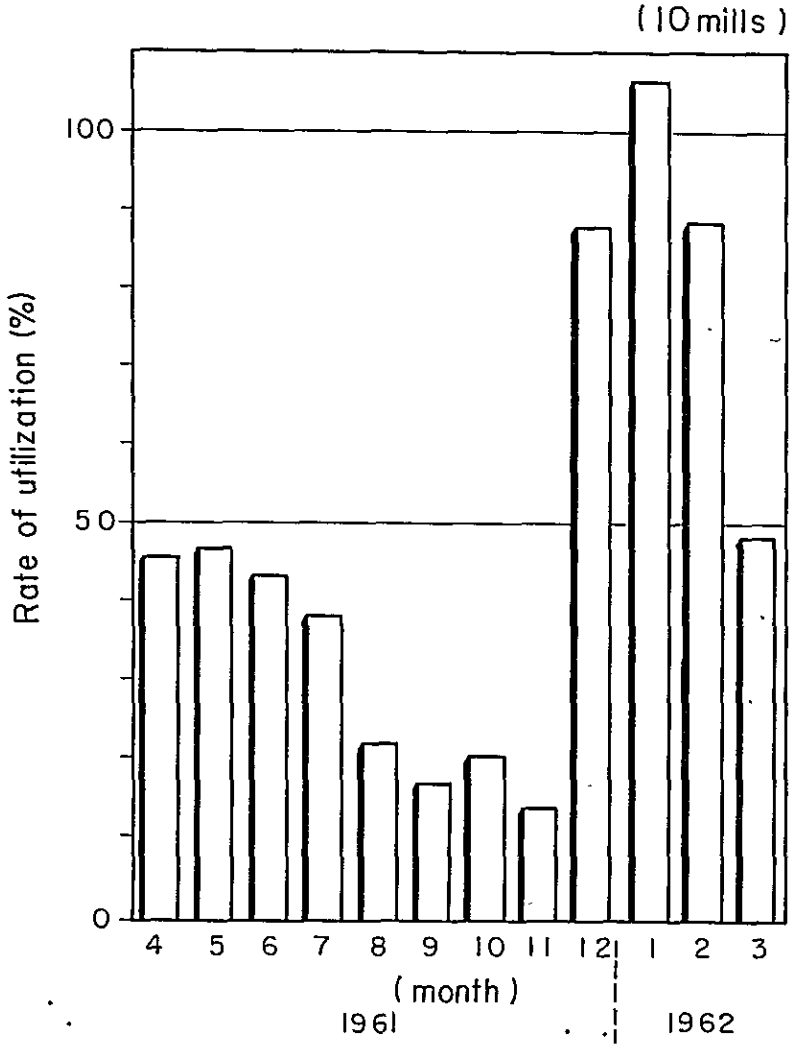
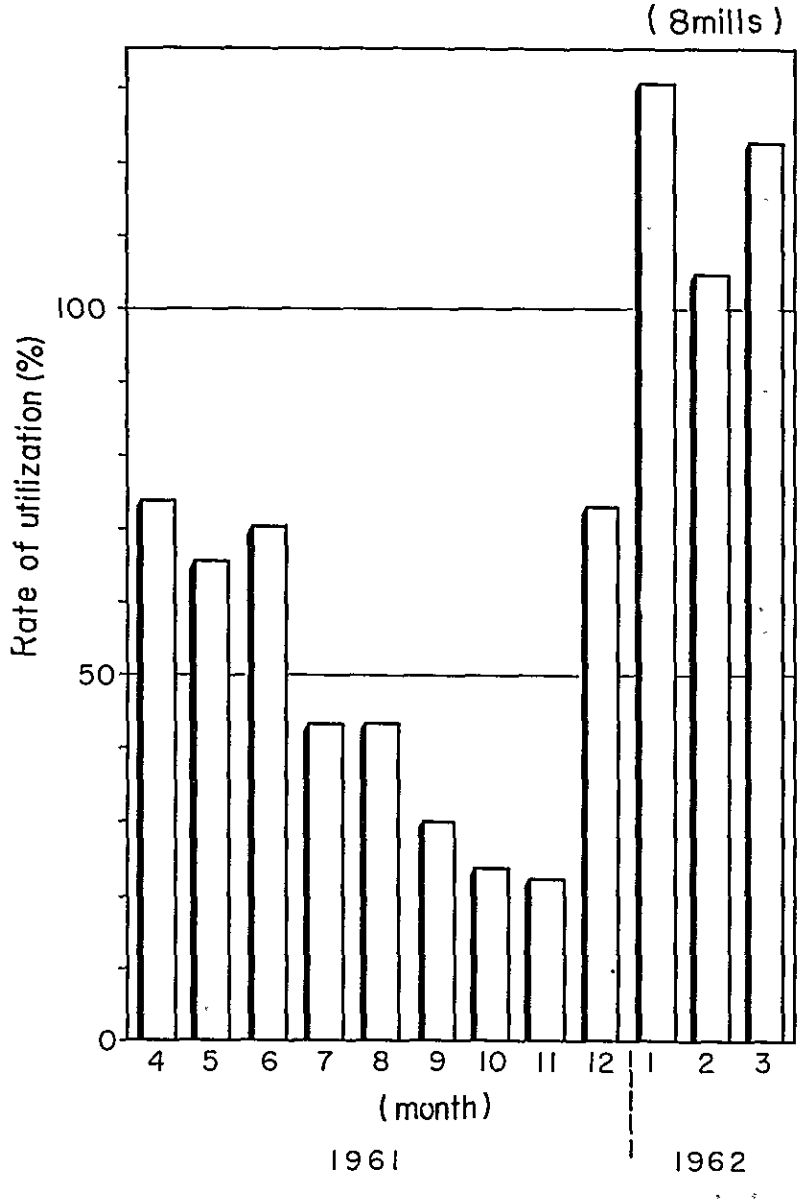


Fig. 8 Rate of monthly utilization of small rice mills in Nueva Ecija province



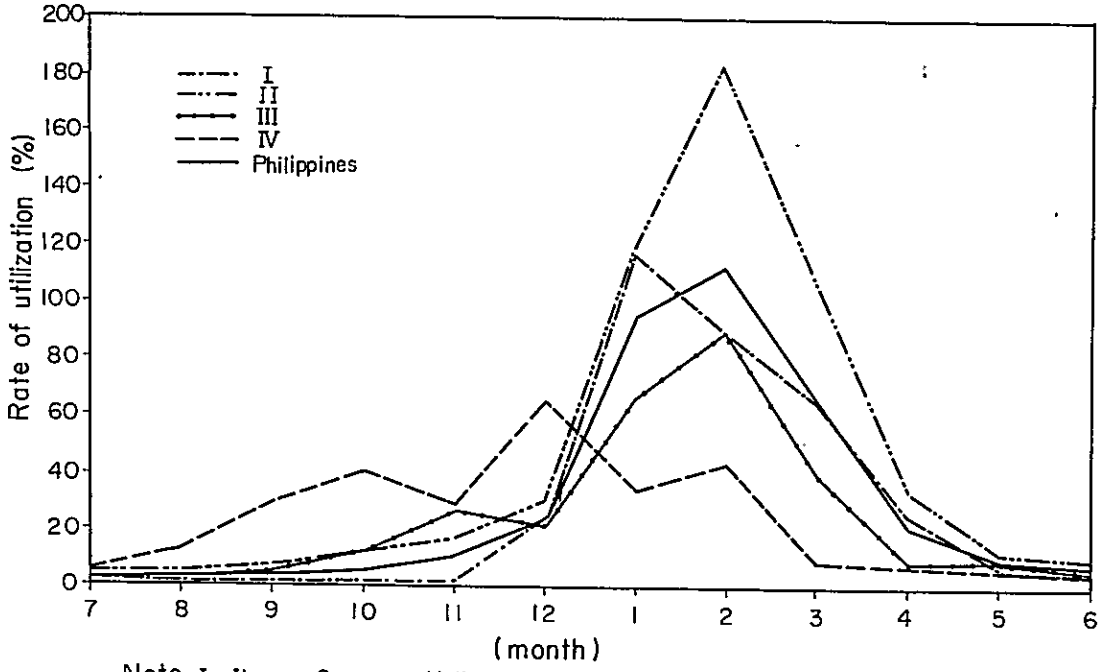

Papers and Reviews " Rice and related Statistics" (1965)

Fig. 9 Rate of monthly utilization of major rice mills in Nueva Ecija province




Papers and Reviews "Rice and related Statistics." (1965)

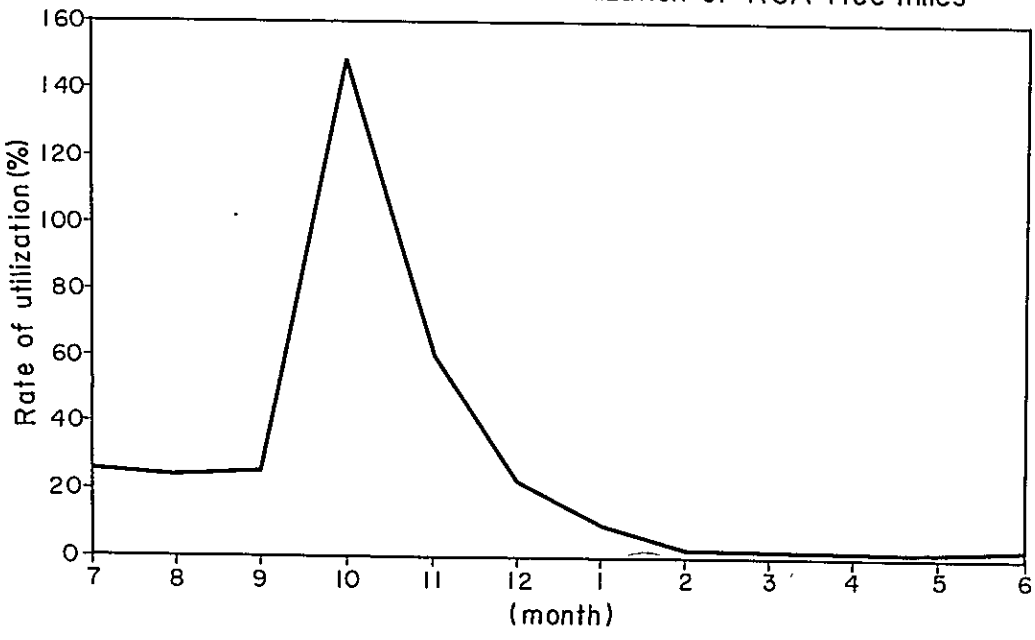
Fig 10 Rate of seasonal utilization Cono type miles in FECOMA




Note I Ilocos, Cagayan Valley III Eastern Visayas, Western Visayas
II Central Luzon, Southern Tagalog, Bicol IV N & W Mindanao, S & E Mindanao

Papers and Reviews "Rice and related Statistics." (1965)

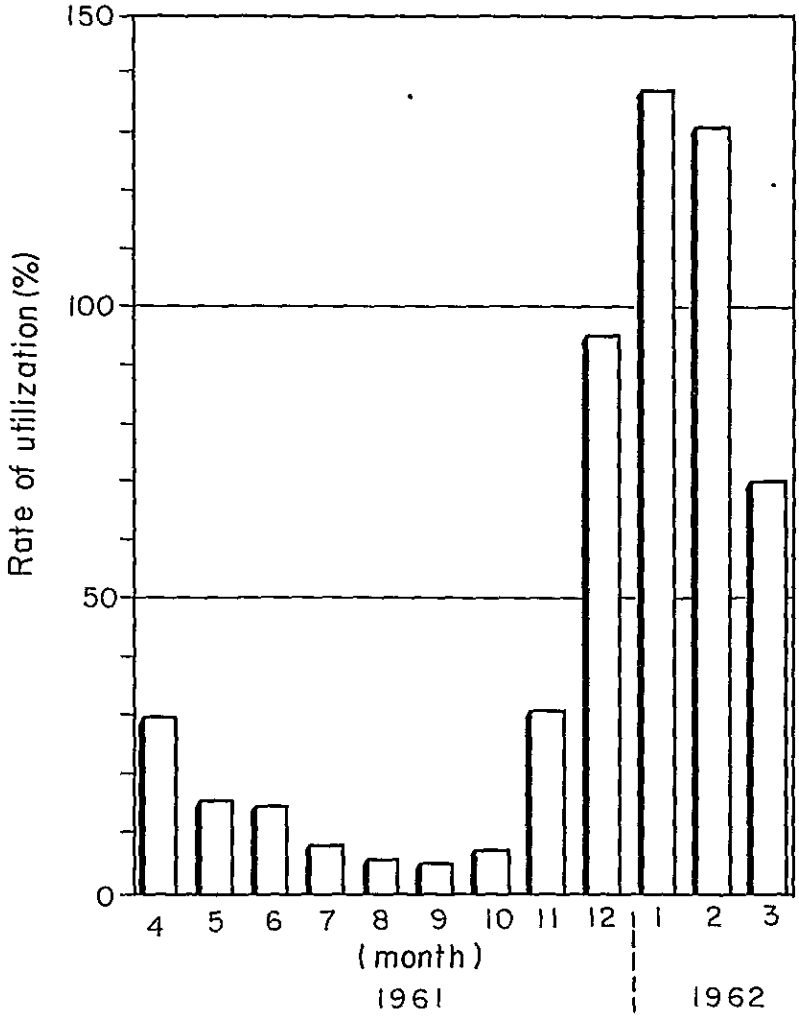
Fig.11 Rate of seasonal utilization of RCA rice miles




Papers and Reviws "Rice and related Statistics" (1965)

Fig.12 Rate of monthly utilization of warehouse by small cargo booking agents in Nueva Ecija province

(53 agents)

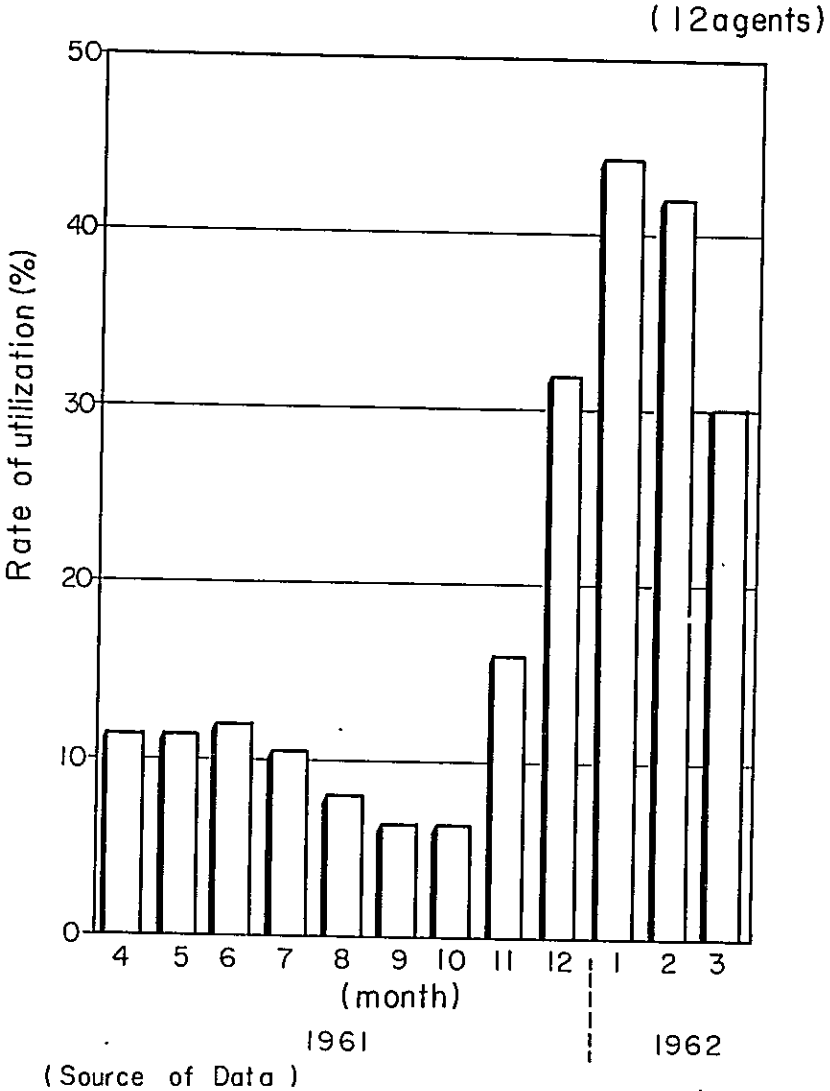



(Source of Data)

"Cost of marketing Palay and Rice in Nueva Ecija"

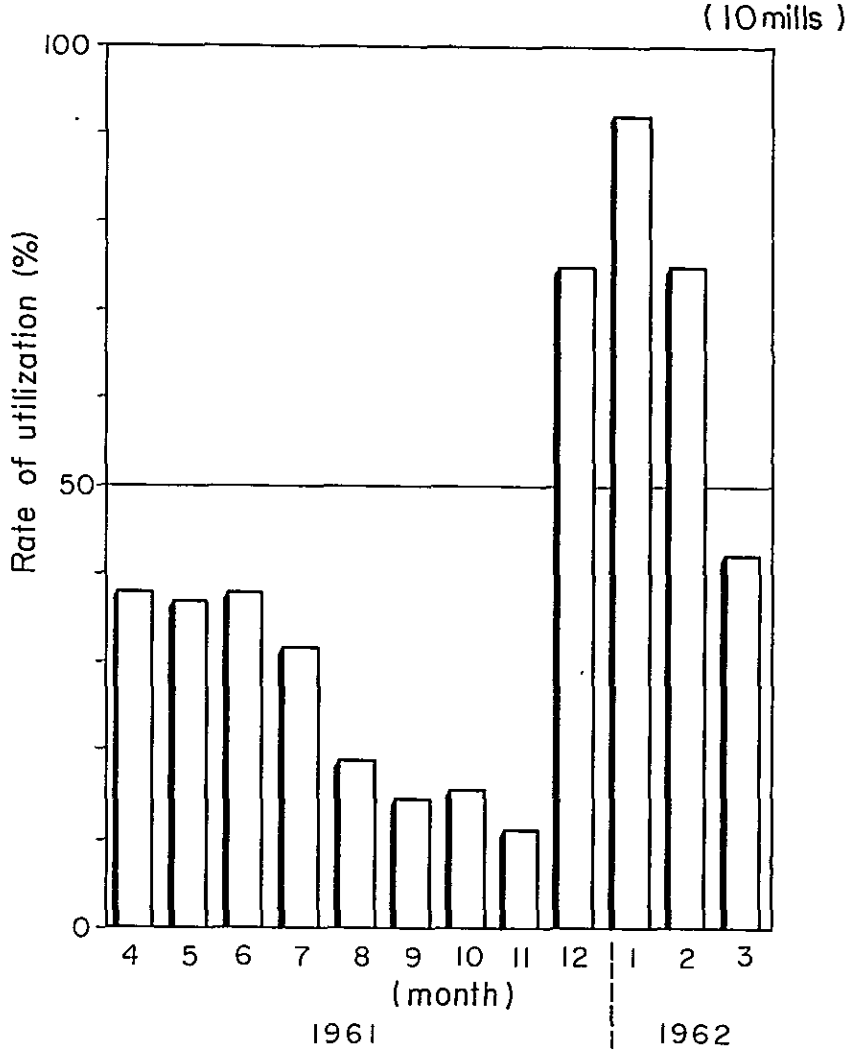
UPCA (1961 ~ 1962) by MR B D. Peredo and others.

Fig.13 Rate of monthly utilization of warehouse by major cargo booking agent in Nueva Ecija province



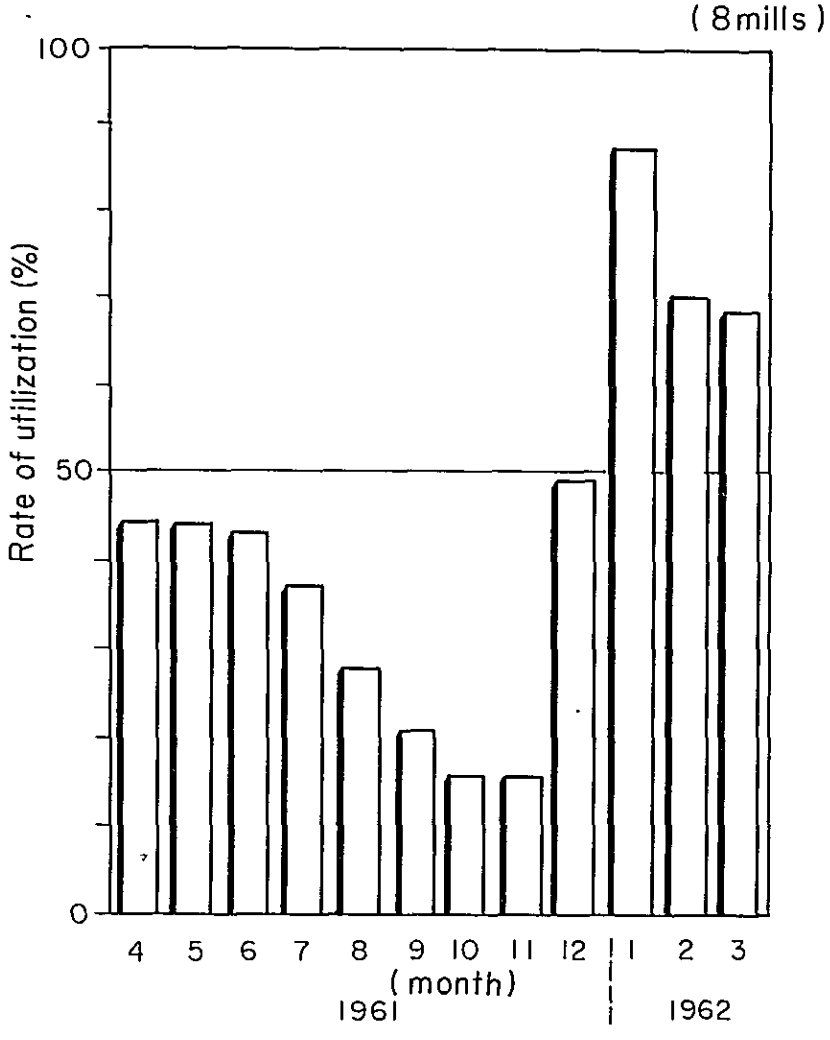

( Source of Data )
"Cost of marketing Palay and Rice in Nueva Ecija"
U.P.C A (1961 ~ 1962) by MR.B.D.Peredo and others

Fig 14. Rate of monthly utilization of warehouse by small operators in Nueva Ecija province



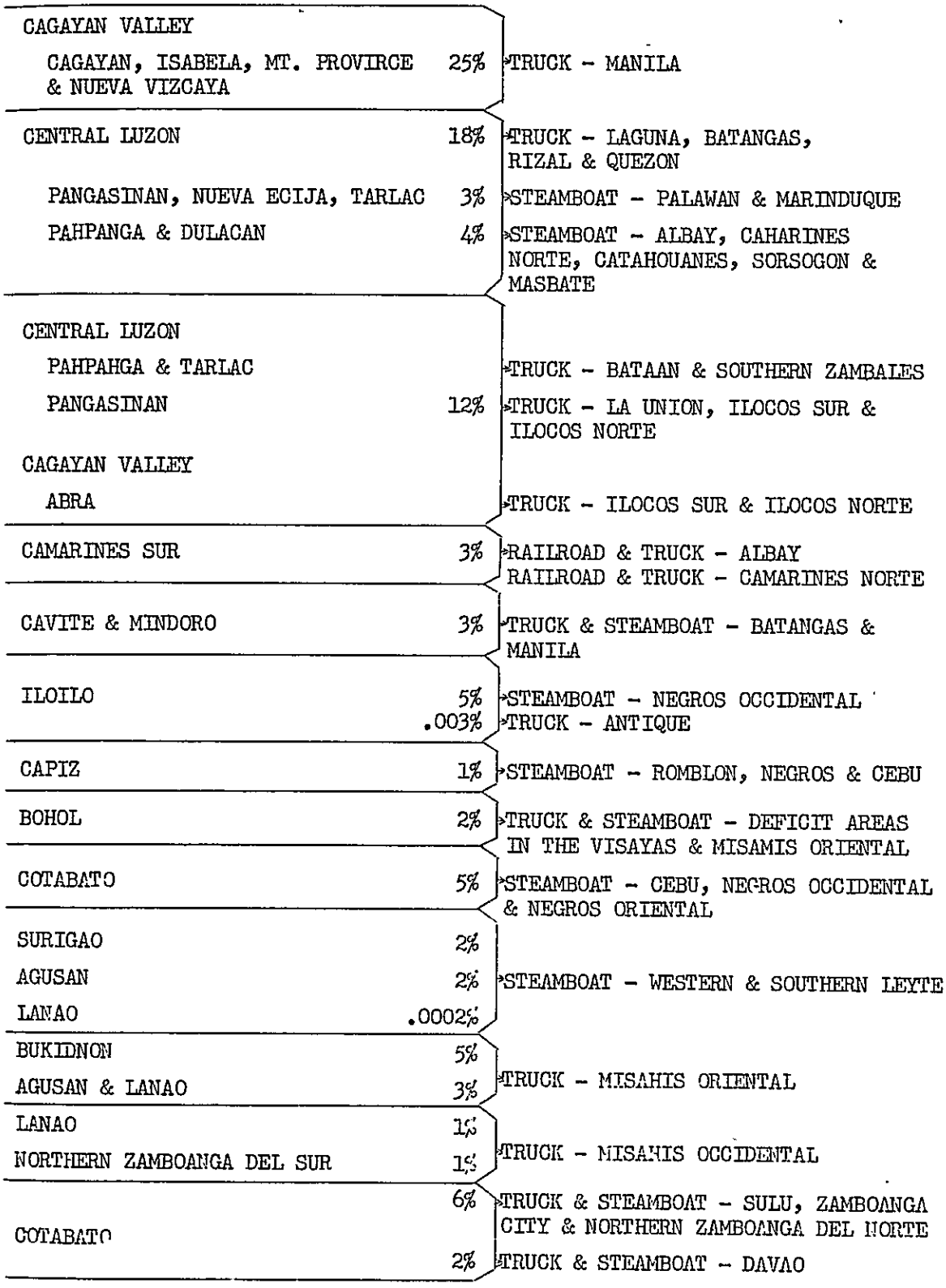

(Source of Data)
"Cost of marketing Palay and Rice in Nueva Ecija"
U.P.C A(1961 ~ 1962) by MR. B.D Pered and others

Fig 15 Rate of monthly utilization of major rice mill warehouses in Nueva Ecija province

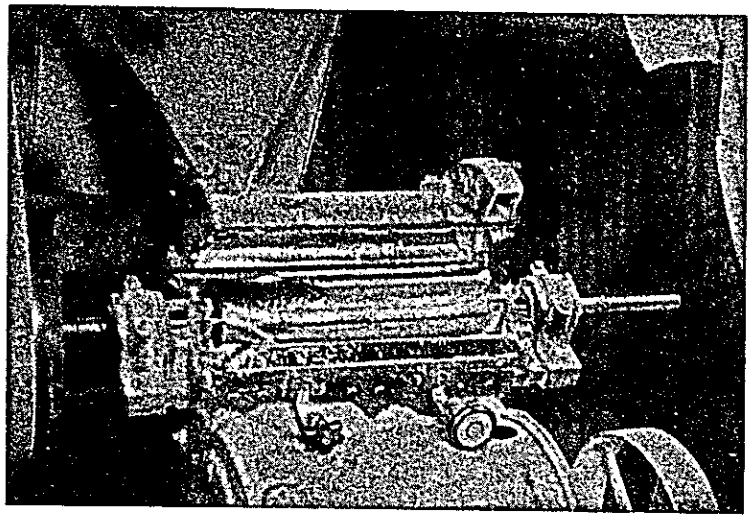



( Source of Data )
"Cost of marketing Palay and Rice in Nueva Ecija"
U.P C A (1961 ~ 1962) by MR B D Peredo and others

Fig. 16 Mobility of Paddy and Milled Rice in the Philippines



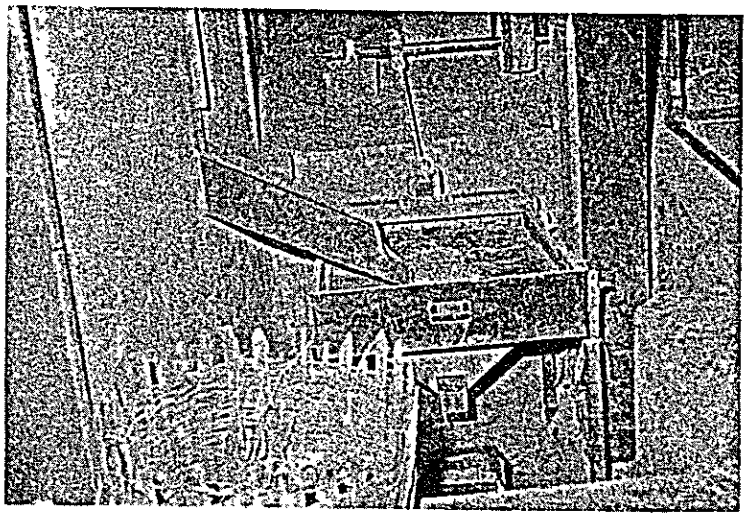

Stanford Research Institute An Economic Analysis of Philippine Domestic Transportation Vol. 11 ( 1955 )



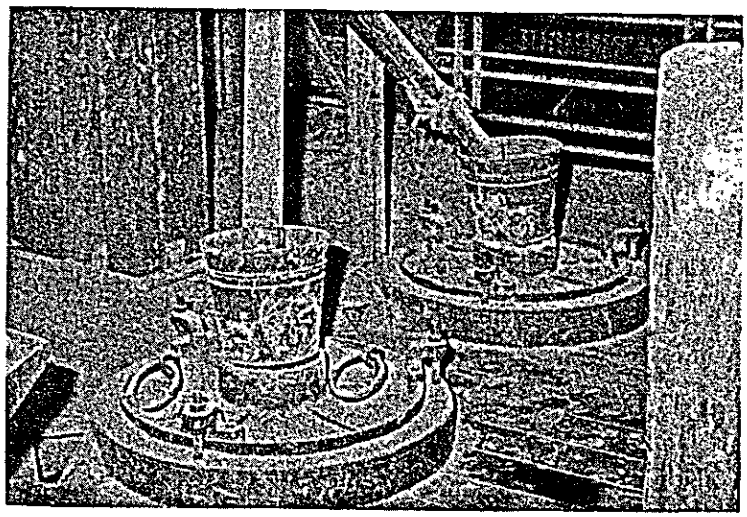
Photograph 1. Inside of Cylinder :

Kiskisan Milling Machine

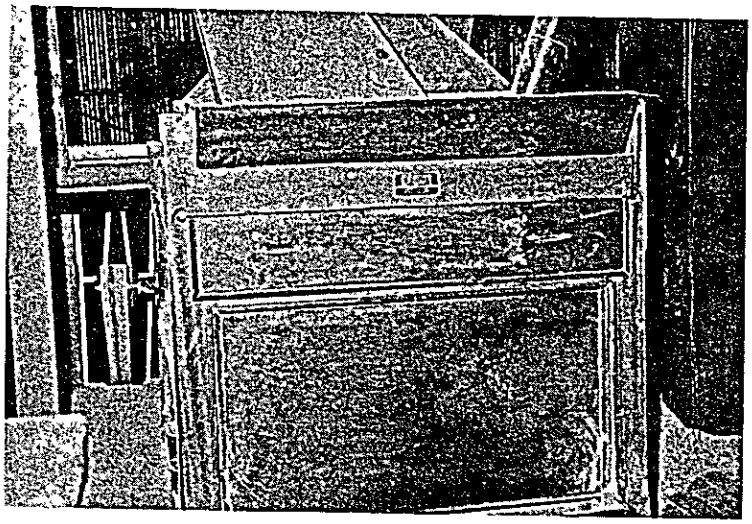
Photograph 2. Kiskisan Milling Machine



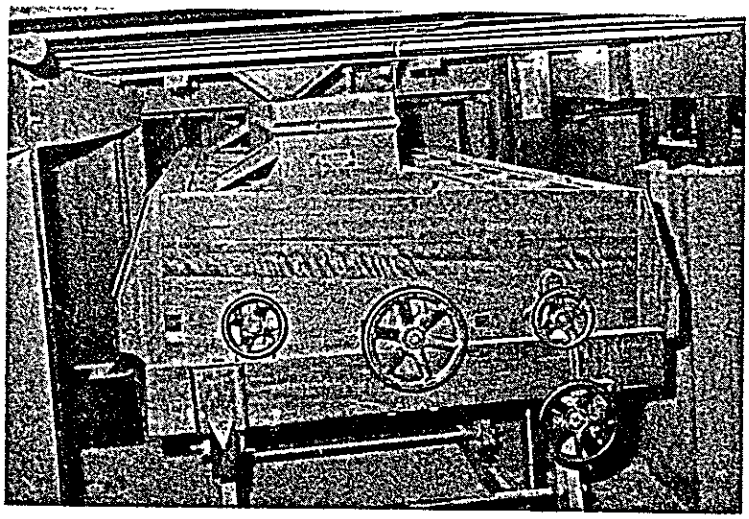
Photograph 3. Preliminary Cleaning Seve



Photograph 4. Huller

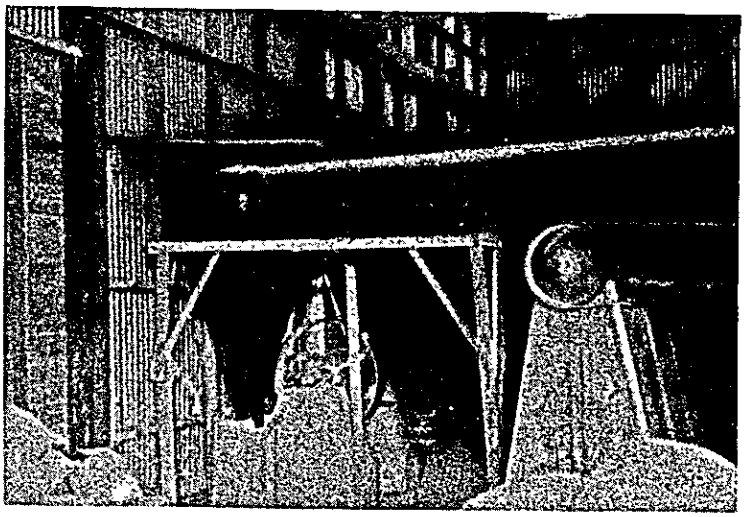


Photograph 5. Aspirator

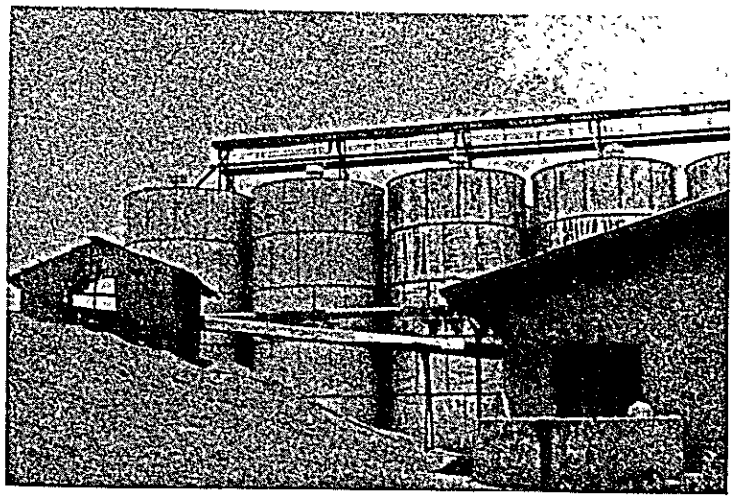


Photograph 6. Paddy Separator

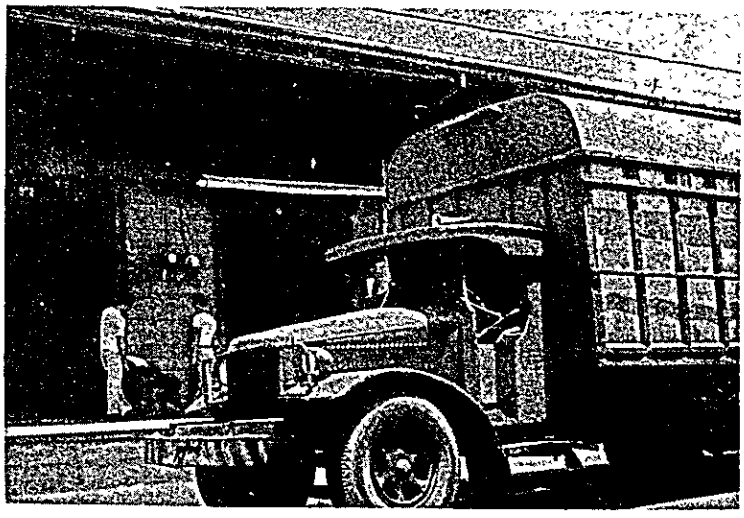
Photograph 7. Cone



Photograph 8. Bran Gathering Cyclon

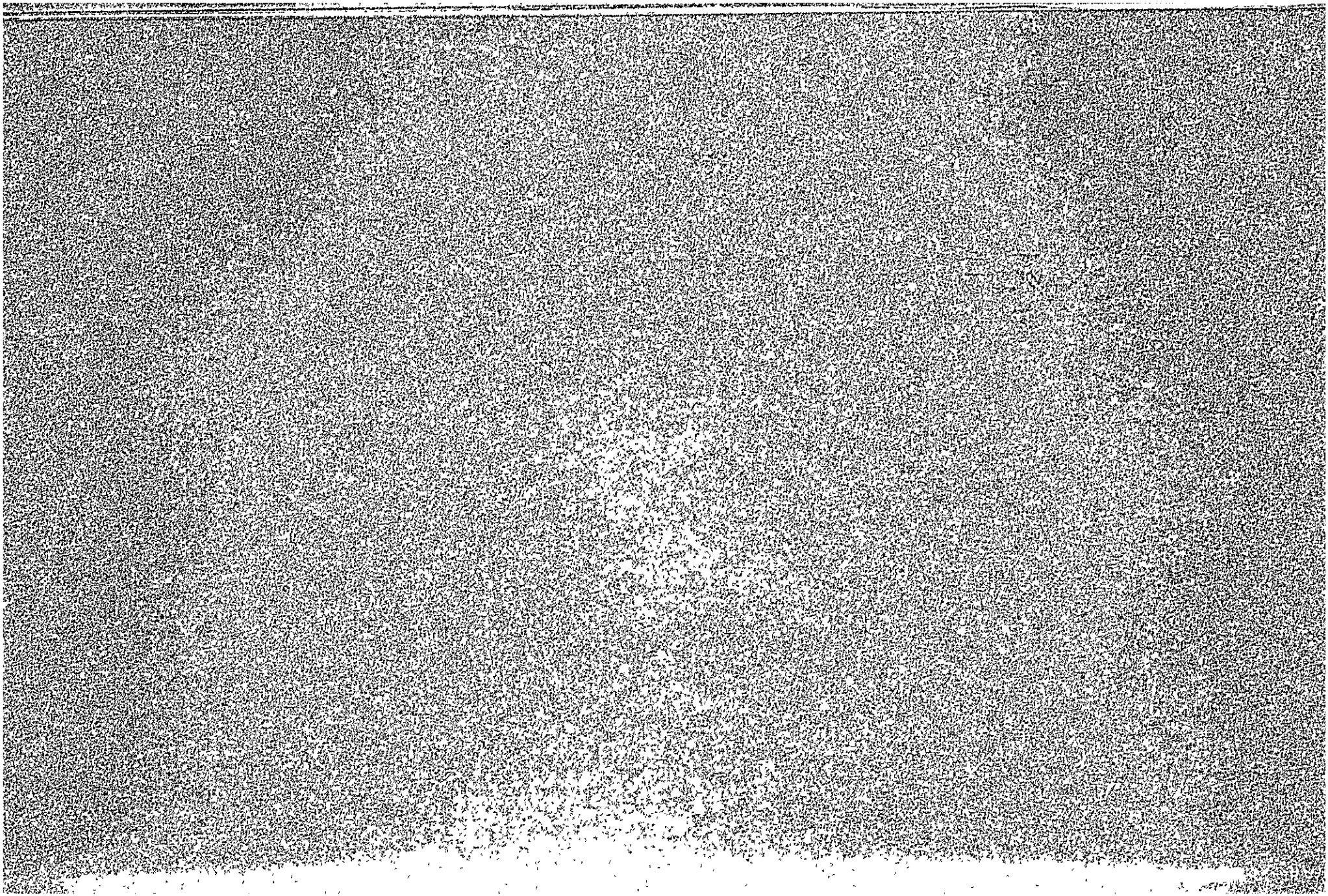


Photograph 9. Silo for Paddy Storage



Photograph 10. Truck for Rice Transportation

# Appendix



# APPENDIX

A. The List of Individuals of the Philippines who helped & Cooperated with the Japanese Team

Note: The list of Fillipino Counterpart Committee etc. shows in Chapter 1 of this report.

## PROVINCE OF ORIENTAL MINDORO

1. Mr. Mauricio C. Garcia
   Acting Provincial Agriculturist, APC
   Acting Provincial Director, RCPCC

2. Mr. Pedro B. Angara
   Provincial Officer-In-Charge, BPI
   Deputy Provincial Director, RCPCC

3. Mr. Pedro A. Guanio
   Arca Supervisor, ISU

4. Mr. Hernando N. Sanchez
   Regional Director
   Bureau of Agricultural Economics

5. Mr. Fred Q. de Graoia
   Seed Inspector, BPI

6. Mr. Rodolfo A. Ignacio
   Provincial Governor, Or. Mindoro

7. Mr. Felix M. Cuasay
   Municipal Mayor, Calapan

8. Major Epigenio Navarro
   Provincial Commander, Or. Mindoro
   Philippine Constabulary, AFP

9. Mr. Jose Lobrin
   Chief of Police, Ca lapan

10. Mr. Rodolfo G. Paras
    Officer-In-Charge, Mindodo Agency
    Agricultural Credit Administration

11. Mr. Agapito A. Revilla
Observer-In-Charge, Weather Bureau
Calapan

12. Mr. Alejandro Sarmiento
Superintendent, Pula River Irrigation System
Actg. Provincial Irrigation Engineer, NIA

13. Mr. Francisco C. Robles
Manager, Calapan Agency, PNB

14. Mr. Bartolome P. Javier
Manager, Calapan Branch, DBP

15. Dr. Alberto C. Montellano
Municipal Health Officer, Calapan

16. Mr. Marcelo Rodillas
Asst. Irrigation Project Supervisor, ISU

17. Mr. Francisco Abao
Acting Assistant District Engineer
Bureau of Public Highways (BPH)

18. Mr. Leovigildo Geco
Senior Civil Engineer, BPH

19. Mr. Celso Cunanan
Civil Engineer, BPH

20. Mr. Nelson A. B arranda
Agricultural Credit Extension Technician
Dept. of Rural Banks, Central Bank

21. Mr. Antonio Luciano, Jr.
Manager, Naujan Rural Bank

22. Atty. Pastor de Guzman
Actg. District Land Officer
Bureau of Lands

23. Mr. Lito Eustaquio
Accountant, Naujan Rural Bank

24. Mr. Paquito Riel
Bookkeeper, Naujan Rural Bank

25. Mr. Ernesto T. Villena
District Engineer
Bureau of Public Works (BPW)

26. Miss Mona G. Valenzuela
Clerk-Typist, APC

27. Mr. Amado Mararac
Clerk-Typist, APC

28. Mr. Teofilo Viray
Breeding Station, BAI

PROVINCE OF LEYTE DEL NORTE

1. Mr. Rufino Ayaso
Provincial Agriculturist, APC

2. Mr. Bulgaris V. Lelis
Assist. Provincial Agriculturist, APC

3. Mr. Ignacio M. Ortega
Assist. Regional Irrig. Engineer, NLA

4. Mr. Celestino P. Tampil
Provincial Officer Incharge BPI

5. Mr. Jose M. Solis
Agronomist, BPI

6. Mr. Salvador B. Salamio, Jr.
Agronomist, BPI

7. Mr. Marciano La. Laguna
Provincial Statistician, BAE co.

8. Mr. Remicio A. Tabones
Farm Management Technician, Alang-alang, APC

9. Miss Anita A. de Guia
Farm Management Technician, San Miguel, APC

10. Mrs. Estefania T. Daga
Farm Management Technician, Palo, APC

11. Mr. Norberto Romualdez, Jr.
Provincial Governor, Leyte

12. Mr. Andres C. Yu
Municipal Mayor, Alang-alang

13. Mr. Uldigario Lapidario
Municipal Mayor, San Miguel

14. Mr. Genaro Araos
Supr., C E I, BPH

15. Mr. Lauro Castillo
Dist. Land Officer, Bu. of Lands

16. Emilio D. Ayaso
Officer Incharge B P W

17. Mr. Cesar Yray
Supervisor, RCA Tacloban

18. Mr. Ramon Eamiguel
Representative, RCA Tacloban

19. Mr. Conrado A. Clarin
Credit Officer, ACA

20. Mr. Vicente V. Cabanlit
Branch Accountant, ACA

21. Mr. Valentin M. Dulce
Manager, PNB

22. Mr. Esteban T. Fadullom
Assist. Manager, DBP

PROVINCE OF ZAMBOANGA DEL SUR

1. Mr. Daniel B. Coloma
Reg. Accountant, BPI

2. Mr. Celso J. Palma Gil
Actg. Reg. Director, BPI

3. Mr. Abundio Mojica
Actg. Reg. Director, Bureau of Soils

4. Mr. Silverio Grazmen
Prov. Director-Zambo. del Sur,
Prov. Pest Control Officer, BPI

5. Mr. Leoncio U. Balico
Adm. Assistant, BPI

6. Mr. Bayani M. Pauda
Staff Officer, BPI

7. Mr. Glicerio A. Pescador
Prov. Agriculturist, APC

8. Mr. Venancio R. Fontanilla
Farm Management Technician, Ipil, APC

9. Mr. Anastasio B. Dascallar
Farm Management Technician, Titay, APC

10. Mr. Pablo Parredo
Bureau of Plant Industry

11. Mr. Jose Arce
Regional Irrigation Engr, N I A

12. Mr. Ruperto Grimares
Bureau of Plant Industry

13. Mr. Wilihardo Acero
Bureau of Plant Indus try

14. Mr. Vicente M. Cerilles
Vice-Provincial Governor, Zamboanga del Sur

15. Mr. Saturnino A. Baybayan
Municipal Mayor, Titay

16. Mr. Margarito F. Babaan
Provincial Incharge, ACA

17. Mr. Bernarbe C. Arandela
Incharge, RCA Region VIII

18. Mr. Eugenio Sinoy
PACD., Ipil

19. Mr. Doroteo V. Romero
PACD, Ipil

## B. The List of Data Collected

| NO. | D A T A | S O U R C E |
|---|---|---|
| | CALAPAN - NAUJAN Area | |
| | Meteorology | |
| 1. | Daily rainfall at CALAPAN ( 1957 - 1966 ) | Weather Bureau |
| 2. | Daily temperature at CALAPAN (1966) | " " |
| 3. | Monthly temperature at CALAPAN ( 1957 - 1966 ) | " " |
| 4. | Records of typhoon at CALAPAN ( 1949 - 1959 ) | " " |
| 5. | Records of tidal range at CEBU ( April, 1967 ) | |
| | Hydrology | |
| | Map | |
| 6. | Topographical map of Magasawang tubig river ( 1:2.000 ) | Office of the Highway Dist. Engin. |
| 7. | General plan and elevation of bridge over Magasawang tubig river | " " " |
| 8. | Map of Mindoro Oriental showing road system ( 1:200.000 ) | " " " |
| 9. | Soil map of Mindoro island ( 1:200.000 ) | B. S. |
| 10. | General plan of irrigation project (I.S.U.) in Barrio BUHANGIN (1:4000) and attached, NAUJAN | |
| | Construction | |
| 11. | List of construction materials, equipments and construction companies Engineer | Office of the Highway Dist. Engineer |
| 12. | Road List | |
| | Agriculture | |
| 13. | Statistics of rice production GALAPAN, NAUJAN ( 1958 - 1967 ) | |

| NO. | DATA | SOURCE |
|---|---|---|
| 14. | Statistics of corn and coconut CALAPAN, NAUJAN ( 1963 - 1967) | |
| 15. | Crop damage report CALAPAN, NAUJAN ( 1958 - 1967 ) | |
| | Agricultural Economy | |
| 16. | Census of the PHILIPPINES, 1960 Agriculture ORIENTAL MINDORO | Bureau of Census & Statistics |
| 17. | Census of the PHILIPPINES, 1960, Population, housing ORIENTAL MINDORO | Bureau of Census & Statistics |
| 18. | Answers to questions submitted by the Philippine - Japanese survey team in ORIENTAL MINDORO | ACA, DBP, PNB, RB of NAUJAN |
| 19. | Condition of health of people ORIENTAL MINDORO | Principal Health Officer, CALAPAN |
| | ALANGALANG - SAN MIGUEL Area | |
| | Meteorology | |
| 1. | Daily rain fall at TACLOBAN ( 1957 - 1967 April ) | W. B. Tacloban City |
| 2. | Daily temperature at TACLOBAN ( 1966 ) | " " " |
| 3. | Climatological data for TACLOBAN CITY ( Normal Values ) | " " " |
| | MAP | |
| 4. | Mainit river irrigation project | Office of the Reg. Irrig. Engin. |
| | Top graphic map and others | Eastern Visayas Irrigation Region NIA. |
| 5. | Soil Survey of LEYTE province PHILIPPINES with Soil map (1:200.000) Soil Report 18 | B. S. |
| | Construction | |
| 6. | List of construction materials and their unit price | Office of the Reg. Irrig. Engin. |

| NO. | DATA | SOURCE |
|---|---|---|
| | Agricultural Economy | |
| 7. | Agricultural Credit Survey | ACA Leyte - Samar branch |
| 8. | One year barrio development program ALANGALANG, LEYTE<br>( 1965 - 1966 )<br>( 1966 - 1967 )<br>( 1967 - 1968 ) | Farm Management Technician<br>Alangalang, Leyte del Norte |
| 9. | Census of the Philippines 1960 agriculture LEYTE | Bu. of Census & Statistics |
| | TITAY VALLEY | |
| | Meteorology | |
| 1. | Daily rainfall at rubber plantation estate, TITAY ( 1961 - 1966 ) | Marcelo Tire & Rubber Corporation |
| 2. | Daily rainfall at ZAMBOANGA ( 1957 - 1966 ) | Weather Bureau |
| 3. | Daily rainfall at KABASALAN (1956 - April 1967 ) | PHILIPPINE RUBBER PROJECT CO.,Inc |
| 4. | Monthly rainfall at rubber plantation estate, TITAY ( 1961 - 1966 ) | Marcelo Tire & Rubber Corporation |
| | Hydrology | |
| 5. | Findings and observation of the proposed TITAY IRRIG. PROJECT (consolidated records of discharge of the palomoc river) | Office of the Reg. Irrig. Engin. for Mindanao |
| | Map | |
| 6. | Map of the municipality of IPIL and TITAY ( 1:100.000 ) | Office of the Dist. Highway Engineer |
| 7. | Sketch map of TITAY VALLEY (1:20.000) | |
| 8. | Soil map (Temporary) of ZAMBOANGA DEL SUR ( 1:20.000 ) | B. S. |
| 9. | Resister map ( 1:4000 ) TITAY | Bu. of Lands, Ipil Zamboanga del Sur |
| | Construction | |

| NO. | DATA | SOURCE |
|---|---|---|
| 10. | Unit price of construction materials in IPIL | Office of the Dist. Highway Engineer |
| 11. | Equipments assigned in this district | " " " |
| | Agriculture | |
| 12. | Rice and corn production statistics, ZAMBOANGA DEL SUR ( 1957 - 1966 ) | B.P.I. |
| 13. | Rice and corn Pests diseases statistics, TITAY ( 1957 - 1966 ) | B.P.I. |
| 14. | Report of chemical analysis for soil samples and fertilizer, lime recommended | B. S. |
| | Agricultural Economy | |
| 15. | Project plan (January - June 1967) TITAY | |
| 16. | Agricultural statistical data of TITAY | |
| 17. | Census of the PHILIPPINES 1960 Agriculture LEYTE | |
| | COMMON | |
| 1. | Census of PHILIPPINES 1960 agriculture, Summary | |
| 2. | The PHILIPPINES statistical survey of households 1961 | |
| 3. | Rice and corn financing | |
| 4. | Weights and measures conversion factors and related information for use in PHILIPPINE agriculture and trade | |
| 5. | Average cost of production per hectare of rice, by various cost of farm expenses by region. | |

## C. Climate Data

### C. 1. Precipitation Data of Naujan District

The daily precipitation record in Calapan for the last 10 years ( 1957 - 1966 ) is given in table C.1.1. The figures in the table were obtained from Calapan Observatory and were recalculated in terms of the centi meter.

In table C.1.2., monthly precipitation and annual precipitation derived on the basis of table C.1.1. are shown. In accordance with the table, annual precipitation probability and maximum daily precipitation probability are calculated, using the Iwai formula, and given in tables C-1.5 and C-1-6.

In table C-1.3, consecutive dry days with daily precipitation less than 5 mm. obtained as the sum in table C-1-1 are given.

Table C-1-1. Daily Precipitation Record

(1) 1957 (mm) Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ※ 16.46 | — | 20 | — | 33 | 20 | 6.1 | 0.3 | 25 | 1.5 | 0.5 | 1.0 | 183.8 |
| 2 | 27.4 | — | 0.8 | — | — | — | 1.40 | 1.14 | 0.3 | 4.3 | 0.5 | 7.4 | 66.1 |
| 3 | — | T | — | 46.5 | — | 1.8 | 6.4 | 1.8 | — | 37.1 | 2.3 | 0.8 | 96.7 |
| 4 | 7.9 | — | — | 1.0 | — | 0.8 | 5.8 | 0.5 | 8.4 | 6.6 | 3.3 | — | 34.3 |
| 5 | 1.8 | — | — | 13.7 | — | 0.3 | — | 81.5 | 1.0 | 0.8 | 1.3 | T | 100.4 |
| 6 | 1.0 | — | — | 1.3 | — | 1.0 | — | 83.6 | 4.1 | 2.3 | 16.3 | 1.5 | 111.1 |
| 7 | 10.4 | — | 1.3 | T | — | 9.7 | 0.3 | 0.5 | — | 0.3 | 0.5 | T | 23.0 |
| 8 | 1.0 | — | 3.0 | — | — | — | 0.5 | 43.2 | — | 2.3 | 0.3 | 0.5 | 50.8 |
| 9 | 0.3 | — | 1.5 | — | — | 15.0 | 30.7 | 0.8 | 9.7 | 0.3 | — | — | 58.3 |
| 10 | — | T | — | 3.3 | 19.8 | 2.0 | 1.0 | 1.0 | 7.9 | 0.8 | 1.0 | 4.3 | 41.1 |
| 11 | — | 1.8 | 3.3 | 18.5 | — | 0.5 | 1.5 | 5.6 | 2.8 | 0.5 | 1.8 | 43.9 | 80.2 |
| 12 | 0.8 | 0.3 | T | — | — | T | 14.2 | 10.7 | — | 1.8 | 7.4 | 0.3 | 35.5 |
| 13 | 4.3 | — | — | — | — | — | 11.4 | 31.8 | — | 9.4 | — | — | 56.9 |
| 14 | T | — | — | — | — | 1.0 | 27.2 | 3.8 | 0.3 | 88.9 | — | T | 121.2 |
| 15 | — | T | 1.0 | — | — | — | 0.5 | 9.7 | 4.1 | — | — | T | 15.3 |
| 16 | — | 3.3 | 29.2 | 2.8 | — | — | — | 4.3 | 0.3 | — | — | 0.8 | 40.7 |
| 17 | — | 2.5 | 1.5 | — | — | — | — | 18.8 | — | 2.0 | — | — | 24.8 |
| 18 | — | — | — | — | — | — | 10.7 | T | — | 4.1 | 0.3 | 0.3 | 15.4 |
| 19 | T | 1.3 | 4.1 | — | — | — | 0.3 | — | — | 9.4 | 5.8 | 0.3 | 21.2 |
| 20 | T | 2.0 | 5.3 | — | — | 24.9 | 2.5 | — | — | 0.5 | T | 1.8 | 37.0 |
| 21 | 0.3 | 1.8 | — | 3.3 | — | — | 1.0 | 0.8 | | 2.5 | — | — | 9.7 |
| 22 | 1.5 | — | — | — | T | — | 9.7 | 9.9 | 2.8 | 2.5 | 1.3 | — | 27.7 |
| 23 | 10.7 | T | — | — | T | — | 31.8 | 1.3 | 1.3 | 3.8 | 1.8 | — | 50.7 |
| 24 | 1.5 | T | — | — | 0.8 | T | — | — | 2.5 | 0.3 | 1.3 | 8.1 | 14.5 |
| 25 | T | — | — | 1.3 | 14.5 | 3.0 | — | — | 2.5 | 2.0 | — | — | 23.3 |
| 26 | T | T | — | 0.8 | 2.0 | — | — | — | — | T | — | 5.3 | 8.1 |
| 27 | — | 2.3 | — | 0.5 | — | 1.5 | 4.1 | 11.2 | — | 0.3 | 0.3 | T | 20.2 |
| 28 | 0.5 | 1.0 | — | — | — | — | 8.7 | 1.3 | — | — | 2.3 | 2.0 | 15.8 |
| 29 | — | — | — | 1.0 | — | 1.5 | — | — | 0.5 | 8.9 | — | 0.3 | 12.2 |
| 30 | T | | — | — | 34.5 | 5.1 | — | — | 4.3.2 | 0.3 | 9.9 | 1.5 | 94.5 |
| 31 | 6.1 | | — | | 1.3 | | — | 1.5 | 1.3 | 8.9 | | — | 19.1 |
| Total | 240.1 | 16.3 | 53.0 | 94.0 | 76.2 | 70.1 | 188.4 | 335.3 | 95.5 | 202.4 | 58.2 | 80.1 | 1,509.6 |

(2) 1958 (mm) Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | T | — | 55.9 | — | 66.8 | — | 1.3 | — | — | — | — | 1.4 | 125.4 |
| 2 | 0.3 | T | 0 | — | 4.3 | 22.1 | 26.7 | 7.4 | — | 12.2 | 33.8 | — | 106.8 |
| 3 | 5.3 | 1.8 | 1.3 | — | T | 26.2 | 0.3 | 14.7 | — | 38.4 | 5.8 | — | 93.8 |
| 4 | 10.2 | 0.3 | — | — | — | 3.6 | 54.6 | 6.6 | — | 25.7 | 5.8 | 2.3 | 109.1 |
| 5 | 0.3 | 16.0 | 3.3 | — | 9.1 | 4.3 | T | 3.3 | — | 20.1 | 3.6 | 1.3 | 61.3 |
| 6 | — | — | — | 4.8 | 0.8 | — | 30.0 | 54.1 | 1.0 | — | — | — | 90.7 |
| 7 | T | — | — | — | T | — | 2.8 | 53.4 | 12.7 | 125.0 | — | — | 193.9 |
| 8 | 1.0 | — | — | — | — | — | 2.3 | 30.0 | 20.3 | 27.0 | 6.1 | 13.0 | 99.7 |
| 9 | 11.4 | — | 0.5 | — | — | 14.0 | — | — | 5.1 | 4.6 | 40.6 | — | 76.2 |
| 10 | 2.0 | — | 0.8 | — | T | 14.5 | — | — | — | 2.0 | 2.8 | 4.3 | 26.4 |
| 11 | T | T | — | — | T | 4.8 | — | 65.3 | — | 1.0 | 4.3 | 24.0 | 99.4 |
| 12 | 1.5 | T | 25.4 | — | — | — | — | 11.4 | — | 17.3 | 3.0 | 3.6 | 62.2 |
| 13 | 13.7 | 0.8 | 4.1 | — | — | 1.3 | 8.9 | 2.5 | — | 2.8 | 3.3 | 1.0 | 38.4 |
| 14 | T | 9.1 | T | T | — | — | 62.0 | — | 0.3 | 7.9 | 9.9 | — | 89.2 |
| 15 | 1.3 | T | 9.1 | — | — | — | 29.0 | 43.9 | — | 22.9 | 4.1 | — | 110.3 |
| 16 | 0.5 | 27.2 | — | — | 7.6 | — | 9.9 | 59.4 | — | 20.6 | 3.0 | — | 128.2 |
| 17 | 58.2 | 0.5 | — | — | — | — | 18.8 | 1.3 | — | 11.7 | 12.0 | 1.5 | 104.0 |
| 18 | 3.6 | T | — | 0.3 | T | — | 15.7 | 17.5 | — | — | 4.1 | 0.8 | 42.0 |
| 19 | 0.3 | — | — | — | T | — | T | 49.5 | 18.5 | 13.0 | — | — | 81.3 |
| 20 | — | — | — | 18.0 | T | — | — | 5.3 | 1.3 | 60.2 | 22.4 | 4.6 | 111.8 |
| 21 | 5.8 | — | — | 0.3 | T | — | — | 26.1 | 6.6 | ※ 118.9 | — | — | 157.7 |
| 22 | 16.5 | 1.8 | — | — | — | 25.4 | — | 9.1 | — | 4.6 | 19.4 | — | 76.8 |
| 23 | 0.5 | 2.8 | — | — | — | — | — | 5.6 | — | 0.3 | 22.1 | 0.5 | 31.8 |
| 24 | 9.9 | 0.5 | — | — | — | — | — | 5.6 | — | — | 39.1 | 1.0 | 56.1 |
| 25 | T | 1.8 | — | — | — | 0.5 | — | 0.3 | 3.8 | — | — | — | 6.4 |
| 26 | T | 27.4 | — | — | 1.3 | 2.8 | 27.4 | 0.5 | 0.3 | 0.5 | — | — | 60.2 |
| 27 | 1.5 | 12.2 | — | 1.8 | 0.3 | — | — | — | — | 19.6 | 26.7 | — | 62.1 |
| 28 | 3.8 | 8.4 | — | 0.5 | 15.0 | 0.3 | — | 2.0 | 0.8 | — | 9.1 | — | 39.9 |
| 29 | 8.1 | — | 14.2 | 6.1 | — | 1.5 | — | 19.8 | — | T | — | — | 49.7 |
| 30 | 13.7 | | 7.9 | 31.2 | — | 1.5 | — | 10.4 | 23.1 | — | — | — | 87.8 |
| 31 | 25.4 | | — | | — | | — | 7.1 | | — | | — | 32.5 |
| Total | 194.8 | 110.6 | 122.5 | 63.0 | 105.2 | 122.8 | 289.7 | 512.1 | 93.8 | 556.3 | 281.0 | 59.3 | 2511.1 |

(3) 1959 (mm) Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | — | — | — | — | 17.5 | 19.1 | 0.5 | 1.3 | — | 10.4 | 2.3 | 1.5 | |
| 2 | — | — | 4.6 | — | 7.1 | — | 5.6 | 6.4 | — | 7.9 | 6.9 | 1.5 | |
| 3 | 4.3 | — | 12.4 | — | 34.0 | — | 3.3 | — | — | 25.7 | 13.2 | 3.6 | |
| 4 | 18.3 | — | 3.8 | — | T | — | — | 9.9 | — | 3.8 | 2.3 | 0.3 | |
| 5 | 5.8 | 3.8 | 2.0 | — | 1.3 | — | 2.3 | 1.0 | — | 40.1 | — | 11.2 | |
| 6 | — | — | 0.8 | — | 10.2 | — | — | — | 8.6 | T | 68.6 | 1.0 | |
| 7 | 2.3 | — | — | — | — | — | — | — | 1.8 | — | 22.4 | — | |
| 8 | — | 2.5 | — | — | — | — | 6.6 | — | — | — | 6.8 | — | |
| 9 | — | 0.8 | 7.6 | — | — | — | 1.0 | — | — | 1.3 | — | 8.1 | |
| 10 | 2.3 | — | 1.0 | — | 5.9 | — | — | — | — | — | — | — | |
| 11 | 0.3 | — | 3.0 | — | 1.8 | — | — | — | — | — | — | — | |
| 12 | 8.9 | 5.3 | 3.6 | — | — | — | — | — | — | — | 1.3 | — | |
| 13 | — | — | 7.9 | — | — | — | — | 27.7 | 2.5 | — | — | — | |
| 14 | 7.9 | — | 7.4 | — | — | — | 39.6 | 1.0 | — | — | 16.8 | 1.0 | |
| 15 | — | — | 9.7 | 13.2 | — | 8.2 | 8.9 | 21.1 | — | — | 71.9 | T | |
| 16 | 6.6 | — | 1.1 | — | 13.7 | — | — | — | — | — | 72.4 | 1.0 | |
| 17 | 1.3 | — | — | — | 1.8 | 1.8 | — | 4.3 | — | 5.1 | 5.8 | 3.0 | |
| 18 | 2.3 | 8.4 | — | — | — | 5.6 | 4.9 | 8.6 | — | 5.6 | — | 37.6 | |
| 19 | — | 87.1 | — | — | — | 5.6 | 4.6 | — | — | 21.6 | — | 11.4 | |
| 20 | 1.5 | 18.0 | — | 11.7 | 16.0 | — | 73.9 | 0.8 | — | 0.8 | 2.5 | — | |
| 21 | — | 15.2 | — | — | 8.6 | 1.3 | 1.5 | — | — | 3.8 | 3.3 | 4.3 | |
| 22 | 15.5 | — | — | — | — | 7.9 | — | — | — | — | 0.8 | 4.6 | |
| 23 | 2.3 | — | — | — | — | 2.3 | — | 1.3 | — | 0.3 | — | 3.0 | |
| 24 | 4.6 | — | — | — | 4.3 | 0.8 | 19.8 | — | — | 3.6 | 1.8 | 0.8 | |
| 25 | 22.6 | — | — | — | 12.7 | 3.3 | 3.3 | 1.0 | — | — | 12.2 | 2.3 | |
| 26 | — | 3.8 | — | — | — | T | 8.9 | — | 3.0 | 1.5 | 11.4 | 2.3 | |
| 27 | 1.8 | — | — | — | — | 43.9 | — | 0.8 | ※ 73.9 | 2.8 | 9.4 | — | |
| 28 | — | — | — | — | — | — | 2.3 | 5.6 | — | 4.1 | 5.8 | 2.5 | |
| 29 | — | — | — | — | — | 87.6 | T | 3.3 | — | 0.5 | 0.5 | — | |
| 30 | — | | — | — | — | 7.6 | — | — | 14.0 | — | 0.5 | — | |
| 31 | — | | — | | — | | 7.6 | — | | 0.3 | | 205.7 | |
| Total | 108.6 | 94.9 | 64.9 | 24.9 | 134.9 | 195.0 | 194.6 | 94.1 | 103.8 | 139.2 | 338.9 | 306.7 | 1,800.5 |

(4) 1960 (mm) Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ※ 169.7 | 1.3 | — | — | — | — | 34.0 | — | 50.0 | 1.8 | 3.6 | 3.3 | |
| 2 | 1.5 | 0.3 | — | 30.0 | — | 16.3 | 42.2 | — | 5.1 | — | 2.3 | 2.0 | |
| 3 | — | — | — | 2.3 | — | 0.3 | 0.3 | 30.2 | 27.7 | — | — | — | |
| 4 | 1.3 | 10.7 | — | 2.8 | — | 13.2 | 9.1 | 30.5 | 7.4 | — | T | — | |
| 5 | 0.5 | 8.9 | 9.1 | — | 0.3 | 3.8 | 2.5 | 17.0 | 0.8 | 53.3 | 2.8 | — | |
| 6 | — | — | — | — | 0.3 | — | 0.5 | 3.8 | 1.5 | 15.2 | 28.5 | 5.3 | |
| 7 | 12.2 | 7.4 | — | — | 1.0 | — | — | 32.0 | — | 72.9 | 8.1 | 14.7 | |
| 8 | 2.5 | 0.3 | — | — | 26.7 | — | — | 18.0 | 4.8 | — | 0.5 | 1.3 | |
| 9 | 0.8 | 6.6 | — | — | — | — | — | 1.0 | 6.1 | — | T | 5.1 | |
| 10 | — | 19.3 | 0.3 | 5.1 | 1.3 | — | 16.5 | 0.3 | — | — | 3.8 | 1.3 | |
| 11 | 0.8 | 0.5 | — | — | 1.8 | — | 2.0 | 2.3 | — | — | 8.9 | — | |
| 12 | — | 17.0 | 0.5 | — | — | 22.9 | 30.5 | — | 7.1 | 30.7 | — | 2.3 | |
| 13 | — | 0.3 | 7.9 | — | 86.4 | — | 45.5 | 40.6 | — | 9.9 | 0.3 | 1.8 | |
| 14 | — | — | — | — | 14.0 | 10.2 | 0.5 | 89.2 | — | — | — | — | |
| 15 | — | — | — | — | 0.3 | — | — | 28.2 | — | — | 0.8 | 2.0 | |
| 16 | — | 0.5 | — | — | 14.5 | — | 0.5 | 0.3 | 0.3 | — | 1.5 | — | |
| 17 | — | — | — | — | 1.0 | 22.9 | 0.8 | — | 3.3 | 0.3 | 2.3 | — | |
| 18 | — | — | — | 5.9 | — | — | — | — | — | 24.6 | 0.5 | — | |
| 19 | — | 0.8 | — | 0.3 | — | — | — | — | 0.5 | — | — | 11.2 | |
| 20 | 1.3 | — | — | — | 4.1 | 2.3 | — | — | 13.5 | 9.4 | — | 3.3 | |
| 21 | 1.0 | 1.1 | — | — | — | 23.4 | — | 0.5 | 0.8 | 0.5 | — | 1.3 | |
| 22 | 0.3 | 0.3 | — | 9.4 | — | 0.8 | — | — | 7.4 | 9.7 | 0.3 | 1.0 | |
| 23 | 1.5 | 16.5 | — | 69.9 | — | 16.0 | — | — | 5.8 | 1.5 | — | — | |
| 24 | 0.3 | 92.7 | — | — | — | 0.3 | — | — | 10.4 | 0.3 | 0.8 | 1.0 | |
| 25 | — | 2.0 | — | — | 2.5 | 15.2 | 0.3 | — | 22.6 | — | 0.3 | 0.5 | |
| 26 | 8.1 | 5.1 | 2.8 | — | 25.1 | 12.4 | — | — | 0.3 | — | 2.3 | 1.8 | |
| 27 | 5.8 | — | — | — | 51.6 | 26.4 | — | — | 15.2 | 26.7 | 1.8 | 22.1 | |
| 28 | — | 5.1 | — | — | 7.1 | 6.5 | 0.8 | — | 96.3 | — | 4.6 | — | |
| 29 | — | — | — | 7.1 | 7.6 | — | — | — | 15.2 | 5.6 | 8.4 | 4.1 | |
| 30 | 7.1 | | 1.5 | — | 23.6 | — | — | — | 6.6 | — | 1.0 | 1.5 | |
| 31 | — | | 2.8 | | 0.3 | | — | 4.3 | | 4.3 | | 3.8 | |
| Total | 214.7 | 196.7 | 24.9 | 132.8 | 269.5 | 192.9 | 186.0 | 298.2 | 308.7 | 266.7 | 83.4 | 90.7 | 2,265.2 |

(5) 1961 (mm)

Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8.4 | 2.5 | 10.2 | — | 25.4 | — | 0.3 | — | T | T | 0 3 | — | 47.1 |
| 2 | 1.8 | 1.3 | 10.7 | — | — | — | — | — | — | — | — | — | 13.8 |
| 3 | — | — | — | 0.3 | T | — | 3.8 | — | — | 2.5 | — | 14.5 | 21.1 |
| 4 | 1.8 | 4.8 | 0.3 | — | 30.0 | — | 3.8 | 03 | 1 6 8 | 0.8 | — | 4.8 | 63.4 |
| 5 | 4.3 | — | — | — | 0.8 | 0.8 | 3.6 | 1.0 | 0.8 | — | — | 4.3 | 15.6 |
| 6 | 1.3 | — | — | 5.8 | 11.9 | — | — | — | — | — | 4.8 | 9.4 | 33.2 |
| 7 | — | T | — | 2.3 | — | 26.2 | — | — | T | T | 5.3 | 1.0 | 34.8 |
| 8 | 5.6 | — | — | — | — | — | — | 2.5 | T | 2.5 | 1.0 | 0.3 | 11.9 |
| 9 | 0.5 | — | 8.1 | 0.5 | 1.0 | 49.3 | — | 5.1 | — | 2 0 | T | — | 66.5 |
| 10 | — | — | 4.8 | — | — | 4. 6 | — | 0.3 | — | 22.4 | 6.6 | — | 38.7 |
| 11 | 1.3 | T | — | T | 33 8 | — | 0.5 | — | — | 24.4 | — | — | 60.0 |
| 12 | 12.2 | 5.1 | — | T | 8.1 | — | — | — | — | 2.8 | 30.0 | — | 58.2 |
| 13 | 2.0 | 3.0 | 0.5 | — | 3.3 | — | — | — | 1.0 | 0.8 | 0.8 | 2.5 | 13.9 |
| 14 | — | — | — | — | ※ 147.3 | 16.5 | — | 3.0 | 5.3 | 4.3 | 4.8 | 0.3 | 181.5 |
| 15 | — | — | — | 27.9 | 175.3 | — | — | — | 0 8 | 47.5 | 9.1 | — | 230.6 |
| 16 | — | — | 1.5 | T | 11.4 | 2.0 | 0.3 | 26.4 | — | — | — | T | 41.6 |
| 17 | — | — | 0.8 | — | 17.3 | 2.8 | 3.3 | 23.9 | — | 59.2 | — | T | 107.3 |
| 18 | — | 5.6 | 0.3 | — | 1.5 | 61.7 | 5.3 | 9 4 | T | 3.6 | 6.6 | — | 94.0 |
| 19 | 1.5 | — | — | T | — | 29.7 | — | 1 2 7 | — | T | 2.3 | — | 46.2 |
| 20 | 1.5 | — | 36.6 | — | — | 29.5 | — | 17.3 | — | 1.8 | 1.8 | 1.3 | 89.8 |
| 21 | 0.3 | — | — | — | — | 8.1 | — | 18.3 | 49.0 | — | — | 0.5 | 76.2 |
| 22 | 0.3 | — | — | — | — | 2.8 | — | 3 1 0 | 1.5 | T | 63.5 | — | 99.1 |
| 23 | 0.5 | — | — | — | — | T | 1.3 | 1 1.2 | — | 7.6 | 161.8 | 1.5 | 183.9 |
| 24 | 0.5 | — | — | — | — | 43 | — | 7.1 | T | 1 3 | — | 3.0 | 162 |
| 25 | 0.3 | — | — | 1.0 | 19.6 | 2.3 | — | — | T | 7.9 | T | 5.8 | 369 |
| 26 | 8.9 | 163 | — | — | 10.9 | T | T | — | — | — | 0.8 | 0.8 | 37.7 |
| 27 | 20.3 | — | 3.3 | — | — | 48.5 | T | — | — | 5.3 | 0.3 | T | 77.7 |
| 28 | — | 3.0 | — | — | T | 16.5 | — | 2.8 | — | 39.4 | 0.8 | 5.3 | 67.8 |
| 29 | — | — | — | 1.3 | — | 2.5 | — | 1.8 | 0.3 | — | — | 2.0 | 7.9 |
| 30 | — | | — | 1.0 | — | 37.3 | — | 1.3 | — | T | 4.8 | — | 44.4 |
| 31 | — | | T | | — | | — | 38.1 | | 4.3 | | — | 42.4 |
| Total | 73.3 | 41.6 | 77.1 | 40.1 | 467.6 | 345.4 | 22.2 | 213.5 | 75.5 | 240.4 | 3054 | 57.3 | 1,9594 |

(6) 1962 (mm) Mindoro Island Calapan

| Date \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | — | 8.9 | — | T | 0.5 | — | 5.6 | 26.7 | — | — | — | — | |
| 2 | 1.8 | 2.3 | 7.6 | 13.7 | — | — | 6.9 | 5.6 | 0.8 | 0.8 | — | 0.3 | |
| 3 | 1.8 | T | 2.0 | 0.8 | 60.9 | — | 4.8 | 1.8 | 33.3 | — | 1.3 | 7.4 | |
| 4 | 0.5 | 3.0 | — | — | 8.6 | — | 43.2 | 8.1 | 106.9 | — | 6.4 | 26.2 | |
| 5 | 11.8 | 4.8 | — | 2.3 | 3.8 | — | 2.5 | 22.6 | ※ 127.5 | — | 7.1 | 2.5 | |
| 6 | 0.8 | 2.5 | — | — | | — | 0.5 | 2.5 | 3.0 | 5.1 | 102.4 | 0.8 | |
| 7 | — | 1.8 | — | — | | 5.1 | 1.8 | 14.5 | 2.0 | 3.6 | 7.9 | 2.3 | |
| 8 | 3.8 | 4.3 | — | — | | — | 1.0 | 59.2 | 2.5 | — | — | 0.8 | |
| 9 | 1.3 | — | — | — | | — | 0.3 | — | 11.7 | 1.0 | 9.9 | 3.3 | |
| 10 | 4.8 | — | 6.6 | — | | — | 15.7 | 1.3 | 11.7 | T | 14.7 | — | |
| 11 | 1.5 | — | — | — | | — | 4.1 | 14.7 | 5.3 | 11.4 | 1.0 | — | |
| 12 | 1.3 | — | — | — | | — | 0.8 | 3.0 | 4.1 | 14.2 | T | — | |
| 13 | — | 1.3 | — | — | 1.5 | 5.1 | 0.8 | 2.8 | 2.0 | — | — | 30.5 | |
| 14 | 0.5 | T | — | — | 0.5 | — | 22.4 | 3.3 | 0.8 | 11.4 | — | 5.6 | |
| 15 | — | 1.8 | — | 1.8 | 3.3 | 3.6 | — | — | — | T | — | — | |
| 16 | T | 5.1 | — | — | — | — | T | — | 17.3 | — | — | — | |
| 17 | 2.5 | 3.3 | — | — | 6.1 | — | — | — | 1.0 | 1.8 | 2.5 | — | |
| 18 | — | — | — | 40.6 | 2.5 | — | T | — | 12.2 | 5.1 | — | 0.5 | |
| 19 | 1.0 | 0.8 | 1.8 | — | — | — | 12.7 | — | 12.2 | — | — | — | |
| 20 | 6.3 | — | 0.3 | — | — | — | 16.3 | T | — | — | 6.4 | 1.5 | |
| 21 | 6.3 | — | — | — | 1.3 | 0.8 | 52.3 | 4.3 | 1.3 | 25.1 | 9.9 | T | |
| 22 | — | — | — | 2.3 | — | 33.5 | 11.9 | — | 11.2 | — | 5.3 | 1.0 | |
| 23 | 4.1 | — | — | 3.8 | — | 1.3 | 0.5 | 7.4 | 10.4 6 | — | 11.9 | 1.3 | |
| 24 | 2.0 | 5.8 | — | — | 13.7 | 2.0 | 10.7 | 2.0 | 12.4 | — | 25.4 | 3.0 | |
| 25 | 2.0 | 5.1 | — | — | 7.6 | — | 9.9 | — | 0.8 | — | — | 1.5 | |
| 26 | 3.0 | — | — | — | 26.4 | 6.4 | 1.0 | 10.1 | — | — | 4.1 | 27.9 | |
| 27 | 1.0 | — | — | — | 16.5 | 3.0 | 12.4 | — | — | 1.3 | 18.5 | 0.6 | |
| 28 | 6.6 | 5.1 | — | — | — | 0.8 | 6.4 | — | — | 10.1 | — | T | |
| 29 | — | — | — | 14.5 | 2.8 | T | 11.9 | 0.8 | — | 10.7 | T | — | |
| 30 | 13.2 | | — | 40.4 | — | 57.2 | 8.4 | 14.5 | — | 4.3 | 3.0 | — | |
| 31 | 4.3 | | — | | — | | 3.6 | — | | — | | — | |
| Total | 82.2 | 55.9 | 18.3 | 120.2 | 156.0 | 118.8 | 268.4 | 205.2 | 484.6 | 105.9 | 237.7 | 117.0 | 1,970.2 |

(7) 1963 (mm) Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | 0.8 | 0.3 | 1.5 | 29.9 | 6.4 | | | |
| 2 | | 1.5 | | | | 8.1 | | 11.7 | T | 12.9 | | T | |
| 3 | | | | | | 5.6 | 7.9 | T | T | 0.8 | 12.9 | | |
| 4 | | 1.3 | | | | 2.8 | | 0.8 | 20.3 | 8.4 | 0.3 | | |
| 5 | 1.5 | | T | 1.3 | | T | | | 7.1 | | 10.9 | 0.8 | |
| 6 | 13.2 | T | | T | | | | | 6.8 | 8.6 | 2.5 | 0.8 | |
| 7 | 6.8 | T | | 6.9 | | 1.5 | | | — | 6.3 | 1.5 | 2.3 | |
| 8 | 7.6 | 0.5 | | 2.3 | | 0.8 | | 0.5 | 15.5 | 0.3 | 0.5 | 3.0 | |
| 9 | 13.0 | 0.5 | | | | 6.3 | | T | 37.3 | | T | 3.8 | |
| 10 | | | | | | 0.8 | | | 19.8 | | 4.6 | 14.0 | |
| 11 | 7.9 | | | | | | | | 1.3 | T | 13.4 | 52.3 | |
| 12 | | | | | | 12.5 | | 5.6 | | 3.0 | T | 5.8 | |
| 13 | 10.2 | | | | | | 0.8 | ※ 54.8 | T | 9.1 | T | 11.9 | |
| 14 | 6.1 | 5.1 | | | | | | 17.5 | | T | T | | |
| 15 | 4.3 | 1.3 | | | | 20.3 | 30.5 | 0.8 | | 0.3 | | 0.9 | |
| 16 | | | | 1.5 | | 14.7 | | | | 12.9 | | T | |
| 17 | | | | | | 12.7 | | 35.6 | | 10.9 | | — | |
| 18 | | 4.6 | | | | 12.7 | | 9.1 | | 3.8 | 0.3 | 5.1 | |
| 19 | | | | | T | 0.8 | | 34.8 | | 3.0 | 3.0 | 2.0 | |
| 20 | | | | | | 5.6 | 0.5 | 6.3 | 10.4 | 0.3 | 5.6 | 1.0 | |
| 21 | | | | | | 3.6 | 14.2 | T | 16.0 | 23.9 | | 0.8 | |
| 22 | | T | | | | | | | 0.3 | 13.7 | | | |
| 23 | 8.4 | | | 0.5 | | | | 2.3 | 28.9 | 12.7 | | 1.3 | |
| 24 | 1.8 | 1.8 | | | | | 9.6 | 42.4 | 3.3 | 1.0 | | | |
| 25 | 0.5 | | | | 24.4 | | 13.5 | | 3.3 | — | 26.6 | | |
| 26 | 4.3 | | | 5.6 | 11.4 | 1.8 | 26.2 | 27.4 | 12.2 | T | 13.5 | 4.1 | |
| 27 | 1.0 | 1.0 | | 3.0 | 18.0 | 5.1 | 6.1 | 20.6 | 1.5 | 14.7 | — | 1.3 | |
| 28 | 2.8 | | | | | T | 11.0 | 2.8 | 42.4 | | T | 5.3 | |
| 29 | | | T | | | 5.8 | 8.1 | T | 2.0 | | 5.8 | 2.8 | |
| 30 | | | | | | 1.8 | | | 9.1 | | 5.1 | T | |
| 31 | | | | | | | | | | | | | |
| Total | 89.4 | 17.6 | | 21.1 | 53.8 | 124.1 | 128.7 | 274.5 | 267.4 | 153.0 | 106.5 | 119.3 | 1,355.4 |

18) 1964 (mm) Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8.1 | 8.1 | 12.1 | | | | 0.3 | T | | | 1.8 | 26.9 | |
| 2 | 5.6 | 12.7 | | T | | 10.2 | 1.8 | 24.3 | | 1.0 | 41.0 | | |
| 3 | 25.4 | 25.4 | | | | | | | | T | 2.1 | 9.0 | |
| 4 | 12.2 | 5.8 | | 2.3 | 7.0 | | | T | | 0.5 | T | 1.3 | |
| 5 | 6.1 | 4.6 | T | | | | | | | 0.8 | 10.9 | 2.8 | |
| 6 | 1.0 | 5.3 | | T | | | 10.8 | 30.0 | 1.0 | T | 87.0 | 25.0 | |
| 7 | T | 5.1 | | | | | | 17.0 | 3.6 | 2.9 | 0.8 | 27.6 | |
| 8 | 1.3 | | T | 1.0 | | | T | 2.0 | 4.3 | | 1.8 | | |
| 9 | | 1.5 | | 0.3 | | | | T | T | T | | T | |
| 10 | 5.1 | 2.0 | | T | | 2.8 | 52.5 | 1.0 | | 11.0 | | | |
| 11 | 0.8 | 3.1 | 0.8 | | | | | | 0.8 | 0.3 | | | |
| 12 | 5.1 | 33. | | T | 0.8 | T | 7.8 | 4.8 | 10.7 | T | | 3.0 | |
| 13 | 1.0 | T | | 29.0 | 4.8 | | | 1.3 | 44.5 | | 23.0 | 2.9 | |
| 14 | | 3.8 | T | | | | 2.0 | 2.6 | 1.0 | 5.0 | 24.0 | 52.2 | |
| 15 | | 9.9 | | | 14.4 | | 9.8 | | | T | 18.0 | 35.3 | |
| 16 | | 1.5 | | T | T | | | | | 3.0 | 36.0 | 1.0 | |
| 17 | | | | | | 5.0 | 105.0 | | | | 8.0 | | |
| 18 | | T | 1.0 | | | 17.7 | 1.8 | | | | 13.0 | 0.5 | |
| 19 | 4.3 | | | 0.5 | | 13.9 | | T | T | 2.0 | 16.0 | T | |
| 20 | 3.3 | | | | | 21.4 | | 0.3 | 2.0 | 23.0 | 93.0 | 1.6 | |
| 21 | 5.8 | T | | | | 32.7 | 9.0 | 1.8 | 24.3 | 1.4 | | 4.6 | |
| 22 | | 4.3 | | | 1.0 | 1.0 | 6.0 | | 3.8 | | | T | |
| 23 | | | | | 2.0 | 8.5 | | | 5.8 | 1.0 | T | T | |
| 24 | | 0.8 | | | 0.3 | 12.1 | | T | 56.0 | 5.0 | 30.6 | 1.2 | |
| 25 | 0.8 | 14.7 | | | 1.8 | T | | 1.8 | 43.6 | 2.8 | 171.0 | | |
| 26 | | 20.1 | 16.5 | | | | | 5.1 | 0.1 | T | 52.0 | | |
| 27 | | 2.8 | 37.8 | T | | 0.8 | | | | 38.9 | ※ 178.0 | | |
| 28 | | 28.5 | | | | 3.6 | | 1.3 | 39.5 | 12.9 | 77.9 | T | |
| 29 | | | | | 0.3 | 72.3 | | | 16.3 | 10.9 | 12 | | |
| 30 | 4.1 | | | | 14.7 | 10.1 | | | 2.0 | 26.9 | 28.0 | | |
| 31 | | | | | | | 0.3 | 4.3 | | 11.0 | | 20 | |
| Total | 90.0 | 163.3 | 68.2 | 33.1 | 47.1 | 212.1 | 207.1 | 97.6 | 259.3 | 160.3 | 915.1 | 196.9 | 2450.1 |

(9) 1965 (mm) Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 3.9 | | 0.5 | | | 16.6 | 0.5 | — | T | — | 27.9 | |
| 2 | | 0.3 | | 7.0 | 0.6 | | T | 3.0 | 1.0 | 41.0 | 5.5 | 8.0 | |
| 3 | | 7.9 | | | 4.8 | | | | 2.3 | 4.3 | 0.3 | 0.3 | |
| 4 | 5.3 | | | 1.0 | 0.9 | | | | | 3.3 | 39.0 | 2.3 | |
| 5 | | | | | | | | | | | 11.8 | 0.3 | |
| 6 | | | | | 11.0 | | | | | | 30.3 | | |
| 7 | | 10.9 | 22.5 | | 5.0 | 0.8 | 3.0 | | 1.0 | | 10.0 | 40.5 | |
| 8 | | 2.8 | 4.5 | | | | 3.0 | 70.0 | | 18.4 | T | 4.0 | |
| 9 | | 2.3 | 1.0 | | | 1.3 | 1.1 | | | 0.6 | | T | |
| 10 | 11.3 | 0.8 | 0.3 | | | 2.3 | 11.0 | 9.0 | | 30.5 | | 5.3 | |
| 11 | 29.0 | | | | 18.0 | | — | 24.3 | T | 13.9 | | T | |
| 12 | 3.0 | | | 6.0 | T | | 0.3 | | 2.1 | | 4.0 | | |
| 13 | 1.3 | 3.0 | 0.3 | | | | 22.5 | 3.0 | 2.0 | 1.3 | 1.5 | 10.5 | |
| 14 | 2.0 | 1.0 | | 1.0 | 4.0 | | 3.3 | 5.4 | 8.5 | | 2.5 | 10.6 | |
| 15 | 0.9 | | | 3.0 | 18.0 | | | | 2.3 | 5.0 | 0.6 | 2.0 | |
| 16 | 2.0 | T | T | 1.0 | 10.0 | | T | 21.0 | 1.8 | 2.5 | 0.8 | 35.0 | |
| 17 | 6.5 | | | T | | | 14.0 | | 10.5 | 1.8 | 0.5 | 41.5 | |
| 18 | 6.9 | | | 3.0 | 5.0 | | T | | 4.0 | 2.0 | 2.5 | 3.5 | |
| 19 | T | | | 31.0 | T | T | 0.3 | | 5.0 | 2.5 | T | 6.0 | |
| 20 | | | | 52.0 | ※ 112.0 | 4.0 | 83.0 | | 1.8 | 1.5 | 5.5 | 4.8 | |
| 21 | | 2.3 | | — | T | 0.9 | — | | 1.0 | 4.3 | 15.5 | | |
| 22 | 0.3 | | | 14.0 | 2.5 | T | 31.0 | 18.0 | 3.6 | 4.6 | | | |
| 23 | 11.0 | | | 2.0 | 7.0 | 0.5 | | 47.0 | 8.9 | T | 4.0 | 0.5 | |
| 24 | 5.9 | 0.6 | | 10.0 | 3.0 | 10.3 | 3.8 | 5.5 | 1.5 | 58.4 | | 2.3 | |
| 25 | | 3.0 | 20.0 | 9.0 | 19.0 | | 16.0 | 2.5 | | 3.3 | T | 11.0 | |
| 26 | | 8.0 | 34.0 | 5.0 | 12.3 | | 59.0 | 8.0 | | T | 4.5 | 2.0 | |
| 27 | T | 4.0 | 4.0 | 10.0 | 9.3 | | 2.3 | 91.0 | | | 0.5 | 0.8 | |
| 28 | | T | 3.0 | 4.0 | 0.3 | | — | 1.0 | 0.5 | T | 5.3 | | |
| 29 | | | 2.0 | 1.0 | 0.6 | | 0.7 | 14.1 | 2.8 | T | 4.6 | 3.0 | |
| 30 | | | | — | 0.6 | 4.0 | | 1.5 | 1.0 | T | 7.0 | | |
| 31 | 8.9 | | | | T | | 6.3 | 1.4 | | 42.0 | | 15.7 | |
| Total | 94.3 | 50.8 | 91.6 | 160.5 | 243.9 | 24.1 | 277.2 | 326.2 | 61.6 | 241.2 | 156.2 | 237.8 | 1,965.4 |

00 1966 (mm) Mindoro Island Calapan

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.3 | 0.5 | | | | | | | | 3.1 | | 0.3 | |
| 2 | 7.4 | 3.0 | | 1.0 | | | 0.3 | | | 1.8 | | 10.7 | |
| 3 | 6.6 | | 11.0 | | | | 5.0 | 5.0 | 2.0 | 7.3 | | 5.6 | |
| 4 | 18.1 | | T | 1.0 | | | | | 6.3 | 0.5 | T | 19.6 | |
| 5 | | | | 11.0 | 0.3 | | 3.0 | | 0.5 | 8.1 | | 2.0 | |
| 6 | | | | | 10.5 | | T | | 17.0 | 27.0 | T | 3.3 | |
| 7 | | 1.0 | | | 1.0 | | 15.0 | | 83.0 | 5.4 | 0.5 | 2.9 | |
| 8 | | | T | | 1.0 | | T | | 44.0 | 6.5 | | | |
| 9 | 4.1 | | 2.0 | | 1.8 | 24.0 | 0.8 | | | 3.5 | 0.3 | 3.2 | |
| 10 | | | 1.5 | 0.5 | 6.0 | | 13.5 | | | | 14.2 | | |
| 11 | | | 14.0 | | | | 35.5 | | 8.0 | | T | 7.3 | |
| 12 | 0.8 | | 3.5 | | | | 0.5 | T | 12.0 | | 11.2 | | |
| 13 | | | | | | | 14.5 | 1.0 | T | | 6.7 | 3.6 | |
| 14 | 5.8 | | | | 7.5 | 1.3 | | T | | | T | 3.1 | |
| 15 | 3.3 | 0.3 | | 11.0 | | 46.5 | 0.5 | | | | | | |
| 16 | 0.5 | 0.3 | | 55.0 | 50.0 | | | | T | 0.3 | 6.5 | T | |
| 17 | 1.8 | | | | ※ 97.5 | 16.0 | 3.5 | | 10.5 | 0.5 | 4.0 | 6.9 | |
| 18 | 4.0 | | | | 39.5 | 0.8 | 4.0 | | 4.0 | 2.2 | | 15.8 | |
| 19 | 7.5 | | T | | 37.0 | 0.3 | | | T | 8.5 | 8.0 | 3.8 | |
| 20 | | 3.4 | | 9.5 | 9.0 | 1.5 | 15.0 | | | 62.0 | 86.5 | | |
| 21 | 2.5 | | T | | 0.3 | 8.0 | 15.0 | | 3.5 | 42.4 | 10.5 | | |
| 22 | | | — | | T | 3.0 | 3.5 | | | 4.0 | T | 9.3 | |
| 23 | T | 0.3 | — | | 16.0 | T | 18.0 | | | | T | T | |
| 24 | T | 2.0 | T | 2.3 | 6.3 | 19.1 | | | | | | 0.5 | |
| 25 | | | | | 51.0 | 6.1 | | | | T | 3.0 | 9.4 | |
| 26 | 7.0 | 0.5 | | 39.0 | 14.0 | | 10.0 | | 21.0 | 3.0 | | 211.3 | |
| 27 | 11.0 | | | | 1.0 | 0.5 | | 0.5 | 1.0 | 11.0 | 15.4 | 52.8 | |
| 28 | T | 0.9 | 11.0 | | 0.3 | 6.5 | 1.5 | | 15.5 | 1.0 | 2.3 | 51.0 | |
| 29 | 0.5 | 3.7 | 10.9 | T | 8.0 | T | 0.3 | 15.0 | 8.5 | 0.3 | 9.7 | 1.1 | |
| 30 | 1.0 | | 0.5 | T | | | 8.5 | 4.0 | T | T | 10.7 | 0.3 | |
| 31 | 8.5 | | 2.5 | | 0.3 | | | | | | | | |
| Total | 94.7 | 15.9 | 56.9 | 130.3 | 358.3 | 133.6 | 167.9 | 25.5 | 233.8 | 193.4 | 189.5 | 417.8 | 2,022.6 |

## Table C-1-2. Monthly Precipitation Record

Calapan (mm)

| Year \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1957 | 240.1 | 16.3 | 53.0 | 94.0 | 76.2 | 70.1 | 188.4 | 335.3 | 95.5 | 202.4 | 58.2 | 80.1 | 1,509.6 |
| 58 | 194.8 | 110.6 | 122.5 | 63.0 | 105.2 | 122.8 | 289.7 | 512.1 | 93.8 | 556.3 | 281.0 | 59.3 | 2,511.1 |
| 59 | 108.6 | 94.9 | 64.9 | 24.9 | 134.9 | 195.0 | 194.6 | 94.1 | 103.8 | 139.2 | 338.9 | 306.7 | 1,800.5 |
| 60 | 214.7 | 196.7 | 24.9 | 132.8 | 269.5 | 192.9 | 186.0 | 298.2 | 308.7 | 266.7 | 83.4 | 90.7 | 2,265.2 |
| 61 | 73.3 | 41.6 | 77.1 | 40.1 | 467.6 | 345.4 | 22.2 | 213.5 | 75.5 | 240.4 | 305.4 | 57 3 | 1,959.4 |
| 62 | 82.2 | 55.9 | 18.3 | 120.2 | 156.0 | 118.8 | 268.4 | 205.2 | 484.6 | 105.9 | 237.7 | 117.0 | 1,970.2 |
| 63 | 89.4 | 17.6 | 0 | 21.1 | 53.8 | 124.1 | 128.7 | 274.5 | 267.4 | 153 0 | 106.5 | 119.3 | 1,355.4 |
| 64 | 90.0 | 163.3 | 68.2 | 33.1 | 47.1 | 212.1 | 207.1 | 97.6 | 259.3 | 160.3 | 915.1 | 196.9 | 2,450.1 |
| 65 | 94.3 | 50.8 | 91.6 | 160.5 | 243.9 | 21.1 | 277.2 | 326.2 | 61.6 | 241.2 | 156.2 | 237.8 | 1,965.4 |
| 66 | 94.7 | 15.9 | 56.9 | 130.3 | 358.3 | 133.6 | 167.9 | 255 | 233.8 | 198.4 | 189.5 | 417.8 | 2,022.6 |
| Total | 1,282.1 | 763.6 | 577.4 | 820.0 | 1,912.5 | 1538.9 | 1930.2 | 2,382.2 | 1,984.0 | 2,263.8 | 2,671.9 | 1,682.9 | 19,809.5 |
| Average | 128.2 | 76.4 | 57.7 | 82.0 | 191.3 | 153.9 | 193.0 | 238.2 | 198.4 | 226.4 | 267.2 | 168.3 | 1,981.0 |
| Monthly Precipitation Max | 240.1 | 196.7 | 122.5 | 160.5 | 467.6 | 345.4 | 289.7 | 335.3 | 484.6 | 556.3 | 915.1 | 417.8 | |
| Monthly Precipitation Min | 73 3 | 17.6 | 0 | 21.1 | 47.1 | 24.1 | 22.0 | 25.5 | 61.6 | 105.9 | 58.2 | 57.3 | |

## Table C - 1. 3 Consecutive Dry Days

Calapan ( day )

| Year \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1957 | 16 | 45 | 18 | 30 | 15 | 11 | 5 | 8 | 20 | 9 | 11 | 13 | |
| 58 | 5 | 10 | 14 | 22 | 12 | 12 | 7 | 5 | 10 | 6 | 6 | 20 | |
| 59 | 7 | 18 | 31 | 11 | 6 | 14 | 6 | 10 | 21 | 12 | 8 | 13 | |
| 60 | 19 | 11 | 20 | 8 | 10 | 8 | 21 | 17 | 8 | 6 | 18 | 10 | |
| 61 | 15 | 16 | 17 | 16 | 12 | 6 | 18 | 22 | 19 | 6 | 10 | 19 | |
| 62 | 15 | 15 | 23 | 16 | 13 | 9 | 6 | 12 | 12 | 7 | 10 | 13 | |
| 63 | 10 | 22 | 53 | 19 | 29 | 7 | 12 | 10 | 10 | 6 | 9 | 10 | |
| 64 | 11 | 10 | 25 | 22 | 15 | 15 | 11 | 14 | 19 | 11 | 7 | 16 | |
| 65 | 8 | 19 | 18 | 10 | 9 | 29 | 10 | 8 | 16 | 9 | 14 | 8 | |
| 66 | 10 | 31 | 17 | 10 | 10 | 11 | 7 | 26 | 9 | 11 | 14 | 7 | |
| Total | (12) 116 | (19) 192 | (24) 236 | (16) 164 | (13) 131 | (12) 122 | (10) 103 | (13) 132 | (14) 144 | (8) 83 | (11) 107 | (13) 129 | Average in ( ) |
| Max. Spell | 19 | 45 | 53 | 30 | 29 | 29 | 21 | 26 | 21 | 12 | 18 | 20 | |
| Min Spell | 5 | 10 | 14 | 8 | 6 | 6 | 6 | 5 | 8 | 6 | 6 | 7 | |

Table C - 1. 4 Rainy Days

Calapan (day)

Rainy (over 5mm) days

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1957 | 6 | 0 | 2 | 3 | 3 | 4 | 12 | 11 | 4 | 7 | 4 | 4 |
| 58 | 11 | 6 | 5 | 3 | 3 | 5 | 10 | 20 | 6 | 15 | 13 | 2 |
| 59 | 7 | 5 | 5 | 2 | 9 | 8 | 8 | 6 | 3 | 7 | 13 | 4 |
| 60 | 5 | 10 | 2 | 6 | 9 | 11 | 6 | 8 | 15 | 10 | 3 | 5 |
| 61 | 5 | 3 | 4 | 2 | 10 | 10 | 1 | 11 | 3 | 8 | 7 | 4 |
| 62 | 5 | 5 | 2 | 4 | 7 | 5 | 15 | 10 | 12 | 8 | 12 | 5 |
| 63 | 8 | 1 | 0 | 2 | 3 | 11 | 9 | 11 | 13 | 12 | 8 | 6 |
| 64 | 8 | 10 | 3 | 1 | 3 | 10 | 7 | 4 | 8 | 9 | 17 | 6 |
| 65 | 8 | 3 | 3 | 9 | 11 | 1 | 9 | 12 | 4 | 7 | 9 | 11 |
| 66 | 8 | 0 | 4 | 5 | 13 | 7 | 10 | 2 | 10 | 8 | 10 | 10 |
| Average | 7.1 | 4.3 | 30 | 3.7 | 7.1 | 7.2 | 8.7 | 9.5 | 7.8 | 9.1 | 9.6 | 5.7 |

Table C - 1. 5 Calculation of Annual Precipitation Probability

| Precedence | $x_i$ | $\log x_i$ | $x_i + b$ | $\log(x_i + b)$ | $\log \frac{x_i+b}{x_0+b}$ | $\left\{\log \frac{x_i+b}{x_0+b}\right\}^2$ |
|---|---|---|---|---|---|---|
| 1 | 2,511 | 3.400 | Same as | Same as | 0.110 | 0.0121 |
| 2 | 2,450 | 3.389 | $x_i$ | $\log x_i$ | 0.099 | 0.0098 |
| 3 | 2,265 | 3.355 | | | 0.065 | 0.0042 |
| 4 | 2,022 | 3.306 | | | 0.016 | 0.0003 |
| 5 | 1,970 | 3.294 | | | 0.004 | 0.0002 |
| 6 | 1,965 | 3.293 | | | 0.003 | 0.0001 |
| 7 | 1,959 | 3.292 | | | 0.002 | — |
| 8 | 1,800 | 3.255 | | | −0.035 | 0.0012 |
| 9 | 1,509 | 3.179 | | | −0.111 | 0.0123 |
| 10 | 1,355 | 3.132 | | | −0.158 | 0.0249 |
| Total | | 32.895 | | | | 0.0649 |

$$\log x_0 = \frac{\Sigma \log x_i}{n} = \frac{32.895}{10} = 3.2895$$

$$\therefore x_0 = 1{,}948\text{mm}$$

$$b = \frac{x_s x_t - x_0^2}{2 \times x_0 - (x_s + x_t)} = -1.3 \times 10^7$$

$$|b| > x_{min} \qquad b = 0$$

$$\sqrt{2}\,C = \frac{1}{\sqrt{\sum_{i=1}^{n} \frac{1}{n-1}\left\{\log\frac{x_i+b}{x_0+b}\right\}^2}} = \frac{1}{\sqrt{\frac{1}{10-1}\times 0.0649}} = 37.2$$

| $\frac{1}{T}$ | $\sqrt{2}\,\varepsilon$ | $\sqrt{2}\,C$ | $\log\frac{x_i+b}{x_0+b}$ | $\log(x_0+b)$ | $\log(x_i+b)$ | $x_i+b$ | $b$ | $x_i$ |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $a/b = c$ | $d$ | $c+d$ | $e$ | $f$ | $e-f$ |
| 1/5 | 0.8416 | 37.2 | 0.0223 | 3.29 | 3.3113 | 2,056 | 0 | Same as $x_i+b$ |
| 1/10 | 1.2816 | 37.2 | 0.0334 | 3.29 | 3.3224 | 2,109 | 0 | |
| 1/20 | 1.6449 | 37.2 | 0.0444 | 3.29 | 3.3334 | 2,158 | 0 | |
| 1/100 | 2.3263 | 37.2 | 0.0663 | 3.29 | 3.3553 | 2,255 | 0 | |

Table C - 1. 6 Calculation of Maximum Daily Precipitation Probability

| Precedence | $x_i$ | $\log x_i$ | $x_i+b$ | $\log(x_i+b)$ | $\log\frac{x_i+b}{x_0+b}$ | $\left\{\log\frac{x_i+b}{x_0+b}\right\}^2$ |
|---|---|---|---|---|---|---|
| 1 | 178.0 | 2.2500 | Same as $x_i$ | Same as $\log x_i$ | 0.1181 | 0.03328 |
| 2 | 169.7 | 2.2300 | | | 0.1161 | 0.02659 |
| 3 | 164.6 | 2.2116 | | | 0.1147 | 0.02216 |
| 4 | 147.3 | 2.1688 | | | 0.0999 | 0.00998 |
| 5 | 127.5 | 2.1066 | | | 0.0477 | 0.00222 |
| 6 | 118.9 | 2.0755 | | | 0.0006 | — |
| 7 | 112.0 | 2.0499 | | | −0.0200 | 0.00004 |
| 8 | 97.5 | 1.9899 | | | −0.0800 | 0.00644 |
| 9 | 73.9 | 1.8699 | | | −0.2000 | 0.04000 |
| 10 | 54.8 | 1.7399 | | | −0330 | 0.10899 |
| Total | | 20.6911 | | | | 02480 |

$$\log x_0 = \frac{\Sigma \log x_i}{n} = \frac{20.6911}{10} = 2.0669$$

$$\therefore\ x_0 = 117.3$$

$$b = \frac{x_s x_t - x_0^2}{2x_0 - (x_s + x_t)} = -2.224$$

$$|b| > x\,\text{mim} \qquad b = 0$$

$$\sqrt{2}C = \frac{1}{\sqrt{\Sigma \frac{1}{n-1}\left\{\log\frac{x_i+b}{x_0+b}\right\}^2}} = \frac{1}{\sqrt{\frac{1}{10-1}\times 0.2480}} = 6.02$$

| $\frac{1}{T}$ | $\sqrt{2}\varepsilon$ | $\sqrt{2}C$ | $\log\frac{x_i+b}{x_0+b}$ | $\log(x_0+b)$ | $\log(x_i+b)$ | $x_i+b$ | $b$ | $x_i$ |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $a/b=c$ | $d$ | $C+d$ | $e$ | $f$ | $e-f$ |
| 1/5 | 0.8416 | 6.02 | 0.1400 | 2.069 | 2.209 | 161.9 | 0 | Same as $x_i+b$ |
| 1/10 | 1.2816 | 6.02 | 0.213 | 〃 | 2.282 | 191.5 | 〃 | |
| 1/20 | 1.6449 | 6.02 | 0.274 | 〃 | 2.343 | 220.3 | 〃 | |
| 1/100 | 2.3263 | 6.02 | 0.394 | 〃 | 2.463 | 290.4 | 〃 | |

## C-2. Precipitation Data in San-Miguel Alangalang District

Daily Precipitation throughout the year in Tacloban for the last 10 years ( 1957 - 1966 ) is given in table C-2-1. The figures obtained from Tacloban Observatory are converted in terms of inch to mm. to the above end by the Survey Mission.

In table C-2-2, Monthly precipitation and annual precipitation derived as a sum of data in table C-2-1 are given. On the basis of the table, annual precipitation probability and maximum daily precipitation probability are calculated, using the Iwai Formula, and given in table C-2.5 and C-2- 6

In table C-2-3, consecutive dry days with daily precipitation less than 5 mm. obtained as the sum in table C-1-1 are given. Table C-2-4 shows days with daily precipitation more than 5 mm..

Table C-2-1 Daily Precipitation Record

(1) 1957 (mm) Tacloban

| Date \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | — | 59.9 | 2.3 | 0.3 | 2.5 | 1.5 | 0.8 | 13.2 | — | 23.9 | 0.2 | 3.8 | |
| 2 | 1.0 | 52.8 | — | 25.7 | 15.5 | 19.3 | 0.3 | 1.0 | 1.0 | 14.5 | 0.5 | 6.4 | |
| 3 | 14.7 | 2 6 | — | 12.2 | 1.3 | 48.0 | T | — | — | — | 21.8 | — | |
| 4 | — | 3.8 | — | 4.8 | — | 4 3 | 2.0 | — | — | — | 5.3 | 0.3 | |
| 5 | 64.8 | — | — | 25.2 | 2.0 | — | 20.3 | 43.4 | — | — | 27.2 | 0.3 | |
| 6 | 58.4 | — | 25.4 | 1.5 | 0.5 | 3.8 | 3.8 | — | 4.6 | 2.5 | 0.5 | 5.1 | |
| 7 | 0.5 | — | 9.1 | 9.4 | 10.7 | — | 6.9 | 38.9 | 35.3 | — | 8.9 | 1.0 | |
| 8 | T | — | 0.8 | 21.6 | 9.1 | 9.1 | 2.0 | 0.3 | 20.6 | 0.2 | 5 8 | — | |
| 9 | 3.8 | 7.1 | 2 0 | — | — | — | — | 10.7 | — | 3.8 | 0.8 | 1.8 | |
| 10 | 4.1 | — | 3.8 | — | 3.3 | — | 13.2 | 2.8 | — | — | 17.2 | 4.3 | |
| 11 | 1.0 | 2.5 | 1.3 | — | — | 12.5 | — | — | 2.8 | 31.8 | — | 2.5 | |
| 12 | 1.8 | 4.1 | 0.3 | — | — | — | 5.1 | 3.1 | — | 16 8 | — | — | |
| 13 | 9.9 | 19.6 | — | 4.6 | 0.3 | — | 10.2 | — | — | — | — | 0.8 | |
| 14 | 16.8 | 18.5 | — | 43.2 | — | — | 1.0 | — | — | — | — | — | |
| 15 | 4.6 | 46.5 | — | — | — | 16.5 | — | 0.2 | 13.5 | 6.4 | 2.3 | — | |
| 16 | 2.5 | 8.9 | — | — | — | — | T | 2.3 | — | 8.4 | 1.0 | 9.9 | |
| 17 | 1.5 | 10.2 | — | — | — | 9.4 | 1.0 | — | 1.8 | 5.3 | 1.0 | 5.8 | |
| 18 | 8.4 | — | — | — | — | — | — | — | 12.2 | 8.4 | — | 10 2 | |
| 29 | — | 1.0 | 5.1 | — | — | 0.2 | 34.8 | — | — | 2.2 | — | 1.5 | |
| 20 | — | 1.3 | 4.3 | 1.8 | — | 2.5 | 0.5 | — | T | 8 9 | — | — | |
| 21 | 1.0 | — | — | 2.8 | — | 6.4 | 3.3 | 0 2 | — | 10.2 | 0.6 | 1.5 | |
| 22 | 3.1 | 1 5 | 0.5 | 0.8 | — | 2.8 | 5.8 | — | — | — | T | 1.8 | |
| 23 | — | — | — | 0.4 | — | — | 2.5 | — | — | 17.3 | — | — | |
| 24 | 22.9 | — | T | — | — | — | 1.3 | — | — | 0.4 | — | 4 3 | |
| 25 | — | 0.6 | — | — | — | 13.5 | 2.5 | — | — | 3.8 | — | 0.5 | |
| 26 | 0.2 | — | 2.0 | 2.5 | — | — | 1.0 | T | — | 9.9 | 1.0 | — | |
| 27 | 7.1 | 15.5 | 0.3 | 38 | 31.0 | — | 0.3 | 16.5 | 17.0 | — | 20.3 | — | |
| 28 | T | 566 | 28 | 0.4 | — | T | 11.9 | — | — | — | 6.9 | — | |
| 29 | — | | 0.2 | 5.6 | — | 6.1 | — | 1.3 | 0.2 | — | 9.9 | 1.0 | |
| 30 | — | | 1.5 | 16.3 | — | 31 | 0.3 | 0.5 | 0.2 | — | 1.5 | 0.5 | |
| 31 | 2.3 | | — | | 0.5 | | 3.1 | — | | 31.8 | | 3.3 | |
| Total | 230.4 | 333 0 | 61.7 | 182.9 | 76.7 | 159.0 | 133.9 | 13 44 | 109.2 | 206.5 | 132.6 | 66.6 | 1,826.9 |

(2) 1958 (mm) Tacloban

| Date \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.3 | — | 1.0 | 10.7 | 36.1 | — | 9.9 | 4.6 | — | 6.6 | — | — | |
| 2 | 0.3 | 7.6 | — | — | 11.4 | — | 16.5 | 35.1 | — | 17.8 | — | 1.3 | |
| 3 | 6.1 | T | — | 0.5 | 2.3 | — | 17.0 | — | — | — | — | — | |
| 4 | 16.0 | 39.4 | 0.3 | 0.5 | 0.3 | 12.2 | T | 15.5 | — | T | 0.3 | 1.5 | |
| 5 | 27.2 | 0 | 6.4 | 2.0 | 1.3 | 27.2 | 9.4 | 0.8 | 43.9 | 5.3 | 21.6 | 32.0 | |
| 6 | — | T | 6.1 | 0.8 | — | T | 2.0 | 0.5 | 3.3 | 0.5 | — | 192.8 | |
| 7 | — | 0 | 3.1 | 1.0 | — | — | 0 | — | 3.8 | — | — | 21.3 | |
| 8 | — | 0 | 4.1 | 0.8 | 1.5 | — | 18.3 | — | — | — | 51.8 | 0.5 | |
| 9 | 9.9 | 4.8 | 20.8 | 0.5 | — | 25.4 | 22.4 | 1.3 | — | 10.9 | — | — | |
| 10 | 0.3 | — | 1.0 | — | — | — | 0 | 1.3 | — | — | — | 5.8 | |
| 11 | 16.0 | — | 0.5 | — | — | — | 1.0 | 30.0 | — | 0.5 | 4.3 | 4.3 | |
| 12 | 4.1 | — | 6.1 | — | — | — | — | 1.8 | — | 0.8 | — | — | |
| 13 | — | 25.4 | T | — | T | — | — | 0 | — | 24.6 | — | — | |
| 14 | — | 33.0 | 0.5 | 3.3 | — | 10.2 | 0.3 | 1.5 | 1.5 | 2.0 | 1.3 | 0.3 | |
| 15 | — | 2.8 | T | — | 10.7 | — | — | T | — | 0 | 9.4 | 2.5 | |
| 16 | T | 0 | 3.8 | 9.9 | 0.5 | — | — | 9.9 | — | 7.6 | 1.8 | — | |
| 17 | 3.3 | 1.3 | — | 25.7 | 1.5 | — | — | 8.1 | — | 13.2 | 23.6 | — | |
| 18 | — | — | — | — | — | — | — | 3.1 | 9.1 | 6.1 | 25.4 | 1.8 | |
| 19 | — | — | — | 4.8 | — | — | — | 7.1 | — | 19.3 | 10.4 | 0.3 | |
| 20 | 34.5 | 12.2 | — | 32.8 | — | — | — | 0.5 | 1.3 | 90.9 | 10.9 | 13.2 | |
| 21 | 16.0 | — | — | — | — | 11.7 | 0.5 | 0 | 0.8 | 0.8 | 6.1 | — | |
| 22 | 7.6 | 7.6 | — | 1.5 | — | 20.1 | — | 9.9 | — | — | 7.9 | 0.5 | |
| 23 | 17.3 | — | — | 0.5 | — | — | — | 5.8 | T | — | 10.9 | 4.5 | |
| 24 | 1.5 | T | — | 16.8 | 0.8 | — | — | 4.8 | 7.6 | — | 18.8 | T | |
| 25 | 1.8 | 29.0 | — | 13.5 | — | — | — | 7.6 | — | — | 0 | 4.2 | |
| 26 | 9.4 | 43.2 | — | — | 8.1 | 3.1 | 13.5 | 28.7 | — | 33.5 | 0 | 2.2 | |
| 27 | 0 | 1.8 | — | 3.1 | 1.8 | 7.1 | — | 1.5 | — | 23.1 | 0.5 | — | |
| 28 | 0 | 11.9 | — | 9.1 | 0.4 | 0.8 | — | 0 | — | 14.6 | 1.2 | — | |
| 29 | T | | 0.3 | 9.6 | — | 6.0 | — | 9.9 | 0.6 | 0 | 28.2 | 3.2 | |
| 30 | 1.0 | | 10.6 | 3.7 | — | 1.4 | 0.5 | 0 | 9.9 | 0 | 21.6 | — | |
| 31 | 0.5 | | 16.2 | | — | | 0.5 | 4.0 | | 0.5 | | — | |
| Total | 178.1 | 220.0 | 80.8 | 151.1 | 76.7 | 125.2 | 111.8 | 193.3 | 81.8 | 278.6 | 256.0 | 292.2 | 2045.6 |

(3) 1959 (mm) Tacloban

| Date \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11.2 | 0.5 | 18.5 | 2.5 | 1.3 | — | 2.3 | — | — | 11.9 | 1.0 | 2.5 | |
| 2 | 3.6 | 8.4 | 12.5 | 3.6 | 32.6.1 | — | 2.5 | 6.1 | — | 2.3 | 7.4 | — | |
| 3 | — | 0.5 | 3.3 | 6.1 | 2.0 | T | T | T | — | 1.5 | 2.8 | — | |
| 4 | 7.1 | — | 5.6 | 4.6 | 4.3 | 27.4 | — | 2.5 | — | 0.3 | — | 3.1 | |
| 5 | — | 19.3 | — | — | 0.3 | — | — | — | — | — | — | — | |
| 6 | — | 1.8 | 1.5 | 4.3 | 0.3 | — | 1.5 | — | 4.1 | 0.3 | — | 2.8 | |
| 7 | 22.9 | — | 0.3 | — | — | 4.1 | 29.5 | — | 4.6 | — | — | — | |
| 8 | 0.5 | 6.9 | 0.3 | 3.8 | — | — | — | 5.1 | — | — | — | 12.5 | |
| 9 | — | 1.3 | — | — | 18.8 | 2.8 | 9.4 | — | — | 2.0 | 20.8 | 3.3 | |
| 10 | — | 3.3 | — | — | 3.1 | — | T | — | — | 10.9 | — | 1.0 | |
| 11 | — | 1.0 | — | — | 2.0 | — | 0.8 | 0.5 | 0.5 | — | — | 10.2 | |
| 12 | 3.3 | 1.0 | 19.6 | — | 25.7 | — | 0.5 | — | 4.3 | — | — | — | |
| 13 | 34.8 | T | 21.6 | 4.3 | 1.8 | — | — | — | 1.3 | — | — | 2.8 | |
| 14 | 0.8 | 1.3 | 11.7 | 13.7 | 2.5 | — | 8.9 | 1.0 | 1.0 | 0.3 | 33.3 | 2.8 | |
| 15 | — | 13.5 | 1.5 | — | 1.8 | 0.5 | — | 0.5 | — | — | 81.5 | — | |
| 16 | — | 2.0 | — | 6.6 | — | 13.2 | — | T | 0.3 | 50.8 | 22.6 | T | |
| 17 | 2.5 | — | 7.1 | 8.9 | 4.6 | 0.5 | T | 13.0 | 16.0 | 3.1 | 92.7 | 47.8 | |
| 18 | 0.8 | 3.8 | 11.4 | 1.3 | 1.5 | 2.3 | 0.5 | 4.1 | — | 6.6 | — | 64.0 | |
| 19 | 0.8 | 6.1 | 2.8 | 0.5 | — | — | 2.3 | 1.5 | — | 6.6 | 1.3 | — | |
| 20 | 0 | 32.8 | — | — | 0.3 | T | 0.3 | — | 5.6 | T | 0.5 | T | |
| 21 | 1.5 | 0.5 | — | — | — | — | — | 13.0 | 13.7 | — | 3.3 | — | |
| 22 | 1.0 | 32.8 | — | — | — | 0.3 | 11.2 | 1.0 | — | — | 1.8 | 13.5 | |
| 23 | 3.1 | 1.5 | — | — | 8.1 | — | 23.1 | T | — | 1.8 | 12.5 | 27.2 | |
| 24 | 7.4 | 8.4 | 5.8 | — | 5.6 | 23.1 | 26.7 | 22.1 | 0.3 | 1.5 | 16.3 | 13.5 | |
| 25 | 5.3 | — | 0.6 | — | — | 4.3 | 7.9 | 4.3 | — | 7.1 | 6.2 | 30.2 | |
| 26 | 26.4 | 1.2 | — | — | 0.5 | — | 2.5 | 1.8 | 29.7 | 1.8 | — | 13.2 | |
| 27 | T | — | — | — | — | — | 5.8 | — | — | T | — | 8.3 | |
| 28 | 0 | 0.2 | 1.2 | — | — | 4.1 | 0.8 | 4.0 | 6.1 | 8.9 | — | 3.2 | |
| 29 | 0 | | 9.9 | — | 4.2 | — | — | 1.0 | — | — | 0.5 | 0.5 | |
| 30 | 3.6 | | 16.8 | 0.8 | 0.4 | — | — | — | 7.0 | — | 25.7 | 1.0 | |
| 31 | 9.8 | | 3.2 | | 18.8 | | 1.4 | — | | 7.0 | | — | |
| Total | 146.4 | 148.1 | 155.2 | 61.0 | 434.0 | 82.6 | 137.7 | 81.5 | 94.5 | 124.7 | 330.2 | 263.4 | 2,059.3 |

(4) 1960 (mm) Tacloban

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | — | 2.3 | 3.6 | 1.3 | — | — | 25.9 | T | — | 9.4 | 8.1 | 1.5 | |
| 2 | — | 4.1 | — | 2.0 | — | 7.6 | 27.2 | 27.2 | 1.0 | 15.8 | 17.8 | T | |
| 3 | T | — | 4.1 | 0.8 | T | 3.6 | 1.0 | 11.4 | 1.8 | 0.5 | 15.8 | — | |
| 4 | 0.8 | — | — | 0.5 | — | — | — | 1.3 | 0.8 | 9.1 | 15.0 | T | |
| 5 | 19.6 | 0.5 | — | 25.7 | 0.3 | — | — | — | 8.1 | 79.5 | 2.5 | 1.5 | |
| 6 | 0.5 | 2.3 | — | T | — | — | 0.5 | 8.9 | — | 16.8 | 19.1 | 7.6 | |
| 7 | T | 59.4 | — | — | 1.5 | — | — | — | 44.2 | 0.8 | 18.5 | — | |
| 8 | 49.0 | 1.8 | — | — | 1.0 | — | T | 3.6 | 7.4 | 1.0 | 6.6 | 30.2 | |
| 9 | 9.9 | 11.2 | — | T | — | 15.8 | 2.8 | — | 10.9 | — | 1.3 | 15.0 | |
| 10 | — | 3.1 | 0.5 | — | — | 5.1 | 2.3 | — | — | — | 3.1 | 66 | |
| 11 | 19.1 | 0.5 | — | 7.6 | — | 3.6 | 6.9 | — | T | 0.5 | 0.3 | 50.3 | |
| 12 | — | — | 7.4 | 0.8 | — | 2.0 | 4.8 | — | 1.3 | 18.3 | — | — | |
| 13 | 1.0 | 3.6 | 36.6 | — | 12.7 | 32.0 | 15.0 | — | — | — | 0.8 | 0.5 | |
| 14 | — | — | 25.4 | 4.3 | 17.0 | — | — | 1.5 | — | — | — | — | |
| 15 | — | 7.6 | 9.1 | 2.0 | 4.6 | — | 1.5 | — | — | — | 0.3 | — | |
| 16 | — | 6.6 | — | 0.3 | — | 1.5 | 1.5 | — | — | — | 3.8 | — | |
| 17 | — | 0.5 | T | 9.9 | — | T | 1.0 | — | 3.8 | — | 6.6 | — | |
| 18 | 2.3 | — | 2.5 | 5.6 | — | — | 0.3 | — | 7.9 | — | 3.8 | — | |
| 19 | 2.5 | — | 0.3 | 8.4 | 0.5 | — | 10.2 | — | — | 4.8 | 27.4 | — | |
| 20 | 0.8 | — | — | 2.5 | 37.6 | 1.3 | 0.5 | — | 3.1 | 2.3 | 1.3 | — | |
| 21 | 1.3 | 4.3 | — | 39.4 | — | — | — | — | 5.6 | 1.0 | 32.3 | — | |
| 22 | — | 16.0 | — | 22.1 | — | 0.5 | — | — | 3.6 | — | 83.6 | — | |
| 23 | 0.5 | 22.9 | — | — | 28.5 | 3.8 | — | — | 0.5 | — | 13.0 | 20.8 | |
| 24 | — | 3.8 | 8.9 | 14.1 | 26.4 | 4.1 | 3.6 | — | 4.1 | T | 22.6 | 4.6 | |
| 25 | 0.5 | — | 0.5 | — | 2.3 | 23.1 | 10.2 | 10.9 | — | — | 7.9 | 16.8 | |
| 26 | 9.1 | 1.4 | 0.9 | — | 8.1 | 21.3 | 30.7 | — | 5.6 | — | 13.2 | 0.3 | |
| 27 | 2.0 | — | 0.9 | 0.8 | — | 4.1 | 38.9 | 4.8 | 8.4 | 4.3 | 7.7 | 15.0 | |
| 28 | 10.9 | — | — | — | 2.3 | 11.2 | 10.9 | — | — | 7.0 | 17.5 | 17.2 | |
| 29 | 28.2 | — | — | — | 4.1 | — | — | — | 0.7 | 0.8 | 2.0 | 46.0 | |
| 30 | 2.8 | | 8.0 | — | 10.3 | 5.3 | 0.7 | — | 8.0 | 22.4 | 5.9 | 4.3 | |
| 31 | 1.3 | | — | | — | 4.2 | 2.7 | 10.7 | | T | | | |
| Total | 136.7 | 151.9 | 108.7 | 148.1 | 157.2 | 150.1 | 199.1 | 80.3 | 126.8 | 194.3 | 357.8 | 238.2 | 2,049.2 |

(5) 1961 (mm) Tacloban

| Date \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.0 | — | 24.6 | 3.8 | 2.8 | 14.7 | T | — | — | — | — | 8.4 | |
| 2 | T | 52.1 | 2.3 | 2.8 | 9.7 | — | 1.0 | — | — | 12.7 | — | 0.5 | |
| 3 | 0.3 | 12.5 | 1.0 | — | — | 0.8 | 24.1 | 12.7 | — | — | — | 0.3 | |
| 4 | — | T | 2.8 | 1.3 | — | 15.8 | 13.5 | 1.0 | 1.5 | 5.6 | — | 12.5 | |
| 5 | — | 15.2 | — | 2.3 | 3.6 | — | T | T | 3.6 | — | — | 0.5 | |
| 6 | 0.8 | 2.0 | T | 1.0 | 3.8 | 3.3 | — | T | T | 5.6 | — | — | |
| 7 | 1.0 | 5.6 | — | 9.9 | 26.9 | 3.8 | — | 5.3 | — | 1.5 | 2.8 | 0.5 | |
| 8 | 1.5 | 5.6 | — | 3.1 | 2.8 | 3.1 | 2.0 | T | — | 3.6 | 4.6 | 1.3 | |
| 9 | 4.1 | 37.9 | 0.3 | T | — | 0.8 | 9.1 | 1.3 | — | — | 18.5 | — | |
| 10 | 3.6 | 31.8 | T | 26.7 | 0.3 | — | — | — | — | 19.1 | — | — | |
| 11 | 5.6 | 0.5 | 1.5 | 1.0 | 5.3 | — | 2.3 | 3.1 | — | 18.8 | 5.6 | — | |
| 12 | 9.1 | 9.1 | 10.2 | 3.3 | 6.6 | — | — | 0.3 | 4.3 | 23.4 | 3.8 | — | |
| 13 | 0.3 | 0.5 | 26.4 | — | 8.1 | 0.5 | — | 28.2 | — | — | 6.1 | 1.0 | |
| 14 | T | 2.3 | — | — | 26.2 | 0.3 | — | 15.2 | — | T | 17.3 | 10.7 | |
| 15 | — | — | 2.3 | — | 32.8 | 1.0 | T | T | — | 0.5 | 0.8 | 2.3 | |
| 16 | — | 18.5 | 7.1 | — | 8.1 | 1.0 | T | T | 0.3 | — | 54.4 | 0.5 | |
| 17 | 0.3 | 5.1 | 1.5 | — | T | 9.7 | — | 15.5 | 28.7 | 77.2 | 23.4 | 0.5 | |
| 18 | — | — | 0.8 | 0.3 | 1.5 | 2.0 | — | 3.3 | — | — | 5.6 | 1.0 | |
| 19 | T | 4.6 | — | — | — | 2.8 | — | T | 1.0 | 3.8 | 9.7 | 0.5 | |
| 20 | — | 1.3 | — | — | — | — | T | 3.3 | 4.3 | 5.6 | 23.4 | 14.7 | |
| 21 | 0.3 | — | 0.5 | — | 5.1 | 9.1 | 13.7 | — | 6.4 | 12.2 | 66.6 | 0.8 | |
| 22 | 0.3 | — | 17.0 | — | — | 2.0 | — | 1.3 | — | 2.3 | — | 0.5 | |
| 23 | 2.5 | — | — | 0.5 | T | — | 38.4 | 10.9 | — | T | 0.5 | — | |
| 24 | 4.8 | 1.3 | — | 2.8 | 0.2 | — | 58.2 | T | 11.9 | 0.8 | — | 2.0 | |
| 25 | 7.4 | 5.6 | — | 9.7 | — | 2.0 | 27.9 | — | 0.8 | — | 0.5 | 16.5 | |
| 26 | 2.0 | 12.3 | — | — | 0.2 | 2.8 | 2.3 | — | 0.3 | 0.5 | 17.5 | 13.5 | |
| 27 | 20.3 | T | 6.1 | — | — | 0.8 | 1.3 | 0.5 | T | — | 24.4 | 10.7 | |
| 28 | 40.6 | — | 0.5 | 1.3 | — | 2.0 | — | 0.8 | — | — | 0.5 | 20.3 | |
| 29 | 10.4 | | — | 3.6 | — | 0.4 | — | 0.5 | 1.4 | — | 2.8 | 17.7 | |
| 30 | 15.6 | | 1.3 | 36.1 | — | T | — | — | — | — | 1.0 | 2.0 | |
| 31 | 3.6 | | 3.5 | | 32.0 | | — | 10.6 | | 10.0 | | — | |
| Total | 135.4 | 223.8 | 109.7 | 109.5 | 176.0 | 78.7 | 193.8 | 113.8 | 64.5 | 203.2 | 289.8 | 139.2 | 1,837.1 |

(6) 1962 (mm) Tacloban

| Date \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.7 | T | 14.7 | — | 4.1 | 0.5 | 3.6 | — | — | — | 4.1 | 14.5 | |
| 2 | — | — | 8.4 | 0.5 | 0.3 | — | 2.3 | — | — | — | 14.0 | 1.8 | |
| 3 | 3.1 | — | 0.3 | 1.5 | 7.1 | — | 2.3 | — | — | — | 3.6 | 1.3 | |
| 4 | 41.4 | — | 9.9 | 0.5 | 20.8 | — | 17.8 | — | 2.3 | 0.3 | — | — | |
| 5 | 22.4 | 5.8 | 45.5 | 1.5 | — | — | 3.8 | — | — | 0.3 | 14.2 | 1.3 | |
| 6 | 8.9 | 46.5 | 20.8 | — | 1.3 | 3.3 | 0.3 | 16.0 | — | — | 11.4 | 7.6 | |
| 7 | 3.8 | 2.3 | 4.1 | — | 0.5 | 5.1 | T | 77.5 | 6.4 | — | — | 0.3 | |
| 8 | 1.0 | 25.7 | 35.1 | — | 4.1 | — | 0 | 10.7 | 6.9 | 1.5 | 0.3 | — | |
| 9 | 3.8 | 4.3 | 18.1 | — | 3.8 | — | 14.2 | — | 25.4 | — | 5.8 | — | |
| 10 | 9.1 | T | — | — | T | — | 0.5 | — | 82.6 | 0.3 | — | — | |
| 11 | 84.1 | — | 3.1 | — | — | — | 1.0 | 12.5 | — | 5.1 | — | — | |
| 12 | 5.3 | — | 2.0 | 8.9 | 3.6 | 4.1 | 8.6 | 7.9 | 11.7 | T | T | — | |
| 13 | 5.1 | 1.3 | 0.5 | — | — | 0.8 | 10.9 | — | 1.0 | — | — | — | |
| 14 | 4.1 | 8.1 | 7.4 | — | — | 3.1 | 10.2 | 7.1 | 8.9 | — | — | 1.5 | |
| 15 | — | 7.1 | 0.5 | — | 1.8 | 1.0 | T | 17.8 | 3.8 | 0.5 | — | — | |
| 16 | — | 0.8 | — | 6.9 | 42.4 | 0.8 | 0.3 | — | 16.0 | 19.1 | — | 13.0 | |
| 17 | — | 0.3 | — | 29.5 | 46.0 | T | — | 11.4 | 6.9 | 2.5 | — | 5.6 | |
| 18 | 0.8 | — | — | 4.3 | — | — | 23.9 | 4.3 | 18.0 | 1.3 | — | 0.5 | |
| 19 | — | 62.0 | 2.8 | 9.7 | 15.2 | — | — | 1.8 | — | 2.5 | — | 12.5 | |
| 20 | 0.3 | 22.9 | 7.9 | — | — | — | — | 7.9 | — | 0.5 | 18.3 | 44.5 | |
| 21 | 0.5 | 1.5 | 0.5 | 5.1 | — | T | — | 46.7 | — | — | 3.1 | 1.3 | |
| 22 | 0.5 | 12.5 | — | 2.8 | — | — | — | 2.5 | 19.6 | — | 11.2 | 1.5 | |
| 23 | 0.3 | 14.5 | — | 0.5 | — | 5.3 | — | 4.1 | 23.9 | 1.7 | 11.9 | 0.8 | |
| 24 | — | 0.7 | — | 4.1 | 1.3 | — | — | — | 0.3 | — | 9.1 | 28.5 | |
| 25 | — | 0.2 | 8.4 | — | 4.1 | — | 7.8 | 3.8 | — | 0.3 | 5.1 | 17.8 | |
| 26 | 1.3 | — | — | — | 25.9 | T | — | T | 3.8 | — | 11.4 | 3.1 | |
| 27 | 0.5 | 15.7 | — | — | 11.4 | 7.1 | 3.5 | 3.2 | 8.5 | — | 61.5 | — | |
| 28 | — | 4.5 | 5.8 | 4.1 | 2.4 | — | 17.0 | — | 1.2 | — | 9.9 | — | |
| 29 | — | | 0.5 | 1.3 | 9.6 | 0.5 | 3.0 | — | — | 0.4 | 0.4 | — | |
| 30 | 1.8 | | 5.2 | 2.4 | — | 1.2 | | — | 0.5 | 13.0 | — | 31.8 | |
| 31 | 2.3 | | — | | — | | | — | | | | 0.5 | |
| Total | 211.1 | 236.7 | 201.5 | 83.6 | 205.7 | 32.8 | 131.0 | 235.2 | 247.7 | 49.3 | 195.3 | 189.2 | 2,019.1 |

(7) 1963 (mm) Tacloban

| Date \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | T | T | — | T | 0.5 | 1.5 | — | T | 28.4 | 4.6 | 8.6 | T | |
| 2 | 10.9 | 1.8 | — | — | 9.9 | — | T | — | 43.7 | — | 13.0 | — | |
| 3 | 5.3 | 0.5 | T | — | — | — | 1.5 | 27.2 | — | 1.5 | 35.0 | 0.5 | |
| 4 | 4.8 | — | 4.6 | — | 1.5 | 19.6 | T | — | — | — | 54.6 | — | |
| 5 | 23.1 | T | 3.8 | — | — | — | T | 1.0 | — | 0.5 | 0.3 | — | |
| 6 | 35.8 | — | 0.3 | 0.8 | — | — | — | 3.1 | — | — | 38.6 | — | |
| 7 | 21.8 | — | — | 19.8 | — | — | — | 1.3 | — | T | 20.8 | — | |
| 8 | 3.6 | T | 4.8 | — | 3.8 | — | 7.4 | 3.6 | — | — | 1.0 | 18.0 | |
| 9 | 4.3 | 41.9 | 12.5 | 0.5 | T | — | T | — | — | — | 5.1 | 57.4 | |
| 10 | 25.7 | 1.0 | 2.0 | 2.3 | 1.0 | — | 0.3 | 0.3 | — | — | — | 6.4 | |
| 11 | 19.1 | — | T | 2.0 | — | — | T | 43.7 | — | — | 2.3 | 21.3 | |
| 12 | — | — | — | 0.3 | 2.5 | — | — | 106.7 | 0.3 | — | 2.5 | — | |
| 13 | — | 3.3 | — | — | 1.8 | — | — | 2.8 | — | 0.5 | 0.5 | — | |
| 14 | 3.1 | T | — | — | 18.0 | — | 0.3 | — | — | — | 2.5 | 18.3 | |
| 15 | 14.7 | 1.8 | 7.9 | — | 3.6 | — | — | T | — | 9.7 | 6.9 | 0.5 | |
| 16 | 4.1 | 6.9 | 1.8 | 2.5 | 4.6 | — | — | 2.0 | 3.1 | — | 0.8 | — | |
| 17 | T | 25.4 | 13.5 | — | 5.3 | — | 0.3 | 54.1 | T | 7.4 | 2.8 | 7.4 | |
| 18 | — | 40.6 | 0.5 | 2.8 | 1.9 | — | — | 7.6 | 3.1 | 2.5 | — | — | |
| 19 | — | 0.8 | 5.1 | 0.5 | 7.2 | T | — | — | — | 3.1 | 12.7 | 8.6 | |
| 20 | 1.3 | — | 40.6 | 8.1 | 0.4 | — | 19.1 | — | T | 1.0 | 5.1 | 1.5 | |
| 21 | — | — | 0.8 | 2.0 | — | 2.3 | — | — | 24.9 | 5.6 | 17.5 | 10.2 | |
| 22 | — | — | — | 21.3 | T | — | 13.5 | — | 2.5 | 39.9 | 1.5 | 5.1 | |
| 23 | 2.3 | T | 6.6 | — | — | — | 6.6 | 2.5 | 4.3 | 1.3 | 2.0 | 2.0 | |
| 24 | 50.3 | — | 2.2 | 2.8 | — | 26.9 | 36.1 | 3.3 | 1.5 | — | 14.7 | — | |
| 25 | 3.3 | — | — | — | — | 67.5 | 1.8 | 6.9 | 8.9 | — | — | 1.5 | |
| 26 | 1.3 | — | 1.0 | 3.6 | — | 8.9 | 19.1 | 14.5 | — | 1.0 | T | T | |
| 27 | 0.4 | — | — | 12.5 | — | — | T | T | 16.0 | 4.3 | 1.1 | 0.5 | |
| 28 | 0.9 | 1.0 | — | 2.0 | — | 43.5 | 0 | — | 0.3 | 1.0 | 4.6 | 1.0 | |
| 29 | 5.4 | | — | — | — | T | T | 1.8 | 3.6 | — | 19.8 | 3.6 | |
| 30 | — | | T | — | — | — | 0 | 20.5 | 9.6 | — | T | 14.5 | |
| 31 | 0.6 | | 0 | | — | | 14.0 | 0.5 | | 2.2 | | 9.4 | |
| Total | 242.1 | 125.0 | 108.0 | 83.8 | 62.0 | 170.2 | 120.0 | 303.4 | 150.2 | 86.1 | 274.3 | 187.7 | 1,912.8 |

(8) 1964 (mm) Tacloban

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11.4 | 0.8 | 0.8 | 19.1 | 0.5 | T | 0.3 | — | — | — | — | — | |
| 2 | 0.3 | 0.5 | 2.6 | 0.8 | — | — | 0.3 | T | — | 3.3 | — | 8.1 | |
| 3 | — | 1.5 | — | — | — | — | 2.0 | — | — | 0.3 | — | T | |
| 4 | — | 0.5 | 19.8 | — | 3.1 | — | 5.8 | 1.0 | — | — | 4.1 | 23.3 | |
| 5 | 11.9 | 0.5 | 6.8 | 0.5 | 1.3 | — | 23.3 | — | 2.8 | 3.5 | 26.0 | 10.7 | |
| 6 | 5.8 | 4.9 | — | — | 4.8 | — | — | 6.7 | 3.3 | — | 6.1 | 24.9 | |
| 7 | 5.6 | 2.9 | — | 13.8 | 0.3 | — | 0.8 | — | — | 9.5 | — | 3.6 | |
| 8 | 7.7 | 1.0 | — | 2.3 | 3.6 | — | 0.3 | T | — | T | — | — | |
| 9 | 0.3 | 1.0 | — | 0.5 | 0.5 | — | 35.3 | — | T | 3.6 | 1.0 | 10.4 | |
| 10 | — | 4.3 | T | 5.6 | 8.4 | 3.1 | — | 2.3 | 26.2 | 47.2 | 14.7 | — | |
| 11 | 22.1 | 0.8 | 7.7 | 14.2 | 0.3 | 3.1 | 0.3 | — | 19.0 | T | 0.5 | 2.5 | |
| 12 | 30.9 | 1.6 | 1.0 | 7.6 | T | 3.3 | — | — | 0.8 | — | 1.5 | — | |
| 13 | 0.3 | 8.4 | 0.3 | 2.8 | T | 5.2 | — | — | — | — | — | 14.4 | |
| 14 | 0.3 | 51.5 | 1.0 | — | — | — | — | — | — | T | — | — | |
| 15 | 7.3 | 29.8 | — | 23.4 | — | — | 1.0 | — | T | — | 2.5 | — | |
| 16 | T | 2.0 | — | 8.6 | 2.1 | T | — | — | 14.5 | 1.3 | 7.1 | — | |
| 17 | — | — | — | 6.4 | 5.4 | — | — | — | 0.5 | 5.6 | 5.8 | 0.8 | |
| 18 | — | 3.8 | 4.8 | 30.7 | 17.6 | — | — | — | T | 17.8 | 127.5 | — | |
| 19 | — | 16.8 | — | T | — | 0.3 | — | — | — | 4.1 | 124.7 | 3.1 | |
| 20 | 1.1.0 | 0.3 | — | 0.5 | 4.1 | 5.3 | — | — | T | 3.1 | — | 0.4 | |
| 21 | 10.4 | 1.4.0 | 22.6 | 11.4 | T | 0.8 | 1.8 | — | 18.0 | 3.3 | — | 1.9 | |
| 22 | 1.8 | 24.4 | 0.8 | — | 0.5 | 2.3 | 3.1 | — | — | — | — | 8.4 | |
| 23 | 3.6 | 0.8 | 0.3 | — | 2.3 | 22.6 | 2.3 | — | T | 0.5 | — | 4.7 | |
| 24 | 6.3 | 1.3 | — | 4.3 | — | 5.8 | — | T | — | 9.9 | 0.5 | 29.5 | |
| 25 | 11.2 | 9.7 | — | — | — | 1.0 | — | 1.1 | — | 2.3 | 23.4 | 2.3 | |
| 26 | — | 0.5 | — | 1.3 | — | 0.5 | T | 18.0 | 0.5 | 48.2 | — | 0.8 | |
| 27 | — | 50.5 | 5.9 | 5.3 | — | 1.5 | — | 9.2 | 1.5 | — | 0.8 | 1.0 | |
| 28 | — | 21.0 | — | 5.3 | 11.2 | 34.4 | — | 0.3 | 21.8 | — | 3.1 | 0.3 | |
| 29 | — | 122.8 | 0.8 | 14.7 | — | 28.2 | — | 10.4 | 34.8 | 31.3 | T | 0.3 | |
| 30 | 2.3 | | 2.0 | 10.4 | 2.0 | 16.8 | 18.5 | T | 5.6 | — | — | — | |
| 31 | 22.3 | | — | | — | | | 1.0 | | — | | — | |
| Total | 172.8 | 377.9 | 77.2 | 189.5 | 68.0 | 134.2 | 95.1 | 50.0 | 149.3 | 194.8 | 349.3 | 151.4 | 2,009.5 |

(9) 1965 (mm) Tacloban

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.8 | 1.8 | T | 5.7 | 15.5 | 0.5 | — | 0.3 | — | — | 8.4 | 10.4 | |
| 2 | 1.5 | 0.3 | 1.0 | 3.3 | — | — | — | — | — | 13.0 | — | 2.8 | |
| 3 | — | 3.3 | — | T | — | 46.0 | 6.7 | 2.0 | 18.3 | — | 22.4 | 12.1 | |
| 4 | T | 12.1 | — | 0.3 | 0.5 | 26.7 | 3.1 | 14.0 | 4.9 | — | 21.0 | 1.0 | |
| 5 | 2.0 | 26.9 | T | 0.3 | — | T | 9.1 | 6.4 | 23.4 | — | 4.1 | 41.2 | |
| 6 | 1.3 | 9.0 | 34.8 | 21.6 | — | 12.2 | 0.8 | — | — | — | — | T | |
| 7 | — | 2.8 | 62.2 | 5.3 | T | 18.0 | 1.0 | 0.3 | 1.3 | — | 21.9 | 49.8 | |
| 8 | — | 0.8 | 10.7 | 9.7 | — | — | 9.2 | — | 1.3 | 0.8 | 20.3 | 85.3 | |
| 9 | — | 7.5 | 14.9 | 1.0 | 1.3 | — | — | 3.8 | 12.7 | — | 1.6 | 24.6 | |
| 10 | 21.8 | 12.5 | 26.6 | 13.2 | 8.2 | — | T | — | — | 23.4 | 6.4 | 0.8 | |
| 11 | — | 68.3 | 2.3 | 8.6 | 1.0 | 14.8 | 0.3 | — | 4.6 | 6.1 | 1.8 | 6.9 | |
| 12 | 0.5 | T | 9.9 | 0.5 | 9.1 | — | 20.3 | — | 2.0 | 4.8 | 4.0 | 6.6 | |
| 13 | 20.9 | 1.0 | 0.3 | — | 7.9 | — | 9.4 | — | — | 17.5 | 1.5 | 5.9 | |
| 14 | 17.0 | 7.4 | T | 8.1 | 2.8 | — | — | — | — | — | — | 18.1 | |
| 15 | 44.2 | 3.9 | T | 21.1 | — | — | 11.9 | 1.6 | 3.3 | 0.8 | — | 96.1 | |
| 16 | 46.2 | — | — | 7.2 | — | T | 6.3 | 5.9 | 0.5 | 0.5 | — | 54.4 | |
| 17 | 1.8 | — | 1.0 | 9.7 | — | 2.5 | 14.3 | — | 3.3 | 0.3 | 4.3 | 3.0 | |
| 18 | T | — | T | 5.3 | 4.1 | T | 1.5 | — | — | 1.5 | 9.7 | 56.1 | |
| 19 | 2.9 | 1.8 | 1.0 | 0.3 | — | — | 16.3 | 14.2 | — | — | 2.3 | 0.6 | |
| 20 | — | 24.2 | — | — | 1.6 | — | 24.4 | — | 12.2 | 0.3 | 1.3 | 18.4 | |
| 21 | — | — | — | — | 20.1 | 1.4 | 10.4 | T | — | 5.6 | 2.1 | 2.1 | |
| 22 | — | — | 5.9 | — | 42.9 | 8.1 | — | 5.9 | — | 6.9 | 0.5 | 29.3 | |
| 23 | — | — | 14.7 | — | 0.8 | 3.1 | 4.1 | 1.6 | 6.4 | 0.3 | — | — | |
| 24 | 2.3 | 1.8 | 8.6 | 34.1 | — | — | 1.0 | — | 18.5 | — | 4.9 | 0.5 | |
| 25 | 22.4 | 5.1 | 28.8 | 2.3 | — | — | T | 8.1 | 7.6 | — | T | 15.5 | |
| 26 | 0.8 | 6.1 | 0.5 | — | — | — | T | 2.0 | T | 11.2 | 2.3 | 1.8 | |
| 27 | 4.8 | 63.5 | — | 37.1 | — | 1.8 | — | 14.7 | 5.9 | — | — | — | |
| 28 | T | 2.5 | — | — | — | T | — | 2.3 | 11.2 | — | 25.9 | T | |
| 29 | 4.4 | | T | — | — | 18.9 | 1.3 | 3.6 | 24.6 | 0.3 | 24.4 | — | |
| 30 | 8.9 | | T | — | — | 20.1 | 7.9 | — | 11.7 | 0.5 | 2.9 | — | |
| 31 | 15.3 | | 10.2 | | 0.5 | | | 0.8 | | | | — | |
| Total | 223.8 | 262.6 | 233.4 | 194.7 | 116.3 | 174.1 | 159.3 | 87.5 | 173.7 | 93.8 | 194.0 | 543.3 | 2,456.5 |

000 1966 (mm) Tacloban

| Month / Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 21.3 | — | 1.4 | — | — | — | 0.8 | 24.9 | 3.0 | 0.8 | — | — | |
| 2 | 4.2 | — | 27.4 | — | — | — | — | 1.0 | 7.9 | 2.0 | — | 2.8 | |
| 3 | T | 1.3 | 0.3 | 0.5 | 0.5 | — | 4.3 | 2.3 | — | 14.5 | — | 38.1 | |
| 4 | 0.8 | 1.1 | — | T | — | — | 1.8 | — | — | 2.3 | 2.0 | 3.1 | |
| 5 | — | 0.8 | 1.5 | — | — | — | — | 11.2 | — | 4.2 | 6.7 | 29.8 | |
| 6 | 1.5 | T | — | — | — | — | 0.3 | 5.6 | — | 5.6 | — | 0.3 | |
| 7 | — | 2.3 | T | 0.5 | 0.8 | 31.0 | 6.9 | 2.3 | — | 2.8 | — | 3.8 | |
| 8 | T | 3.3 | 4.1 | 1.8 | 14.5 | T | 6.9 | 0.8 | — | 21.3 | 0.8 | 24.2 | |
| 9 | — | T | — | 0.3 | 7.7 | 3.8 | 1.8 | 2.5 | — | T | — | 11.3 | |
| 10 | 10.5 | — | 6.8 | 1.5 | 1.3 | 25.9 | 21.1 | 14.0 | — | 16.3 | 7.1 | 11.4 | |
| 11 | 1.5 | — | 19.2 | — | 29.7 | — | — | — | — | 3.1 | 1.0 | 2.5 | |
| 12 | 2.3 | 0.8 | — | — | 9.1 | — | — | — | — | 0.3 | 13.5 | 8.4 | |
| 13 | 1.8 | 1.6 | 5.2 | — | 9.9 | — | 4.6 | T | — | — | 1.1 | 4.6 | |
| 14 | — | 1.3 | 19.8 | — | 2.6 | 5.3 | 3.3 | — | — | — | 14.5 | 8.6 | |
| 15 | 1.8 | 0.9 | — | — | 15.22 | T | — | — | — | — | 6.30 | 0.5 | |
| 16 | — | — | 5.9 | — | 5.3 | T | — | — | — | 3.1 | 1.8 | 13.7 | |
| 17 | 8.9 | 35.1 | 0.5 | — | 1.3 | T | T | — | 21.0 | 1.8 | 11.7 | T | |
| 18 | 22.9 | 2.1 | — | — | — | 1.8 | T | — | 0.3 | 9.1 | 1.0 | 56.7 | |
| 19 | — | 0.9 | — | 3.8 | T | — | 4.7 | — | 4.0 | 3.0 | 32.6 | 7.4 | |
| 20 | 6.1 | 2.0 | 1.8 | 8.4 | — | T | 9.7 | — | 3.0 | 21.1 | — | — | |
| 21 | 4.5 | — | 1.3 | — | — | 1.5 | 0.5 | — | 1.8 | — | — | — | |
| 22 | T | — | — | — | — | 0.8 | — | — | — | 1.3 | — | — | |
| 23 | 3.7 | 4.1 | — | 1.8 | — | 0.8 | — | T | — | 3.8 | — | 8.1 | |
| 24 | 1.5 | 25.4 | 2.3 | — | — | 14.7 | — | T | — | 11.4 | — | — | |
| 25 | 2.6 | T | 0.5 | — | — | 1.1 | 10.4 | 16.5 | T | — | 6.2 | 2.8 | |
| 26 | 0.5 | 5.3 | — | 1.8 | 16.0 | 0.3 | 8.9 | — | — | 18.6 | 12.4 | 105.7 | |
| 27 | — | 18.6 | — | — | 42.4 | T | 116.9 | 19.4 | 17.3 | 0.3 | — | 30.5 | |
| 28 | 2.8 | 20.4 | — | — | — | — | 37.1 | 3.6 | 3.1 | 2.5 | — | 15.2 | |
| 29 | T | | — | 13.2 | — | — | 1.1 | 14.0 | 3.1 | — | — | 9.9 | |
| 30 | — | | — | — | 4.1 | 14.2 | — | — | 0.5 | — | — | 5.6 | |
| 31 | — | | — | | — | | 1.6 | 13.5 | | 1.5 | | 1.5 | |
| Total | 99.2 | 127.3 | 98.0 | 33.6 | 297.4 | 100.2 | 242.7 | 131.6 | 65.0 | 150.7 | 175.4 | 407.0 | 1,928.1 |

## Table C-2-2 Monthly Precipitation

Tacloban (mm)

| Year \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1957 | 230.4 | 333.0 | 61.7 | 182.9 | 76.7 | 159.0 | 133.9 | 134.4 | 109.2 | 206.5 | 132.6 | 66.6 | 1,826.9 |
| 58 | 178.1 | 220.0 | 80.8 | 151.1 | 76.7 | 125.2 | 111.8 | 193.3 | 81.8 | 278.6 | 256.0 | 292.2 | 2,045.6 |
| 59 | 146.4 | 148.1 | 155.2 | 61.0 | 434.0 | 82.6 | 137.7 | 81.5 | 94.5 | 124.7 | 330.2 | 263.4 | 2,059.3 |
| 60 | 136.7 | 151.9 | 108.7 | 148.1 | 157.2 | 150.1 | 199.1 | 80.3 | 126.3 | 194.3 | 357.8 | 238.2 | 2,049.2 |
| 61 | 135.4 | 223.8 | 109.7 | 109.5 | 176.0 | 78.7 | 193.8 | 113.8 | 64.5 | 203.2 | 289.8 | 139.2 | 1,837.4 |
| 62 | 211.1 | 236.7 | 201.5 | 83.6 | 205.7 | 32.8 | 131.0 | 235.2 | 247.7 | 49.3 | 195.3 | 189.2 | 2,019.1 |
| 63 | 242.1 | 125.0 | 108.0 | 83.8 | 62.0 | 170.2 | 120.0 | 303.4 | 150.2 | 86.1 | 274.3 | 187.7 | 1,912.8 |
| 64 | 172.8 | 377.9 | 77.2 | 189.5 | 68.0 | 134.2 | 95.1 | 50.0 | 149.3 | 194.8 | 349.3 | 151.4 | 2,009.5 |
| 65 | 223.8 | 262.6 | 233.4 | 194.7 | 116.3 | 174.1 | 159.3 | 87.5 | 173.7 | 93.8 | 194.0 | 543.3 | 2,456.5 |
| 66 | 99.2 | 127.3 | 98.0 | 33.6 | 297.4 | 100.2 | 242.7 | 131.6 | 65.0 | 150.7 | 175.4 | 407.0 | 1,928.1 |
| Total | 1776.0 | | | | | | | | | | | | 2,014 |
| Average | 177.6 | 220.6 | 123.4 | 123.8 | 167.0 | 120.7 | 152.4 | 141.1 | 126.2 | 158.2 | 255.4 | 247.8 | 2,014.4 |
| Monthly Precipitation Max | 242.1 | 377.9 | 233.4 | 189.5 | 434.0 | 174.1 | 242.7 | 303.4 | 247.7 | 278.6 | 357.8 | 543.3 | |
| Monthly Precipitation Min | 99.2 | 125.0 | 61.7 | 33.6 | 62.0 | 32.8 | 95.1 | 50.0 | 65.0 | 49.3 | 132.6 | 66.6 | |

## Table C - 2. 3 Consecutive Dry Days

Tacloban (day)

| Year \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1957 | 6 | 9 | 12 | 14 | 18 | 4 | 5 | 17 | 8 | 8 | 16 | 13 | |
| 58 | 8 | 8 | 17 | 14 | 12 | 6 | 16 | 6 | 10 | 5 | 6 | 11 | |
| 59 | 10 | 6 | 7 | 13 | 10 | 11 | 7 | 8 | 16 | 8 | 6 | 7 | |
| 60 | 14 | 6 | 11 | 6 | 12 | 11 | 8 | 18 | 8 | 15 | 8 | 11 | |
| 61 | 12 | 7 | 10 | 14 | 9 | 12 | 11 | 7 | 16 | 9 | 8 | 9 | |
| 62 | 18 | 5 | 5 | 11 | 11 | 15 | 6 | 10 | 6 | 13 | 10 | 9 | |
| 63 | 8 | 10 | 8 | 12 | 12 | 19 | 11 | 7 | 18 | 14 | 5 | 7 | |
| 64 | 5 | 12 | 9 | 5 | 9 | 12 | 20 | 19 | 9 | 6 | 5 | 8 | |
| 65 | 9 | 5 | 9 | 5 | 9 | 10 | 8 | 10 | 10 | 7 | 9 | 6 | |
| 66 | 11 | 16 | 15 | 19 | 9 | 9 | 9 | 14 | 14 | 7 | 5 | 3 | |
| Total | (10) 101 | ( 8) 84 | (10) 103 | (11) 113 | (11) 111 | (11) 109 | (10) 101 | (12) 116 | (12) 115 | ( 9) 92 | ( 8) 78 | ( 8) 84 | Average in ( ) |
| Max Spell | 18 | 16 | 17 | 19 | 18 | 19 | 20 | 19 | 18 | 15 | 16 | 13 | |
| Min. Spell | 5 | 5 | 5 | 5 | 9 | 4 | 5 | 6 | 6 | 5 | 5 | 3 | |

Table C - 2. 4 Rainy Days

Tacloban (day)

| Year \ Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1957 | 8 | 11 | 3 | 8 | 4 | 9 | 8 | 5 | 5 | 13 | 9 | 5 |
| 1958 | 11 | 9 | 6 | 8 | 4 | 8 | 7 | 11 | 11 | 13 | 13 | 4 |
| 1959 | 8 | 8 | 11 | 4 | 6 | 3 | 8 | 5 | 6 | 8 | 10 | 10 |
| 1960 | 7 | 6 | 6 | 8 | 7 | 8 | 9 | 5 | 9 | 8 | 18 | 10 |
| 1961 | 7 | 12 | 6 | 4 | 10 | 4 | 7 | 7 | 3 | 10 | 12 | 9 |
| 1962 | 8 | 10 | 12 | 5 | 7 | 3 | 8 | 10 | 12 | 3 | 12 | 9 |
| 1963 | 10 | 4 | 6 | 4 | 4 | 5 | 7 | 8 | 6 | 4 | 13 | 11 |
| 1964 | 13 | 10 | 5 | 14 | 4 | 7 | 4 | 4 | 7 | 7 | 8 | 8 |
| 1965 | 8 | 11 | 11 | 13 | 6 | 8 | 12 | 7 | 11 | 7 | 9 | 16 |
| 1966 | 5 | 5 | 6 | 2 | 9 | 5 | 8 | 8 | 3 | 8 | 9 | 16 |
| Averge | 8.5 | 8.6 | 7.2 | 7.4 | 6.1 | 6.0 | 6.8 | 7.0 | 7.3 | 8.1 | 11.1 | 9.8 |

(Tacloban-Weather Bureau)

Table C - 2. 5 Calculation of Annual Precipitation Probability

| Precedence | $x_t$ | $\log x_t$ | $x_t+b$ | $\log(x_t+b)$ | $\log\frac{x_t+b}{x_0+b}$ | $\log\left\{\frac{x_t+b}{x_0+b}\right\}^2$ |
|---|---|---|---|---|---|---|
| 1 | 2,456 | 3.390 | 852 | 2930 | 0447 | 01998 |
| 2 | 2,059 | 3.314 | 355 | 2550 | 0067 | 00045 |
| 3 | 2,049 | 3.312 | 345 | 2538 | 0055 | 00030 |
| 4 | 2,046 | 3.311 | 342 | 2534 | 0051 | 00026 |
| 5 | 2,019 | 3.305 | 315 | 2498 | 0015 | 00002 |
| 6 | 2,009 | 3.303 | 305 | 2484 | 0001 | — |
| 7 | 1,928 | 3.285 | 224 | 2350 | −0133 | 00177 |
| 8 | 1,913 | 3.282 | 209 | 2320 | −0163 | 00266 |
| 9 | 1,837 | 3.264 | 133 | 2.124 | −0359 | 01289 |
| 10 | 1,827 | 3.262 | 123 | 2090 | −0393 | 01544 |
| Total | | 33.028 | | | | 05377 |

$$\log x_0 = \frac{\Sigma \log x_t}{n} = \frac{33.028}{10} = 33028$$

$$\therefore x_0 = 2008$$

$$b = \frac{x_s x_t - x_0^2}{2x_0 - (x_s + x_t)} = -1704$$

$$\log(x_0+b) = \log(2008-1704) = \log 304 = 2483$$

$$\sqrt{2}C = \frac{1}{\sqrt{\sum_{i=1}^{n} \frac{1}{n-1}\left\{\log \frac{x_i+b}{x_0+b}\right\}^2}}$$

$$= \frac{1}{\sqrt{\frac{1}{10-1} \times 0.5377}} = 4.08$$

| $\frac{1}{T}$ | $\sqrt{2}\varepsilon$ | $\sqrt{2}C$ | $\log\frac{x_i+b}{x_0+b}$ | $\log(x_0+b)$ | $\log(x_t+b)$ | $x_i+b$ | $b$ | $x_t$ |
|---|---|---|---|---|---|---|---|---|
| | a | b | a/b=c | d | c + d | e | f | e − f |
| 1/5 | 0.8416 | 4.08 | 0.206 | 2.483 | 2.689 | 4.887 | − 1.704 | 2.1927 |
| 1/10 | 1.2816 | 〃 | 0.314 | 〃 | 2.797 | 6.266 | 〃 | 2.3306 |
| 1/20 | 1.6449 | 〃 | 0.403 | 〃 | 2.886 | 7.691 | 〃 | 2.4731 |
| 1/100 | 2.3263 | 〃 | 0.570 | 〃 | 3.053 | 11.298 | 〃 | 2.8338 |

Table C - 2. 6 Calculation of Maximum Daily Precipitation Probability

| Precedence | $x_t$ | $\log x_i$ | $x_t+b$ | $\log(x_t+b)$ | $\log\frac{x_t+b}{x_0+b}$ | $\log\left\{\frac{x_i+b}{x_0+b}\right\}^2$ |
|---|---|---|---|---|---|---|
| 1 | 326.1 | 2.5133 | 277.7 | 2.444 | 0.615 | 0.3782 |
| 2 | 192.8 | 2.2855 | 144.4 | 2.160 | 0.331 | 0.1096 |
| 3 | 152.2 | 2.1822 | 103.8 | 2.016 | 0.187 | 0.0350 |
| 4 | 127.5 | 2.1055 | 79.1 | 1.898 | 0.069 | 0.0048 |
| 5 | 106.7 | 2.0283 | 58.3 | 1.766 | −0.063 | 0.0040 |
| 6 | 96.1 | 1.9827 | 47.7 | 1.678 | −0.151 | 0.0228 |
| 7 | 84.1 | 1.9255 | 35.7 | 1.553 | −0.276 | 0.0762 |
| 8 | 83.6 | 1.9222 | 35.2 | 1.547 | −0.282 | 0.0795 |
| 9 | 77.2 | 1.8888 | 28.8 | 1.459 | −0.370 | 0.1369 |
| 10 | 64.8 | 1.8124 | 16.4 | 1.215 | −0.014 | 0.3770 |
| Total | | 20.642 | | | | 1.2240 |

$$\log x_0 = \frac{\Sigma \log x_t}{n} = \frac{20.642}{10} = 2.0642$$

$$x_0 = 115.9$$

$$b = \frac{x_s x_t - x_0^2}{2x_0 - (x_s + x_t)} = -48.4$$

$$\log(x_0+b) = \log(115.9-48.4) = 1.829$$

$$\sqrt{2}\,c = \frac{1}{\sqrt{\Sigma \frac{1}{n-1}\left\{\log \frac{x_i+b}{x_o+b}\right\}^2}} = 2.71$$

| $\frac{1}{T}$ | $\sqrt{2}\,\xi$ | $\sqrt{2}\,c$ | $\log\frac{x_i+b}{x_o+b}$ | $\log(x_o+b)$ | $\log(x_t+b)$ | $x_t+b$ | $b$ | $x_i$ |
|---|---|---|---|---|---|---|---|---|
| | a | b | a/b=c | d | c + d | e | f | e − f |
| 1/5 | 0.8416 | 2.71 | 0.311 | 1.829 | 2.140 | 139.0 | −48.4 | 187.4 |
| 1/10 | 1.2816 | 〃 | 0.473 | 〃 | 2.302 | 200.4 | 〃 | 248.8 |
| 1/20 | 1.6449 | 〃 | 0.607 | 〃 | 2.436 | 272.9 | 〃 | 321.3 |
| 1/100 | 2.3263 | 〃 | 0.858 | 〃 | 2.687 | 486.4 | 〃 | 534.8 |

## C-3 Precipitation Data in Titay Valley

Daily precipitation data for the last 11 years in Kabasalan is given in table C-3-1. The figures recorded by the Philippine Rubber Project Co., Ltd., are converted in terms of inch to mm.

In table C-3-2, monthly precipitation and annual precipitation derived as a sum of data in table C-3-1 are given. In table C-3-3, consecutive days with daily precipitation below 5 mm. are shown.

Table C - 3. 1 Monthly Precipitation

Kabasalan (mm)

| Year \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 122.0 | 124.9 | 250.9 | 174.6 | 236.1 | 239.7 | 416.8 | 353.1 | 271.4 | 247.7 | 245.7 | 473.2 | 3,156.1 |
| 57 | 174.8 | 64.0 | 147.5 | 147.8 | 272.4 | 231.4 | 396.4 | 201.3 | 451.6 | 102.0 | 119.2 | 156.3 | 2,464.7 |
| 58 | 136.7 | 37.6 | 45.1 | 112.9 | 315.5 | 381.3 | 287.8 | 376.8 | 271.6 | 419.9 | 352.6 | 171.9 | 2,909.7 |
| 59 | 59.0 | 54.7 | 84.8 | 213.6 | 329.9 | 379.6 | 479.4 | 348.0 | 154.1 | 356.0 | 303.4 | 209.7 | 2,972.2 |
| 60 | 47.2 | 165.5 | 203.5 | 229.0 | 326.5 | 279.2 | 338.6 | 368.3 | 349.6 | 373.4 | 392.6 | 152.6 | 3,226.0 |
| 61 | 77.4 | 78.2 | 139.9 | 182.6 | 296.3 | 298.3 | 167.2 | 312.5 | 340.7 | 229.6 | 203.6 | 253.8 | 2,580.1 |
| 62 | 134.2 | 100.1 | 230.7 | 233.3 | 356.9 | 189.0 | 250.2 | 335.0 | 292.1 | 162.0 | 242.0 | 168.7 | 2,694.2 |
| 63 | 152.5 | 116.2 | 277.9 | 55.9 | 240.1 | 329.3 | 190.4 | 434.7 | 239.1 | 203.5 | 320.6 | 218.1 | 2,778.3 |
| 64 | 70.4 | 104.4 | 152.1 | 232.9 | 423.7 | 364.0 | 134.6 | 154.2 | 241.6 | 233.9 | 371.6 | 200.2 | 2,683.6 |
| 65 | 144.8 | 143.7 | 203.2 | 243.8 | 201.2 | 96.5 | 250.8 | 368.0 | 213.8 | 158.6 | 239.0 | 166.9 | 2,430.3 |
| 66 | 166.1 | 80.7 | 98.7 | 170.0 | 162.0 | 382.1 | 324.6 | 235.1 | 248.3 | 305.8 | 156.8 | 372.4 | 2,702.6 |
| Total | 1,285.1 | 1,070.0 | 1,834.3 | 1,996.4 | 3,160.6 | 3,170.4 | 3,236.8 | 3,487.0 | 3,073.9 | 2,792.4 | 2,947.1 | 2,543.8 | 30,597.8 |
| Average | 116.8 | 97.3 | 166.8 | 181.5 | 287.3 | 288.2 | 294.2 | 317.0 | 279.4 | 253.9 | 267.9 | 231.3 | 2,781.6 |
| Monthly Precipitation Max | 174.8 | 165.5 | 277.9 | 243.8 | 423.7 | 382.1 | 479.4 | 434.7 | 451.6 | 419.9 | 392.6 | 473.2 | |
| Monthly Precipitation Min. | 47.2 | 37.6 | 45.1 | 55.9 | 162.0 | 96.5 | 134.6 | 154.2 | 154.1 | 102.0 | 119.2 | 152.6 | |

Table C-3.2 Consecutive Dry Days

Kabasalan (day)

| Year \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1956 | 7 | 9 | 6 | 12 | 6 | 5 | 4 | 3 | 4 | 8 | 12 | 3 | |
| 57 | 11 | 15 | 6 | 9 | 7 | 9 | 3 | 8 | 3 | 8 | 9 | 10 | |
| 58 | 12 | 26 | 29 | 12 | 5 | 6 | 5 | 4 | 11 | 8 | 6 | 14 | |
| 59 | 10 | 22 | 8 | 12 | 4 | 3 | 5 | 6 | 4 | 5 | 3 | 12 | |
| 60 | 19 | 6 | 14 | 5 | 3 | 5 | 5 | 5 | 5 | 4 | 4 | 12 | |
| 61 | 27 | 10 | 12 | 4 | 5 | 4 | 10 | 9 | 5 | 16 | 9 | 6 | |
| 62 | 11 | 13 | 8 | 8 | 6 | 5 | 4 | 4 | 14 | 9 | 5 | 7 | |
| 63 | 8 | 11 | 6 | 20 | 9 | 4 | 12 | 3 | 8 | 6 | 4 | 6 | |
| 64 | 24 | 8 | 10 | 6 | 7 | 7 | 8 | 14 | 6 | 13 | 5 | 5 | |
| 65 | 7 | 10 | 9 | 5 | 5 | 8 | 4 | 7 | 6 | 5 | 5 | 9 | |
| 66 | 8 | 22 | 8 | 15 | 15 | 4 | 5 | 4 | 4 | 4 | 7 | 5 | |
| Total | (13) 144 | (14) 152 | (11) 116 | (10) 108 | ( 7) 72 | ( 5) 60 | (6) 65 | (6) 67 | (6) 70 | (8) 86 | (6) 69 | (8) 89 | Average in ( ) |
| Max Spell | 27 | 26 | 29 | 20 | 15 | 9 | 12 | 14 | 14 | 16 | 12 | 14 | |
| Min. Spell | 7 | 6 | 6 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | |

Table C-3.3 Calculation of Maximum Daily Precipitation Probability

Kabasalan

| Precedence | $x_i$ | $\log x_i$ | $x_i + b$ | $\log(x_i+b)$ | $\log\frac{(x_i+b)}{(x_0+b)}$ | $\left\{\log\frac{(x_i+b)}{(x_0+b)}\right\}^2$ |
|---|---|---|---|---|---|---|
| 1 | 139.4 | 2.1443 | 413.7 | 2.6167 | 0.0532 | 0.0028 |
| 2 | 118.2 | 2.0726 | 392.5 | 2.5938 | 0.0303 | 0.0009 |
| 3 | 108.7 | 2.0362 | 383.0 | 2.5832 | 0.0197 | 0.0004 |
| 4 | 101.6 | 2.0069 | 375.9 | 2.5751 | 0.0116 | 0.0001 |
| 5 | 95.5 | 1.9800 | 369.8 | 2.5680 | 0.0045 | 0.0000 |
| 6 | 92.7 | 1.9671 | 367.0 | 2.5647 | 0.0012 | 0.0000 |
| 7 | 90.4 | 1.9562 | 364.7 | 2.5619 | −0.0016 | 0.0000 |
| 8 | 89.7 | 1.9528 | 364.0 | 2.5611 | −0.0024 | 0.0000 |
| 9 | 87.6 | 1.9425 | 361.9 | 2.5586 | −0.0049 | 0.0000 |
| 10 | 67.8 | 1.8312 | 342.1 | 2.5342 | −0.0293 | 0.0009 |
| 11 | 49.5 | 1.6946 | 323.8 | 2.5103 | −0.0532 | 0.0028 |
| $\Sigma$ | | 21.5844 | | | | 0.0079 |

$$\log x_0 = \frac{\log x_i}{n} = \frac{21.5844}{11} = 1.9622$$

$$x_0 = 91.7$$

$$m = 11 \div 10 = 1$$

$$b_s = \frac{x_s x_t - x_0^2}{2x_0 - (x_s + x_t)} \qquad b = \frac{b_s}{m}$$

$$b_s = \frac{1394 \times 495 - 91.7^2}{2 \times 91.7 - (1394 + 495)}$$

$$= \frac{690.03 - 840.89}{183.4 - 1889}$$

$$= \frac{-150.86}{-5.5}$$

$$= 274.3$$

$b = 274.3$ $\qquad \log(2743+91.7) = 2.5635$

$$\sqrt{2}\,c = 1\Big/\sqrt{\frac{1}{11-1}\left\{\log\frac{(x_i+b)}{(x_0+b)}\right\}^2} = 1\Big/\sqrt{\frac{1}{10} \times 0.0079} = \frac{1}{\sqrt{0.00079}} = \frac{1}{0.0281} = 35.5871$$

| $W$ | $\sqrt{2}\ \xi$ | $\sqrt{2}\ c$ | $\log\frac{(x_i+b)}{(x_0+b)}$ | $\log(x_0+b)$ | $\log(x_i+b)$ | $(x_i+b)$ | $b$ | $x_i$ |
|---|---|---|---|---|---|---|---|---|
| | a | b | a/b=c | d | c+d | e | f | e−f |
| 1/10 | 1.2816 | 35587 | 0.0360 | 2.5635 | 2.5995 | 3976 | 2743 | 1233 |
| 1/50 | 2.0537 | 〃 | 0.0577 | 〃 | 2.6212 | 4180 | 2743 | 1437 |
| 1/100 | 2.3263 | 〃 | 0.0654 | 〃 | 2.6289 | 4255 | 2743 | 1512 |
| 1/200 | 2.5758 | 〃 | 0.0724 | 〃 | 2.6359 | 4324 | 2743 | 1581 |
| 1/300 | 2.7191 | 〃 | 0.0764 | 〃 | 2.6399 | 4364 | 2743 | 1621 |
| 1/500 | 2.8782 | 〃 | 0.0809 | 〃 | 2.6444 | 4410 | 2743 | 1667 |
| 1/3 | 0.4306 | 〃 | 0.0121 | 〃 | 2.5756 | 3764 | 2743 | 1021 |
| 1/5 | 0.8416 | 〃 | 0.0236 | 〃 | 2.5871 | 3865 | 2743 | 1122 |

## Table C - 4. Temperature & Humidity Data

Temperature

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calapan max | 28.7 | 29.2 | 30.5 | 32.0 | 32.5 | 32.5 | 31.4 | 31.6 | 31.5 | 31.2 | 30.4 | 29.4 |
| min | 21.9 | 22.2 | 22.6 | 24.2 | 24.1 | 23.7 | 23.3 | 23.4 | 23.6 | 23.2 | 23.1 | 22.7 |
| mean | 25.3 | 25.7 | 26.6 | 27.6 | 28.3 | 28.1 | 27.4 | 27.5 | 27.6 | 27.2 | 26.8 | 26.1 |
| 較 差 | 6.8 | 7.0 | 7.9 | 6.8 | 8.4 | 8.8 | 8.1 | 8.2 | 7.9 | 8.0 | 7.3 | 6.7 |
| Tocloban max | 29.2 | 29.8 | 30.4 | 31.5 | 31.6 | 31.6 | 31.6 | 32.1 | 31.8 | 31.4 | 30.5 | 29.5 |
| min | 23.1 | 23.1 | 23.5 | 24.4 | 24.8 | 24.8 | 24.5 | 24.7 | 24.5 | 24.4 | 24.0 | 23.5 |
| mean | 26.2 | 26.5 | 27.0 | 28.0 | 28.2 | 28.2 | 28.1 | 28.4 | 28.2 | 27.9 | 27.3 | 26.5 |
| 較 差 | 6.1 | 6.7 | 6.9 | 7.1 | 6.8 | 6.8 | 7.1 | 7.4 | 7.3 | 7.0 | 6.5 | 6.0 |
| Zamboanga mean | 26.3 | 26.4 | 26.8 | 27.1 | 27.1 | 26.8 | 26.6 | 26.8 | 26.7 | 26.6 | 26.6 | 26.4 |
| Los Banos mean | 25.1 | 25.7 | 27.0 | 28.5 | 28.7 | 28.0 | 27.5 | 27.3 | 27.2 | 26.7 | 26.2 | 25.4 |

Relative Humidity

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calapan | 84 | 81 | 78 | 77 | 78 | 82 | 83 | 84 | 84 | 84 | 84 | 84 |
| Tacloban | 85 | 84 | 82 | 81 | 82 | 82 | 81 | 79 | 81 | 82 | 85 | 85 |
| Zamboanga | 83 | 82 | 81 | 83 | 84 | 85 | 85 | 85 | 85 | 85 | 86 | 84 |
| Los Banos | 84 | 78 | 78 | 76 | 78 | 84 | 85 | 86 | 84 | 85 | 84 | 85 |

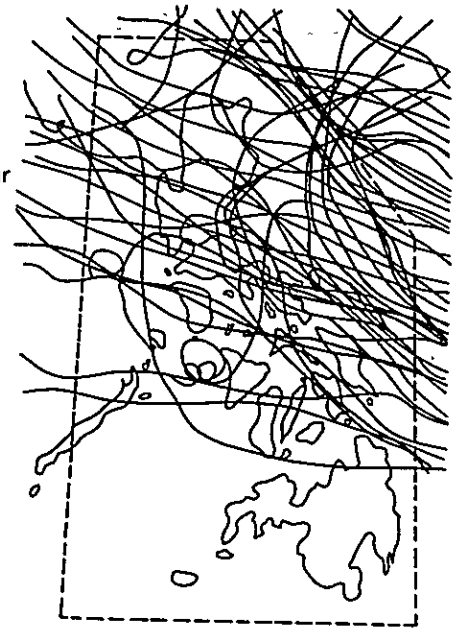
(Philippine Weather Bureau
Calapan Weather Bureau
Tacloban Weather Bureau)

## C-5 Data on Tropical Cyclons

Tropical depression
Maximum wind speed within the disturbance up to 38miles per hour

Tropical storm
maximum wind speed within the disturbance ranges from 39miles per hour to 72miles per hour

Typhoon
maximum wind speed within the disturbance exceeds 72miles per hour.



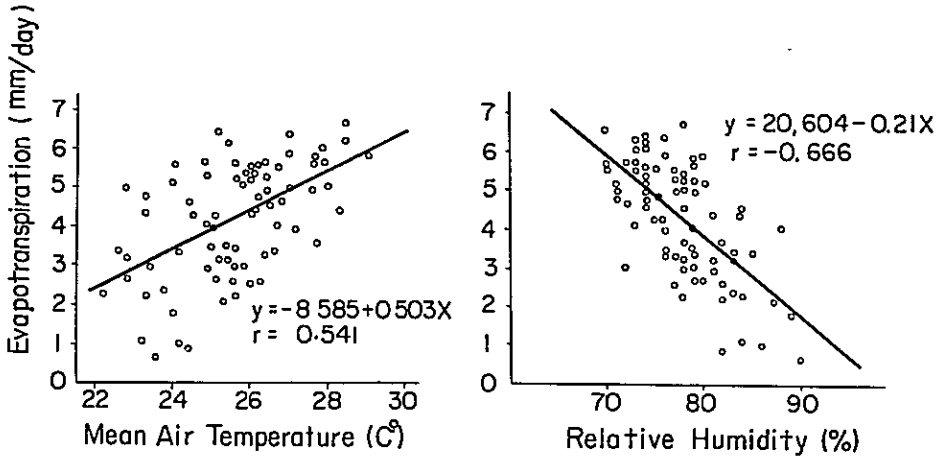
### Incidence of Tropical Cyclon Hatched 1961-1964

| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Whole Area | Depression | – | – | – | – | – | – | 2 | 4 | 2 | – | – | 1 |
| | Storm | – | – | – | – | – | 2 | 1 | 1 | 2 | 1 | 3 | 2 |
| | Typhoon | – | – | – | – | 3 | 1 | 3 | 5 | 1 | 3 | 3 | 2 |
| | Total | – | – | – | – | 3 | 3 | 6 | 10 | 5 | 4 | 6 | 5 |
| Calapan with in 200 miles | Depression | – | – | – | – | – | – | – | – | 1 | – | – | |
| | Storm | – | – | – | – | – | 1 | – | 1 | 2 | 1 | 3 | 1 |
| | Typhoon | – | – | – | – | 1 | 1 | 2 | 1 | – | 2 | 3 | 2 |
| | Total | – | – | – | – | 1 | 2 | 2 | 2 | 3 | 3 | 6 | 3 |
| Tacloban with in 200 miles | Depression | – | – | – | – | – | – | 2 | – | 2 | – | – | – |
| | Storm | – | – | – | – | – | 1 | – | 1 | 2 | 1 | 2 | 2 |
| | Typhoon | – | – | – | – | 2 | 1 | 3 | 1 | – | 1 | 3 | 2 |
| | Total | – | – | – | – | 2 | 2 | 5 | 2 | 4 | 2 | 5 | 4 |
| Calapan with in 100 miles | Depression | – | – | – | – | – | – | – | – | 1 | – | – | – |
| | Storm | – | – | – | – | – | – | – | 1 | 2 | – | 1 | – |
| | Typhoon | – | – | – | – | 1 | 1 | 1 | – | – | – | 1 | 1 |
| | Total | – | – | – | – | 1 | 1 | 1 | 1 | 3 | – | 2 | 1 |
| Tacloban with in 100 miles | Depression | – | – | – | – | – | – | – | – | – | – | – | – |
| | Storm | – | – | – | – | – | 1 | – | 1 | – | – | 1 | – |
| | Typhoon | – | – | – | – | 1 | – | – | 1 | – | – | 3 | – |
| | Total | – | – | – | – | 1 | 1 | – | 2 | – | – | 4 | – |

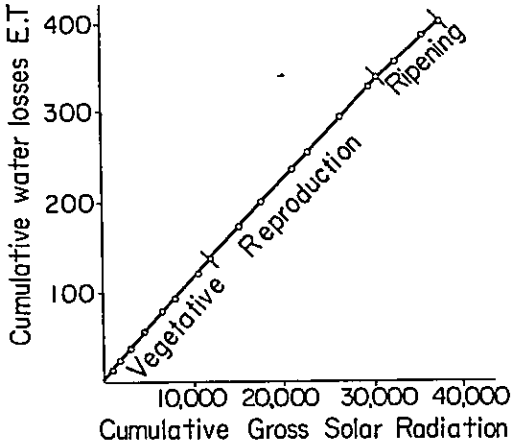
( Philippine Weather Bureau – Scientific Papers 1961~64 )

C-6 Lowland Paddy Evapotranspiration Measurement Record

Observed and Recorded by International Rice Research Institute




The relationship of evapotranspiration in vegetative and reproductive stage to mean air temperature and relative humidity (5. January 1965 to 2. May )
( IRRI Annual Report 1965 )




Cumulative water losses from the field related to cumulative gross solar radiation
( IRRI Aunual Report 1965 )

IRRI ANNUAL REPORT

| | | | | | |
|---|---|---|---|---|---|
| 1963 | Feb.-Jun. | ET | max/day | 10.6 | mm/day |
| | | | min/day | 4.8 | mm/day |
| | Rainy Season | ET | max/day | 7.8 | mm/day |
| | | | min/day | 5.02 | mm/day |
| 1964 | Aug.-Dec. | ET | may/day | 7.9 | mm/day |

## D. Data on Main source of Irrigation ( Rivers )

### D-1 Discharge Data of the Rivers in Naujan District

Discharge of the Magasawangtubig River and the Pangalaan River was recorded respectively by B.P.W. as in the tables D-1-1, and D-1-2. The minimum discharge derived on the basis of the above data is given in tables D-1-3. D-1-4, as well as in charts D-1-a, D-1-b. The close examination of the data, discloses discharge of the Magasawangtubig river in April, May and June is remarkably small to the extent that it cannot maintain irrigation requirement 4.52$m^3$/sec. of the district.

Calculation of maximum discharge probability and minimum discharge probability were given in D-1-5.

# Table D-1.1 Records of the Discharge of the Magasawang River

LOCATION : LAT. 13° 14' 15", LONG. 121° 14' 15", APPROXIMATELY 6 KMS. UPSTREAM FROM THE HIGHWAY BRIDGE ALONG THE CALAPAN - PINAMALAYAN ROAD.

DRAINAGE AREA : 435 SQ. KMS.

RECORDS AVAILABLE : OCTOBER, 1951 TO DECEMBER, 1959; OCTOBER, 1951 TO DECEMBER, 1956 INCLUDED IN THE SURFACE WATER SUPPLY BULLETIN NO. 2, VOL. I.

GAGE : WATER STAGE RECORDER. ELEVATION OF ZERO OF GAGE IS 23.299 METERS ABOVE MLLW. PRIOR TO FEBRUARY 12, 1955, STAFF GAGE READ THREE TIMES A DAY, APPROXIMATELY 300 METERS UPSTREAM OF THE PRESENT SITE AT DATUM 0.541 METER HIGHER.

EXTREMES : 1957 - 59: MAXIMUM DISCHARGE, 829,400 SECOND - LITERS, JANUARY 8, 1957, GAGE HEIGHT, 4.18 M., FROM RATING CURVE EXTENDED ABOVE 550,000 SECOND - LITERS ON BASIS OF SLOPE - AREA MEASUREMENT @ GAGE HEIGHT, 3.34 M., MINIMUM DESCHARGE, 360 SECOND - LITERS, JUNE 7 - 29, 1957, GAGE HEIGHT, 0.41 M.
1951 - 59: MAXIMUM DISCHARGE ESTIMATED, 928,400 SECOND - LITERS, APRIL 10, 1956, GAGE HEIGHT, 4.44 M., FROM RATING CORVE AS EXPLINED ABOVE; MINIMUM DISCHARGE, SAME AS ABOVE.

REMARKS : RECORDS ARE GOOD EXCEPT THOSE ABOVE 150,000 SECOND - LITERS, WHICH ARE FAIR.

REVISIONS : ALL DISCHARGES ABOVE STAGE 1.70 METERS INCLUDED IN WATER SUPPLY BULLETIN NO. 2, VOL. I WERE REVISED AND INCLUDED HEREWITH IN THIS VOLUME, PAGE 41 TO 45.

( 1 ) 1957 ( M3/Sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY. | JUNE | JULY | AUG. | SEPT. | OCT | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 731,000 | 38,090 | 15,400 | 9,980 | 1,610 | 480 | *3,340 | *6,880 | 15,800 | * 18,680 | 50,830 | *38,090 |
| 2 | 388,000 | *38,860 | 15,400 | 9,980 | 1,500 | 480 | 5,860 | 9,660 | 16,280 | 18,680 | 77,000 | 30,750 |
| 3 | 115,000 | 34,240 | 14,600 | 9,980 | 1,610 | 480 | 4,240 | 17,240 | 18,680 | 29,450 | 139,400 | 30,100 |
| 4 | * 20,600 | 33,470 | 13,000 | 28,150 | 1,610 | * 600 | 4,060 | 10,620 | 18,680 | 39,630 | 77,000 | 32,050 |
| 5 | 23,550 | 31,400 | 11,260 | 27,500 | 1,610 | 420 | 4,060 | 10,940 | 20,600 | 31,400 | 57,610 | 28,800 |
| 6 | 23,550 | 29,450 | 10,620 | *38,860 | 1,400 | 420 | 5,650 | 10,620 | 21,160 | 29,450 | 49,700 | 27,500 |
| 7 | 55,200 | 28,150 | *10,300 | 24,730 | 1,400 | *360 | 8,200 | 11,260 | 22,840 | 28,150 | 44,120 | 30,100 |
| 8 | *768,400 | 27,500 | 15,000 | 15,620 | 1,300 | 360 | 6,280 | 11,260 | 25,640 | 29,450 | 40,400 | 31,400 |
| 9 | 448,000 | 26,200 | *35,010 | 12,200 | 1,300 | 360 | 7,200 | 10,620 | 29,450 | 29,450 | 35,780 | 29,450 |
| 10 | 105,000 | 23,960 | 29,450 | 10,100 | 1,400 | 360 | 6,700 | 9,980 | 35,010 | 31,400 | 28,800 | 24,520 |
| 11 | 55,350 | 22,280 | 22,840 | 9,500 | 1,400 | 360 | 7,450 | 9,020 | 33,470 | 27,500 | 26,200 | 24,520 |
| 12 | 42,260 | 28,800 | 21,160 | 7,950 | 1,400 | 360 | 7,450 | 8,600 | 32,050 | 24,520 | 218,000 | 30,750 |
| 13 | 38,090 | 28,800 | 19,640 | 6,070 | 1,400 | 360 | 8,200 | 8,180 | 29,450 | 48,770 | 73,800 | 26,850 |
| 14 | 35,010 | 26,200 | 18,200 | 4,810 | 1,400 | 360 | 10,400 | 22,840 | 30,750 | 36,550 | 47,840 | 23,400 |
| 15 | 30,100 | 25,080 | 16,760 | 3,520 | 1,610 | 360 | 15,240 | 32,050 | 37,320 | 32,050 | 38,090 | 21,720 |
| 16 | 27,500 | 24,520 | 15,000 | 2,350 | *1,830 | 360 | 18,300 | *37,320 | *38,090 | 28,800 | 29,450 | 19,640 |
| 17 | 31,400 | 22,840 | 13,800 | 2,350 | 1,400 | 360 | 22,370 | 35,780 | 38,090 | 26,850 | 25,080 | 18,200 |
| 18 | 28,150 | 21,160 | 13,400 | 2,350 | 1,100 | 360 | 22,840 | 33,470 | 30,100 | 29,450 | 23,960 | 17,720 |
| 19 | 44,120 | 20,600 | 13,000 | 2,200 | 840 | 360 | 16,280 | 29,450 | 29,450 | 29,450 | 22,840 | 17,240 |
| 20 | 129,000 | 19,160 | 22,280 | 2,050 | 760 | 360 | 11,800 | 23,960 | 28,800 | 28,150 | 21,720 | 16,760 |
| 21 | 70,600 | 18,680 | 19,640 | 2,050 | 680 | 360 | 11,800 | 22,840 | 28,150 | 32,050 | *20,600 | 16,280 |
| 22 | 62,600 | 16,760 | 18,200 | 1,940 | 760 | 360 | 11,800 | 21,160 | 27,500 | 36,550 | 21,160 | 15,400 |
| 23 | 55,350 | 15,400 | 16,280 | 1,830 | 760 | 360 | 11,580 | 20,120 | 26,200 | 35,780 | 21,720 | 14,600 |
| 24 | 49,700 | 15,000 | 14,200 | 1,720 | 680 | 360 | 10,620 | 18,680 | 25,640 | 34,240 | 21,160 | 14,200 |
| 25 | 45,980 | 13,800 | 13,000 | 840 | 600 | 360 | 9,660 | 17,240 | 23,400 | 36,550 | 20,600 | 14,200 |
| 26 | 41,330 | 13,400 | 11,580 | * 600 | 540 | 360 | 9,340 | 16,760 | 22,280 | 37,320 | 20,600 | 13,400 |
| 27 | 39,630 | *13,000 | 10,300 | 760 | 540 | 360 | 8,600 | 15,800 | 20,120 | 45,050 | 21,160 | 13,000 |
| 28 | 38,090 | 13,800 | 10,620 | 1,100 | 540 | 360 | 8,180 | 15,800 | 18,680 | *78,800 | 23,960 | 12,600 |
| 29 | 37,320 | | 10,620 | 1,500 | 540 | 360 | 7,660 | 16,280 | 19,160 | 42,260 | 30,100 | 12,200 |
| 30 | 35,010 | | 10,620 | 1,830 | * 480 | 420 | 7,400 | 15,400 | 18,680 | 38,860 | 38,860 | *11,800 |
| 31 | 34,240 | | 10,300 | | 480 | | 7,140 | 15,000 | | 37,320 | | 11,800 |
| TOTAL | 3,649,130 | 670,600 | 491,480 | 244,420 | 34,480 | 11,580 | 299,700 | 544,830 | 781,520 | 1,052,610 | 1,367,540 | 669,040 |
| MEAN | 117,710 | 23,950 | 15,850 | 8,150 | 1,110 | 390 | 9,670 | 17,580 | 26,050 | 33,960 | 45,580 | 21,580 |
| LSKM | 270.60 | 55.06 | 36.44 | 18.74 | 2.55 | 0.90 | 22.23 | 40.41 | 59.88 | 78.07 | 104.78 | 49.61 |
| CM | 72.48 | 13.32 | 9.76 | 4.86 | 0.68 | 0.23 | 5.95 | 10.82 | 15.52 | 20.91 | 27.16 | 13.29 |
| HA-M | 31,530 | 5,790 | 4,250 | 2,110 | 300 | 100 | 2,590 | 4,710 | 6,750 | 9,090 | 11,820 | 5,780 |

ANNUAL MAX - 768,400 MIN - 360 MEAN - 26,900 LSKM - 61.84 CM - 194.98 HA-M - 84,820

PEAK DISCHARGE: JAN. 8, 7:00 AM., 829,400 SECOND - LITERS, GAGE HEIGHT, 4.18 METERS.
* MAXIMUM OR MINIMUM

(2) 1958 ( $m^3$/sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11,800 | 28,800 | 23,960 | *14,200 | 6,620 | 1,000 | 4,060 | 8,600 | 23,960 | 33,470 | | 32,700 |
| 2 | 10,940 | 27,500 | 23,400 | 13,400 | *13,800 | * 920 | 5,440 | 7,920 | | | | |
| 3 | 9,980 | 27,500 | 25,080 | 11,800 | 5,860 | 1,100 | 55,200 | 12,200 | 21,720 | 73,800 | 21,720 | 48,770 |
| 4 | * 7,660 | 26,200 | *73,200 | 10,940 | 4,060 | 4,810 | 20,120 | 17,240 | | | | |
| 5 | 38,090 | 25,080 | 69,000 | 10,300 | 3,340 | 4,060 | 14,200 | 16,760 | 20,600 | | 22,840 | 53,090 |
| 6 | 38,860 | 26,850 | 50,830 | 9,660 | 2,980 | 3,520 | 11,800 | 15,000 | | 41,330 | | |
| 7 | 32,700 | 24,520 | 38,090 | 7,920 | 2,650 | 2,650 | 10,620 | | | | 21,720 | |
| 8 | 26,850 | 21,720 | 30,750 | 7,920 | 2,200 | 2,350 | 9,980 | 11,800 | 30,100 | 30,750 | | 125,000 |
| 9 | 20,120 | 19,640 | 28,800 | 5,260 | 1,940 | 4,060 | 9,980 | | | | | |
| 10 | 21,160 | 19,160 | 35,010 | 4,210 | 1,720 | 4,600 | 9,980 | | 38,860 | 48,770 | 34,520 | 49,700 |
| 11 | 19,640 | 19,160 | 30,750 | 3,520 | 1,610 | 4,810 | 9,020 | 10,620 | | | | |
| 12 | 20,600 | 22,840 | 26,200 | 3,200 | 1,500 | 4,600 | 8,180 | | 26,200 | | 26,800 | 44,120 |
| 13 | 20,600 | 45,050 | 24,520 | 3,360 | 1,400 | 4,240 | 7,920 | 11,800 | | 55,350 | | |
| 14 | 19,160 | *73,800 | 22,840 | 5,050 | 1,400 | 3,880 | 18,680 | | | | 24,520 | |
| 15 | 16,760 | 64,200 | 20,120 | 4,840 | 1,300 | 4,240 | 50,830 | 14,200 | 17,720 | 48,770 | | 54,220 |
| 16 | 17,240 | 46,910 | 18,680 | 4,840 | 1,200 | 4,810 | 45,050 | | | | | |
| 17 | 17,720 | 35,780 | 18,200 | 6,100 | 1,300 | 6,700 | 32,700 | | 13,800 | 45,050 | 38,090 | 45,050 |
| 18 | 30,750 | 32,700 | 17,240 | 5,260 | 1,300 | 3,880 | 32,050 | 38,860 | | | | |
| 19 | 25,080 | 30,100 | 16,280 | 4,210 | 1,000 | 2,800 | 30,750 | | 12,200 | 49,700 | 51,960 | 41,330 |
| 20 | 21,160 | 28,150 | 15,400 | 4,000 | * 760 | 2,200 | 23,960 | 51,960 | | 54,220 | | |
| 21 | 20,120 | 25,080 | 14,600 | 3,520 | 760 | 2,200 | 19,160 | | | | 141,600 | |
| 22 | 21,160 | 22,840 | 13,400 | 3,520 | 760 | 3,340 | 15,800 | 23,960 | 15,000 | 78,800 | | 33,470 |
| 23 | 21,160 | 21,720 | 13,000 | 3,360 | 760 | 4,420 | 14,200 | | | | | |
| 24 | 69,000 | 19,640 | 12,200 | 3,360 | 760 | *9,200 | 13,000 | | 14,200 | 67,400 | 95,000 | 29,450 |
| 25 | *77,000 | 18,680 | 11,580 | 3,520 | 1,000 | 6,490 | 11,800 | 23,400 | | | | |
| 26 | 64,200 | *17,720 | 11,260 | 3,040 | 1,940 | 5,650 | | | 19,640 | | 59,870 | 31,400 |
| 27 | 54,220 | 19,640 | 10,940 | 2,880 | 2,050 | 4,810 | | 22,840 | | 42,260 | | |
| 28 | 46,910 | 23,960 | *10,620 | *2,720 | 2,050 | 4,060 | 10,940 | | | 41,330 | 51,960 | |
| 29 | 33,090 | | 11,260 | 2,720 | 1,830 | 3,340 | | 25,080 | 26,200 | 33,470 | | 25,640 |
| 30 | 33,470 | | 13,800 | 3,520 | 1,400 | 5,440 | 11,800 | | | 28,150 | | |
| 31 | 30,190 | | 16,760 | | 1,000 | | | | | 26,850 | | 21,720 |
| TOTAL | 902,300 | 814,940 | 747,770 | 172,150 | 72,250 | 120,180 | | | | | | |
| MEAN | 29,110 | 29,080 | 24,120 | 5,740 | 2,330 | 4,010 | | | | | | |
| LSKM | 66.92 | 66.85 | 55.45 | 13.20 | 5.36 | 9.22 | | | | | | |
| CM | 17.92 | 16.17 | 14.85 | 3.42 | 1.44 | 2.39 | | | | | | |
| HA-M | 7,800 | 7,040 | 6,460 | 1,490 | 620 | 1,040 | | | | | | |

PEAK DISCHARGE: JULY 3, 9:30 AM., 192,000 SECOND - LITERS, GAGE HEIGHT, 2.15 METERS.
* MAXIMUM OR MINIMUM

(3) 1959 ( $m^3$/ sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | 8,700 | 3,160 | 8,200 | 6,950 | | | | | |
| 2 | 17,720 | 43,190 | 11,580 | | | | | | 20,600 | 14,860 | 39,600 | 84,200 |
| 3 | | | | 7,200 | | 8,200 | 6,490 | 7,450 | | | | |
| 4 | | 39,630 | 58,740 | | 760 | | | | 17,380 | | 61,000 | 34,200 |
| 5 | 23,400 | | | | | 7,950 | | 8,700 | | 21,190 | | |
| 6 | | 37,320 | 45,980 | 11,600 | 2,650 | | 8,450 | | | | 49,400 | |
| 7 | 59,870 | | | | | | | 7,200 | 14,480 | 59,550 | | 42,300 |
| 8 | | | | 10,100 | 2,050 | 6,490 | 7,950 | | | | | |
| 9 | 38,090 | 31,400 | 26,850 | | | | | | 10,400 | 28,200 | 41,900 | 28,140 |
| 10 | | | | 6,490 | | 5,650 | 7,200 | 9,500 | | | | |
| 11 | | 29,650 | 58,740 | | 1,940 | | | | 7,950 | | 27,350 | 10,020 |
| 12 | 32,700 | | | | | 5,020 | | 9,200 | | 10,400 | | |
| 13 | | 26,850 | 70,600 | 4,240 | 1,500 | | 5,650 | | | | 20,140 | |
| 14 | 31,400 | | | | | | | 9,500 | 6,280 | 8,700 | | 8,310 |
| 15 | | | | 2,650 | 1,610 | 3,880 | 5,440 | | | | | |
| 16 | 30,750 | 22,840 | 152,600 | | | | | | 6,700 | 7,950 | 61,000 | 5,920 |
| 17 | | | | 1,200 | | 3,520 | 11,900 | 18,760 | | | | |
| 18 | | 20,120 | 152,600 | | 9,800 | | | | 5,860 | | 41,900 | 21,420 |
| 19 | 58,740 | | | | | 3,340 | | 15,240 | | 19,680 | | |
| 20 | | 16,760 | 89,600 | 1,720 | 6,280 | | 10,400 | | | | 20,600 | |
| 21 | 35,780 | | | 3,520 | | | | 12,580 | 8,950 | 13,720 | | 133,000 |
| 22 | | | | 2,980 | 4,600 | 3,520 | 9,200 | | | | | |
| 23 | 38,090 | 14,600 | 28,200 | 2,800 | | | | | 8,200 | 17,840 | 25,320 | 77,000 |
| 24 | | | | 2,800 | | 3,520 | 10,700 | 15,620 | | | | |
| 25 | | 13,800 | 24,140 | 2,800 | 5,650 | | | | 11,300 | | 24,140 | 67,400 |
| 26 | 48,770 | | | | | 3,700 | | 14,480 | | 41,900 | | |
| 27 | | 12,600 | 18,300 | 1,100 | 7,200 | | 12,200 | | | | 26,500 | |
| 28 | 70,600 | | | | | | | 14,860 | 16,460 | 131,000 | | 56,200 |
| 29 | | | | 3,160 | 6,700 | 3,160 | 10,100 | | | | | |
| 30 | 101,000 | | 13,720 | | | | | | 13,340 | 119,000 | 179,000 | 23,660 |
| 31 | | | | | | | 9,200 | 16,460 | | | | |

PEAK DISCHARGE OBSERVED: NOV. 30, 6:00 AM., 179,000 SECOND - LITERS, GAGE HEIGHT, 2.10 METERS.
* MAXIMUM OR MINIMUM

( 4 ) 1960 ( M3/Sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 84,200 | 5,920 | | 2,150 | | 2,360 | 7,740 | 5,580 | | 9,310 | 133,000 | *103,000 |
| 2 | | | 10,590 | | 7,170 | | | | 2,780 | 7,740 | 129,000 | 93,200 |
| 3 | | 6,260 | | | | 2,360 | | 5,920 | | 6,600 | 133,000 | 89,600 |
| 4 | 57,800 | | 10,020 | 2,150 | 7,170 | | 6,260 | | | 5,240 | 131,000 | 82,400 |
| 5 | | 5,920 | | | | | | 11,160 | 2,570 | 2,990 | 137,200 | 78,800 |
| 6 | 23,660 | | | 1,940 | 6,260 | 2,150 | 6,260 | | | 16,300 | 143,800 | 75,400 |
| 7 | | | 10,020 | | | | | *179,000 | 1,940 | 131,000 | 152,600 | 86,000 |
| 8 | 17,100 | 5,920 | | 2,150 | | 1,730 | 5,580 | 54,600 | | *228,450 | *176,800 | 93,200 |
| 9 | | | 8,880 | | *8,880 | 1,520 | | | 1,520 | 194,600 | 163,600 | 101,000 |
| 10 | | *87,800 | | | | 1,520 | | 18,700 | | 186,800 | 146,000 | 97,000 |
| 11 | 11,730 | | 8,880 | 2,780 | 7,170 | | 5,580 | | | 165,800 | 137,200 | 93,200 |
| 12 | | 34,200 | | | | | | 10,590 | 1,310 | 154,800 | 148,200 | 89,600 |
| 13 | 10,590 | | | 2,780 | 5,580 | 2,150 | 4,900 | | | 148,200 | 146,000 | 82,400 |
| 14 | | | *15,500 | | | | | | 1,020 | 141,600 | 129,000 | 78,800 |
| 15 | 9,450 | 24,780 | | 2,780 | | 2,150 | 3,880 | 56,200 | | 137,200 | 129,000 | 75,400 |
| 16 | | | 12,300 | | 4,900 | | | | 1,020 | 133,000 | 133,000 | 82,400 |
| 17 | | 13,100 | | | | 2,360 | | 18,700 | | 129,000 | 150,400 | 86,000 |
| 18 | 7,170 | | 10,590 | 2,780 | 4,220 | | 3,880 | | | 125,000 | 133,000 | 91,400 |
| 19 | | 11,160 | | | | | | 12,300 | 1,310 | 117,000 | 117,000 | 86,000 |
| 20 | 6,600 | | | 3,200 | 4,220 | 2,570 | *3,880 | | | 113,000 | 101,000 | 80,600 |
| 21 | | | 8,880 | | | | | | 1,100 | 109,000 | 97,000 | 75,400 |
| 22 | 6,260 | 10,590 | | 3,880 | | 2,570 | 4,220 | 6,600 | | 109,000 | * 93,200 | 72,200 |
| 23 | | | 6,260 | | 3,540 | | | | 1,020 | 119,000 | 93,200 | 69,000 |
| 24 | | 12,300 | | | | 2,570 | | 3,880 | 780 | 121,000 | 105,000 | 65,800 |
| 25 | 6,260 | | 3,200 | *11,730 | 3,200 | | 4,220 | | 780 | 117,000 | 101,000 | 61,000 |
| 26 | | 10,590 | | | | *127,000 | | *2,570 | 780 | 113,000 | 103,000 | *56,200 |
| 27 | 5,920 | | | 11,160 | 2,780 | 48,200 | 4,220 | | 780 | 111,000 | 105,000 | 59,400 |
| 28 | | | 2,570 | | | | | | *14,700 | 113,000 | 107,000 | 59,400 |
| 29 | 5,580 | 11,730 | | 10,020 | | 17,100 | 5,240 | 2,990 | | 113,000 | 129,000 | 72,200 |
| 30 | | | *2,360 | | *2,780 | | | | 11,730 | 117,000 | 117,000 | 69,000 |
| 31 | | | | | | | | 3,540 | | 117,000 | | 69,000 |
| TOTAL | | | | | | | | | | 3,411,630 | 3,820,200 | 2,474,000 |
| MEAN | | | | | | | | | | 110,050 | 127,340 | 79,810 |
| LSKM | | | | | | | | | | 252.99 | 292.65 | 183.47 |
| CM | | | | | | | | | | 67.75 | 75.85 | 49.13 |
| HA-M | | | | | | | | | | 29,480 | 33,010 | 21,370 |

PEAK DISCHARGE COMPUTED: OCT. 8, SLOPE-AREA, 528,000 SECOND - LITERS, GAGE HEIGHT, 3.34 METERS.
* MAXIMUM OR MINIMUM

( 5 ) 1961 ( M3/Sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 78,800 | 46,600 | 45,000 | 7,740 | 2,570 | 31,500 | *139,400 | 12,300 | *36,900 | 31,500 | 45,000 | 61,000 |
| 2 | 78,800 | 46,600 | 57,800 | 7,170 | 2,150 | 29,260 | 84,200 | 11,730 | 29,260 | 23,660 | *39,600 | 54,600 |
| 3 | 73,800 | 49,800 | *107,000 | 6,600 | 1,730 | 28,140 | 57,800 | 11,730 | 25,900 | 27,020 | 95,000 | 48,200 |
| 4 | 69,000 | 53,000 | 82,400 | 6,600 | * 1,310 | 28,140 | 51,400 | 12,300 | 24,780 | 27,020 | 148,200 | 42,300 |
| 5 | 65,800 | 49,800 | 51,400 | 6,600 | 1,310 | 28,140 | 46,600 | 13,100 | 22,540 | 25,900 | 163,600 | *39,600 |
| 6 | *64,200 | 46,600 | 43,650 | 6,600 | 1,310 | 30,380 | 42,300 | 12,300 | 17,100 | 24,780 | 78,800 | 45,000 |
| 7 | 69,000 | 53,000 | 75,400 | 6,260 | 11,730 | 27,020 | 38,250 | 11,730 | 14,700 | 25,900 | 99,000 | 99,000 |
| 8 | 65,800 | *54,600 | 32,850 | 6,260 | 6,260 | 23,660 | 34,200 | 12,300 | 13,100 | 29,260 | 115,000 | *174,600 |
| 9 | 70,600 | 53,000 | 29,260 | 6,600 | 6,600 | 22,540 | 27,020 | 11,750 | *12,300 | 28,140 | 119,000 | 99,000 |
| 10 | 69,000 | 45,000 | 28,140 | *18,700 | 5,580 | 19,500 | 24,780 | 11,750 | 13,900 | 23,660 | 125,000 | 84,200 |
| 11 | 67,400 | 43,650 | 27,020 | 14,700 | 5,580 | 14,700 | 21,420 | 12,300 | 13,900 | *21,420 | 111,000 | 77,000 |
| 12 | 65,800 | 43,650 | 24,780 | * 1,520 | 6,260 | 11,730 | 22,540 | 11,730 | 16,300 | 23,660 | 115,000 | 70,600 |
| 13 | 72,200 | 42,300 | 22,540 | 14,700 | 11,160 | 11,160 | 18,700 | 11,160 | 15,500 | 21,420 | 119,000 | 67,400 |
| 14 | *141,600 | *40,950 | 21,420 | 13,100 | 9,450 | *10,590 | 13,900 | *10,590 | 13,900 | 21,420 | 131,000 | 64,200 |
| 15 | 119,000 | 45,000 | 20,300 | 12,300 | 46,600 | 11,160 | 11,160 | 10,590 | 15,500 | 23,660 | 131,000 | 56,200 |
| 16 | 109,000 | 46,600 | 19,500 | 13,100 | *172,400 | 10,590 | 13,100 | 11,160 | 17,900 | 22,540 | 117,000 | 51,400 |
| 17 | 111,000 | 48,200 | 18,700 | 12,300 | 99,000 | 16,300 | 9,450 | 11,730 | 20,300 | 22,540 | 103,000 | 48,200 |
| 18 | 113,000 | 51,400 | 17,100 | 10,020 | 46,600 | 17,900 | 11,160 | 16,300 | 20,300 | 152,600 | 91,400 | 51,400 |
| 19 | 113,000 | 54,600 | 15,500 | 8,310 | 46,600 | 27,020 | 11,160 | 19,500 | 30,360 | 57,800 | 80,600 | 51,400 |
| 20 | 103,000 | 53,000 | 14,700 | 6,600 | 59,400 | 34,200 | 10,590 | 25,900 | 29,260 | 42,300 | 77,000 | 61,000 |
| 21 | 78,800 | 51,400 | 13,100 | 5,580 | 54,600 | *43,650 | 10,590 | 39,600 | 24,780 | *202,400 | 80,600 | 57,800 |
| 22 | 70,600 | 46,600 | 11,160 | 5,580 | 57,800 | 39,600 | 10,590 | 170,200 | 23,660 | 123,000 | 105,000 | 54,600 |
| 23 | 73,800 | 48,200 | 10,020 | 5,240 | 59,400 | 29,260 | 11,160 | *310,000 | 20,300 | 103,000 | *179,000 | 53,000 |
| 24 | 77,000 | 49,800 | 8,880 | 4,900 | 53,000 | 28,140 | 10,590 | 210,200 | 18,700 | 87,800 | 95,000 | 51,400 |
| 25 | 77,000 | 49,800 | 7,740 | 4,900 | 51,400 | 25,900 | 11,730 | 165,800 | 17,900 | 78,900 | 80,600 | 53,000 |
| 26 | 72,200 | 46,600 | * 7,170 | 4,900 | 56,200 | 24,780 | 13,900 | 137,200 | 16,300 | 70,600 | 84,200 | 51,400 |
| 27 | 69,000 | 43,650 | 7,170 | 4,220 | 57,800 | 23,660 | 13,100 | 93,200 | 19,500 | 84,200 | 87,800 | 48,200 |
| 28 | 64,200 | 43,650 | 7,170 | 3,880 | 48,200 | 40,950 | 11,730 | 62,600 | 17,100 | 99,000 | 84,200 | 54,600 |
| 29 | 70,600 | | 7,740 | 3,540 | 42,300 | 27,020 | 11,730 | 53,000 | 17,100 | 87,800 | 78,800 | 51,400 |
| 30 | 69,000 | | 9,450 | 3,200 | 39,600 | 28,140 | 11,730 | 46,600 | 18,700 | 72,200 | 69,000 | 48,200 |
| 31 | 67,400 | | 8,310 | | 32,850 | | 11,730 | 43,650 | | 51,400 | | 46,600 |
| TOTAL | 2,509,400 | 1,347,050 | 852,370 | 231,720 | 1,096,750 | 744,730 | 817,710 | 1,593,960 | 597,760 | 1,736,400 | 3,048,400 | 1,916,500 |
| MEAN | 80,950 | 48,110 | 27,500 | 7,720 | 35,380 | 24,820 | 26,380 | 51,420 | 19,920 | 56,010 | 101,610 | 61,820 |
| LSKM | 186.09 | 110.59 | 63.20 | 17.74 | 81.33 | 57.06 | 60.63 | 118.20 | 45.80 | 128.76 | 233.59 | 142.11 |
| CM | 49.83 | 26.75 | 16.92 | 4.60 | 21.78 | 14.79 | 16.24 | 31.65 | 11.87 | 34.48 | 60.54 | 38.06 |
| HA-M | 21,680 | 11,640 | 7,360 | 2,000 | 9,480 | 6,430 | 7,060 | 13,770 | 5,160 | 15,000 | 26,340 | 16,560 |

ANNUAL MAX - 310,000 MIN - 1,310 MEAN - 45,190 LSKM - 103.89 CM - 327.51 HA-M - 142,480

PEAK DISCHARGE OBSERVED: AUG. 23, 7:00 AM., 370,000 SECOND - LITERS, GAGE HEIGHT, 2.79 METERS.
* MAXIMUM OR MINIMUM

# Table D-1.2 Records of Discharge of the Pangalaan River

Up stream

LOCATION : LAT. 13° 15' 33", Long. 121° 11' 24", ABOUT 6 KILOMETERS UPSTREAM OF THE MOUTH OF THE BUKAYAO RIVER AND APPROXIMATELY 500 METERS DOWNSTREAM OF THE PROPOSED DAMSITE OF THE PANGALAAN RIVER IRRIGATION PROJECT, IN NAUJAN, ORIENTAL MINDORO.

DRAINAGE AREA : 28 SQ. KMS.

RECORDS AVAILABLE : OCTOBER 11, 1951 TO DECEMBER 31, 1956.

GAGE : STAFF GAGE READ THREE TIMES A DAY. ELVATION OF ZORO OF GAGE IS 15.427 METERS REFERRED TO MLIW.

EXTREMES : OCTOBER 11, 1951 TO DECEMBER 31, 1956: MAXIMUM DISCHARGE ESTIMATED, 496,500 SECOND - LITERS, DECEMBER 26 & 27, 1954 AND JANUARY 6, 1955, GAGE HEIGHT, 4.15 METERS, MINIMUM DISCHARGE OBSERVED, 6,350 SECOND - LITERS MAY 16, 1952, GAGE HEIGHT, 0.50 METER.

REMARKS : RECORDS ARE GOOD EXCEPT THOSE ABOVE 128,500 SECOND - LITHERS, WHICH ARE FAIR. DURING HIGH DISCHARGES, PART OF THE FLOW IS SUPPLIED BY OVERFLOW FROM THE MAGSAWANG TUBIG RIVER. IN VIEW OF THIS, RUN-OFF PER SQUARE KILOMETER OF DRAINAGE AREA IS NOT EVALVATED.

( 1 ) 1951 ( M3/SEC )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | 19,100 | 11,600 |
| 2 | | | | | | | | | | | 16,400 | 12,200 |
| 3 | | | | | | | | | | | 12,800 | 13,100 |
| 4 | | | | | | | | | | | 13,100 | 12,800 |
| 5 | | | | | | | | | | | *21,200 | 12,200 |
| 6 | | | | | | | | | | | 18,500 | 15,200 |
| 7 | | | | | | | | | | | 14,000 | 14,600 |
| 8 | | | | | | | | | | | 15,200 | 14,000 |
| 9 | | | | | | | | | | | 11,900 | 12,200 |
| 10 | | | | | | | | | | | 11,300 | 12,800 |
| 11 | | | | | | | | | | 7,500 | 11,000 | 16,400 |
| 12 | | | | | | | | | | 7,500 | 13,400 | 13,400 |
| 13 | | | | | | | | | | 9,000 | 11,000 | 12,200 |
| 14 | | | | | | | | | | 9,500 | 10,750 | 11,600 |
| 15 | | | | | | | | | | 13,100 | 18,200 | 11,900 |
| 16 | | | | | | | | | | 10,500 | 17,900 | 62,400 |
| 17 | | | | | | | | | | 10,000 | 12,200 | *138,000 |
| 18 | | | | | | | | | | 11,600 | 11,000 | 53,800 |
| 19 | | | | | | | | | | 10,000 | 10,250 | 18,800 |
| 20 | | | | | | | | | | 10,500 | *9,750 | 13,400 |
| 21 | | | | | | | | | | 9,750 | 11,600 | 12,200 |
| 22 | | | | | | | | | | 9,250 | 14,300 | 11,600 |
| 23 | | | | | | | | | | 9,500 | 14,600 | 10,750 |
| 24 | | | | | | | | | | 9,250 | 12,200 | 10,750 |
| 25 | | | | | | | | | | 9,250 | 11,300 | 10,750 |
| 26 | | | | | | | | | | 10,000 | 10,750 | 10,500 |
| 27 | | | | | | | | | | 14,000 | 10,500 | 11,000 |
| 28 | | | | | | | | | | 10,250 | 12,200 | 10,500 |
| 29 | | | | | | | | | | 9,750 | 15,800 | 10,000 |
| 30 | | | | | | | | | | 10,250 | 12,500 | *9,500 |
| 31 | | | | | | | | | | 14,000 | | 9,750 |
| TOTAL | | | | | | | | | | | 404,700 | 599,900 |
| MEAN | | | | | | | | | | | 13,490 | 19,350 |

RECORDS INCOMPLETE
* MAXIMUM OR MINIMUM

( 2 ) 1952 ( M3/SEC )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *9,250 | 53,800 | *74,000 | 23,000 | 9,750 | *7,500 | 29,150 | 43,400 | 43,800 | 54,200 | | |
| 2 | 9,250 | 46,600 | 73,000 | 21,200 | 11,600 | 10,250 | 27,400 | 40,600 | 41,400 | 45,800 | | |
| 3 | 9,250 | 44,200 | 60,150 | 18,500 | 11,600 | 28,100 | 40,200 | 36,200 | 39,800 | 36,600 | | |
| 4 | 9,500 | 40,200 | 56,600 | 16,700 | 9,750 | 14,000 | 15,800 | 98,500 | 39,800 | 45,400 | | |
| 5 | 10,750 | 39,400 | 49,800 | 14,900 | 8,300 | 11,900 | 57,900 | 115,000 | 50,600 | 57,900 | | |
| 6 | 10,250 | 38,600 | 44,600 | 13,700 | 7,700 | 12,800 | 42,600 | 108,500 | 54,200 | 43,000 | | |
| 7 | 10,250 | 40,200 | 42,200 | 14,300 | *7,500 | 14,900 | 35,800 | 100,000 | 46,600 | 39,400 | | |
| 8 | 9,750 | 92,500 | 39,400 | 12,500 | 7,500 | 15,800 | 32,300 | *152,600 | 35,000 | *35,400 | | |
| 9 | 19,700 | 60,600 | 38,600 | 11,900 | 7,700 | 14,000 | 27,750 | 141,600 | 31,950 | 39,400 | | |
| 10 | 18,500 | 61,500 | 32,650 | 11,300 | 11,600 | 13,100 | 26,350 | 118,500 | 29,850 | 42,200 | | |
| 11 | 40,600 | 79,500 | 30,550 | 10,750 | 10,000 | 12,800 | 24,500 | 95,000 | 27,750 | 75,500 | | |
| 12 | 20,300 | 70,500 | 33,000 | 9,250 | 9,500 | 13,100 | 23,300 | 67,500 | 24,200 | 86,500 | | |
| 13 | 14,000 | 57,450 | 35,400 | 17,600 | 8,750 | 13,100 | 21,500 | 75,500 | 20,600 | 81,000 | | |
| 14 | 12,200 | 51,000 | 35,800 | 14,000 | 9,250 | 12,200 | 20,300 | 61,050 | 24,800 | 81,500 | | |
| 15 | 12,200 | 44,600 | 51,800 | 11,900 | 8,750 | 13,400 | 19,400 | 53,400 | 31,950 | 99,000 | | |
| 16 | 11,600 | 39,000 | 45,400 | 12,500 | 7,500 | 12,800 | 19,400 | 92,500 | 30,900 | 108,500 | | |
| 17 | 10,750 | 35,000 | 36,200 | *23,600 | 16,700 | 18,800 | 19,400 | 103,000 | 27,750 | 159,600 | | |
| 18 | 10,250 | 32,300 | 34,200 | 21,500 | 10,250 | 97,000 | 18,800 | 99,500 | 25,700 | 105,000 | | |
| 19 | 9,750 | *31,250 | 30,900 | 17,900 | 10,250 | 65,500 | 18,800 | 76,500 | 24,500 | 112,000 | | |
| 20 | 11,000 | 70,000 | 28,450 | 16,700 | 13,100 | 40,600 | 17,000 | 55,800 | *20,000 | 123,500 | | |
| 21 | 37,400 | *149,800 | 26,350 | 16,700 | 16,400 | 33,800 | 15,500 | 49,000 | 24,500 | 135,000 | | |
| 22 | *148,400 | 90,000 | 25,400 | 15,500 | 17,300 | 61,050 | *14,300 | 45,800 | 24,800 | 171,800 | | |
| 23 | 135,000 | 68,000 | 24,200 | 13,700 | *19,400 | *114,000 | 14,600 | 43,800 | 27,050 | 148,400 | | |
| 24 | 106,000 | 57,900 | 23,900 | 12,800 | 13,700 | 77,000 | 14,600 | 39,800 | 30,550 | 145,800 | | |
| 25 | 81,500 | 71,000 | 23,900 | 12,200 | 16,100 | 47,800 | 19,100 | 47,800 | 35,800 | 148,400 | | |
| 26 | 78,500 | 86,000 | 23,000 | 10,750 | 13,100 | 37,800 | 15,200 | 42,200 | 53,400 | *180,800 | | |
| 27 | 78,500 | 113,500 | 22,400 | 10,250 | 11,300 | 36,600 | 26,000 | 43,800 | 58,800 | 148,400 | | |
| 28 | 147,700 | 80,500 | 20,300 | 9,750 | 9,750 | 35,800 | 77,000 | 39,800 | 78,500 | 130,000 | | |
| 29 | 104,500 | 91,500 | *19,700 | 9,000 | 9,000 | 30,200 | *119,000 | 39,800 | *87,500 | 113,500 | | |
| 30 | 80,500 | | 20,600 | *8,300 | 8,500 | 31,250 | 80,500 | *37,000 | 74,000 | 98,500 | | |
| 31 | 67,000 | | 20,300 | | 7,900 | | 40,600 | 43,400 | | 86,000 | | |
| TOTAL | 1,334,100 | 1,772,950 | 1,122,750 | 432,650 | 339,500 | 946,950 | 974,000 | 2,206,850 | 1,166,050 | 2,978,000 | | |
| MEAN | 43,030 | 61,140 | 36,220 | 14,420 | 10,950 | 31,560 | 31,420 | 71,190 | 38,870 | 96,060 | | |

PEAK DISCHARGE OBSERVED: OCTOBER 26, 5:00 P.M., 207,000 SECOND - LITERS, 2.59 M. (RECORDS FROM JANUARY TO OCTOBER)
* MAXIMUM OR MINIMUM

( 3 ) 1953 ( M3/SEC )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | A38,200 | *127,100 |
| 2 | | | | | | | | | | | A38,800 | 108,400 |
| 3 | | | | | | | | | | | 39,400 | 83,600 |
| 4 | | | | | | | | | | | 37,000 | 75,600 |
| 5 | | | | | | | | | | | 35,800 | *69,200 |
| 6 | | | | | | | | | | | 35,200 | 120,300 |
| 7 | | | | | | | | | | | 83,600 | 127,100 |
| 8 | | | | | | | | | | | 35,800 | 127,100 |
| 9 | | | | | | | | | | | 31,000 | 127,100 |
| 10 | | | | | | | | | | | *29,200 | 127,100 |
| 11 | | | | | | | | | | | 29,800 | 127,100 |
| 12 | | | | | | | | | | | 36,400 | 110,600 |
| 13 | | | | | | | | | | | 82,800 | 92,300 |
| 14 | | | | | | | | | | | 94,100 | 109,500 |
| 15 | | | | | | | | | | | 101,300 | 127,100 |
| 16 | | | | | | | | | | | 70,800 | 127,100 |
| 17 | | | | | | | | | | | 71,600 | 127,100 |
| 18 | | | | | | | | | | | 63,600 | 112,800 |
| 19 | | | | | | | | | | | 51,900 | 106,500 |
| 20 | | | | | | | | | | | 47,000 | 110,600 |
| 21 | | | | | | | | | | | 42,800 | 119,400 |
| 22 | | | | | | | | | | | 65,200 | 110,600 |
| 23 | | | | | | | | | | | *127,100 | 127,100 |
| 24 | | | | | | | | | | | 98,600 | 127,100 |
| 25 | | | | | | | | | | | 74,800 | 117,200 |
| 26 | | | | | | | | | | | 61,200 | 126,000 |
| 27 | | | | | | | | | | | 62,000 | 123,800 |
| 28 | | | | | | | | | | | 127,100 | 115,000 |
| 29 | | | | | | | | | | | 127,100 | 102,200 |
| 30 | | | | | | | | | | | 107,200 | 83,700 |
| 31 | | | | | | | | | | | | 127,100 |
| TOTAL | | | | | | | | | | | 1,946,400 | 3,527,500 |
| MEAN | | | | | | | | | | | 64,880 | 113,790 |

RECORDS INCOMPLETE
* MAXIMUM OR MINIMUM
A DISCHARGES ESTIMATED ON BASIS OF SUCCEEDING AND PRECEDING YEARS.

( 4 ) 1954 ( M3/SEC )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 127,100 | 49,100 | 64,400 | *34,600 | 14,750 | *16,550 | 13,400 | 24,400 | 29,800 | 8,900 | 10,500 | 131,500 |
| 2 | 127,100 | 42,100 | 52,600 | 32,200 | 15,200 | 16,550 | 12,100 | 22,000 | 27,400 | *8,500 | *10,900 | 122,700 |
| 3 | 127,100 | 39,400 | 59,600 | 32,200 | *13,850 | 14,750 | 11,700 | 20,500 | 30,400 | 8,500 | 11,300 | 89,600 |
| 4 | 110,600 | 37,000 | 70,800 | 32,800 | 23,800 | 14,750 | *10,500 | 19,000 | 25,600 | 10,100 | 10,500 | 98,600 |
| 5 | 90,500 | 54,000 | 59,600 | 31,600 | 18,000 | 13,850 | 11,300 | 18,000 | 21,500 | 8,900 | 10,500 | 69,200 |
| 6 | 74,800 | 41,400 | 123,800 | 26,200 | 16,550 | 13,400 | 11,700 | 17,500 | 20,500 | 8,900 | 10,500 | 66,800 |
| 7 | 66,800 | 40,000 | *196,400 | 22,000 | 15,650 | 12,950 | 13,850 | 22,000 | 20,500 | 8,900 | *9,700 | *64,400 |
| 8 | 61,200 | 53,000 | 172,700 | 22,600 | 44,900 | 12,100 | 12,100 | 19,000 | 21,000 | 8,900 | 10,100 | 119,400 |
| 9 | 57,200 | *96,800 | 124,900 | 21,000 | 28,600 | *9,700 | 13,850 | 19,000 | 19,500 | 10,500 | *71,600 | 86,900 |
| 10 | 52,600 | 72,400 | 92,300 | 22,000 | 23,200 | 9,700 | 15,200 | 18,000 | 18,000 | 9,300 | 29,800 | 74,000 |
| 11 | 56,400 | 62,000 | 70,800 | 19,500 | 21,500 | 9,700 | 13,400 | *16,100 | 18,000 | 9,300 | 17,500 | 100,400 |
| 12 | 66,000 | 53,300 | 62,800 | 20,500 | 21,000 | 9,700 | 14,300 | 16,550 | 26,200 | 8,900 | 15,650 | 97,700 |
| 13 | 63,600 | 45,600 | 55,600 | 18,000 | *86,000 | 9,700 | 16,100 | 16,100 | *42,100 | 8,900 | 13,850 | 134,800 |
| 14 | 71,600 | 40,000 | 69,200 | 18,000 | 25,000 | 9,700 | 22,000 | 20,000 | 39,400 | 8,900 | 12,100 | 116,100 |
| 15 | 74,000 | 37,600 | 52,600 | 16,100 | 58,000 | 9,700 | 15,200 | 34,000 | 26,200 | *12,100 | 11,300 | 197,800 |
| 16 | 90,500 | 34,600 | 54,000 | 15,200 | 35,200 | 11,300 | 13,400 | 34,000 | 27,400 | 11,300 | 10,900 | 143,000 |
| 17 | 78,000 | 34,000 | 60,400 | 13,400 | 30,400 | 12,500 | 24,400 | 29,200 | 32,200 | 10,900 | 10,500 | 108,400 |
| 18 | 76,400 | 30,400 | 83,600 | 13,850 | 30,400 | 12,950 | 30,400 | 23,800 | 30,400 | 10,900 | 10,100 | 147,800 |
| 19 | 70,000 | 41,400 | 76,400 | 12,950 | 27,400 | 12,950 | *35,200 | 20,500 | 11,700 | 11,300 | 9,700 | 137,000 |
| 20 | 62,000 | 32,800 | 93,200 | *12,100 | 28,000 | 13,400 | 28,000 | 23,800 | 9,300 | 10,500 | 38,800 | 115,000 |
| 21 | 58,000 | *29,200 | 102,200 | 29,200 | 23,800 | 13,850 | 24,400 | 24,400 | *8,900 | 10,500 | 34,000 | 100,400 |
| 22 | 51,200 | 37,000 | 117,200 | 16,100 | 21,500 | 15,200 | 30,400 | 23,800 | 8,900 | 10,500 | 41,400 | 90,500 |
| 23 | 47,000 | 50,500 | 108,400 | 20,000 | 23,200 | 13,400 | 26,200 | 20,000 | 8,900 | 10,500 | 40,000 | 80,400 |
| 24 | 44,200 | 40,000 | 80,400 | 29,800 | 23,200 | 12,500 | 25,600 | 19,000 | 8,900 | 10,500 | 30,400 | 74,000 |
| 25 | 38,800 | 43,500 | 66,800 | 26,200 | 20,500 | 12,100 | 25,000 | 17,500 | 8,900 | 10,500 | 25,000 | 150,200 |
| 26 | 34,600 | 39,400 | 56,400 | 22,000 | 24,400 | 12,100 | 21,000 | 20,000 | 9,300 | 12,100 | 21,500 | *496,500 |
| 27 | 34,000 | 56,400 | 51,900 | 21,000 | 21,500 | 11,700 | 20,000 | 21,000 | 8,900 | 10,500 | 19,000 | 496,500 |
| 28 | *32,800 | 93,200 | 47,000 | 21,500 | 22,000 | 11,700 | 22,000 | 20,500 | 8,900 | 10,500 | 18,000 | 424,000 |
| 29 | 54,800 | | 49,100 | 18,500 | 19,500 | 10,900 | 29,200 | 28,000 | 8,900 | 10,500 | 21,000 | 393,600 |
| 30 | 46,300 | | 53,300 | 15,650 | 17,000 | 10,900 | 30,400 | *45,600 | 8,900 | 10,500 | 62,000 | 149,000 |
| 31 | 65,200 | | *39,400 | | 16,550 | | 24,400 | 37,600 | | 10,500 | | 481,600 |
| TOTAL | 2,110,400 | 1,331,100 | 2,467,800 | 657,250 | 810,550 | 370,250 | 616,700 | 710,850 | 586,500 | 311,500 | 648,100 | 5,157,800 |
| MEAN | 68,080 | 47,540 | 79,610 | 21,910 | 26,150 | 12,340 | 19,890 | 22,930 | 19,550 | 10,050 | 21,600 | 166,380 |

PEAK DISCHARGE ESTIMATED: DECEMBER 26 - 27, 6:00 A.M.-5:00 P.M., 496,500 SECOND - LITERS, 4.15 M.
* MAXIMUM OR MINIMUM

( 5 ) 1955 ( M3/SEC )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 128,200 | *75,600 | 65,200 | 31,600 | *77,200 | 18,500 | 25,600 | 28,000 | 17,500 | 53,300 | 45,600 | 109,500 |
| 2 | 105,100 | 67,600 | 45,600 | 28,000 | 52,600 | 17,500 | 32,200 | 29,800 | 16,550 | 54,800 | 49,800 | 94,100 |
| 3 | 104,000 | 60,400 | 36,400 | 25,000 | 27,400 | 17,000 | 25,600 | 25,600 | 16,550 | 38,200 | 54,000 | 81,200 |
| 4 | 120,300 | 65,200 | 31,000 | 26,800 | 22,600 | *15,200 | 30,400 | 22,600 | 19,500 | 33,400 | 44,900 | 69,200 |
| 5 | 155,000 | 60,400 | 27,400 | 29,800 | 21,500 | 17,000 | 28,600 | 21,000 | 25,600 | 31,000 | 49,100 | 72,400 |
| 6 | *496,500 | 52,600 | 25,000 | 44,900 | 28,600 | 19,500 | 26,200 | 22,600 | 31,600 | 28,000 | 44,200 | 69,200 |
| 7 | 431,200 | 47,700 | 22,600 | 50,500 | 27,400 | 35,000 | 29,200 | 25,600 | 19,500 | 25,000 | *38,800 | 64,400 |
| 8 | 233,000 | 42,100 | 23,800 | 58,800 | 19,000 | 41,400 | 48,400 | 21,500 | 17,000 | *24,400 | 95,000 | 89,600 |
| 9 | 212,500 | 35,800 | 22,600 | 35,800 | 17,500 | 26,200 | 40,700 | 19,500 | 16,100 | 32,800 | 81,200 | 93,200 |
| 10 | 170,100 | 32,800 | 21,000 | 31,000 | 17,500 | 22,600 | 54,800 | 21,800 | 18,500 | 89,600 | 68,400 | 120,300 |
| 11 | 131,500 | 26,800 | 20,500 | 28,600 | 16,550 | 20,500 | 43,500 | 34,600 | 21,500 | 89,600 | 130,400 | 110,600 |
| 12 | 185,200 | 22,600 | 21,000 | 27,400 | *15,200 | 18,000 | 35,300 | 24,400 | 23,200 | 59,600 | 120,300 | 121,600 |
| 13 | 196,400 | *20,500 | 19,000 | 26,800 | 15,200 | 17,000 | 31,600 | *41,400 | 20,500 | 54,800 | 76,400 | *143,000 |
| 14 | 223,400 | 21,000 | 22,000 | 23,000 | 15,200 | 16,550 | 34,000 | 27,400 | 17,500 | 46,300 | 70,000 | 123,800 |
| 15 | 131,500 | 21,000 | 21,500 | 25,000 | 16,550 | 16,100 | 36,400 | 25,600 | *15,650 | 68,400 | 63,600 | 85,200 |
| 16 | 164,900 | 29,200 | 20,000 | 30,400 | 16,100 | 17,500 | 36,400 | 24,400 | 32,200 | 67,600 | 94,100 | 64,400 |
| 17 | 161,000 | 25,600 | 20,500 | 29,800 | 25,000 | 17,500 | 31,600 | 23,200 | 30,400 | 76,400 | 95,000 | 72,400 |
| 18 | 134,800 | 31,000 | 23,200 | 26,200 | 37,000 | 17,500 | 28,000 | 21,500 | 29,800 | 62,000 | 122,700 | 63,600 |
| 19 | 203,500 | 25,000 | 21,500 | 23,800 | 38,200 | 16,100 | 25,000 | 25,000 | 78,800 | 52,600 | 104,000 | 54,000 |
| 20 | 150,200 | 23,200 | 18,500 | 22,000 | 32,800 | 22,600 | 28,600 | 24,400 | 71,600 | 47,700 | 74,000 | 46,300 |
| 21 | 134,800 | 65,200 | 18,000 | 22,000 | 26,200 | 34,600 | 24,400 | 25,000 | *97,700 | *133,700 | 62,800 | 42,100 |
| 22 | 131,500 | 64,400 | 17,500 | 26,200 | 21,500 | 27,400 | 28,000 | 23,800 | 66,000 | 109,500 | 54,800 | 39,400 |
| 23 | 131,500 | 46,300 | 17,000 | 19,000 | 18,500 | 26,200 | 24,400 | 21,500 | 45,600 | 100,400 | 49,800 | *37,600 |
| 24 | 158,600 | 42,100 | *16,100 | 16,550 | 17,000 | 29,200 | 22,600 | 23,800 | 41,400 | 93,200 | 107,300 | 56,400 |
| 25 | 115,000 | 35,200 | 26,800 | *16,100 | 15,650 | 23,800 | 22,000 | 30,400 | 38,800 | 70,800 | 260,200 | 113,900 |
| 26 | 100,400 | 34,600 | 29,800 | 52,600 | 15,650 | 21,500 | 23,800 | 27,400 | 32,800 | 60,400 | 137,000 | 82,800 |
| 27 | 92,300 | 106,500 | 31,000 | 66,000 | 16,550 | 20,500 | 23,200 | 24,400 | 29,800 | 50,500 | 140,600 | 68,400 |
| 28 | 84,400 | 107,300 | *78,800 | *151,400 | 23,200 | 21,500 | 22,600 | 22,600 | 26,800 | 49,800 | 249,000 | 51,900 |
| 29 | 75,600 | | 56,400 | 105,100 | 19,500 | *42,100 | 22,600 | 25,000 | 24,400 | 52,600 | *460,000 | 43,500 |
| 30 | 70,800 | | 53,300 | 95,000 | 20,500 | 36,400 | *21,000 | 20,500 | 25,600 | 49,800 | 293,400 | 43,500 |
| 31 | *66,000 | | 37,000 | | 18,000 | | 21,500 | *19,000 | | 50,500 | | 58,000 |
| TOTAL | 4,999,200 | 1,287,700 | 910,000 | 1,200,150 | 751,350 | 693,250 | 968,700 | 775,300 | 968,450 | 1,776,060 | 3,336,400 | 2,385,500 |
| MEAN | 161,260 | 45,990 | 29,350 | 40,010 | 24,240 | 23,110 | 31,250 | 25,010 | 32,280 | 57,290 | 111,210 | 76,950 |

PEAK DISCHARGE ESTIMATED: JANUARY 6, 6:00 A.M.-5:00 P.M., 496,500 SECOND - LITERS, 4.15 M.
* MAXIMUM OR MINIMUM

1 9 5 6 ( M3/SEC )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 84,400 | 90,500 | 122,700 | 33,400 | 29,800 | *71,600 | * 22,000 | 45,600 | 74,800 | 54,000 | 55,600 | 85,200 |
| 2 | 58,000 | 108,400 | 115,000 | 32,800 | 29,200 | 61,200 | 23,200 | 89,600 | *107,300 | 89,600 | 44,900 | *49,100 |
| 3 | 46,300 | *123,800 | 104,000 | 43,500 | 28,000 | 54,000 | 28,000 | 70,000 | 107,300 | *112,800 | 42,800 | 64,400 |
| 4 | 40,700 | 96,800 | 95,000 | 47,700 | 26,200 | 50,500 | 26,600 | 58,800 | 97,700 | 107,300 | 37,000 | 146,600 |
| 5 | 37,600 | 68,400 | 59,600 | 49,100 | 31,000 | 45,600 | 28,600 | 47,700 | 80,400 | 76,400 | 56,400 | 185,200 |
| 6 | 34,000 | 45,600 | 51,200 | 217,000 | 28,000 | 42,100 | 34,600 | 47,700 | 75,600 | 57,200 | 70,800 | *223,400 |
| 7 | 42,100 | 54,000 | 48,400 | 115,000 | 25,600 | 38,800 | *80,400 | 41,400 | 109,500 | 73,200 | 62,000 | 208,000 |
| 8 | 34,000 | 47,700 | 72,400 | 109,500 | *23,200 | 36,400 | 54,000 | 50,500 | 109,500 | 56,400 | 47,700 | 115,000 |
| 9 | *31,000 | 42,100 | 72,400 | 155,000 | 25,000 | 34,000 | 37,600 | 76,400 | 109,500 | 48,400 | 40,700 | 84,400 |
| 10 | 39,400 | 40,700 | 54,800 | *448,000 | 27,400 | 34,000 | 34,600 | *106,500 | 105,100 | 54,800 | 37,600 | 124,900 |
| 11 | 34,000 | 38,800 | 61,200 | 126,000 | 30,400 | 33,400 | 39,400 | 96,800 | 76,400 | 48,400 | 37,600 | 75,600 |
| 12 | 44,200 | 38,200 | 74,000 | 99,500 | 38,200 | 29,800 | 44,200 | 66,000 | 93,200 | 70,000 | 46,300 | 64,400 |
| 13 | 35,200 | 51,200 | 75,600 | 84,400 | 94,100 | 26,800 | 41,400 | 50,500 | 85,200 | 70,000 | 66,000 | 62,800 |
| 14 | 32,200 | 49,100 | 62,800 | 72,400 | *208,000 | 25,600 | 39,400 | 41,400 | 70,800 | 67,600 | *193,600 | 53,300 |
| 15 | 70,000 | 46,300 | *133,700 | 61,200 | 117,000 | 26,200 | 35,200 | 31,600 | 54,800 | 94,100 | 130,400 | 65,200 |
| 16 | 51,200 | 47,000 | 74,000 | 49,800 | 66,800 | 24,400 | 32,800 | 28,000 | 49,100 | 79,600 | 117,200 | 81,200 |
| 17 | 60,400 | 51,900 | 62,000 | 52,600 | 57,200 | 22,000 | 30,400 | *25,000 | 38,800 | 64,400 | 61,200 | 97,700 |
| 18 | 43,500 | 50,500 | 54,000 | 48,400 | 50,500 | *21,000 | 28,600 | 26,800 | 41,400 | 52,600 | 47,000 | 75,600 |
| 19 | 38,200 | 45,600 | 51,900 | 44,200 | 38,200 | 23,200 | 25,600 | 28,000 | 34,000 | 44,900 | 37,000 | 95,900 |
| 20 | 36,400 | 39,400 | 44,900 | 44,900 | 31,000 | 23,800 | 28,600 | 27,400 | 39,400 | 41,400 | 29,200 | 87,800 |
| 21 | 33,400 | 57,200 | 40,700 | 31,000 | 34,600 | 29,200 | 26,800 | 28,000 | 38,800 | 39,400 | 25,000 | 77,200 |
| 22 | 32,800 | 53,300 | 37,600 | 28,600 | 36,400 | 27,400 | 31,000 | 34,000 | 35,800 | *38,800 | 22,600 | 76,400 |
| 23 | 31,600 | 42,800 | 37,000 | 26,800 | 29,800 | 28,000 | 30,400 | 39,400 | 32,200 | 41,400 | 21,500 | 94,100 |
| 24 | 50,500 | 39,400 | 34,000 | 27,400 | 29,000 | 26,800 | 25,000 | 39,400 | 31,000 | 41,400 | 20,500 | 104,000 |
| 25 | 121,600 | 37,600 | 77,200 | 29,800 | 26,800 | 25,000 | 25,200 | 52,600 | 29,800 | 40,000 | 22,600 | 90,500 |
| 26 | 106,500 | 36,400 | 37,600 | 28,600 | 25,600 | 26,800 | 33,400 | 42,800 | 29,200 | 44,200 | 20,000 | 91,400 |
| 27 | 90,500 | 32,800 | 47,000 | 26,800 | 25,000 | 22,600 | 25,600 | 42,100 | *28,000 | 74,000 | 21,500 | 129,300 |
| 28 | 115,000 | *32,200 | 40,700 | *25,000 | 25,000 | 21,500 | 26,200 | 52,600 | 28,600 | 70,000 | 19,000 | 109,500 |
| 29 | 118,300 | 54,800 | 38,200 | 58,000 | 31,000 | 21,000 | 46,300 | 99,500 | 30,400 | 75,600 | 18,000 | 151,400 |
| 30 | 121,600 | | *33,400 | 33,400 | 40,200 | 26,200 | 35,800 | 86,000 | 35,200 | 80,400 | *17,000 | 129,300 |
| 31 | *126,000 | | 40,700 | | 58,000 | | 37,000 | 58,800 | | 57,200 | | 129,300 |
| TOTAL | 1,840,600 | 1,562,500 | 1,953,700 | 2,249,800 | 1,361,700 | 978,900 | 1,060,900 | 1,630,900 | 1,878,800 | 1,965,500 | 1,468,700 | 3,228,100 |
| MEAN | 59,370 | 53,880 | 63,020 | 74,990 | 43,930 | 32,630 | 34,220 | 52,610 | 62,630 | 63,400 | 48,960 | 104,130 |

PEAK DISCHARGE OBSERVED: APRIL 10, 6:00 A.M., 460,000 SECOND - LITERS, 4.00 M.
* MAXIMUM OR MINIMUM

RECORDS AVAILBLE : OCTOBER, 1951 TO DECEMBER, 1959: OCTOBER, 1951 TO DECEMBER, 1956 INCLUDED IN THE SURFACE WATER SUPPLY BULLETIN NO. 2, VOL. II.

GAGE : STAFF GAGE READ THREE TIMES A DAY. ELEVATION OF ZERO OF GAGE IS 15.427 METERS REFERRED TO MLLW.

EXTREMES : 1957 - 59: MAXIMUM DISCHARGE OBSERVED, 460,000 SECOND - LITERS, OCTOBER 22, 1958 AND NOVEMBER 17, 1959, GAGE HEIGHT, 4.00 M., FROM RATING CURVE EXTENDED ABOVE 420,000 SECOND - LITERS, ON BASIS OF SLOPE - AREA MEASUREMENT AT GAGE HEIGHT, 3.87 M.; MINIMUM DISCHARGE OBSERVED, 4,900 SECOND - LITERS, JULY 6, 1959, GAGE HEIGHT, 0.48 M.
1951 - 59: MAXIMUM DISCHARGE OBSERVED, 496,500 SECOND - LITERS, DECEMBER 26 AND 27, 1954 AND JANUARY 6, 1955, GAGE HEIGHT, 4.15 M. FROM RATING CURVE AS EXPLAINED ABOVE; MINIMUM DISCHARGE OBSERVED, SAME AS ABOVE.

REMARKS : RECORDS FAIR. DURING HIGH STAGES, PART OF THE FLOW IS SUPPLIED BY THE OVERFLOW FROM THE MAGASAWANG TUBIG RIVER. IN VIEW OF THIS, RUN OFF PER SQUARE KILOMETER OF DRAINAGE AREA IS NOT EVALUATED.

(7)

1 9 5 7 ( $m^3$/sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *260,200 | *65,000 | 11,200 | 7,600 | 8,500 | *5,800 | 9,400 | * 6,800 | 14,000 | * 10,800 | 153,200 | 112,000 |
| 2 | 146,200 | 55,000 | 10,000 | 7,600 | *9,400 | 5,800 | 15,200 | 7,000 | 14,000 | 23,000 | 225,200 | 97,600 |
| 3 | 102,400 | 39,600 | 9,100 | 7,600 | 8,500 | 5,800 | 15,200 | 15,800 | 19,400 | 61,000 | *255,000 | 84,400 |
| 4 | 74,800 | 32,400 | 8,500 | 21,200 | 8,200 | 5,800 | 11,600 | 11,200 | 22,400 | 34,800 | 220,400 | 77,200 |
| 5 | 106,000 | 25,400 | 8,200 | *102,400 | 7,900 | 5,800 | 7,900 | 11,200 | 20,000 | 31,600 | 163,000 | 71,200 |
| 6 | 101,200 | 21,800 | 7,900 | 28,400 | 7,900 | 5,800 | 7,600 | 8,800 | 23,600 | 27,600 | 126,400 | 73,600 |
| 7 | 246,000 | 24,200 | * 7,600 | 24,200 | 7,600 | 5,800 | 30,000 | 9,400 | 16,400 | 30,800 | 115,600 | 88,000 |
| 8 | 246,000 | 14,600 | 8,200 | 20,600 | 7,600 | 5,800 | 28,400 | 7,900 | 14,000 | 30,800 | 112,000 | 79,600 |
| 9 | 217,200 | 12,800 | *104,800 | 15,200 | 7,600 | 5,600 | 30,000 | 10,000 | 23,600 | 27,600 | 96,400 | 74,800 |
| 10 | 130,000 | 12,400 | 71,200 | 12,400 | 7,300 | 5,200 | 20,600 | 8,200 | 32,400 | 31,600 | 82,000 | 77,200 |
| 11 | 97,600 | 12,800 | 34,800 | 11,600 | 7,300 | 5,200 | 17,000 | 8,200 | *46,000 | 24,200 | 77,200 | 101,200 |
| 12 | 97,600 | 33,200 | 26,000 | 10,000 | 7,000 | 5,200 | 25,400 | 8,200 | 38,800 | 21,200 | 255,000 | *118,000 |
| 13 | 102,400 | 35,600 | 38,800 | 9,100 | 7,000 | 5,200 | 22,400 | 8,200 | 34,800 | *198,000 | 196,200 | 95,200 |
| 14 | 89,200 | 26,000 | 21,200 | 8,500 | 7,000 | 5,200 | 18,200 | 38,000 | 25,400 | 106,000 | 115,600 | 79,600 |
| 15 | 86,800 | 20,000 | 20,600 | 8,200 | 6,600 | 5,200 | *84,400 | 45,200 | 21,800 | 48,400 | 96,400 | 70,000 |
| 16 | 78,400 | 17,000 | 16,400 | 7,600 | 6,600 | 5,200 | 42,800 | 94,000 | 27,600 | 25,400 | 85,600 | 68,000 |
| 17 | 103,600 | 24,800 | 13,600 | * 7,300 | 7,000 | 5,200 | 25,400 | 124,000 | 37,200 | 20,000 | 62,000 | 69,000 |
| 18 | 91,600 | 26,000 | 12,400 | 7,300 | 7,000 | 5,200 | 20,000 | *150,400 | 26,800 | 19,400 | 49,200 | 58,000 |
| 19 | 89,200 | 23,600 | 10,800 | 7,300 | 7,900 | 5,200 | 16,400 | 130,000 | 23,000 | 25,400 | 51,000 | 58,000 |
| 20 | 106,000 | 16,400 | 26,800 | 7,300 | 7,900 | 5,200 | 17,000 | 101,200 | 20,000 | 28,400 | 54,000 | 59,600 |
| 21 | 107,200 | 13,200 | 24,200 | 7,300 | 6,400 | 5,200 | 15,200 | 91,600 | 25,400 | 58,000 | 48,400 | 51,000 |
| 22 | 104,800 | 12,000 | 17,000 | 12,000 | 6,200 | *5,000 | 13,200 | 43,600 | 24,800 | 46,000 | 43,600 | 45,200 |
| 23 | 110,800 | 11,200 | 13,600 | 9,700 | *5,800 | 5,000 | 12,400 | 26,800 | 21,800 | 42,000 | 37,200 | 42,800 |
| 24 | 126,400 | 9,700 | 12,600 | 8,800 | 5,800 | 5,000 | 10,000 | 17,600 | 19,400 | 39,600 | 40,400 | 40,400 |
| 25 | 109,600 | 9,400 | 10,800 | 9,700 | 5,800 | 5,000 | 9,100 | 15,800 | 15,800 | 30,000 | 34,800 | 53,000 |
| 26 | 91,600 | 9,100 | 9,700 | 10,000 | 5,800 | 5,000 | 8,200 | 14,000 | 14,600 | 34,800 | * 31,600 | 42,000 |
| 27 | 79,600 | * 8,800 | 9,700 | 9,400 | 5,800 | 5,000 | 8,200 | 13,600 | 13,200 | 67,000 | 42,800 | 39,600 |
| 28 | 68,000 | 9,100 | 9,400 | 8,500 | 5,800 | 5,200 | 8,200 | 14,000 | 12,800 | 146,200 | 113,200 | * 38,000 |
| 29 | 82,000 | | 8,500 | 8,200 | 5,800 | 5,200 | 7,900 | 15,200 | 12,000 | 101,200 | 86,800 | 38,800 |
| 30 | 57,000 | | 8,200 | 8,200 | 5,800 | 5,000 | * 7,300 | 14,600 | *10,800 | 69,000 | 77,200 | 39,600 |
| 31 | * 51,000 | | 7,600 | | 5,800 | | 7,300 | 14,000 | | 37,200 | | 58,000 |
| TOTAL | 3,560,400 | 621,100 | 599,600 | 423,200 | 216,600 | 159,800 | 571,900 | 1,084,500 | 671,800 | 1,497,000 | 3,147,400 | 2,100,000 |
| MEAN | 114,850 | 22,180 | 19,340 | 14,110 | 6,990 | 5,330 | 18,450 | 34,980 | 22,390 | 48,290 | 104,910 | 67,740 |

ANNUAL MAX. - 260,200 MIN. - 5,000 MEAN - 40,150

PEAK DISCHARGE OBSERVED: JAN. 1, 12:00 MOON, 265,000 SECOND-LITERS, GAGE HEIGHT, 3.10 METERS.
* MAXIMUM OR MINIMUM.

(8) 1958 ( $m^3$/sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 38,800 | 42,800 | 33,200 | 14,000 | 8,200 | * 5,800 | 6,600 | 5,800 | 13,200 | 14,000 | 31,000 | 115,000 |
| 2 | 37,200 | 38,000 | 31,600 | 12,400 | *21,800 | 5,800 | 7,900 | 5,800 | 11,600 | 15,800 | 30,400 | *229,800 |
| 3 | * 34,800 | 38,000 | 34,000 | 11,200 | 13,600 | 6,200 | 120,400 | 5,800 | 10,000 | 37,200 | 34,000 | 174,000 |
| 4 | 69,000 | 39,600 | 127,600 | 10,000 | 10,400 | 6,600 | 17,600 | 10,800 | 9,400 | 28,400 | 34,000 | 131,500 |
| 5 | 132,400 | 37,200 | *210,800 | 9,400 | 8,800 | 6,400 | 12,000 | 10,000 | 8,800 | 17,600 | 39,400 | 115,000 |
| 6 | 131,200 | 40,400 | 77,200 | 9,400 | 8,500 | 6,000 | 8,500 | 12,400 | 8,200 | 17,600 | 37,000 | 113,900 |
| 7 | 113,200 | 34,800 | 64,000 | 9,400 | 8,500 | 5,800 | 9,400 | 11,600 | 8,200 | 17,000 | 35,200 | 110,600 |
| 8 | 74,800 | 32,400 | 51,000 | 9,400 | 8,500 | 6,000 | 7,300 | 9,400 | 13,600 | 14,600 | 34,000 | 108,400 |
| 9 | 68,000 | 30,800 | 30,800 | 10,800 | 8,200 | 6,200 | 7,300 | 6,600 | *46,000 | 14,000 | 32,200 | 108,400 |
| 10 | 66,000 | 29,200 | 58,000 | 14,000 | 7,900 | 6,400 | 7,300 | 6,200 | 29,200 | * 12,800 | 32,800 | 43,500 |
| 11 | 60,000 | 27,600 | 43,600 | 14,000 | 7,900 | 6,400 | 6,800 | 6,000 | 17,000 | 18,800 | 31,600 | 34,000 |
| 12 | 86,800 | 57,000 | 34,800 | *18,200 | 7,600 | 6,400 | 6,400 | 12,400 | 12,000 | 18,800 | 30,400 | 46,300 |
| 13 | 66,000 | 109,600 | 27,600 | 13,200 | 7,600 | 6,200 | *5,000 | 10,000 | 10,000 | 43,600 | * 29,200 | 42,800 |
| 14 | 62,000 | *150,400 | 26,800 | 12,000 | 7,600 | 7,300 | 23,000 | 7,900 | 8,800 | 26,800 | 32,800 | 34,000 |
| 15 | 52,000 | 121,600 | 24,800 | 9,100 | 7,300 | 6,200 | *144,800 | 11,600 | 7,900 | 20,000 | 31,600 | 34,000 |
| 16 | 48,400 | 82,000 | 21,800 | 8,500 | 7,000 | 8,500 | 97,600 | 11,600 | 7,000 | 20,000 | 34,000 | 37,000 |
| 17 | 80,800 | 55,000 | 20,600 | 8,800 | 7,300 | 10,400 | 70,000 | 13,600 | 7,000 | 23,000 | 40,000 | 24,400 |
| 18 | 95,200 | 44,400 | 17,000 | 8,500 | 8,200 | 7,000 | 42,000 | 26,000 | 6,400 | 18,800 | 131,500 | 22,000 |
| 19 | 94,000 | 36,400 | 15,800 | 8,200 | 7,600 | 6,600 | 48,400 | 14,000 | 6,000 | 38,800 | 132,600 | 22,000 |
| 20 | 70,000 | 34,000 | 13,600 | 8,200 | 6,800 | 6,600 | 30,000 | *41,200 | 6,400 | 16,400 | 90,500 | 22,000 |
| 21 | 61,000 | 29,200 | 13,600 | 8,200 | 6,800 | 6,400 | 19,400 | 14,000 | 7,000 | 102,400 | 233,000 | 21,000 |
| 22 | 86,800 | 27,600 | 12,000 | 8,200 | 6,600 | 6,200 | 13,600 | 14,000 | 6,600 | *389,000 | 245,800 | 21,500 |
| 23 | 71,200 | 26,000 | 12,000 | 7,900 | 6,600 | 6,000 | 13,200 | 14,000 | 6,400 | 168,800 | 212,500 | 21,000 |
| 24 | 215,600 | 21,200 | 11,200 | * 7,600 | 6,400 | *16,400 | 10,800 | 14,000 | 6,200 | 62,000 | *260,200 | 21,000 |
| 25 | *236,400 | * 14,600 | 11,200 | 7,600 | 6,600 | 12,800 | 9,400 | 14,000 | 6,200 | 34,000 | 185,200 | 21,000 |
| 26 | 119,200 | 18,800 | 11,200 | 7,600 | 6,200 | 9,400 | 8,800 | 13,600 | 6,200 | 34,000 | 141,800 | 21,000 |
| 27 | 77,200 | 19,400 | 10,400 | 7,600 | 6,200 | 8,200 | 8,500 | 13,200 | 5,800 | 40,000 | 132,600 | 20,000 |
| 28 | 60,000 | 20,600 | * 9,700 | 7,600 | 6,200 | 6,800 | 7,900 | 12,400 | * 5,200 | 41,400 | 153,800 | 19,000 |
| 29 | 69,000 | | 9,700 | 7,600 | 6,200 | 6,200 | 8,800 | 14,000 | 5,400 | 34,000 | 175,400 | 19,000 |
| 30 | 55,000 | | 10,000 | 7,600 | 6,000 | 7,900 | 6,600 | 14,000 | 15,200 | 32,800 | 115,000 | 18,000 |
| 31 | 51,000 | | 21,200 | | * 5,800 | | 6,200 | 13,200 | | 31,600 | | * 17,000 |
| TOTAL | 2,583,000 | 1,258,600 | 1,096,800 | 296,200 | 248,900 | 219,100 | 791,500 | 389,100 | 316,900 | 1,404,000 | 2,779,500 | 1,788,100 |
| MEAN | 83,320 | 44,950 | 35,380 | 9,870 | 8,030 | 7,300 | 25,530 | 12,550 | 10,560 | 45,290 | 92,650 | 57,680 |

ANNUAL MAX. - 389,000 MIN. - 5,000 MEAN - 36,090

PEAK DISCHARGE OBSERVED: OCT. 22, 6:00 AM., 460,000 SECOND-LITERS, GAGE HEIGHT, 4.00 METERS.

* MAXIMUM OR MINIMUM.

(9) 1959 ( $m^3$/sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17,000 | *70,000 | 17,000 | *18,500 | 6,500 | *17,500 | 5,700 | 15,200 | *20,500 | 17,000 | 34,000 | 109,500 |
| 2 | 17,000 | 53,300 | 17,000 | 17,000 | 8,100 | 16,100 | 5,700 | 17,000 | 19,500 | 22,000 | 34,000 | 96,800 |
| 3 | 16,550 | 43,500 | 70,000 | 16,100 | 9,700 | 15,650 | 5,700 | 16,100 | 17,500 | 29,200 | 34,000 | 92,300 |
| 4 | * 16,100 | 38,200 | 70,000 | 14,750 | 8,900 | 17,500 | 5,700 | 30,400 | 15,650 | 26,200 | 34,000 | 86,000 |
| 5 | 17,000 | 37,000 | 66,000 | 14,750 | 17,500 | 17,000 | 5,300 | 28,600 | 15,200 | 25,000 | 34,000 | 86,000 |
| 6 | 17,000 | 35,200 | 45,600 | 13,400 | 14,300 | 15,650 | * 4,900 | 23,800 | 14,300 | 33,400 | 40,000 | 87,800 |
| 7 | 70,000 | 34,000 | 32,200 | 13,400 | 12,100 | 14,300 | 5,700 | 21,500 | 13,400 | 31,600 | 66,000 | 85,200 |
| 8 | 43,500 | 30,400 | 28,000 | 12,950 | 10,100 | 13,400 | 5,700 | 18,500 | 13,400 | 26,200 | 56,400 | 79,600 |
| 9 | 34,000 | 32,800 | 19,500 | 12,500 | 10,900 | 12,100 | 5,700 | 16,100 | 12,950 | 19,000 | 45,600 | 70,000 |
| 10 | 33,400 | 36,400 | 33,400 | 12,500 | 13,400 | 11,300 | 5,700 | 13,850 | 12,500 | 15,650 | 34,000 | 64,400 |
| 11 | 28,000 | 32,200 | 26,800 | 12,100 | 11,700 | 10,500 | 5,700 | 12,100 | 11,700 | 14,750 | 34,000 | 62,000 |
| 12 | 45,600 | 28,000 | 24,400 | 11,700 | 10,100 | 9,700 | 5,700 | *10,900 | 11,700 | 13,850 | 32,800 | 59,600 |
| 13 | 39,400 | 25,600 | 50,500 | 11,700 | 10,500 | 9,300 | 5,700 | 10,900 | 11,700 | 12,950 | 27,400 | 55,600 |
| 14 | 38,800 | 22,600 | 82,000 | 11,700 | 14,750 | 8,900 | 5,700 | 21,000 | 11,700 | 12,950 | * 20,500 | 50,500 |
| 15 | 29,800 | 21,500 | 291,500 | 10,500 | 12,950 | 9,700 | *30,400 | 18,500 | 11,700 | 12,950 | 20,000 | * 47,000 |
| 16 | 28,000 | 20,500 | 217,000 | 10,500 | 10,100 | 8,900 | 16,100 | 19,500 | *11,300 | 12,950 | 90,500 | 47,000 |
| 17 | 27,400 | 19,000 | 115,000 | 10,500 | * 5,300 | 8,500 | 13,850 | 19,500 | 11,300 | *12,100 | *367,000 | 47,000 |
| 18 | 66,000 | 19,000 | *345,000 | 10,500 | 5,300 | 8,100 | 10,100 | 21,500 | 11,700 | 16,550 | 58,000 | 60,400 |
| 19 | 59,600 | 19,000 | 334,000 | 10,500 | 10,100 | 7,300 | 10,100 | 19,500 | 18,500 | 19,500 | 60,400 | *312,000 |
| 20 | 53,300 | 19,000 | 209,500 | 10,100 | 11,700 | 7,300 | 16,100 | 17,500 | 19,500 | 19,500 | 62,000 | 104,000 |
| 21 | 47,000 | 19,000 | 89,600 | 10,100 | 10,900 | 7,300 | 12,500 | 17,000 | 14,300 | 18,500 | 70,600 | 86,000 |
| 22 | 34,000 | 19,000 | 32,800 | 10,100 | 12,950 | 6,500 | 13,400 | 16,100 | 14,300 | 21,000 | 70,000 | 82,800 |
| 23 | 40,000 | 18,500 | 32,800 | 9,300 | 10,900 | * 5,700 | 10,900 | 15,200 | 13,400 | 26,800 | 70,000 | 78,000 |
| 24 | 82,000 | 18,000 | 32,200 | 10,100 | 9,700 | 5,700 | 10,100 | 15,200 | 13,400 | 30,400 | 70,000 | 83,600 |
| 25 | *137,000 | 18,000 | 28,000 | 8,900 | 12,100 | 5,700 | 12,500 | 16,100 | 14,750 | 33,400 | 68,400 | 83,600 |
| 26 | 104,000 | 18,000 | 27,400 | 7,700 | 10,100 | 5,700 | 12,950 | 16,100 | 12,950 | *49,100 | 84,400 | 91,400 |
| 27 | 62,000 | 18,000 | 26,200 | 6,500 | 8,100 | 5,700 | 21,500 | 16,100 | 12,500 | 40,000 | 78,000 | 209,500 |
| 28 | 26,800 | *17,000 | 23,800 | 6,500 | 7,700 | 5,700 | 18,000 | 16,100 | 15,650 | 34,000 | 90,500 | 104,000 |
| 29 | 23,803 | | 21,500 | 6,500 | 12,950 | 5,700 | 18,000 | *32,200 | 16,550 | 33,400 | 143,000 | 88,700 |
| 30 | 25,000 | | 19,500 | * 5,700 | *21,000 | 5,700 | 17,000 | 31,600 | 15,200 | 27,400 | 188,000 | 82,800 |
| 31 | 37,000 | | 19,000 | | 18,500 | | 17,000 | 21,000 | | 34,000 | | 89,600 |
| TOTAL | 1,316,050 | 782,700 | 2,447,200 | 337,050 | 348,900 | 298,100 | 339,100 | 584,650 | 428,700 | 741,300 | 2,166,900 | 2,782,700 |
| MEAN | 42,450 | 27,950 | 78,940 | 11,240 | 11,250 | 9,940 | 10,940 | 18,860 | 14,290 | 23,910 | 72,230 | 89,760 |
| ISKM | | | | | | | | | | | | |
| CM | | | | | | | | | | | | |
| HA-M | | | | | | | | | | | | |

ANNUAL MAX. - 367,000 MIN. - 4,900 MEAN - 34,450

PEAK DISCHARGE OBSERVED: NOV. 17, 6:00 AM., 460,000 SECOND-LITERS, GAGE HEIGHT, 4.00 METERS.

* MAXIMUM OR MINIMUM.

(10) 1960 ( $m^3$/ sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *345,000 | 32,200 | *25,000 | 17,000 | 19,500 | 31,600 | 59,600 | 18,000 | 34,000 | 45,200 | *15,200 | 23,600 |
| 2 | 167,500 | 32.800 | 23,200 | 16,100 | 19,500 | 27,400 | *62,800 | *15,200 | 39,600 | 50,000 | 15,200 | 21,800 |
| 3 | 143,000 | 34,000 | 21,500 | 20,000 | 18,500 | 25,000 | 62,800 | 28,000 | 38,000 | 38,800 | 18,800 | 26,800 |
| 4 | 115,000 | 33,400 | 20,000 | 18,500 | 17,000 | 23,200 | 51,900 | 28,000 | 41,200 | 42,800 | 17,600 | 23,600 |
| 5 | 94,100 | 32,800 | 19,000 | 15,200 | *15,650 | 42,800 | 41,400 | 37,000 | 35,600 | 35,600 | 15,800 | 22,400 |
| 6 | 90,500 | 34,000 | 18,000 | 15,200 | 15,650 | 34,600 | 37,000 | 80,400 | 31,600 | 107,200 | 19,400 | *18,200 |
| 7 | 86,900 | 34,000 | 17,000 | 15,200 | 15,650 | 32,200 | 35,800 | 112,800 | 39,600 | *460,000 | 20,000 | 21,200 |
| 8 | 86,000 | 34,000 | 16,550 | 26,800 | 21,500 | 49,100 | 49,100 | 112,800 | 32,400 | 107,200 | *27,600 | 26,000 |
| 9 | 86,000 | 41,400 | 14,300 | 17,000 | 25,000 | 20,000 | 49,800 | 112,800 | 30,400 | 94,000 | 25,400 | 24,800 |
| 10 | 83,600 | 43,500 | 13,400 | 10,900 | 29,800 | 18,500 | 40,000 | 98,600 | 37,200 | 57,000 | 23,600 | 26,800 |
| 11 | 80,400 | *155,000 | *12,500 | 10,900 | 26,200 | 18,500 | 35,800 | 73,200 | 33,200 | 39,600 | 23,000 | 24,800 |
| 12 | 77,200 | 131,500 | 12,500 | 10,900 | 27,400 | 15,650 | 32,200 | 73,200 | 30,800 | 37,200 | 20,600 | 23,600 |
| 13 | 74,000 | 104,000 | 12,500 | 10,500 | 26,200 | * 10,500 | 33,400 | 71,600 | 27,600 | 34,800 | 18,200 | 24,800 |
| 14 | 70,800 | 66,000 | 12,500 | 10,100 | 29,800 | 12,100 | 33,400 | 124,900 | 25,400 | 33,200 | 17,600 | 23,600 |
| 15 | 69,200 | 56,400 | 19,500 | 9,300 | *40,700 | 15,650 | 37,000 | *143,000 | 23,000 | 30,800 | 26,800 | 23,600 |
| 16 | 67,600 | 51,700 | 22,000 | * 8,500 | 29,800 | 17,500 | 32,200 | 113,200 | 26,800 | 30,000 | 24,800 | 24,200 |
| 17 | 60,400 | 47,000 | 22,000 | 8,500 | 28,000 | 17,500 | 51,900 | 83,200 | 23,600 | 27,600 | 24,200 | *30,800 |
| 18 | 55,600 | 41,400 | 26,200 | 13,400 | 23,800 | 15,650 | 41,400 | 57,000 | 21,800 | 25,400 | 25,400 | 28,400 |
| 19 | 51,200 | 34,000 | 24,400 | 41,400 | 21,500 | 14,300 | 34,600 | 48,400 | * 21,200 | 19,400 | 23,600 | 26,800 |
| 20 | 48,400 | 34,000 | 22,000 | 20,000 | 20,000 | 12,950 | 34,600 | 44,400 | 32,400 | 11,600 | 21,800 | 25,400 |
| 21 | 41,400 | 32,800 | 20,500 | 14,750 | 18,500 | 13,400 | 31,000 | 43,600 | 32,400 | 12,400 | 23,200 | 24,200 |
| 22 | 34,000 | 31,600 | 19,000 | 13,400 | 21,500 | 15,200 | 31,000 | 44,400 | 28,400 | 11,600 | 26,000 | 23,000 |
| 23 | 29,200 | * 28,600 | 17,500 | *58,000 | 23,200 | 17,500 | 29,200 | 40,400 | 26,800 | 12,400 | 23,600 | 21,800 |
| 24 | 29,800 | 34,000 | 15,650 | 54,800 | 20,500 | 20,500 | 27,400 | 36,400 | 25,400 | 13,200 | 23,600 | 24,200 |
| 25 | 27,400 | 37,000 | 14,300 | 33,400 | 20,000 | 17,000 | 25,600 | 31,600 | 24,200 | 11,600 | 22,400 | 24,200 |
| 26 | * 25,000 | 46,300 | 13,850 | 27,400 | 20,500 | 28,600 | 25,000 | 28,400 | 23,000 | 10,000 | 23,600 | 24,200 |
| 27 | 28,000 | 41,400 | 14,300 | 25,600 | 21,500 | *108,400 | 23,800 | 24,800 | 30,800 | * 8,800 | 21,800 | 23,000 |
| 28 | 28,000 | 33,400 | 14,300 | 22,600 | 27,400 | 66,800 | 23,200 | 24,200 | 70,000 | 9,700 | 15,200 | 22,400 |
| 29 | 31,000 | 32,800 | 13,400 | 22,000 | 25,000 | 44,900 | 23,200 | 27,600 | *110,800 | 9,100 | 23,600 | 21,800 |
| 30 | 34,000 | | 15,200 | 20,500 | 29,800 | 35,800 | 22,000 | 23,600 | 67,000 | 9,400 | 26,800 | 24,200 |
| 31 | 32,800 | | 15,200 | | 34,000 | | *21,000 | 34,000 | | 9,400 | | 24,200 |
| TOTAL | 2,293,000 | 1,391,000 | 547,250 | 607,850 | 733,050 | 795,200 | 1,139,100 | 1,834,700 | 1,063,800 | 1,445,000 | 655,400 | 749,000 |
| MEAN | 73,970 | 47,970 | 17,650 | 20,260 | 23,650 | 26,510 | 36,740 | 59,180 | 35,460 | 46,610 | 21,850 | 24,160 |
| LSKM | | | | | | | | | | | | |
| CM | | | | | | | | | | | | |
| HA-M | | | | | | | | | | | | |

ANNUAL MAX - 460,000 MIN - 8,500 MEAN - 36,210

PEAK DISCHARGE OBSERVED: OCTOBER 7, 6:00 A.M., 460,000 SECOND-LITERS, GAGE HEIGHT, 4.00 METERS.
* MAXIMUM OR MINIMUM.

(11) 1961 ( $m^3$/sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24,200 | 13,000 | 11,000 | 7,000 | 8,500 | 17,000 | *133,700 | 7,800 | *32,400 | *15,500 | 47,200 | 18,800 |
| 2 | 24,200 | 15,500 | 22,800 | 7,000 | 9,500 | 12,000 | 64,400 | * 7,600 | 29,200 | 17,500 | 43,800 | 18,800 |
| 3 | 23,000 | *16,000 | *28,400 | 7,200 | 8,000 | 12,000 | 42,700 | 7,600 | 26,000 | 17,000 | 46,100 | 30,000 |
| 4 | 22,400 | 13,500 | 18,800 | 7,000 | 10,000 | 12,000 | 64,400 | 7,600 | 26,000 | 17,500 | 74,200 | 39,400 |
| 5 | 24,200 | 13,000 | 15,000 | 7,200 | 9,000 | 11,000 | 43,800 | 9,000 | 24,400 | 17,500 | 82,600 | 30,000 |
| 6 | 24,200 | 12,500 | 13,000 | 7,200 | 12,000 | 10,000 | 38,300 | 8,000 | 22,800 | 18,800 | 41,600 | 77,000 |
| 7 | 24,200 | 12,000 | 11,500 | 7,400 | 14,500 | 11,500 | 31,600 | 10,000 | 21,200 | 21,200 | 41,600 | *236,000 |
| 8 | 24,200 | 12,000 | 14,500 | 7,200 | 11,000 | 10,000 | 27,600 | 11,000 | 21,200 | 17,000 | 71,400 | 155,800 |
| 9 | 24,200 | 12,000 | 11,000 | 7,800 | 9,000 | 10,000 | 24,400 | 12,000 | 18,800 | 21,200 | 52,700 | 75,600 |
| 10 | 23,600 | 11,500 | 11,000 | 7,800 | * 7,600 | 10,000 | 22,800 | 13,000 | 18,000 | 18,800 | 79,800 | 35,100 |
| 11 | 24,200 | 11,000 | 11,000 | 9,000 | 7,600 | 12,000 | 19,600 | 13,000 | 17,500 | 26,800 | 54,900 | 27,600 |
| 12 | 32,400 | 13,000 | 9,000 | *9,500 | 7,600 | 11,000 | 18,000 | 12,000 | 17,000 | 26,800 | 48,300 | 22,000 |
| 13 | 35,100 | 15,000 | 9,000 | 9,000 | 7,600 | 10,000 | 17,500 | 12,000 | 17,000 | 25,200 | 46,100 | 21,200 |
| 14 | 42,700 | 15,000 | 8,500 | 7,600 | 32,400 | * 9,000 | 22,800 | 12,000 | 16,000 | 18,800 | 60,200 | 22,000 |
| 15 | 32,400 | 14,000 | 8,000 | 7,600 | *47,200 | 9,000 | 18,000 | 14,000 | 30,000 | 18,000 | 43,800 | 26,800 |
| 16 | 29,200 | 14,000 | 8,000 | 7,600 | 42,700 | 9,000 | 21,200 | 13,500 | 24,400 | 31,600 | 43,800 | 17,000 |
| 17 | 26,800 | 13,000 | 8,000 | 6,800 | 27,600 | 11,000 | 21,200 | 27,600 | 24,400 | 31,600 | 37,300 | 18,800 |
| 18 | *48,300 | 12,000 | 7,800 | 6,800 | 18,800 | 13,500 | 18,000 | 42,700 | 18,000 | *91,000 | 33,200 | 17,500 |
| 19 | 42,700 | 12,000 | 7,800 | 6,600 | 15,500 | 16,000 | 42,700 | 84,000 | 16,500 | 61,600 | 30,000 | 17,500 |
| 20 | 27,600 | 11,500 | 7,800 | 6,600 | 17,000 | 24,400 | 28,400 | 70,000 | 16,500 | 82,600 | 33,200 | 18,800 |
| 21 | 19,600 | 11,000 | 7,600 | 6,600 | 14,000 | 16,000 | 23,600 | 82,600 | 15,500 | 82,600 | 30,000 | 19,600 |
| 22 | 16,000 | 10,000 | 7,200 | 6,400 | 27,600 | 14,000 | 19,600 | *106,500 | 23,600 | 88,200 | *143,900 | 17,500 |
| 23 | 15,500 | 10,000 | 6,800 | 6,400 | 14,500 | 13,500 | 16,500 | 94,200 | 18,800 | 81,200 | 89,600 | 16,500 |
| 24 | 14,000 | 9,000 | 6,800 | 6,400 | 13,500 | 12,500 | 16,000 | 92,400 | 17,500 | 68,600 | 50,500 | 16,500 |
| 25 | *13,000 | 9,000 | 6,800 | 6,000 | 12,000 | 12,000 | 16,000 | 85,400 | 17,500 | 40,500 | 30,000 | 17,500 |
| 26 | 15,000 | * 7,200 | 6,800 | 6,000 | 12,000 | 11,000 | 15,000 | 57,400 | 18,000 | 36,200 | 26,800 | 18,800 |
| 27 | 17,500 | 8,500 | * 6,400 | 6,000 | 14,000 | 13,000 | 14,000 | 39,400 | 18,000 | 30,000 | 20,400 | 18,800 |
| 28 | 19,600 | 8,000 | 7,200 | 5,900 | 12,000 | *96,600 | 14,000 | 30,000 | 17,500 | 65,800 | * 19,600 | 17,500 |
| 29 | 17,000 | | 7,200 | *5,800 | 11,000 | 37,300 | 13,000 | 35,100 | 15,500 | 49,400 | 25,200 | 17,500 |
| 30 | 15,000 | | 7,000 | 5,900 | 11,000 | 50,500 | 10,500 | 33,200 | *15,000 | 46,100 | 23,600 | 20,400 |
| 31 | 14,000 | | 7,000 | | 11,000 | | * 8,000 | 31,600 | | 43,800 | | 17,500 |
| TOTAL | 756,000 | 334,200 | 318,700 | 211,300 | 475,700 | 516,800 | 887,300 | 1,083,200 | 614,200 | 1,228,400 | 1,471,400 | 1,123,800 |
| MEAN | 24,390 | 11,940 | 10,280 | 7,040 | 15,340 | 17,230 | 28,620 | 34,940 | 20,470 | 39,620 | 49,050 | 36,250 |
| LSKM | | | | | | | | | | | | |
| CM | | | | | | | | | | | | |
| HA-M | | | | | | | | | | | | |

ANNUAL MAX - 236,000 MIN - 5,800 MEAN - 24,720

PEAK DISCHARGE OBSERVED: DECEMBER 7, 5:00 P.M., 244,000 SECOND-LITERS, GAGE HEIGHT, 2.99 METERS.
* MAXIMUM OR MINIMUM.

Table D-1.3 Records of Discharge of the Magasawangtubig River

( $m^3$/scc )

| Year \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MNG.T.R. | | | | | | | | | | | | |
| 1957 | 20.60 | 13.00 | 10.62 | ※ 0.60 | ※ 0.48 | ※ 0.36 | ※ 3.34 | 6.88 | 15.80 | 18.68 | 20.60 | 11.80 |
| 58 | 7.66 | 17.72 | 10.94 | 2.72 | 0.76 | 0.92 | 4.06 | 7.92 | 13.80 | 28.65 | 21.72 | 21.72 |
| 59 | 17.72 | 12.60 | 11.58 | 1.10 | 0.76 | 3.16 | 5.44 | 7.20 | 5.86 | 7.95 | ※ 20.14 | ※ 5.92 |
| 60 | ※ 5.58 | ※ 5.92 | ※ 2.36 | 1.94 | 2.78 | 1.52 | 3.88 | ※ 2.99 | ※ 0.78 | ※ 2.99 | 93.20 | 56.20 |
| 61 | 64.20 | 40.20 | 7.14 | 3.20 | 1.31 | 10.59 | 10.59 | 10.59 | 12.30 | 21.42 | 39.60 | 46.60 |
| Mode | 17.72 | 13.00 | 10.62 | 1.94 | 0.76 | 1.52 | 4.06 | 7.20 | 12.30 | 18.68 | 21.72 | 21.72 |
| MIN | 5.58 | 5.92 | 2.36 | 0.60 | 0.48 | 0.36 | 3.34 | 2.99 | 0.78 | 2.99 | 20.14 | 5.92 |

Table D-1.4 Records of Minimum Dischage of the Pangalaan River

( $m^3$/scc )

| Year \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1951 | | | | | | | | | | 7.50 | 9.75 | 9.50 |
| 1952 | (1) 9.25 | (8) 31.25 | (7) 19.70 | (5) 8.30 | (4) 7.50 | (4) 7.50 | (6) 14.30 | (9) 37.00 | (7) 20.00 | (8) 35.40 | | |
| 1953 | | | | | | | | | | | (6) 29.20 | (8) 69.20 |
| 1954 | (6) 32.80 | (7) 29.20 | (9) 39.40 | (7) 12.10 | (6) 13.85 | (6) 9.70 | (5) 10.50 | (6) 16.10 | (2) 8.90 | (1) 8.50 | (1) 9.70 | (8) 64.40 |
| 1955 | (9) 66.00 | (5) 20.50 | (5) 16.10 | (8) 16.10 | (7) 15.20 | (8) 15.20 | (7) 21.00 | (7) 19.00 | (6) 15.65 | (7) 24.40 | (9) 38.80 | (4) 37.60 |
| 1956 | (5) 31.00 | (9) 32.20 | (8) 33.40 | (9) 26.80 | (9) 23.20 | (9) 21.00 | (8) 22.00 | (8) 25.00 | (9) 28.00 | (9) 38.80 | (3) 17.00 | (7) 49.10 |
| 1957 | (8) 51.00 | (2) 8.80 | (2) 7.60 | (3) 7.30 | (2) 5.80 | (1) 5.00 | (3) 7.30 | (2) 6.80 | (3) 10.80 | (3) 10.80 | (8) 31.60 | (5) 38.00 |
| 1958 | (7) 34.80 | (3) 14.60 | (3) 9.70 | (4) 7.60 | (2) 5.80 | (3) 5.80 | (2) 5.00 | (1) 5.80 | (1) 5.20 | (5) 12.80 | (6) 29.20 | (2) 17.00 |
| 1959 | (3) 16.10 | (4) 17.00 | (6) 17.00 | (1) 5.70 | (1) 5.30 | (2) 5.70 | (1) 4.90 | (4) 10.90 | (4) 11.30 | (4) 12.10 | (5) 20.50 | (6) 47.00 |
| 1960 | (4) 25.00 | (6) 28.60 | (4) 12.50 | (6) 8.50 | (8) 15.65 | (7) 10.50 | (9) 24.20 | (5) 15.20 | (8) 21.20 | (2) 8.80 | (2) 15.20 | (3) 18.20 |
| 1961 | (2) 13.00 | (1) 7.20 | (1) 6.40 | (2) 5.80 | (5) 7.60 | (5) 9.00 | (4) 8.00 | (3) 7.60 | (5) 15.00 | (6) 15.50 | (4) 19.60 | (1) 16.50 |
| Mode | 31.00 | 20.50 | 16.10 | 8.30 | 7.60 | 9.00 | 10.50 | 15.20 | 15.00 | 12.80 | 20.50 | 47.00 |
| MIN | 9.25 | 7.20 | 6.40 | 5.70 | 5.30 | 5.00 | 4.90 | 5.80 | 5.20 | 8.50 | 9.70 | 16.50 |

(Precedence in ( ) )

Fig D-1-a

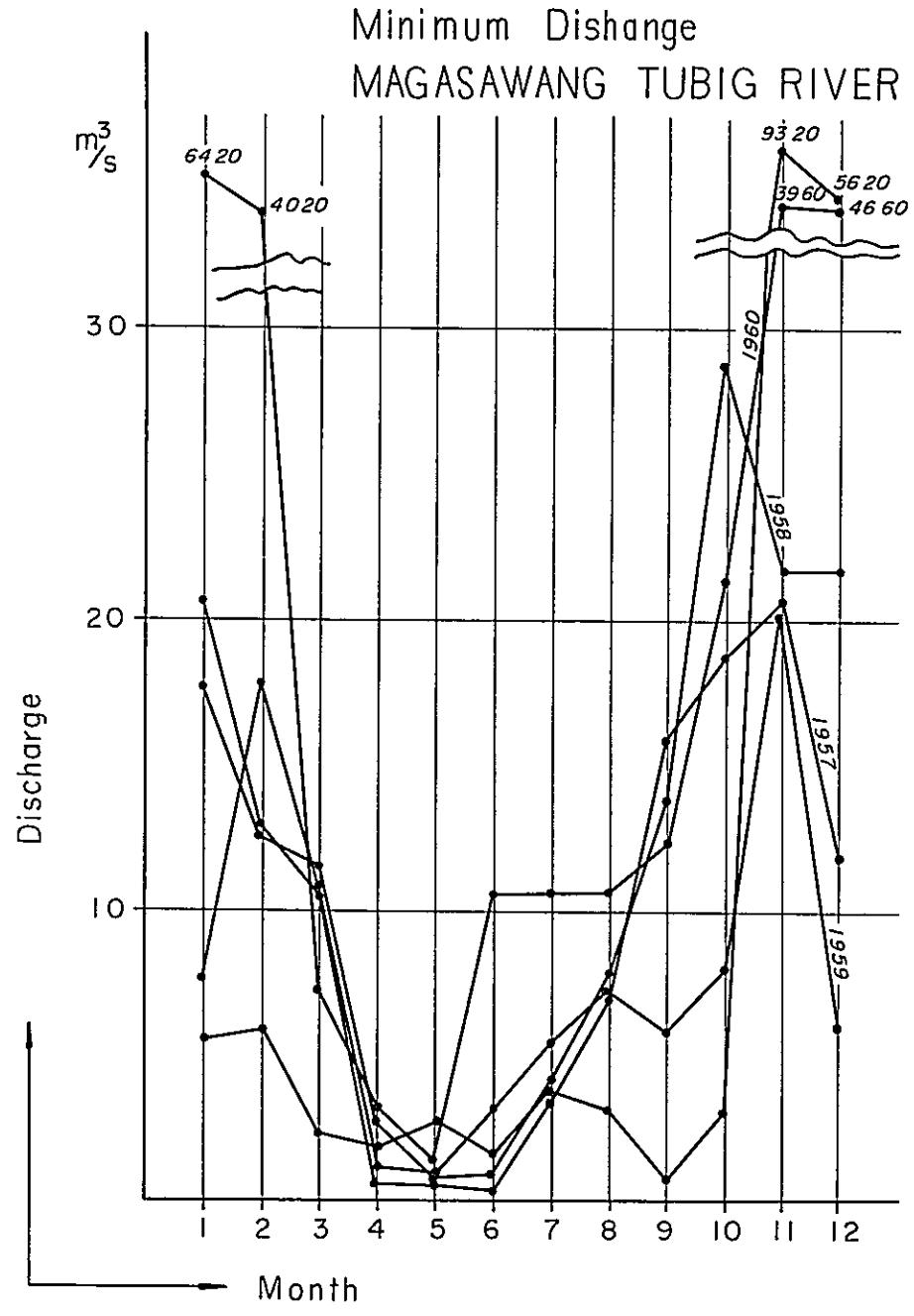
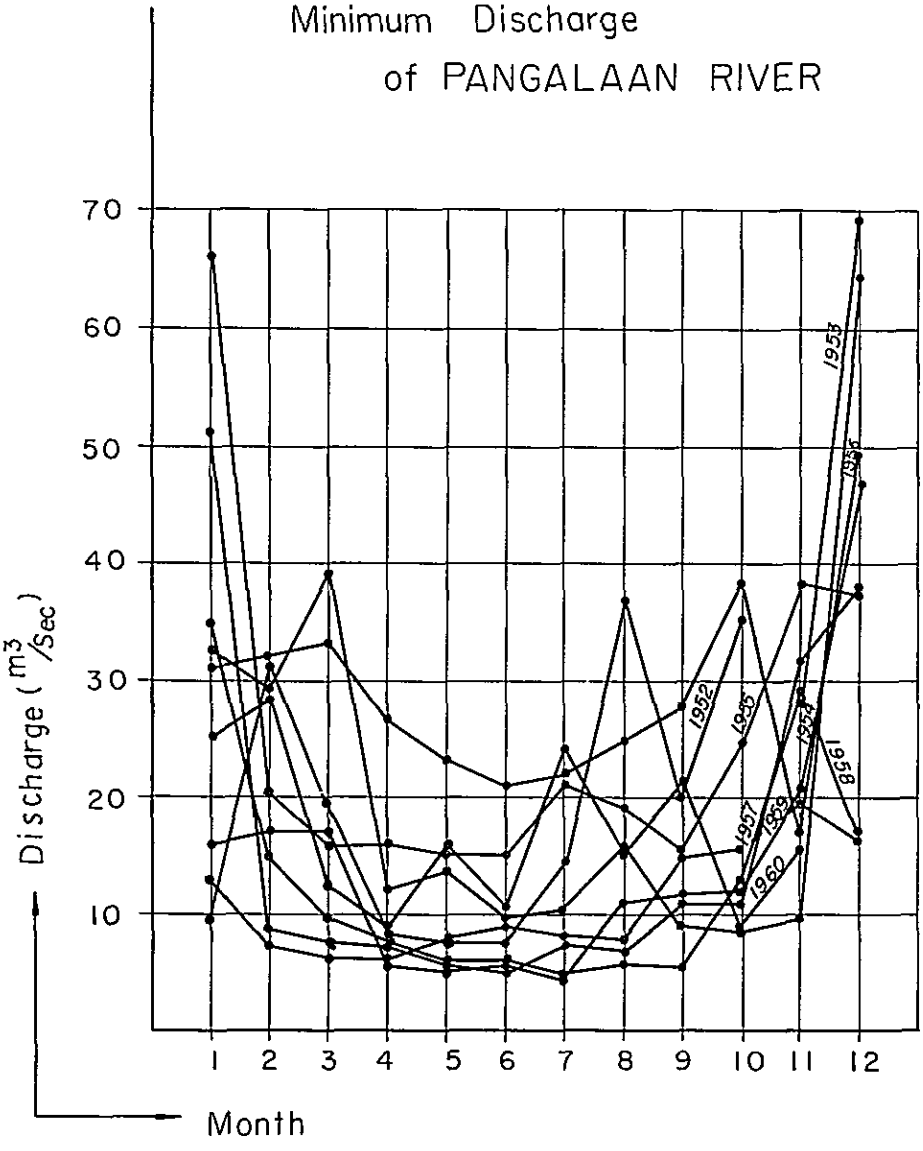

Minimum Dishange
MAGASAWANG TUBIG RIVER
m3/s
6420
4020
9320
5620
3960
4660
30
20
10
1960
1958
1957
1959
Discharge
1 2 3 4 5 6 7 8 9 10 11 12
Month

Fig. D – I – b


Minimum Discharge
of PANGALAAN RIVER
70
60
50
40
30
20
10
Discharge ( m3 /Sec )
1 2 3 4 5 6 7 8 9 10 11 12
Month
1958
1956
1952
1955
1954
1958
1957
1959
1960

D-1.5 Calculation of Discharge Probability

As the diversion ratio of discharge of the Magasawangtubig river and the Pangalaan river is not stable, discharge probabilities of the two rivers calculated are not reliable. Therefore, flood discharge, and minimum discharge of the two rivers are combined to give maximum and minimum discharge probability after further calculation by Iwai formula. The results of the calculation are as in the following table.

(a) Maximum Precipitation (Magasawang + Pangalaan)

| Total | $x_i$ | $\log x_i$ | $x_i+b$ | $\log(x_i+b)$ | $\log\frac{x_i+b}{x_0+b}$ | $(\log\frac{x_i+b}{x_i+b})^2$ |
|---|---|---|---|---|---|---|
| 1 | 1.0 7 5 | 3.0 3 1 | 6 8 8 | 2.8 3 8 | 0.4 7 6 | 0.2 2 6 6 |
| 2 | 6 4 0 | 2.8 0 6 | 2 5 3 | 2.4 0 3 | 0.0 4 1 | 0.0 0 1 7 |
| 3 | 5 3 9 | 2.7 3 1 | 1 5 2 | 2.1 8 2 | −0.1 8 0 | 0.0 3 2 4 |
| 4 | 5 2 1 | 2.7 1 7 | 1 3 4 | 2.1 2 7 | −0.2 3 5 | 0.0 5 5 2 |
| 5 | 4 6 4 | 2.6 6 7 | 7 7 | 1.8 8 6 | −0.4 7 6 | 0.2 2 6 6 |
| Total | | 1 3.9 5 2 | | | | 0.5 4 2 5 |

$$\log x_0=\frac{\Sigma \log x_i}{n}=\frac{13.952}{10}=1.359$$

$$\therefore\quad x=616.9$$

$$b=\frac{x_s x_t-{x_0}^2}{2x_0-(x_s+x_t)}=-387 \qquad \log(x_0+b)=\log(616.9-387)=2,362$$

$$\sqrt{2}C=\frac{1}{\sqrt{\frac{1}{n-1}\Sigma\left|\log\frac{x_t+b}{x_0+b}\right|^2}}=\frac{1}{\sqrt{\frac{1}{5-1}\times 0.5425}}=2.77$$

| $\frac{1}{T}$ | $\sqrt{2}\varepsilon$ | $\sqrt{2}C$ | $\log\frac{x_i+b}{x_0+b}$ | $\log(x_0+b)$ | $\log(x_i+b)$ | $x_i+b$ | $b$ | $x_i$ |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $a/b=c$ | $d$ | $c+d$ | $e$ | $f$ | $e-f$ |
| $\frac{1}{5}$ | 0.84 1 6 | 2.7 7 | 0.3 0 4 | 2.3 6 2 | 2.6 6 6 | 4 6 3.5 | −387 | 8 5 0.5 |
| $\frac{1}{10}$ | 1.2 8 1 6 | 2.7 7 | 0.4 6 5 | 〃 | 2.8 2 7 | 6 7 1.5 | −387 | 1,0 5 8.0 |
| $\frac{1}{20}$ | 1.6 4 4 9 | 2.7 7 | 0.5 9 5 | 〃 | 2.9 5 7 | 9 0 6.0 | −387 | 1,2 9 3.0 |
| $\frac{1}{100}$ | 2.3 2 6 3 | 2.7 7 | 0.8 4 0 | 〃 | 3.2 0 2 | 1 5 9 3 | −387 | 1,9 8 0.0 |

(b) Minimun Discharge (Magasawang + Pangalaan)

| Precedence | $x_i$ | $\log x_i$ | $x_i + b$ | $\log(x_i+b)$ | $\log\frac{x_i+b}{x_o+b}$ | $\left\{\log\frac{x_i+b}{x_i+b}\right\}^2$ |
|---|---|---|---|---|---|---|
| 1 | 5.3 6 | 0.7 2 9 | Same as $x_i$ | Same as $\log x_i$ | −0.1 9 2 | 0.0 3 6 9 |
| 2 | 7.3 6 | 0.8 6 7 | | | −0.0 5 4 | 0.0 0 2 9 |
| 3 | 9.3 4 | 0.9 7 0 | | | 0.0 4 9 | 0.0 0 2 4 |
| 4 | 9.6 6 | 0.9 8 5 | | | 0.0 6 4 | 0.0 0 4 1 |
| 5 | 1 1.2 8 | 1.0 5 2 | | | 0.1 3 1 | 0.0 1 7 2 |
| Total | | 4.6 0 3 | | | | 0.0 6 3 5 |

$$\log x_o = \frac{\Sigma \log x_i}{n} = \frac{4.603}{5} = 0.9206$$

$$\therefore \quad x_o = 8.33$$

$$b = \frac{x_s x_t - x_o^2}{2x_o - (x_s + x_t)} = \frac{5.36 \times 11.28 - 8.33^2}{2 \times 8.33 - (5.36 + 11.28)} = 446.5$$

$|b| > x_{min}$ $\qquad b = o$

$$-\sqrt{2}\,C = \frac{1}{\sqrt{\frac{1}{5-1} \times 0.0635}} = -7.94$$

| $\frac{1}{T}$ | $\sqrt{2}\,\varepsilon$ | $\sqrt{2}\,c$ | $\log\frac{x_i+b}{x_o+b}$ | $\log(x_o+b)$ | $\log(x_i+b)$ | $x_i + b$ | $b$ | $x_i$ |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $a/b=c$ | $d$ | $c+d$ | $e$ | $f$ | $e-f$ |
| $\frac{1}{5}$ | 0.8416 | −7.94 | −0.106 | 0921 | 0815 | 653 | 0 | 653 |
| $\frac{1}{10}$ | 12816 | −7.94 | −0.161 | 09 21 | 0.760 | 5.75 | 0 | 5.75 |
| $\frac{1}{20}$ | 1.6449 | −7.94 | −0.207 | 0921 | 0.714 | 5.18 | 0 | 518 |
| $\frac{1}{100}$ | 23263 | −7.94 | −0293 | 0.921 | 0.628 | 4.25 | 0 | 425 |

therefore,

| | | |
|---|---|---|
| Max.1/5 probability | 850.5 | $m^3$/sec |
| 1/10 probability | 1,058.5 | " |
| Min.1/5 probability | 6.53 | " |
| 1/10 probability | 5.75 | " |

Minimum discharge of the Magasawantubig river sna Pangalaan river, in terms of diversion ratio at the time of minimum flow is Mag.,; Pan. 1:4. Discharge share of the Pangalaan river for 5.75 $m^3$/sec. of 1/10 discharge probability of the Magasawangtubig and Pangalaan rivers combined is obtained as in the following.

$$5.75 \times 0.8 = 4.6 \ m^3/sec \qquad 4.5 \ m^3/sec$$
(Planned Irrigation Capacity)

Therefore, the discharge of the river is sufficient enough to maintain 4.5 m/sec. of planned irrigation capacity.

D - 2 Discharge Data of the River in Sanmiguel Alangalaang District

The record of discharge survey of the Mainit river by B.P.W. is as in table D-2.1.

# Table D-2-1 Discharge Data of the Mainit River

LOCATION: LAT. 11° 13' 21", LONG. 124° 49' 30" AT THE HIGHWAY BRIDGE ON THE TACLOBAN-ORMOC NATIONAL HIGHWAY.

DRAINAGE AREA: 98 SQ. KMS.

RECORDS AVAILABLE: APRIL, 1949 TO DECEMBER, 1959 (FRAGMENTARY): APRIL, 1949 TO DECEMBER, 1956 INCLUDED IN THE WATER SUPPLY BULLETIN NO. 2, VOL. 1.

GAGE: WATER STAGE RECORDER. ELEVATION OF ZERO OF GAGE IS 30.95 METERS REFERRED TO BM #504. PRIOR TO MAY 12, 1956, STAFF GAGE AT SAME SITE AND DATUM.

EXTREMES: 1957-59: MAXIMUM DISCHARGE, 404,000 SECOND-LITERS, JANUARY 6, 1957, GAGE HEIGHT, 4.20 M.; MINIMUM DISCHARGE OBSERVED, 2,650 SECOND-LITERS, SEPTEMBER 30, 1957, GAGE HEIGHT, 0.49 M.
1949-59: MAXIMUM DISCHARGE OBSERVED, 425,000 SECOND-LITERS, NOVEMBER 2, 1949, GAGE HEIGHT, 4.35 M.; MINIMUM DISCHARGE OBSERVED, 2,400 SECOND-LITERS, JULY 6, 1952 GAGE HEIGHT, 0.66 M.

REMARKS: RECORDS ARE GOOD EXCEPT THOSE ABOVE 70,000 SECOND-LITERS, WHICH ARE FAIR. BM #504 IS A STANDARD U.S. ARMY MARKER AT THE CENTER OF THE JUNCTION OF THE ROADS LEADING TO THE TOWNS OF JARO AND SAN MIGUEL, ABOUT 20 METERS FROM THE GAGE WITH AN ELEVATION OF 40.01 METERS REFERRED TO AN ASSUMED DATUM.

(1) 1957 ( $m^3/sec$ )

| DAY | JAN. | FEB. | MARCH | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 12,420 | 7,940 | 7,620 | 5,200 | 5,830 | 4,000 | 3,300 | 3,200 | 3,200 | *3,500 | 3,850 | 4,150 |
| 2 | 10,820 | *56,000 | 7,300 | 5,050 | 6,460 | 4,600 | 3,100 | 3,600 | 3,100 | 3,700 | 3,850 | 4,150 |
| 3 | 9,860 | 18,440 | 6,880 | 6,250 | *6,670 | 3,700 | *2,900 | 4,000 | 3,300 | 5,050 | 4,300 | 3,850 |
| 4 | * 7,940 | 17,870 | 6,670 | 6,460 | 6,460 | 3,400 | 2,900 | 3,400 | 3,000 | 5,200 | 3,700 | 3,700 |
| 5 | 7,940 | 12,420 | 6,250 | *6,670 | 5,830 | 3,400 | 2,900 | 3,200 | 3,000 | 4,450 | 3,700 | 3,600 |
| 6 | *150,800 | 10,500 | 8,260 | 6,250 | 6,250 | 3,850 | 3,200 | *3,100 | 3,000 | 4,300 | 3,850 | 3,850 |
| 7 | 32,060 | 9,860 | 9,860 | 5,830 | 5,830 | 3,500 | 3,000 | 3,100 | 3,000 | 3,850 | 4,150 | 3,850 |
| 8 | 21,290 | 9,220 | 7,620 | 6,250 | 6,250 | 3,600 | 3,000 | 3,100 | 3,000 | 3,700 | 4,000 | 3,600 |
| 9 | 17,300 | 9,220 | *11,140 | 5,830 | 5,050 | 3,500 | *5,200 | 3,300 | 3,300 | 3,600 | 3,850 | 3,600 |
| 10 | 24,440 | 8,580 | 9,860 | 5,620 | 4,900 | 3,500 | 4,000 | 4,150 | 3,200 | 3,600 | 3,850 | *3,500 |
| 11 | 19,580 | 8,580 | 8,580 | 5,410 | 4,750 | 3,400 | 3,600 | *4,450 | 3,100 | 3,600 | *4,900 | 3,600 |
| 12 | 20,720 | 9,860 | 7,940 | 5,620 | 4,750 | 3,400 | 3,400 | 3,850 | 3,200 | 4,750 | 4,150 | 4,000 |
| 13 | 21,290 | 13,700 | 7,300 | 5,200 | 4,450 | 3,500 | 5,200 | 4,300 | 3,100 | 5,620 | 3,850 | 3,600 |
| 14 | 23,720 | 14,780 | 6,670 | 5,410 | 4,300 | 3,500 | 4,300 | 3,600 | 3,100 | 4,300 | 3,700 | 3,600 |
| 15 | 25,160 | 20,720 | 6,460 | 5,410 | 4,150 | 3,400 | 3,850 | 3,500 | 3,400 | 4,150 | 3,700 | 3,500 |
| 16 | 21,290 | 19,010 | 6,250 | 5,830 | 4,150 | 3,400 | 3,850 | 3,400 | 3,400 | 3,850 | 3,850 | 3,500 |
| 17 | 19,580 | 12,100 | 6,040 | 5,410 | 4,000 | 3,400 | 3,600 | 3,400 | 3,000 | 4,150 | 3,700 | 3,500 |
| 18 | 20,150 | 10,180 | 5,830 | 4,900 | 4,000 | 3,400 | 3,700 | 3,300 | 3,000 | 3,850 | 3,600 | *4,600 |
| 19 | 19,010 | 10,500 | 6,040 | *4,750 | 4,000 | 3,300 | 4,000 | 3,200 | *3,700 | 4,450 | 4,450 | 4,000 |
| 20 | 16,220 | 9,220 | 6,670 | 4,750 | 4,000 | 3,300 | 4,900 | 3,300 | 3,200 | 4,000 | 3,850 | 4,300 |
| 21 | 21,290 | 8,260 | 6,040 | 6,040 | 4,000 | 3,300 | 4,000 | 3,200 | 3,100 | 3,850 | 3,600 | 4,450 |
| 22 | 14,780 | 7,620 | 5,620 | 4,900 | 3,850 | 3,300 | 3,850 | 3,200 | 3,100 | 4,450 | 3,600 | 4,000 |
| 23 | 14,060 | 7,300 | 5,410 | 4,750 | 3,850 | 3,400 | 3,700 | 3,100 | 3,100 | *7,300 | *3,500 | 4,000 |
| 24 | 13,060 | 6,880 | 5,200 | 4,900 | 3,700 | 3,400 | 3,400 | 3,100 | 3,000 | 4,600 | 3,500 | 3,700 |
| 25 | 12,420 | * 6,670 | 5,050 | 4,750 | *3,600 | 3,850 | 3,300 | 3,100 | 3,000 | 4,450 | 3,600 | 3,600 |
| 26 | 12,100 | 6,670 | 5,050 | 5,050 | 3,700 | *5,200 | 3,400 | 3,400 | 3,000 | 4,150 | 3,700 | 3,600 |
| 27 | 13,700 | 7,090 | 5,050 | 5,050 | 3,700 | 3,700 | 3,400 | 3,500 | 2,900 | 4,600 | 4,600 | 3,500 |
| 28 | 11,780 | 10,180 | 5,050 | 5,050 | 3,700 | 3,200 | 3,300 | 3,200 | 2,800 | 4,450 | 4,300 | 3,500 |
| 29 | 10,820 | | 5,200 | 5,410 | 3,600 | 3,200 | 3,300 | 3,100 | *2,700 | 4,000 | 4,750 | 3,500 |
| 30 | 10,180 | | * 4,900 | 6,460 | 3,600 | *3,100 | 3,200 | 3,200 | 3,000 | 3,850 | 4,600 | 3,500 |
| 31 | 9,540 | | 5,620 | | 3,600 | | 3,200 | 3,300 | | 4,450 | | 3,700 |
| TOTAL | 645,320 | 349,370 | 207,430 | 164,460 | 142,980 | 106,700 | 111,950 | 105,850 | 93,000 | 133,820 | 118,600 | 117,100 |
| MEAN | 20,820 | 12,480 | 6,690 | 5,480 | 4,610 | 3,560 | 3,610 | 3,410 | 3,100 | 4,320 | 3,950 | 3,780 |
| LSKM | 212.45 | 127.35 | 68.26 | 55.92 | 47.04 | 36.33 | 36.84 | 34.80 | 31.63 | 44.08 | 40.31 | 38.57 |
| CM | 56.89 | 30.81 | 18.28 | 14.49 | 12.60 | 9.42 | 9.87 | 9.32 | 8.20 | 11.80 | 10.45 | 10.33 |
| HA-M | 5,580 | 3,020 | 1,790 | 1,420 | 1,240 | 920 | 970 | 910 | 800 | 1,160 | 1,020 | 1,010 |

ANNUAL MAX - 150,800 MIN - 2,700 MEAN - 6,290 LSKM - 64.18 CM - 202.46 HA-M - 19,860

PEAK DISCHARGE: JAN. 6, 1:25 PM., 404,000 SECOND-LITERS, GAGE HEIGHT, 4.20 METERS.
* MAXIMUM OR MINIMUM

(2) 1958 ( $m^3$/sec )

| DAY | JAN. | FEB. | MARCH | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4,000 | 5,830 | 11,460 | | 7,300 | 4,150 | | *3,200 | 3,850 | 5,620 | 5,830 | 8,900 |
| 2 | 3,600 | 5,830 | 7,940 | 5,620 | 6,460 | 4,000 | 5,050 | 3,400 | 3,850 | 4,900 | 5,830 | |
| 3 | 4,150 | 6,250 | 6,880 | | | 3,850 | | 3,400 | 4,450 | 4,900 | 5,410 | 7,300 |
| 4 | 4,300 | 5,620 | 8,900 | 4,600 | | 4,600 | 11,140 | 3,300 | 4,600 | 5,830 | 5,050 | |
| 5 | 6,460 | 4,900 | 6,040 | | 4,450 | 4,150 | | 3,300 | 4,900 | 4,600 | 5,620 | 6,880 |
| 6 | 5,410 | 4,750 | 8,900 | | 4,300 | 4,300 | | 4,450 | *6,880 | 4,750 | 5,830 | |
| 7 | 4,300 | | 7,300 | 4,900 | 4,300 | 3,850 | 5,050 | 3,850 | 5,050 | 4,450 | 5,050 | |
| 8 | | | | 4,450 | 4,150 | 3,700 | | 3,700 | 4,750 | 4,000 | 6,880 | 38,570 |
| 9 | | | | 4,450 | 4,300 | 3,700 | 4,750 | 3,600 | 4,600 | 3,850 | 5,830 | |
| 10 | | | 9,860 | 4,450 | 4,150 | 3,500 | 4,000 | 3,600 | 4,300 | * 3,700 | 5,410 | 14,420 |
| 11 | | | | 4,450 | | 4,150 | 3,850 | 3,850 | 4,150 | 3,700 | 7,300 | |
| 12 | | | 6,670 | 4,450 | 4,300 | | 3,600 | 5,050 | 4,000 | 3,850 | 6,670 | 13,060 |
| 13 | | | | 4,450 | | 3,700 | 3,500 | 5,410 | 3,850 | 3,700 | 5,830 | |
| 14 | | | 5,830 | 4,300 | 4,150 | | 3,300 | 4,150 | 4,000 | 4,750 | 5,830 | |
| 15 | | | | 4,450 | | | 3,200 | 4,750 | 3,700 | 4,300 | 5,410 | 10,180 |
| 16 | | | | 4,300 | 4,150 | 3,600 | 3,200 | 4,150 | 3,700 | 4,300 | 8,900 | 9,220 |
| 17 | | 7,090 | 5,830 | 4,450 | 4,150 | | 3,200 | 4,150 | 4,000 | 4,600 | 10,180 | 8,900 |
| 18 | | | | 4,750 | 4,000 | 3,700 | 3,200 | 4,000 | 4,150 | 4,300 | 10,180 | 8,580 |
| 19 | | 6,250 | 5,410 | 4,450 | 4,000 | | 3,200 | 3,850 | 3,600 | 4,150 | 7,940 | 8,580 |
| 20 | | | | 4,600 | 3,850 | 3,850 | 3,200 | 3,600 | 3,600 | 10,500 | 11,460 | 9,860 |
| 21 | | 6,250 | 5,050 | 5,050 | 3,850 | | 3,200 | 4,600 | 3,600 | *17,870 | 8,580 | 8,260 |
| 22 | | 6,040 | | 4,600 | 3,850 | | 3,200 | 5,620 | 3,600 | 10,500 | 14,420 | 7,940 |
| 23 | | 5,830 | | 4,300 | 3,850 | 3,850 | 3,200 | 5,050 | 3,850 | 6,880 | 9,220 | 7,300 |
| 24 | 28,760 | 5,830 | 4,750 | 4,450 | | | 3,200 | 4,600 | 4,450 | 6,040 | 8,260 | 7,090 |
| 25 | 12,100 | | 4,750 | 8,580 | 4,000 | 6,670 | 3,200 | 4,600 | 4,600 | 5,410 | 7,940 | 6,880 |
| 26 | 8,900 | 6,460 | 4,750 | 5,620 | | | 3,300 | 4,150 | 4,150 | 5,050 | 7,300 | 6,880 |
| 27 | 7,090 | | 4,750 | 5,410 | | 3,850 | 3,200 | *6,250 | *3,500 | 6,460 | 6,880 | 6,670 |
| 28 | 6,670 | 9,860 | 4,750 | 5,050 | 4,000 | | 3,200 | 5,200 | 3,600 | 13,060 | 6,880 | 6,670 |
| 29 | 6,460 | | 4,600 | 4,900 | | 4,000 | 3,200 | 4,600 | 3,600 | 8,900 | | 6,670 |
| 30 | 6,250 | | 4,750 | 6,460 | 4,000 | | 3,200 | 4,150 | 4,000 | 6,670 | | 6,460 |
| 31 | 5,830 | | 5,200 | | 4,150 | | 3,300 | 4,000 | | 6,040 | | |
| TOTAL | | | | | | | | 131,580 | 124,930 | 187,630 | | |
| MEAN | | | | | | | | 4,240 | 4,160 | 6,050 | | |
| LSKM | | | | | | | | 43.26 | 42.45 | 61.73 | | |
| CM | | | | | | | | 11.59 | 11.00 | 16.53 | | |
| HA-M | | | | | | | | 1,140 | 1,080 | 1,620 | | |

PEAK DISCHARGE: DEC. 6, 3:50 PM., 134,000 SECOND-LITERS, GAGE HEIGHT, 2.20 METERS.
* MAXIMUM OR MINIMUM

(3) 1959 ( $m^3$/sec )

| DAY | JAN. | FEB. | MARCH | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 8,580 | 12,420 | 6,460 | 6,460 | 4,300 | 3,700 | 3,300 | 3,300 | 4,000 | 6,670 |
| 2 | 8,900 | 6,040 | * 6,880 | 9,860 | 6,670 | 8,580 | | 4,150 | 3,300 | 3,400 | 4,150 | 4,900 |
| 3 | | | 6,880 | 11,140 | 6,670 | 7,090 | 4,450 | 4,000 | 3,300 | 3,500 | 4,150 | 4,750 |
| 4 | | 6,040 | 14,420 | 10,180 | 6,460 | 5,620 | 4,300 | 3,850 | 3,300 | 3,300 | 4,000 | 4,600 |
| 5 | 7,620 | | 9,860 | 9,540 | 6,040 | 5,200 | 4,300 | *4,300 | 3,300 | 3,300 | * 3,700 | 4,600 |
| 6 | | 5,830 | 8,260 | 9,220 | 6,040 | 5,050 | 4,150 | 3,850 | 3,300 | | 3,700 | 5,410 |
| 7 | 7,620 | | 7,940 | | 6,040 | 4,900 | 4,450 | 3,700 | 3,300 | 3,300 | 3,700 | 5,050 |
| 8 | | | 7,300 | 8,260 | 6,040 | 4,900 | 5,050 | 3,700 | 3,300 | 3,500 | 3,700 | 4,450 |
| 9 | 8,900 | 6,670 | 7,300 | | 6,040 | 4,750 | 5,410 | 3,700 | 3,300 | 3,500 | 3,700 | 4,450 |
| 10 | | 5,620 | 6,880 | 7,620 | 6,250 | 4,600 | 4,750 | 3,600 | 3,300 | 3,500 | 3,700 | 4,450 |
| 11 | | 5,620 | 6,880 | | 8,900 | 4,450 | 4,450 | 3,600 | 3,300 | 3,500 | 3,700 | 4,450 |
| 12 | 7,940 | 5,410 | 7,090 | | 7,620 | 4,450 | 4,600 | 3,600 | 3,300 | 3,500 | 3,700 | 4,900 |
| 13 | 24,440 | 5,620 | 12,100 | 7,090 | 6,460 | 4,450 | 4,300 | 3,600 | 3,300 | 3,500 | 3,700 | 4,750 |
| 14 | 20,150 | 5,620 | 11,460 | | 7,940 | 4,300 | 4,150 | 3,600 | 3,300 | 3,500 | 3,700 | 4,750 |
| 15 | | 5,830 | *24,440 | 8,580 | 9,860 | 4,300 | 4,000 | 3,500 | 3,300 | 3,400 | 4,600 | 4,450 |
| 16 | 7,300 | 6,250 | 11,780 | | 9,540 | 4,300 | 4,000 | 3,500 | 3,300 | 3,300 | *46,850 | *4,300 |
| 17 | | 5,830 | 9,860 | 7,300 | 7,620 | 4,450 | 4,000 | 3,700 | *3,200 | 3,700 | 11,140 | 4,450 |
| 18 | | 5,410 | 9,860 | | 7,300 | 4,300 | 4,000 | 3,850 | 3,200 | 3,600 | 7,090 | *123,200 |
| 19 | 6,670 | 5,200 | 14,060 | 28,760 | 7,300 | 4,300 | 3,850 | 4,000 | *4,600 | 4,000 | 6,250 | 30,200 |
| 20 | | 6,460 | 10,180 | 9,860 | 6,670 | 4,300 | 3,850 | 3,500 | 3,850 | 4,750 | 5,830 | 12,100 |
| 21 | 6,460 | 5,410 | 9,540 | | 6,460 | 4,150 | 3,850 | 3,600 | 3,600 | 4,150 | 5,620 | 10,180 |
| 22 | | 7,620 | 8,900 | 7,090 | 6,460 | 4,150 | 4,300 | 4,000 | 3,300 | 4,000 | 5,620 | 8,900 |
| 23 | 6,460 | 6,250 | 7,940 | 6,880 | 8,900 | 4,150 | 4,150 | 3,700 | 3,300 | 4,000 | 5,620 | 10,500 |
| 24 | | 6,040 | 9,220 | 6,670 | 6,670 | 4,300 | 3,850 | 3,500 | 3,400 | 4,300 | 7,300 | 14,780 |
| 25 | 6,460 | 6,460 | 8,260 | 6,670 | 6,250 | 5,050 | 4,750 | 3,700 | 3,300 | 4,000 | 8,580 | 10,500 |
| 26 | 9,540 | 5,410 | 7,620 | 6,460 | | 4,900 | 6,040 | 3,600 | 3,400 | 3,850 | 6,880 | 12,420 |
| 27 | | 5,200 | 7,300 | 6,460 | 6,880 | 6,670 | 4,750 | 3,500 | 3,300 | 4,000 | 6,040 | 12,100 |
| 28 | 7,300 | 5,050 | 7,090 | 6,460 | 6,250 | 4,300 | 5,200 | 3,500 | 3,300 | 4,000 | 5,620 | 10,500 |
| 29 | | | 8,580 | 6,670 | 6,880 | 4,150 | 4,300 | 3,700 | 3,300 | 3,850 | 5,200 | 9,540 |
| 30 | 6,460 | | 9,220 | 6,460 | 6,040 | | 4,300 | 3,500 | 3,300 | 3,700 | 5,830 | 7,300 |
| 31 | | | 11,780 | | 6,250 | | 4,000 | *3,400 | | 3,850 | | 9,860 |
| TOTAL | | | 297,460 | | | | | 114,700 | 101,150 | | 197,370 | 363,460 |
| MEAN | | | 9,600 | | | | | 3,700 | 3,370 | | 6,580 | 11,720 |
| LSKM | | | 97.96 | | | | | 37.76 | 34.39 | | 67.14 | 119.59 |
| CM | | | 26,23 | | | | | 10.11 | 8.91 | | 17.40 | 32.03 |
| HA-M | | | 2,570 | | | | | 990 | 870 | | 1,700 | 3,140 |

PEAK DISCHARGE: DEC. 18, 4:00 PM., 329,800 SECOND-LITERS, GAGE HEIGHT, 3.67 METERS.
* MAXIMUM OR MINIMUM

(4) 1960 ( $m^3$/sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7,940 | 6,460 | 4,750 | * 4,000 | *6,250 | 5,050 | 4,600 | 4,450 | 3,300 | * 5,050 | 7,940 | 8,400 |
| 2 | 7,090 | 6,880 | 4,750 | 4,000 | 6,040 | 5,050 | *5,050 | 4,450 | 3,400 | 5,050 | 8,580 | 7,650 |
| 3 | 6,880 | 6,670 | 4,750 | 4,000 | 5,830 | 5,050 | 4,600 | *5,830 | 3,400 | 5,830 | 9,540 | 7,400 |
| 4 | 6,460 | 6,460 | 4,750 | 4,000 | 5,620 | 5,050 | 4,750 | 4,450 | 3,400 | 5,200 | 8,900 | 7,150 |
| 5 | *12,420 | 6,460 | 4,600 | 4,000 | 5,410 | 5,050 | 4,600 | 3,850 | 3,400 | 11,140 | 9,220 | 6,900 |
| 6 | 8,260 | 6,670 | 4,600 | 4,000 | 5,410 | 5,050 | 4,600 | 3,600 | 3,400 | *142,400 | 7,940 | * 6,650 |
| 7 | 6,670 | *17,300 | 4,750 | 4,000 | 5,410 | 4,750 | 4,600 | 3,600 | 3,400 | 41,600 | 9,220 | 6,650 |
| 8 | 8,260 | 13,060 | 6,250 | 4,000 | 5,410 | 4,750 | 4,600 | 3,600 | 3,300 | 15,140 | 10,820 | 8,400 |
| 9 | 7,300 | 9,220 | 5,050 | 4,000 | 5,410 | 4,750 | 4,600 | 3,600 | 3,700 | 10,500 | 8,900 | 13,260 |
| 10 | 6,460 | 8,900 | 4,750 | 4,000 | 5,200 | 4,750 | 4,600 | 3,500 | 3,500 | 7,940 | 7,620 | 10,150 |
| 11 | 7,300 | 7,940 | 4,600 | 4,450 | 5,200 | 4,750 | 4,600 | 3,500 | 3,400 | 7,090 | 6,880 | 9,900 |
| 12 | 7,300 | 12,100 | 4,450 | 4,300 | 5,200 | 4,750 | 4,750 | 3,500 | 3,400 | 6,670 | 6,250 | 9,400 |
| 13 | 6,460 | 8,260 | 4,600 | 4,150 | 5,410 | 4,750 | 4,900 | 3,400 | 3,600 | 7,300 | 5,620 | 9,150 |
| 14 | 6,040 | 7,090 | 6,250 | 4,600 | 5,410 | 4,900 | 4,600 | 3,400 | 3,500 | 6,880 | 5,410 | 8,900 |
| 15 | 5,830 | 6,880 | 5,830 | 4,300 | 5,410 | *4,600 | 4,450 | 3,400 | 3,400 | 6,250 | 5,200 | 8,650 |
| 16 | 5,620 | 6,880 | 5,050 | 4,300 | 5,200 | 4,750 | 4,450 | 3,400 | 3,500 | 6,040 | 4,900 | 8,400 |
| 17 | * 5,410 | 6,460 | *10,180 | 4,600 | 5,200 | 4,600 | 4,450 | 4,000 | 3,600 | 6,040 | * 4,750 | 8,150 |
| 18 | 5,410 | 6,250 | 6,460 | 4,600 | *5,050 | 4,600 | 4,300 | 4,450 | 3,400 | 5,830 | 4,750 | 7,900 |
| 19 | 5,620 | 6,040 | 5,200 | 4,300 | 5,200 | 4,750 | 4,300 | 4,450 | 3,500 | 5,620 | 5,200 | 7,900 |
| 20 | 5,830 | 5,410 | 4,900 | 4,300 | 5,200 | 4,900 | 5,410 | 4,450 | 3,500 | 5,410 | 5,200 | 7,650 |
| 21 | 5,620 | 6,040 | 4,600 | 10,500 | 5,050 | 4,600 | 4,600 | 4,450 | 3,400 | 5,200 | 5,620 | 7,400 |
| 22 | 5,620 | 11,140 | 4,450 | *37,640 | 5,050 | 4,600 | 5,050 | 4,450 | 3,500 | 5,050 | 9,540 | 7,400 |
| 23 | 5,410 | 11,460 | 4,300 | 10,180 | 5,050 | 4,600 | 4,150 | 4,450 | *3,300 | 5,200 | *20,900 | 8,400 |
| 24 | 5,410 | 7,090 | 4,150 | 10,180 | 5,050 | 4,600 | 4,150 | 4,450 | 4,000 | 5,050 | 16,350 | 9,650 |
| 25 | 5,410 | 6,460 | 4,150 | 8,260 | 5,410 | 4,750 | 4,150 | 3,700 | 3,500 | 5,410 | 12,950 | 8,900 |
| 26 | 5,410 | 5,620 | 4,150 | 7,940 | 5,410 | *5,200 | 4,000 | *3,200 | 3,500 | 5,050 | 12,640 | 11,150 |
| 27 | 5,620 | 5,200 | 4,150 | 7,300 | 5,200 | 4,900 | 4,000 | 3,200 | 5,200 | 5,620 | 10,900 | 9,400 |
| 28 | 6,460 | 5,050 | 4,150 | 6,880 | 5,200 | 4,750 | 4,000 | 3,200 | 5,410 | 5,620 | 10,150 | 8,900 |
| 29 | 7,300 | * 4,900 | * 4,000 | 6,460 | 5,620 | 4,750 | 4,000 | 4,000 | *6,880 | 5,200 | 10,650 | *21,350 |
| 30 | 7,300 | | 4,000 | 6,460 | 5,200 | 4,600 | *3,850 | 3,700 | 5,200 | 6,460 | 9,150 | 11,400 |
| 31 | 6,880 | | 4,000 | | 5,200 | | 3,850 | 3,300 | | 7,300 | | 9,900 |
| TOTAL | 205,000 | 224,350 | 152,620 | 195,700 | 165,910 | 144,000 | 138,650 | 120,680 | 112,890 | 374,140 | 261,690 | 282,460 |
| MEAN | 6,610 | 7,740 | 4,920 | 6,520 | 5,350 | 4,800 | 4,470 | 3,890 | 3,760 | 12,070 | 8,720 | 9,110 |
| LSKM | 67.45 | 78.98 | 50.20 | 66.53 | 54.59 | 48.98 | 45.51 | 39.69 | 38.37 | 123.16 | 88.98 | 92.96 |
| CM | 18.06 | 19.79 | 13.44 | 17.24 | 14.62 | 12.70 | 12.19 | 10.63 | 9.95 | 32.98 | 23.06 | 24.89 |
| HA-M | 1,770 | 1,940 | 1,320 | 1,690 | 1,430 | 1,240 | 1,200 | 1,040 | 980 | 3,230 | 2,260 | 2,440 |

ANNUAL MAX - 142,400 MIN - 3,200 MEAN - 6,500 LSKM - 66.33 CM - 209.55 HA-M - 20,540

PEAK DISCHARGE: APR. 22, 2:00 AM., 244,400 SECOND-LITERS, GAGE HEIGHT, 3.06 METERS.

* MAXIMUM OR MINIMUM

(5) 1961 ( $m^3$/sec )

| DAY | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 9,650 | 11,150 | 10,650 | *8,150 | 5,300 | 4,860 | 3,420 | 2,900 | 3,030 | *2,500 | 3,420 | 7,900 |
| 2 | 9,150 | 21,800 | *14,870 | 6,650 | * 4,860 | 4,860 | 3,680 | 2,750 | 2,500 | 2,500 | 3,420 | 8,650 |
| 3 | 8,650 | 17,460 | 10,650 | 6,650 | 4,860 | 4,860 | 3,680 | 2,750 | 2,500 | 2,500 | 3,550 | 8,400 |
| 4 | 7,650 | 12,950 | 11,710 | 6,650 | 4,860 | 4,640 | 3,550 | 3,160 | 2,500 | 2,500 | 3,420 | 8,400 |
| 5 | 7,400 | 13,570 | 9,900 | 6,650 | 4,860 | *6,180 | 3,420 | 3,160 | 2,500 | 3,290 | * 3,160 | 8,900 |
| 6 | 7,400 | 14,870 | 9,150 | 6,180 | 4,860 | 4,640 | 3,420 | 3,030 | 2,500 | 2,900 | 3,160 | 8,400 |
| 7 | 6,900 | 11,400 | 9,150 | 6,180 | 5,960 | 4,640 | 3,160 | 3,160 | 2,450 | 2,900 | 3,160 | 7,900 |
| 8 | 7,150 | 10,650 | 8,900 | 5,960 | 4,860 | 4,420 | 3,160 | 3,160 | 2,400 | 3,030 | 3,420 | 8,150 |
| 9 | 7,150 | *25,500 | 9,150 | 5,960 | 4,860 | 4,420 | 3,030 | 3,420 | 2,300 | 2,900 | 4,070 | 10,150 |
| 10 | 6,900 | 21,800 | 7,900 | 7,650 | 5,300 | 4,420 | 3,160 | 3,030 | 2,300 | 2,750 | 3,680 | 8,150 |
| 11 | 10,150 | 20,450 | 7,650 | 7,900 | 7,650 | 4,200 | 3,160 | 2,900 | 2,300 | 2,900 | 3,680 | 7,400 |
| 12 | 8,400 | 12,330 | 9,400 | 5,960 | 6,180 | 4,200 | *2,900 | 2,750 | *2,250 | 3,030 | 3,420 | 7,150 |
| 13 | 7,400 | 11,150 | 8,650 | 5,740 | *12,640 | 4,200 | 2,900 | 2,900 | 2,300 | 2,900 | 5,740 | 6,650 |
| 14 | 7,150 | 9,900 | 10,150 | 5,740 | 7,150 | 4,200 | 2,900 | 4,860 | 2,450 | 2,900 | 4,200 | 8,400 |
| 15 | 6,900 | 9,650 | 8,900 | 5,740 | 6,650 | 4,070 | 2,900 | *8,400 | 2,400 | 2,750 | 4,860 | 7,650 |
| 16 | 6,900 | 12,330 | 13,880 | 5,740 | 8,400 | 4,070 | 2,900 | 3,810 | 2,300 | 3,030 | 7,400 | 7,150 |
| 17 | 7,150 | 16,350 | 11,400 | 5,740 | 6,180 | 3,940 | 2,900 | 3,810 | 2,750 | *4,650 | 7,150 | 6,650 |
| 18 | 6,900 | 12,020 | 10,400 | 5,520 | 5,960 | 3,940 | 2,900 | 3,290 | 2,900 | 4,420 | 5,740 | 6,400 |
| 19 | 6,650 | 10,900 | 9,150 | 5,520 | 5,520 | 3,810 | 2,900 | 3,160 | *3,290 | 3,680 | 5,520 | * 6,180 |
| 20 | 6,400 | 10,150 | 9,150 | 5,300 | 5,520 | 3,810 | 2,900 | 2,900 | 3,030 | 3,680 | 5,960 | 6,400 |
| 21 | * 6,400 | 9,650 | 8,400 | 5,080 | 5,740 | 3,680 | 3,030 | 2,600 | 2,600 | 3,680 | *42,800 | 6,650 |
| 22 | 6,400 | 9,150 | 8,650 | 5,080 | 5,300 | 3,680 | 3,160 | 2,600 | 2,600 | 3,810 | 12,950 | 6,180 |
| 23 | 6,400 | 8,650 | 8,900 | 5,080 | 5,300 | 3,680 | 3,030 | 2,600 | 3,160 | 4,420 | 9,900 | 5,960 |
| 24 | 6,400 | * 8,400 | 8,400 | 5,080 | 5,300 | 3,680 | 3,030 | 3,420 | 2,750 | 4,070 | 9,400 | 5,960 |
| 25 | 6,400 | 8,400 | 7,650 | *4,860 | 5,300 | 3,680 | 3,290 | 2,750 | 2,500 | 3,810 | 8,900 | 5,740 |
| 26 | 6,400 | 8,400 | 7,400 | 4,860 | 5,080 | 3,420 | *3,680 | 2,600 | 2,450 | 3,550 | 8,400 | 8,150 |
| 27 | *17,460 | 8,900 | 7,400 | 4,860 | 5,080 | 3,290 | 3,290 | 2,600 | 2,450 | 3,550 | 9,150 | 10,150 |
| 28 | 16,350 | 8,650 | 7,400 | 4,860 | 5,080 | 3,290 | 3,160 | 2,600 | 2,450 | 3,680 | 8,900 | *15,610 |
| 29 | 13,260 | | 7,400 | 4,260 | 5,080 | 3,290 | 3,160 | *2,450 | 2,450 | 3,680 | 8,400 | 11,710 |
| 30 | 12,330 | | 7,400 | 5,080 | 4,860 | *3,160 | 3,160 | 2,450 | 2,500 | 3,420 | 7,900 | 16,350 |
| 31 | 10,900 | | * 7,150 | | 4,860 | | 3,030 | 2,750 | | 3,420 | | 11,150 |
| TOTAL | 260,700 | 356,580 | 286,910 | 175,280 | 179,410 | 123,230 | 97,960 | 98,720 | 76,860 | 102,800 | 214,830 | 258,640 |
| MEAN | 8,410 | 12,740 | 9,260 | 5,840 | 5,790 | 4,110 | 3,160 | 3,180 | 2,560 | 3,320 | 7,160 | 8,340 |
| LSKM | 85.82 | 129.95 | 94.49 | 59.59 | 59.08 | 41.94 | 32.24 | 32.45 | 26.12 | 33.88 | 73.06 | 85.12 |
| CM | 22.98 | 31.43 | 25.30 | 15.45 | 15.82 | 10.87 | 8.63 | 8.69 | 6.77 | 9.07 | 18.94 | 22.80 |
| HA-M | 2,250 | 3,080 | 2,480 | 1,510 | 1,550 | 1,060 | 850 | 850 | 660 | 890 | 1,860 | 2,230 |

ANNUAL MAX - 42,800 MIN - 2,250 MEAN - 6,120 LSKM - 62.45 CM - 196.75 HA-M - 19,270

PEAK DISCHARGE: NOV. 20, 12:00 MN., 204,100 SECOND-LITERS, GAGE HEIGHT, 2.77 METERS.

* MAXIMUM OR MINIMUM

Table D-2-2 Minimum Discharge of the Mainit river

( $m^3/sec$ )

| | 1957 | 58 | 59 | 60 | 61 |
|---|---|---|---|---|---|
| | Min | Min | Min | Min | Min |
| 1 | 7.90 | 3.60 | 6.46 | 5.41 | 6.40 |
| 2 | 6.67 | 4.75 | 5.05 | 4.90 | 8.40 |
| 3 | 4.90 | 4.60 | 6.88 | 4.00 | 7.15 |
| 4 | 4.75 | 4.30 | 6.46 | 4.00 | 4.86 |
| 5 | 3.60 | 3.85 | 6.04 | 5.05 | 4.86 |
| 6 | 3.10 | 3.50 | 4.15 | 4.60 | 3.16 |
| 7 | 2.90 | 3.20 | 3.85 | 3.85 | 2.90 |
| 8 | 3.10 | 3.20 | 3.40 | 3.20 | 2.45 |
| 9 | 2.70 | 3.50 | 3.20 | 3.30 | 2.25 |
| 10 | 3.50 | 3.70 | 3.30 | 5.05 | 2.50 |
| 11 | 3.50 | 5.05 | 3.70 | 4.75 | 3.16 |
| 12 | 3.50 | 6.46 | 4.30 | 6.65 | 6.18 |

Fig. D-2-a

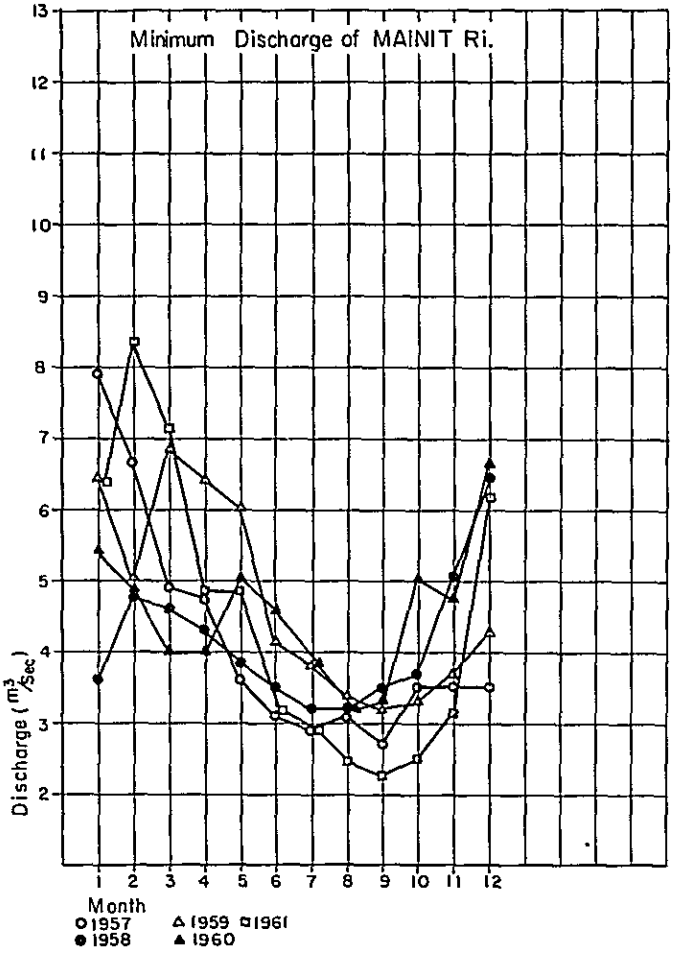



Table D-2-3 Calculation for the Probability Discharge Limit of the Rivers

(a) Yearly Maximum Discharge Limit ($m^3$/sec.)

| Precedence | $x_i$ | $log x_i$ | $x_i + b$ | $log x_i + b$ | $log \frac{x_i + b}{x_o + b}$ | $\{log \frac{x_1 + b}{x_o + b}\}^2$ |
|---|---|---|---|---|---|---|
| 1 | 4 0 4.0 | 2.6 0 6 | 5 3 2.9 | 2.7 2 7 | 0.1 5 3 5 | 0.0 2 3 6 |
| 2 | 3 2 9.8 | 2.5 1 8 | 4 5 8.7 | 2.6 6 2 | 0.0 8 8 4 | 0.0 0 7 8 |
| 3 | 2 4 4.4 | 2.3 8 8 | 3 7 3.3 | 2.5 7 2 | −0.0 0 1 1 | — |
| 4 | 2 0 4.1 | 2.3 1 0 | 3 3 0.0 | 2.5 2 2 | −0.0 5 0 7 | 0.0 0 2 6 |
| 5 | 1 3 4.0 | 2.1 2 7 | 2 6 2.9 | 2.4 2 0 | −0.1 5 3 3 | 0.0 2 3 5 |
| Total | | 1 1.9 4 9 | | | | 0.0 5 7 5 |

$$\log x_o = \frac{\Sigma \log x_i}{n} = \frac{11949}{5} = 23899$$

$$\therefore \quad x_o = 2454$$

$$b = \frac{x_s x_t - x_o^2}{2x_o - (x_s + x_t)} = 1289$$

$$\log(x_o + b) = \log(2454 + 1289) = 25731$$

$$\sqrt{2}C = 1 / \sqrt{\Sigma \frac{1}{n-1} \left\{ \log \frac{x_i + b}{x_o + b} \right\}^2} = 1 / \sqrt{\frac{1}{5-1} \times 0.0575} \fallingdotseq 8.3$$

| $\frac{1}{T}$ | $\sqrt{2}\varepsilon$ | $\sqrt{2}C$ | $\log\frac{x_i+b}{x_o+b}$ | $\log(x_o+b)$ | $\log(x_i+b)$ | $x_i+b$ | $b$ | $x_i$ |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $a/b=c$ | $d$ | $c+d$ | $e$ | $f$ | $e-f$ |
| 1/5 | 0.8416 | 8.33 | 0.1010 | 2.573 | 2.674 | 472.2 | 128.9 | 343.3 |
| 1/10 | 1.2816 | 〃 | 0.1538 | 〃 | 2.727 | 533.2 | 〃 | 404.3 |

## (b) Yearly Minimum Discharge Limit

( $m^3$/sec )

| Precedence | $x_i$ | $\log x_i$ | $x_i + b$ | $\log(x_i+b)$ | $\log\frac{x_i+b}{x_o+b}$ | $\left\{\log\frac{x_i+b}{x_o+b}\right\}^2$ |
|---|---|---|---|---|---|---|
| 1 | 2.25 | 0.352 | Same as $x_i$ | Same as $\log x_i$ | | |
| 2 | 2.70 | 0.431 | | | | |
| 3 | 3.20 | 0.505 | | | | |
| 4 | 3.20 | 0.505 | | | | |
| 5 | 3.20 | 0.505 | | | | |
| Total | | 2.298 | | | | |

$$\log x_o = \frac{\Sigma \log x_i}{n} = \frac{2298}{5} = 0.4596$$

$\therefore \quad x_o = 2881$

$$b = \frac{x_s x_t - x_o^2}{2x_o - (x_s + x_t)} = -3.52$$

$|b| > x_{min}$ のため $\quad b = 0$

$$-\sqrt{2}C = \frac{1}{\sqrt{\Sigma \frac{1}{n-1}\left\{\log \frac{x_i + b}{x_o + b}\right\}^2}} = -1.471$$

| $\frac{1}{T}$ | $\sqrt{2}\varepsilon$ | $\sqrt{2}C$ | $\log\frac{x_i+b}{x_o+b}$ | $\log(x_o+b)$ | $\log(x_i+b)$ | $x_i+b$ | $b$ | $x_t$ |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $a/b=c$ | $d$ | $c+d$ | $e$ | $f$ | $e-f$ |
| 1/5 | 0.8416 | −1.471 | −0.057 | 0.460 | 0.403 | 2.56 | 0 | 2.56 |
| 1/10 | 1.2816 | 〃 | −0.087 | 〃 | 0.373 | 2.36 | 0 | 2.36 |
| 1/20 | 1.6449 | 〃 | −0.112 | 〃 | 0.348 | 2.23 | 0 | 2.23 |
| 1/100 | 2.3263 | 〃 | −0.158 | 〃 | 0.302 | 2.00 | 0 | 2.00 |

# E. Agriculture

## E-1 Present Situation of Land Use

| | Calapan | Naujan | Alangalang | San Miguel | Ipil |
|---|---|---|---|---|---|
| | ha | ha | ha | ha | ha |
| Planted Temporary Crops | 6,240 | 10,071 | 4,621 | 1,907 | 5,246 |
| Lying idle | 585 | 1,239 | 946 | 541 | 5,867 |
| Planted to permanent Crops | 1,441 | 2,237 | 3,578 | 1,732 | 1,784 |
| Permanent pasture | 144 | 72 | 12 | — | 326 |
| Palay | | | | | |
| First Crop Lowland | 4,770 | 8,595 | 2,272 | 1,380 | 1,216 |
| Second Crop Lowland | 272 | 632 | 550 | 26 | 82 |
| Up Land & Kaingin | 1,207 | 1,429 | 16 | 12 | 2,525 |
| Corn Total | 32 | 147 | 1,919 | 343 | 3,236 |
| First | 25 | 10 | 1,214 | 59 | 813 |
| Second | 7 | 52 | 454 | 12 | 884 |
| Third | — | 85 | 251 | 272 | 1,529 |
| Sugar Cane | — | — | 3 | — | 2 |
| Tobacco | — | — | 4 | 2 | — |
| Abaca | 2 | 2 | 24 | 15 | 3 |
| Camote | — | — | 308 | 100 | 39 |
| Cassava | — | — | 29 | 4 | 78 |
| Cabi | — | — | 35 | 44 | — |
| Peanuts | — | — | 22 | — | 32 |

(Census in 1960)

## E-2 Principal Varieties of Lowland Rice

Mindoro

| Variety | Seasonality | Dormancy | Growth Period | | |
|---|---|---|---|---|---|
| | | | Regular | Palagad | |
| BPI—76 | Seasonal | 8 weeks | 156 days | — days | |
| Peta | Weak Seasonal | 5 ~ 7 | 142~145 | 135~140 | |
| Intan | 〃 | 5 ~ 6 | 145 | 145 | |
| Surigao | Non Seasonal | | 120 | 120 | |
| Tjeremas | Weak Seasonal | 4 ~ 5 | 137 | 137 | |
| Malagket | Non Seasonal | | 145 | 145 | Glutinous |
| Pinili | Weak Seasonal | 4 | 145 | 140 | Low & Up Land |

Leyte

| Variety | Seasonality | Dormancy | Growth Period | |
|---|---|---|---|---|
| | | | Regular | Palagad |
| | | weeks | days | days |
| Bengawan | Non Seasoual | 5 ~ 7 | 1 4 1 | 1 3 9 |
| BPI—76 | Seasonal | 4 ~ 6 | 1 5 3 | |
| Peta | Non Seasonal | 6 ~ 7 | 1 3 8 | 1 3 5 |
| BPI—121 | Strong Seasonal | 5 ~ 6 | 1 5 3 | |
| Tjeremas | Non Seasonal | 5 ~ 7 | 1 3 7 | 1 3 7 |
| Daigon | Non Seasonal | 3 ~ 4 | 1 2 0 | 1 2 0 |

Zamboanga

| Variety | Seasonality | Dormancy | Grow th Period | |
|---|---|---|---|---|
| | | | Regular | Polagad |
| | | weeks | days | days |
| ELon—ELon | Seasonal | 5 ~ 6 | 1 7 6 | — |
| BE—3 | Strong Seasonal | 4 ~ 5 | 1 6 6 | — |
| Peta | Non Seasonal | 〃 | | |
| Tjeremas | 〃 | 5 ~ 7 | | |
| Apostol | 〃 | 3 ~ 4 | 1 3 2 | |
| Azncena | Seasonal | 4 ~ 5 | 1 2 7 | — |

(The above was obtained by interviewing local extension workers.

## E-3 Rice Yield

Rice Production Statistic

| | | 1964 | | | 1965 | | | 1966 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Area | Production | Yield | Area | Production | Yield | Area | Production | Yiele |
| | | ha | cav | cav/ha | | | | | | |
| Phi lippines | Total | 3,087,450 | 87,337,700 | 28.3 | 3,199670 | 90,737,800 | 28.4 | 3,109,180 | 92,559,900 | 29.8 |
| | Lowland 1st | 1,978410 | 61,849,300 | 31.3 | 2,074,080 | 64,745,600 | 31.2 | 2,008,970 | 68,900,300 | 34.3 |
| | 〃 2nd | 481,970 | 14,264,800 | 29.6 | 491,330 | 14,631,100 | 29.8 | 494,370 | 13723,100 | 27.8 |
| | Upland | 627,070 | 11223,600 | 17.9 | 634,260 | 11361,100 | 17.9 | 605,840 | 9,936500 | 16.4 |
| Southern | Total | 414,080 | 10420800 | 25.2 | 433280 | 10817200 | 25.0 | 467,290 | 12,572,400 | 26.9 |
| Tagalog | Lowland 1st | 226590 | 6,869,400 | 30.3 | 238300 | 7139300 | 30.0 | 218.460 | 7,540,800 | 31.5 |
| | 〃 2nd | 33910 | 1229,700 | 36 3 | 34,600 | 1,276,400 | 36.8 | 90.040 | 2,254,500 | 25 0 |
| | Upland | 153580 | 2,321,700 | 15.1 | 160320 | 2401,500 | 15 0 | 158,790 | 2,778900 | 17.5 |
| Easterr | Total | 274,600 | 5815,100 | 19.4 | 299470 | 5,737,100 | 19.2 | 323,480 | 5,098.100 | 15.8 |
| Visayas | Lowland 1st | 163850 | 3266,100 | 19.9 | 179680 | 3,557,000 | 19.8 | 209.040 | 3,708,900 | 17.7 |
| | 〃 2nd | 83,760 | 1597,700 | 19.1 | 89840 | 1721,100 | 19.2 | 79,150 | 1,059,400 | 13.4 |
| | Upland | 26,990 | 451,300 | 16.7 | 29950 | 459000 | 15.3 | 35,290 | 329,800 | 9.3 |
| Southern & Western | Total | 565500 | 16,160900 | 286 | 571,740 | 15,889700 | 27 8 | 410.130 | 9,809,500 | 23 9 |
| Mindanao | Lowland 1st | 282,100 | 8914,400 | 31.5 | 285870 | 8739,300 | 30.6 | 246,250 | 6,962,800 | 28.3 |
| | 〃 2nd | 116780 | 3421,300 | 293 | 120.060 | 3,336,800 | 27.8 | 32,350 | 861,300 | 26 6 |
| | Upland | 165,910 | 3,825200 | 23.1 | 165,810 | 3,813,600 | 23 0 | 131,530 | 1,985,400 | 15.1 |

( DANR )

E-4 Record of Yield Survey at Naujan

| Variety | Number of hills studied | Number of Available Stems | Available Stem Ratio (%) | Number of Ripened Grain | Ripened Grain Ratio (%) | Ripened Rice Weight (g) | Per a head Weight (g) | Number of grains | Threshed rice weight (g) | Straw weight |
|---|---|---|---|---|---|---|---|---|---|---|
| IR 8 | 3 | 54 | 84.4 | 3,785 | 68.7 | 115.2 | 2.1 | 70 | 30.4 | 156.0 |
| BPI-76-1 | 3 | 51 | 86.4 | 5,945 | 84.0 | 132.1 | 2.6 | 117 | 22.2 | 157.0 |
| C-18 | 3 | 71 | 95.9 | 4,103 | 72.4 | 110.6 | 1.6 | 58 | 27.0 | 156.2 |
| Peta (1) | 3 | 53 | 94.6 | 4,800 | 82.1 | 128.8 | 2.4 | 91 | 26.8 | 151.5 |
| Peta (2) | 3 | 46 | 100.0 | 4,247 | 83.6 | 115.8 | 2.5 | 92 | 27.3 | 154.1 |
| Tapacoy | - | 16 | 100.0 | 1,006 | 86.4 | 23.1 | 1.4 | 63 | 23.0 | 27.4 |

2

(See the text for yield, amount of fertilizer applied and planting density.)

E-5 Fertilizer and Agricultural Chemical Application Case Report

| 1. Place | Laguna | Calapan | (Philip-pine) | Calapan | (Philip-pine) | Calapan | " | TABUK | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 2. Variety | IR 8 | IR 8 | IR 8 | BPI-76-1 | BPI-76-1 | C - 18 | Peta | IR 8 | |
| 3. Fertilizer | | | | | | | | | |
| Base Fertilizer N | 43 kg/ha | 68 | 70 | 35 | 30 - 35 | 51 | 11 | 62 | |
| $P_2O_5$ | 43 | 19 | | 13 | 30 - 38 | 6 | 0 | | |
| $K_2O$ | 43 | 19 | | 13 | 30 - 78 | 6 | 0 | | |
| Head Fertilizer N | 45 | 23 | 20-40 | 23 | 30 - 38 | 0 | 0 | 19 | |
| 4. Agricultural chemicals | | | | | | | | | |
| BHC-r | 5 kg | 5 | 5 | 5 | 5 | | 1.5 | 3 | |
| 1st application | 2 kg/ha | 2 | 2 | 2 | 2 | | | | |
| 2nd application | 3 kg/ha | 3 | 3 | 3 | 3 | | | | |
| Sevin | 33 kg/ha | | 2 | | 2 | | - | Horidol | |
| 5. Yield | 167cav/ha | 181cav/ha | - | 99 | | 88 | 106 | 168 | |
| Source | USAID | Field Research | DANRBPI | Field Research | DANRBPI | Field Research | Field Reserch | Young Powers | |

## E-6 A Breakdown of Farming households by Landholding patterns

| | Total number of farms | Full owner | Part owner | Tenant | Manager | Other farms of tenure |
|---|---|---|---|---|---|---|
| Philippines | 2,166,216 | 967,725 | 310,944 | 864,538 | 2,487 | 20,522 |
| (%) | (100) | (45) | (14) | (40) | (0) | (1) |
| Calapan | 1,922 | 588 | 158 | 1,226 | 3 | 17 |
| Naujan | 3,495 | 1,244 | 379 | 1,871 | — | 1 |
| sub-total | 5,487 | 1,832 | 537 | 3,097 | 3 | 18 |
| (%) | (100) | (33) | (10) | (57) | (0) | (0) |
| Alangalang | 2,960 | 699 | 299 | 1,927 | 7 | 28 |
| San Miguel | 1,195 | 420 | 146 | 629 | — | — |
| sub-total | 4,155 | 1,119 | 445 | 2,556 | 7 | 28 |
| (%) | (100) | (27) | (11) | (62) | (0) | (0) |
| IPil | 1,864 | 1,343 | 159 | 189 | 2 | 171 |
| (%) | (100) | (72) | (9) | (10) | (0) | (9) |

Note : This table is based on the 1960 Philippine Agricultural Census

## E-7 A Breakdown of Farming Land by Landholding Patterns

( Unit : hectares )

| | Total number of farms | Full owner | Part owner | Tenaut | Manager | Other farms of tenure |
|---|---|---|---|---|---|---|
| Philippines | 7,772,485 | 4,133,276 | 1,139,957 | 2,000,201 | 365,309 | 133,742 |
| (%) | (100) | (53) | (15) | (26) | (5) | (1) |
| Calapan | 8,668 | 3,190 | 827 | 3,988 | 579 | 84 |
| Naujan | 14,952 | 6,991 | 1,966 | 5,918 | — | 77 |
| sub-total | 23,620 | 10,181 | 2,793 | 9,906 | 579 | 161 |
| (%) | (100) | (44) | (11) | (42) | (3) | (0) |

Note : The table is based on the 1960 Philippine Agricultural Census

## E-8 A Breakdown of Cultivated Farm Land by Usages and Respective Area per Farm

( Unit : hectaers )

| | Total number of farms | Total areas of farms | Arable land | | Planted to Permanent crops | Permanent Pastures | Covered with forest growth | All other lands | Cultivated lands |
|---|---|---|---|---|---|---|---|---|---|
| | | | Planted to temporary crops | Lying idle | | | | | |
| Philippines | 2,166,216 | 7,772,485 | 3,784,619 | 1,115,953 | 1,795,606 | 380,024 | 581,712 | 117,571 | 5,580,225 |
| (Per farm) | | (3.6) | (1.7) | (0.5) | (0.8) | (0.2) | (0.3) | (0.1) | (2.5) |
| Calapan | 1,992 | 8,668 | 6,240 | 585 | 1,441 | 144 | 202 | 56 | 7,681 |
| Naujan | 3,495 | 14,952 | 10,071 | 1,239 | 2,237 | 72 | 1,026 | 306 | 12,308 |
| sub-total | 5,487 | 23,620 | 16,311 | 1,824 | 3,678 | 216 | 1,228 | 362 | 19,989 |
| (Per farm) | | (4.3) | (3.0) | (0.3) | (0.7) | (0.0) | (0.2) | (0.1) | (3.6) |
| Alangalang | 2,960 | 9,464 | 4,621 | 946 | 3,578 | 12 | 253 | 55 | 8,199 |
| San Miguel | 1,195 | 4,378 | 1,907 | 541 | 1,732 | — | 199 | — | 3,639 |
| sub-total | 4,155 | 13,842 | 6,528 | 1,487 | 5,310 | 12 | 452 | 55 | 11,838 |
| (Per farm) | | (3.3) | (1.6) | (0.4) | (1.2) | (0.0) | (0.1) | (0.0) | (2.8) |
| IPil | 1,864 | 14,724 | 5,246 | 5,867 | 1,784 | 326 | 859 | 642 | 7,030 |
| (Per farm) | | (7.9) | (2.8) | (3.2) | (1.0) | (0.0) | (0.5) | (0.4) | (3.8) |

Note : 1) This table is based on the 1960 Philippine Agricultural Census.

2) Cultivated Land is a sum of land planted with temporary crops and land planted with permanent crops.

E-9 A Breakdown of Farming Households by size of Cultivating Land

| | Total No of farms | Under 10hectares | 1.0 ~2.0 | 2.0 ~3.0 | 3.0 ~4.0 | 4.0 ~5.0 | 5.0 ~100 | 10hectares and over |
|---|---|---|---|---|---|---|---|---|
| Philippines | 2,166,216 | 249,773 | 642,060 | 458,914 | 252,484 | 152,398 | 289,730 | 120,857 |
| (%) | (100) | (12) | (29) | (22) | (12) | ( 7) | (13) | ( 5) |
| Calapan | 1,992 | 36 | 307 | 509 | 452 | 272 | 300 | 116 |
| Naujan | 3,495 | 9 | 625 | 673 | 646 | 488 | 848 | 206 |
| sub-total | 5,487 | 45 | 932 | 1,182 | 1,098 | 760 | 1,148 | 322 |
| (%) | (100) | ( 1) | (17) | (21) | (20) | (14) | ( 2) | ( 6) |
| Alangalang | 2,960 | 280 | 758 | 709 | 506 | 221 | 382 | 103 |
| San Miguel | 1,195 | 30 | 236 | 334 | 191 | 180 | 174 | 50 |
| sub-total | 4,155 | 210 | 994 | 1,043 | 697 | 401 | 556 | 153 |
| (%) | (100) | ( 7) | (24) | (25) | (17) | (10) | (13) | ( 4) |
| IPil | 1,864 | 5 | 64 | 107 | 71 | 218 | 992 | 407 |
| (%) | (100) | ( 1) | ( 3) | ( 6) | ( 4) | (12) | (53) | (21) |

Note : This is based on the Census of tne Philippines 1960 (Agriculture).

E-10 Area of Farming Land per Farm Classified by Land Tenure Patterns

( Unit : hectares per farms)

| | The Whole | Full owner | Part owner | Tenant | Managar | other farms of tanure |
|---|---|---|---|---|---|---|
| Philippines | 3.6 | 4.2 | 3.7 | 2.3 | 146.0 | 65.0 |
| Calapan | 4.3 | 5.4 | 5.2 | 3.2 | 159.5 | 5.0 |
| Naujan | 4.3 | 5.6 | 5.3 | 3.2 | — | 77.0 |
| Average | 4.3 | 5.6 | 5.2 | 3.2 | 159.5 | 9.0 |

Note : The table is based on the Philippine Agricultural Census of 1960

E-11-a Production Cost per ha. of Standard Farms (unirrigated)

(1) Naujan District

(ton)

| | Up land rice | | | | | Low land (Rain fed) Rice | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average cost of production per ha (pesos) | Man labor Days (number) | Man labor Value (pesos) | Animal labor Days (number) | Animal labor Value (pesos) | Average cost of production per ha | Man labor Days (number) | Man labor Value (pesos) | Animal labor Days (number) | Animal labor Value (pesos) |
| 1. Farm operation | 182.50 | 49.70 | 147.00 | 13.80 | 34.50 | 343.25 | 90.00 | 270.00 | 29.30 | 73.25 |
| (1) Preparation and planting of seedbed | - | - | - | - | - | 15.00 | 4.50 | 13.50 | 0.60 | 1.50 |
| (2) Land preparation | 78.75 | 15.00 | 45.00 | 13.50 | 33.75 | 148.50 | 27.00 | 81.00 | 27.00 | 67.50 |
| (3) Planting | 3.00 | 1.00 | 3.00 | - | - | 55.25 | 18.00 | 54.00 | 0.50 | 1.25 |
| (4) Care of the Crops | 39.50 | 13.50 | 39.50 | - | - | 13.50 | 4.50 | 13.50 | - | - |
| (5) Harvesting | 50.25 | 16.50 | 49.50 | 0.30 | 0.75 | 90.50 | 30.00 | 90.00 | 0.60 | 1.50 |
| (6) Storing | 11.00 | 3.70 | 11.00 | - | - | 19.50 | 6.00 | 18.00 | 0.60 | 1.50 |
| 2. *Other operating* expense | 55.00 | - | - | - | - | 35.00 | - | - | - | - |
| 3. Fixed cost | 8.00 | - | - | - | - | 15.00 | - | - | - | - |
| Total farm *expenses* | 245.50 | | | | | 393.25 | | | | |
| Total rounds | 245.00 | - | - | - | - | 395.00 | - | - | - | - |

Note : 1) The above table is the estimate of rice production cost on the basis of Bureau of Agricultural Economics Average Cost of production per hectare of rice, 1963 - 1964, Southern Tagalog Region.

2) In estimating the above, the followings are considered.
(1) Labor requirement was adjusted by yield per hectare (upland rice 15 cavan/ha., lowland rice 30 cavan/ha.)
(2) As for labor expenses, 3.00 ₱ per day for manpower and 2.50 ₱ per day for animal labor were decided.
(3) Other operating expenses are broken down into expenses for seed, ₱ 48.00 for upland and ₱ 15.00 for lowland, and bag *expense* ₱ 7.00 *for upland rice* ₱ 15.00 for lowland rice. Fixed Cost consists of interest to the capital which is ₱ 5.00 for upland and ₱ 10.00 for lowland, and land tax ₱ 3.00 for upland, 5.00 for lowland. Rent paid by tenants is not considered.

Table E-11-b

(2) San Miguel Alangalang District

(a) Lowland (Rain fed) Rice

| | Average cost of production per ha(pesos) | Man labor | | Animal lalor | |
|---|---|---|---|---|---|
| | | Days (number) | Value (pesos) | Days (number) | Value (pesos) |
| 1. Farm operation | 179.90 | 53.00 | 141.50 | 19.20 | 38.40 |
| (1) preparation and planting of seedbed | 9.50 | 3.00 | 7.50 | 1.00 | 2.00 |
| (2) Land preparation | 74.25 | 16.50 | 41.25 | 16.50 | 33.00 |
| (3) Planting | 29.15 | 11.50 | 28.75 | 0.20 | 0.40 |
| (4) Care of crops | 7.50 | 3.00 | 7.50 | — | — |
| (5) Harvesting | 49.50 | 19.00 | 47.50 | 1.00 | 2.00 |
| (6) Storing | 10.00 | 3.60 | 9.00 | 0.50 | 1.00 |
| 2. Other operating expenses | 35.00 | | | | |
| 3. Fixed cost | 15.00 | | | | |
| Total farm expenses | 229.90 | | | | |
| Total rounds | 230.00 | | | | |

Note: 1) Material Data and the method of estimation are the same as in the previous case, except for the survey site, Eastern Visaya Region, the scale of 2.50 P and 2.0 P. per day for manpower and cattle labor, and yield per hectare is decided to be 18 cavan.

(b) Corn 170.00₱ Note: Bureau of agricultural economies, Average cost of production per hectare of corn, 1963 - 64, Eastern Visayas Region

(c) Camote 200.00₱ Note: Bureau of agricultural economies; Average cost of produetion per hectare of Camote, 1963 - 64, Eastern Visayas Region.

## E-12-a Rice Production Cost at a Standard Farm (Irrigated District)

### (1) Naujan District

| | Phase 1 (Yield 45 cavan/ha) | | | | | Phase 2 (Yield 80 - 90 cavan/ha) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average cost of production per ha(pesos) | Man labor | | Animal labor | | Average cost of production per ha(pesos) | Man labar | | Animal labor | |
| | | Days (number) | Value (pesos) | Days (number) | Value (pesos) | | Days (number) | Value (pesos) | Days (number) | Value (pesos) |
| 1. Farm operation | 409.11 | 109.20 | 327.60 | 32.60 | 81.51 | 479.23 | 122.70 | 392.10 | 34.25 | 87.13 |
| (1)Preparation and planting of seedbed | 17.85 | 4.20 | 12.60 | 2.10 | 5.25 | 17.85 | 4.20 | 12.60 | 2.10 | 5.25 |
| (2)Land preparation | 154.00 | 28.00 | 84.00 | 28.00 | 70.00 | 154.00 | 28.00 | 84.00 | 28.00 | 70.00 |
| (3)Planting | 63.88 | 21.00 | 63.00 | 0.35 | 0.88 | 63.88 | 21.00 | 63.00 | 0.35 | 0.88 |
| (4)Care of the Crops | 49.50 | 16.50 | 49.50 | — | — | 64.50 | 21.50 | 64.60 | — | — |
| (5)Harvesting | 98.88 | 31.50 | 94.50 | 1.75 | 4.38 | 149.00 | 40.00 | 140.00 | 3.00 | 9.00 |
| (6)Storing | 25.00 | 8.00 | 24.00 | 0.40 | 1.00 | 30.00 | 8.00 | 28.00 | 0.80 | 2.00 |
| 2. Other operating expenses | 50.00 | | | | | 328.00 | | | | |
| (1)Seed | 20.00 | | | | | 25.00 | | | | |
| (2)Fertilizers | 10.00 | | | | | 97.00 | | | | |
| (3)Insectisides | — | | | | | 181.00 | | | | |
| (4)Fencingmats, Containers | 20.00 | | | | | 25.00 | | | | |
| 3. Fixed cost | 19.00 | | | | | 22.00 | | | | |
| (1)Depreciation | 12.00 | | | | | 15.00 | | | | |
| (2)Land tax | 7.00 | | | | | 7.00 | | | | |
| Total cost | 478.11 | | | | | 839.23 | | | | |
| Total Rounds | 480.00 | | | | | 840.00 | | | | |

Note : 1) The table is based on the Bureau of Agricultural Economics Average Cost of Production Per Hectare of Irrigated Low Land Rice, 1963 - 64, Southern Tagalog Region.

2) Water Charge and rent are not included in rice production cost.

3) A breakdown of fertilizer and agricultural chemicals in phase 2 of the

| | | | | | |
|---|---|---|---|---|---|
| Fertilizer | nursery | Urea | 10 kg @ 0.50 ₱/ kg | 5.00 ₱ | |
| | base fertilizer | 14.14.14 | 2 bag " 21.00 ₱/bag | 42.00 | 97.00 ₱ |
| | | Urea | 1 bag " 25.00 ₱/bag | 25.00 | |
| | head fertilizer | Urea | 1 bag " " | 25.00 | |
| Agri-cultural Chemical | Stem borer 1st Application | B H C | 30 kg " 1.50 ₱/ kg | 45.00 | 181.00 |
| | " 2nd | B H C | 50 kg " " | 75.00 | |
| | Total | B H C | 80 kg " " | 120.00 | |
| | leaf hopper | Sevin | 6 box " 10.20 ₱/box | 61.00 | |

4) The extent of fertilizer extension of the application technique then was considered in the estimation of fertilizer expense in the plan ( Phase 1 ).

E-12-b (2) San-Miguel Alangalong District

| | Phase 1 (Yield 45 cavan/ha) | | | | | Phase 2 (Yield 80 - 90 cavan/ha) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average cost of production per ha(pesos) | Man labor | | Animal labor | | Average cost of production per ha(pesos) | Man labor | | Animal labor | |
| | | Days (number) | Value (pesos) | Days (number) | Value (pesos) | | Days (number) | Value (pesos) | Days (number) | Value (pesos) |
| 1. Farm operatiom | 307.85 | 100.50 | 251.25 | 28.30 | 56.60 | 354.55 | 117.50 | 293.75 | 30.40 | 60.80 |
| (1)Preparation and planting of seedbed | 13.25 | 4.50 | 11.25 | 1.00 | 2.00 | 13.25 | 4.50 | 11.25 | 1.0.0 | 2.00 |
| (2)Land preparation | 112.50 | 25.00 | 62.50 | 25.00 | 50.00 | 112.50 | 25.00 | 62.50 | 25.00 | 50.00 |
| (3)Planting | 45.80 | 18.00 | 45.00 | 0.40 | 0.80 | 45.80 | 18.00 | 45.00 | 0.40 | 0.80 |
| (4)Care of the Crops | 40.00 | 16.00 | 40.00 | — | — | 50.00 | 20.00 | 50.00 | — | — |
| (5)Harvesting | 75.50 | 29.00 | 72.50 | 1.50 | 3.00 | 104.00 | 40.00 | 100.00 | 2.00 | 4.00 |
| (6)Storing | 20.80 | 8.00 | 20.00 | 0.40 | 0.80 | 29.00 | 10.00 | 25.00 | 2.00 | 4.00 |
| 2. Other operating expenses | 50.00 | | | | | 328.00 | | | | |
| (1)Seed | 20.00 | | | | | 25.00 | | | | |
| (2)Fertilizers | — | | | | | 97.00 | | | | |
| (3)Insectisides | — | | | | | 181.00 | | | | |
| (4)Fencingmats, containers | 20.00 | | | | | 25.00 | | | | |
| 3.Fixed cost | 19.00 | | | | | 22.00 | | | | |
| (1)Depreciation | 12.00 | | | | | 15.00 | | | | |
| (2)Land tax | 7.00 | | | | | 7.00 | | | | |
| Total cost | 376.85 | | | | | 704.55 | | | | |
| Total Rounds | 380.00 | | | | | 710.00 | | | | |

Note : Material data the method of compilation are the same in the previous tables. The field chosen is the Eastern Visaya Region.

E-13 Estimated Cost for Operation and Maintenance of Facilities

1. Naujan District

(1) Average Annual Cost for Pump Operation & Maintenance

(a) Average Annual Running Hours of Pumps

| | |
|---|---|
| 1st crop | 1,423 hr |
| 2nd crop | 2,573 |
| Total | 2,573 = 2,600 ha |

Note: Running hours of pumps were calculated on the basis of the following

1. The daily precipitation record (for 10 years from 1957 - 1966), a list of days requiring irrigation is compiled.

| Days not requiring irrigation | Daily Precipitation | Below 5 mm. | Days |
|---|---|---|---|
| | | 5 - 25 mm | 1 |
| | | 25 - 50 | 2 |
| | | 50 - 75 | 3 |
| | | 75 mm more than | 4 |

2. Days each month requiring irrigation and irrigated land ratio each month in accordance with cultivating variety standards (Phase 2) are applied to (1) to obtain the number of days requiring irrigation per month in a normal season. Running hours of pump are obtained, supposing it runs 20 hours per day.

3. Further, pump running hours for water in land preparation as much as 150 mm., (which is the equivalent to average daily effective precipitation in land preparation period, is calculated) and added to 2.

(b) Pump Fuel Cost

| | |
|---|---|
| Fuel per unit pump | 2,600 hr x 220 ps x 0.2 /hr/ps x 0.9 = 103,000 |
| For 4 units | 103,000 x 4 units = 412,000 |
| Fuel Cost | 412,000 x 0.2 ₱/ = 82,400 ₱ |

(c) Oil Expenses and Others About 2% of Expenses

(d) Pump & Engine Maintenance Cost (per year) 2,000 ₱

(e) Total 104,000 ₱

(2) Personnel Expenses

Personnel Expenses required for operation & maintenance of pumps & canals, allocation of water, and collection of water charges are summed up in the following

(a) Staff 10 members including chief

(b) Personnel Expenses 25,000 ₱

(3) Office Expenses (10% of personnel expenses) 2,500 ₱

(4) Expenses for maintenance and repairment of irrigation canals and others 8,500 ₱

Total 140,000 ₱

Per hectare of irrigated land 140,000 ₱ 1,080 ha = 130 ₱

2. San Miguel Alangalang District

(1) Personnel Expenses

Personnel expenses required for maintenance and operation of diversion dam and irrigation canals, allocation of water, and collection of water charge are as follows:

(a) Staff 5 members including chief

(b) Personnel Expenses 15,000 ₱

(2) Office Expenses 10% of personnel expenses 1,500 ₱

(3) Maintenance and Repairment Cost for Diversion Dam and Irrigation Canals 8,500 ₱

Total 25,000 ₱

Per hectare of irrigated area 25,000 ₱ 712 ha ≒ 35 ₱

F. Land Preparation for Paddy Field

(1) Size & Shape of Standard Field Lot

Size and shape of field lots are not so important, when man and cattle labor are the chief means for production as in the present. When small-size power cultivators such as tiller are used, a field lot which is 50 m. x 20 m. = 10 a., would be sufficient. With the modernization and advance of farm management and techniques, however, it is urged that large-scale farming machines are sooner. In such a case, larger field lots would become necessary.

As both the districts are to have newly overall land preparation for paddy fields, in view of future needs, a field lot as large as possible should be planned. With a larger field lot, smaller area is required for farm roads, irrigation and drainage canals and borders. The Standard Field Lot was decided considering the above factors.

(i) Size, patterns, of land tenure of farmers concerned and the field lot.

(a) Calapan-Naujan District

The Average size of cultivation in the district is 4.3 ha. per household. Consequently, the maximum field lot can be about 4 ha.. As the above figure represents only an average and farmers generally possess land over 2 or 3 dispersed lands, however, the maximum field lot is actually about 1 - 1.5 ha..

(b) San Miguel Alangalang District

The Average size of cultivation in this district is 3.3 ha. per household Therefore the maximum field lot can be about 3 ha.. Due to the same reasons as in (a), however, the maximum field lot would be around 1 ha..

(ii) Efficiency in Machine Farming and Size of Field Lot

In terms of the efficiency in machine farming, the larger the field lot is, the more efficient farming becomes but, the size of the lot have no effect on it as such as the shape of lot.

The longer the length longer side and the bigger the difference between the length and width shorter side of a lot the greater efficiency. The Results of experimentation shows as a desirable length/width ratio at 1 : 5 and sets more than 30 m. in width for best results. With a length of more than 200 m., however, length/width ratio can be shortened without having much effect on efficiency.

Setting the minimum width at 30 m. in terms of machine efficiency, the length would be about 150 m.. This shape can be called a standard field lot in terms of machine efficiency.

(iii) Topography and Lot

In general, it is most economical to set a lot so that the length is parallel with the contour lines, while the width (shorter side) is vertical to it. Land gradient and the topographical changes limit the size of lots, especially the length of shorter side, in terms of land grading cost. A lot of lowland paddy field should be in principle at an even level.

Therefore, as the shorter side becomes longer, land grading (volume) increases, and the level gap with adjoining lots becomes larger. When the field level gap is as much as 30 cm. or more, special care to borders should be given and mobility of machines across the borders becomes extremely difficult. The maximum field level gap seems to be 30 cm., Consequently, when land gradient is 1/100 width should be less than 30 m., and 1/200 with the side less than 60 m..

(a) Calapan-Naujan District

This district shows little topographical change, presenting gradient between 1/500 - 1/1,000, with an average of around 1/700. In such a district, topographical conditions have almost no effect on land demarcation.

(b) San Miguel-Alangalang District

The district shows substantial topographical change, presenting gradient between 1/50 - 1/300, with an average of around 1/200. In such a district, instead of uniform application of the standard field lot, smaller lots according to the gradient of the land, should be partly considered.

(iv) Water Use Conditions including Irrigation and Drainage System Operation and Field Lot.

Operation of irrigation and drainage system after land adjustment are to be planned in principle in such a way that every lot can be irrigated and drained freely.

A very large lot requires more time for irrigation and is not favorable in terms of efficient use of machines and economical use of water. In case of quick drain from the field for spraying of herbicide, longer length of lot is inconvenient, requiring more time for water drain.

Drainable length by open drainage canals is the most dominant factor limiting the length (Congerside) of the lot. The length is decided by considering percoration of the soil, drainage water level, usual groundwater level, and soil at the lower portion of the strata. The length cannot be decided easily. However, accepted standards are 120 m - 200 m in sand, 60 m. - 120 m. in sandy loam, and 40 - 60 m. in clay.

There are many factors which have influence on decision as to shape and size of lots as have been explained in (1) - (IV),. Considering all the factors a lot of 200 m x 50 m = 1 ha. was decided as a standard field lot in Calapan-Naujan District.

The above figures should be interpreted as (100 - 200 m) x (30 - 70 m) = 30 a - 1.4 ha. and do not imply the necessity for uniform application of the standard field lot.

The Standard Field Lot in San Miguel-Alangalang District is set as 150 m x 40 m = 60 a.

The figure should be interpreted, however, as (100 - 200 m) x (30 - 50 m) = 30 ha. - 1 ha.

Having complicated topography, the area should not be adjusted by uniform application of standard field lot, but a smaller lot compatible with local gradient (for example, 50 m x 20 m = 10 a) should be considered in some part of the district.

(2) Decision on Standard Parcel

A parcel is composed of several field lots with their longer sides adjoining. Therefore, the length of the parcel coincides with the longer length of the field lot. Width is determined by allocation of roads (connecting road).

The area of the parcel in terms of the function of irrigation and drainage canals should not be composed of many lots, as being under the control of small irrigation and drainage canals too many lots in the parcel would entails, and would further entail antagonism between the Up Stream and the Down Stream in regard to allocation of water. When a large stretch of field lots within a parcel are owned by a farmer, however, a parcel with many standard field lots would not have so much difficulty.

(a) Calapan-Naujan District

In the district, the average size of land holding is as large as 4.3 ha. per household, while the fields possed scatter over 2 - 3 areas only. Therefore, supposing that the size of standard parcel as 1 ha. x 8 = 8 ha., a parcel consists of two farms on the average.

(b) San Miguel-Alangalang District

As the average land holding in the district is 3.3 ha. per household, supposing that the standard percel is 60 a x 10 = 6 ha. a parcel consists of two farms on the average.

(3) Farm Road

In the district where land preparation is being planned, there are general-purpose-roads to be used for purposes other than farming principally and farm roads, which can be classified further into trunk farm road (connecting roads) and feeder roads

(road for farming) by their respective use. Main road is described in text 2.2.3.. A brief explanation on feeder roads is given in the following.

(i) Arrangement

The Field Lot and Parcel mentioned in (1) and (2) are closely associated with roads and irrigation and drainage canals that demarcate them. Therefore, they should be planned in relation to each other.

Feeder roads can be classified into vertical feeders (henceforth called farm roads) which join a side of respective unit plots, and horizontal feeders (henceforth called feeder road.), which connect farm roads. Farm roads and feeder roads are automatically determined by arrangement and plotting of trunk farm roads and parcels respectively.

In general an interval of 300 m - 600. is most desirable. The Standard Parcel of the present project determines farm road interval as 300 m. in Calapan - Naujan District and 400 m. in San Miguel-Alangalang District, while an interval between feeder roads as 400 m. in both districts. The intervals planned are of ideal length.

(ii) Width

The width of roads is determined so that farming machines which are moved most often and so the largest machine can go through easily. In order to reduce the area for road, one truck with an edge of 50 cm at both ends is planned. The total width is 3 m. for farm road, and 3.5 m. for feeder road.

(iii) Height and (Longitudinal) Slope of Road Surface

The Height of road surface was set at 50 cm. above the field level, considering maintenance of road and convenience of machine introduction to the Field Lot.

The longitudinal (slope gradient) should be less than 4% in principle, and less than 10% in some parts, with a maximum length of 100 m.. The standard transverse (slope gradient) is 1/30. At intersections, corners should be cut for about 2 m. to facilitate smooth transit of machines.

(4) Irrigation and Drainage Canals

(i) Arrangement of Irrigation and Drainage Canals

In principle, separation of irrigation and drainage canals is maintained and small irrigation canals are set alongside the width of the lot. In areas with proper gradient, there is good drainage, canals placed alongside the length of the lot can be used as dual-purpose canals. The two plans above have merits and faults. In the present project, at first the pilot-to pilot irrigation method (with a canal system concurrently used for irrigation and drainage) is being used and separation of irrigation and drainage canals would be considered later. The chart in the text

shows the standard formula for the separation method. Moreover, for grouping of farmlands and exchange and consolidation of farmlands accompanying land preparation project, equality of land conditions is to be considered an important factor. In this sense, small irrigation canals were placed along both sides of the farm road.

(ii) Structure of Irrigation and Drainage Canals

For prevention of conveyance loss and economization of maintenance and operation expenses, main and lateral canals should be lined in principle. Small irrigation canals in field lots are to be unlined earth canal, with the exeption of canals with sand or a pebble bed which would cause sizable water waste and scouring or the canals with gradient.

Drainage canals inclusive of main canals are in principle not to be lined. However, when slope stability is difficult to maintain due to the nature of soil, when velocity is more than 1.2 m/sec. - 1.5 m/sec., and when a cross section must; be reduced to provide road, drainage canals are lined.

G. Rice Center Project

Economical Standardization of rice variety and quality and planned receiving period, (harvesting period), are requirements for increasing efficiency and excessive investment control of the Rice Center facilities. The capacity of drying facility, for example, is determined by the maximum amount of paddy it processes a day. Therefore, for the ideal use of the facility, harvesting and planting periods should be planned so that a fixed quantity of paddy is delivered into the facility every day for a longer period.

As paddies with substantially different moisture percentage cannot be processed simultaneously and paddies of different varieties should be separated in principle, restriction of varieties and planning become necessary. Otherwise, the number of dryers must be increased.

The same is true of the milling facility, though the influence observed is not so direct as that of dryers. Milling facilities along with storing facilities are more subject to change in distribution.

Storing facility capacity in unmilled paddy is about a half of that in milled rice. Also in storing unmilled rice, the capacity and manner change in bulk storing and packed storage. Capacity of storing facilities are influenced by amount and timing of shipment of rice to the market. The adjustment of capacity and shipment is a very difficult problem, since it is subject to the demand at the local market. Within the range of possible coordination and change which is compatible with local conditions, streamlining of distribution channels should be planned to avoid excessive investment.

To summarize, for the effective use of the facilities planned here, farmers should be organized and varieties of paddy, cultivating volume, cropping season, and harvesting volume, and harvesting period should be planned. Along with these attempts, rationalization of streamlining of distribution channels should be endeavored as indispensable requirements.