

[0504]

THE REPORT OF THE COMMISSIONERS

A TRIBUNAL OF INQUIRY

ON

THE DECEASED KINGDOM OF THE NETHERLANDS

1874

THE NETHERLANDS GOVERNMENT

国際協力事業団

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FOREWORD

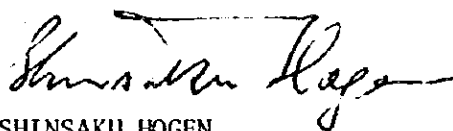
The Japan International Cooperation Agency, at the request of the Government of the Republic of the Philippines, dispatched the pre-feasibility survey mission for the Cagayan Valley integrated agricultural development from May 25 to June 23, 1975.

The mission undertook the survey and successfully achieved its objectives in cooperation with your counterparts in the three provinces in the Cagayan Valley Region. Within the region, after due consultation with the authorities concerned of your Government, the mission identified three areas, i.e., Lower Cagayan River Basin, Pared and Iguig in the Province of Cagayan. Those areas were considered as comparatively less developed except at a few on-going irrigation project sites, while blessed with high potentials for the development of agriculture.

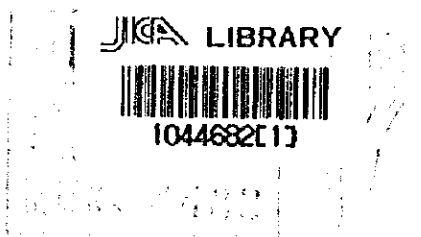
The mission formulated an integrated agricultural development project with the main aims at the improvement of infrastructure for the paddy field and the establishment of a pilot center for the extension of improved agricultural techniques to farmers. This project is named the "Cagayan Integrated Agriculture Project" (CIAP), and we envisage to carry out a feasibility study in a foreseeable future.

I should like to take this opportunity to express my deepest appreciation for the all arrangements and cooperation kindly rendered by your Government to the mission, and sincerely hope our mutual efforts will serve the strengthening of the closer relationship between the Republic of the Philippines and Japan.

August, 1975



SHINSAKU HOGEN
President,
Japan International Cooperation Agency



PREFACE

This report covers the results of the survey on the Integrated Agricultural Development in the Cagayan Valley, the Republic of the Philippines, carried out by the Second Japanese Survey Mission during the period from May 25 through June 23, 1975.

The survey was conducted by the Japan International Cooperation Agency (JICA), entrusted by the Government of Japan, in response to the request of the Government of the Philippines based on the report of the Cagayan Valley Regional Development Planning Mission headed by Mr. Baba and dispatched to the Philippines in July, 1974. Accordingly, the survey was carried forward taking due consideration for the recommendations made by the First Survey Mission which indicated that the region concerned should be developed with the emphasis on integrated agricultural development centering on paddy irrigation and the social betterment of rural community, coupled with the improvement of agricultural techniques and institutions through a pilot center and its extension over the whole region.

It is our great pleasure to have been able to identify the Cagayan Integrated Agriculture Project (CIAP) and to compile a pre-feasibility report thereon as the fruit of the joint efforts between the mission members and the Filipino counterparts.

In these days when the historical world food crisis is encountered and the substantial improvement of farmers' living standard is felt essential, it is considered that the Project, in view of its high priority and prima facie technical and economic feasibility, deserves the earliest possible implementation.

We take this occasion to express our sincere gratitude to the authorities concerned of the Government of the Philippines, the Japanese Embassy in the Philippines, and many others involved for their invaluable guidance and cooperation in leading the survey to a success.

It is our hope that proper steps to promote the Project be taken on the continuing basis by the Governments of both countries.

Kunio Takase

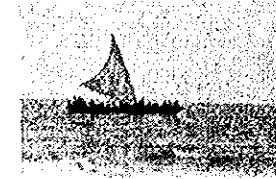
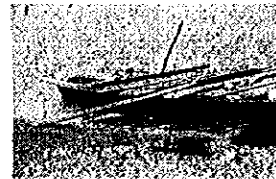
Leader (the 1st half),

The Second JICA Mission for Integrated Agricultural Development in the Cagayan Valley, Philippines

Kanji Endo

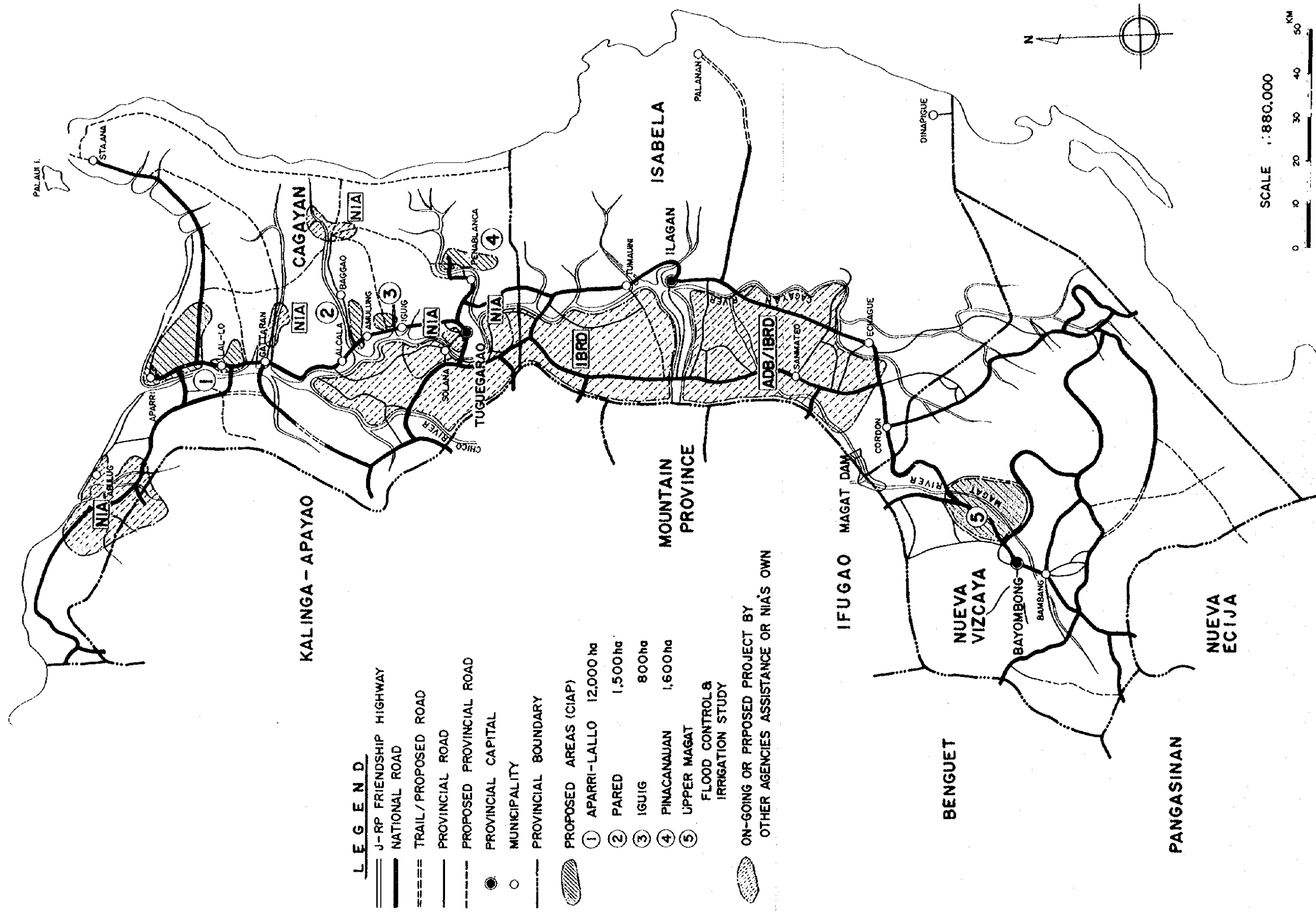
Leader (the 2nd half),

August 31, 1975



A View in Lower Cagayan River Basin
(Aparri area)

GENERAL MAP OF CAGAYAN INTEGRATED AGRICULTURE PROJECT (CIAP)



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ABBREVIATION AND CONVERSION RATE

ACA	Agricultural Credit Administration
ADB	Asian Development Bank
BAEcon	Bureau of Agricultural Economics
BAEx	Bureau of Agricultural Extension
BCS	Bureau of Census and Statistics
BFD	Bureau of Forestry Development
BPI	Bureau of Plant Industry
CCC	Cabinet Coordinating Committee
CIAP	Cagayan Integrated Agriculture Project
CB	Central Bank of the Philippines
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
ILO	International Labor Organization
JICA	Japan International Cooperation Agency
NEA	National Electrification Administration
NEDA	National Economic and Development Authority
NFAC	National Food and Agriculture Council
NGA	National Grains Authority
NIA	National Irrigation Administration
NPC	National Power Corporation
OECF	Overseas Economic Cooperation Fund
PNB	Philippine National Bank
USAID	United States Agency for International Development
FaCoMa	Farmers Cooperative Marketing Association
USDIBR	United States Department of Interior, Bureau of Reclamation
DA	Department of Agriculture
DPWTC	Department of Public Works, Transportation and Communication
DPH	Department of Public Highway
DF	Department of Finance
DLGCD	Department of Local Governments and Community Development
DAR	Department of Agrarian Reform
DNR	Department of Natural Resources

m	:	Meter
km	:	Kilometer
ha	:	Hectare
m ³	:	Cubic meter (s)
m/sec	:	Meter per second
cu. m/sec, m ³ /sec.	:	Cubic meter per second
kw	:	Kilowatt
El.	:	Elevation
H.W.L.	:	High Water Level
¥	:	Yen 1\$ = 300 yen
p	:	Peso(s) 7p = 1 \$
\$:	US Dollar(s) 1\$ = 7p = 300 yen

SUMMARY AND CONCLUSIONS

1. Background

The Mission was the second one dispatched by the Japan International Cooperation Agency (JICA) at the request of the Government of the Philippines in line with the recommendations made by the First Mission headed by Mr. Baba. The Mission consisted of ten members, namely, four from the Ministry of Agriculture and Forestry, one from the Overseas Economic Cooperation Fund (OECF), three from the JICA and two from the Sanyu Consultants, Inc.

The Mission stayed in the Philippines for thirty days from May 25 through June 23, 1975 and had the detailed discussions with the authorities concerned of various departments and agencies of the Government of the Philippines as well as carried out the field investigation in the three provinces in the Cagayan Valley.

As a result of consultations with the Government of the Philippines, the Mission identified a development project with high potentials and priority out of the framework of the Cagayan Valley Integrated Rural Development Plan, and reached an agreement with the Government of the Philippines on the procedures of follow-up actions, and on the name of the Project to be called "The Cagayan Integrated Agriculture Project (CIAP)".

Since the CIAP is an integrated rural development program with its nucleus on irrigated agriculture, the Government of the Philippines has recently organized the Cabinet Coordinating Committee (CCC) under the jurisdiction of the National Economic and Development Authority (NEDA) to be responsible for the CIAP. In practice, those members of CCC such as the Department of Agriculture and the National Irrigation Administration will mainly shoulder the execution of the Project. Further, the Government of the Philippines is considering a system under which other government agencies related to rural development projects also cooperate in the Project in a positive manner under the coordination of CCC.

2. The Cagayan Valley

The Cagayan Valley region is located at the northeastern part of the Luzon Island extending over three provinces; Cagayan, Isabela, and Nueva Vizcaya.

The region is endowed with natural conditions such as favored rainfall, high temperature, abundant discharge of the Cagayan River and fertile soils run down by the River, and fertile soils run down by the river, in addition to a vast land left unexploited, thus awaiting for agricultural development under the most favorable conditions. About 75 per cent of 1.64 million inhabitants in this region are engaged in agriculture and the latent unemployment reaches as high as 19 per cent.

The main farm products in this region are rice and corn, and tobacco is grown as cash crop. These products are transported to the great consuming city, Manila with a distance of 600 km, through the Philippine-Japan Friendship Highway which is nearly completed.

In response to the progress of the above highway and the Cagayan Power Transmission Line Project, which have been started in cooperation with OECF, Japan, running through the region as the main artery for the regional development. An international port at Casambalangan has been completed and an international air port is proposed near Lallo. With regard to agricultural development, the Magat River Irrigation Project is in good progress with the assistance of the Asian Development Bank and the World Bank, the Chico River Irrigation Project will soon be started, and other irrigation projects are also under construction by the Philippine Government's own force. Thus, the region has become highlighted quite recently as a base of food supply to Manila or as a northern base for the development of the entire Philippine economy.

3. Development Strategy

In these circumstances, it is reasonable that the development of this region should be worked out by "integrated" approach with its center on irrigated agriculture supported by basic infrastructures. The Project, therefore, contains the following three components;

- 1) Infrastructure --- namely;
irrigation, drainage, flood control and farm roads, etc.
- 2) Agriculture --- namely;
Improvement of agricultural techniques (crop varieties, fertilizer, pesticides), rationalization of agricultural institutions (co-operatives, credit, marketing, mechanization and land reform), promotion of livestock, raising of farm income and its fair distribution.

3) Social Development --- namely;
Improvement of living environment and promotion of employment by means of rural electrification, water supply and agro-industries.
Only when the above-mentioned components are put into harmonious execution, it would be possible that the Project contributes to the national economy, and improvement of farmers' income. Particularly, all benefits accruing from this Project should be equally shared by all the farmers. For this purpose, it is prerequisite to operate the Project in such a way that farmers themselves understand it and participate in it, rather than being always initiated by the Government.

4. The Project

The following three areas have been chosen, because agricultural infrastructure has not yet been equipped in these areas but potential in agricultural development is high from the viewpoints of water, land, electric power and traffic conditions. All of these areas happen to be under the jurisdiction of the Cagayan Province.

Aparri-Lallo area	12,000 ha
Pared area	1,500 ha
Iguig area	800 ha
<u>Total</u>	<u>14,300 ha</u>

First of all, the agricultural infrastructure should be equipped in the total area of 14,300 ha by irrigation and drainage facilities, farm roads, etc. so as to facilitate a double cropping with a base on rice. As a main water source, high-lift and large-sized pumps are to be installed in the main stream of the Cagayan River and the Pared River, one of its tributaries. The lifted irrigation water is distributed to farm lands on the plain through earth canals with feeder roads running along the skirts of mountains, for the purposes of effective water management, transportation of farm inputs and marketing of farm products. On a poorly drained land within the area, drainage canals must be established.

An Agricultural Pilot Center with 150 ha in area will be set up aiming at ensuring the increased agricultural production in the Project. The area of 150 ha is divided into an experimental farm (10 ha) for the adaptation tests of new varieties and the production of foundation seeds, a seed farm (40 ha) for the production of registered seeds, and a demonstration farm (100 ha) utilizing paddy fields owned by farmers, to train farmers and to demonstrate agricultural techniques to them. In these facilities, highly-organized agricultural techniques must be established, its extension service be rendered, the system of farmers' organization be fostered, seeds of high yielding varieties be distributed, the guidance for irrigation water management and the testing on farm mechanization be carried out. The technical guidance within the Agricultural Pilot Center should be spread to farmers primarily by experts of the Philippine Government. Upon the request of the Government of the Philippines, however, the Government of Japan may consider technical cooperation including the dispatch of experts and various equipments.

The location of the Pilot Center will be decided by the next feasibility study mission after due consideration of various aspects as well as the relation with the Cagayan Regional Cooperatives Development Program in cooperation with the Canadian Government.

With regards to social development aspect, there is a problem to what extent could the facilities of rural electrification, water supply and agro-industry, be incorporated into the Project. Even in this case, it will be more effective to disseminate them throughout the entire Project

while studying the actual results to come out through the Pilot Center. In short, it is the basic philosophy of the Project to combine financial cooperation in the infrastructure construction with technical cooperation in the Agricultural Pilot Center for the most effective and smooth implementation.

5. Project Cost

The total cost of this Project is roughly estimated using the price as of July 1, 1975, with the construction period four years to end of 1980 and price escalation during this period at 8 per cent. The fund required for the Project will amount to US\$ 21.5 million equivalent in local currency and US\$ 19.7 million in foreign currency, totaling US\$ 41.2 million.

Table 1

Area	<u>F.C.</u> (\$ 1,000)	<u>L.C.</u> (\$ 1,000)	<u>Total</u> (\$ 1,000)	<u>P.C. with escalation</u> (\$ million)
Aparri-Lallo	11,923	12,530	24,453	15.2
Pared	2,153	2,418	4,571	2.7
Iguig	1,397	883	2,280	1.8
Price Escalation	4,227	5,669	9,896	-
Grand Total	19,700 (48 %)	21,500 (52 %)	41,200 (100 %)	19.7

6. Project Implementation

If all the necessary arrangements are made on time mainly by NIA and the Department of Agriculture under the coordination of CCC, the feasibility study would be done in mid-1976, followed by detailed designs in 1976, and the construction works could be set about in 1977 and completed in 1980. However, in implementing the Project, there

exists some problem of how to share the responsibilities for the Project among agencies concerned of the Government of the Philippines or of how to coordinate relations with other Projects such as the Agricultural Cooperatives Development Program in cooperation with Canada. It would be necessary to avoid overlap and complement each other for the best use of available man-power and resources.

7. Economic Evaluation

By implementing this Project, annual production of about 58,000 tons of paddy can be increased and about 11 million US dollars are expected to be saved in import. Also, farmers in this area will gain an increased annual income of 8.3 million US dollars in total and the average annual income per farming household will be about 1,657 US dollars.

Further, the internal rate of return of the Project is roughly estimated at 15.0 per cent. In conclusion, it can be said, on the preliminary basis, that this Project is technically feasible, economically viable and socially also significant.

8. Future Schedule

In order to start CIAP in 1976 according to the schedule planned out, it is a major premise that Japan and the Philippines should agree to include CIAP in the Fifth Yen Credit List at a meeting of the Consultative Group for the Philippines to be scheduled some time in October, 1975. In this case, the categories of the survey missions to be dispatched in future would be as follows:

- (1) Consultative Mission to Explain and Discuss the Results of the Second Survey Mission
The report will be explained to the Government of the Philippines by the mission and at the same time the project must be adjusted not to overlap the Canadian Government's Cooperation Project. Also, the mission will hold counsel with the executive agencies for CIAP.
- (2) Feasibility Survey Mission for the Basic Planning of CIAP
The observation and measurement of floods as well as collection of basic data to work out the basic plan will be carried out by the mission during the coming rainy season.
- (3) Implementation Survey Mission for the Pilot Center
The location of the pilot center will be selected, plans for facilities, machinery and equipments, and personnel formation must be made and discussions with the Department of Agriculture will be held.
- (4) Feasibility Survey Mission for the Basic Planning of CIAP
A feasibility survey mainly on the infrastructural aspect of CIAP will be conducted so as to facilitate the raising of foreign funds. Afterwards, an appraisal mission from the Overseas Economic Cooperation Fund will possibly be dispatched to evaluate the project in response to a loan proposal by the Government of the Philippines.
- (5) Survey Mission for the Detailed Design of the Pilot Center
The detailed design of the pilot center will be made and thereby the record of discussions on technical cooperation shall be confirmed between both parties.

Chapter 1 PRESENT STATUS OF THREE PROVINCES IN THE CAGAYAN VALLEY

1 - 1 Economic Background

- (1) The Philippine economy showed an annual average rate of economic growth at 5 to 6 per cent in the decade of 1960. Entered in the decade of 1970, however, the growth rate has become stagnant occasionally as the result of widening gap in balance of payment.

From 1972 on, the Philippine economy has grown rapidly, showing the growth rate of GNP at 9.8 per cent in 1973 or about two times as high as that of the 1960's and the trade balance recorded a plus of US\$ 270 million. This black-ink balance had been supported by a sudden rise of international prices of such goods as sugar, coconut products (the price of sugar almost doubled from the end of 1973 to 1974 and the price of coconut oil 2.5 times in 1973) and the increased domestic agricultural production.

Agriculture in the Philippines plays an important role in the Philippine economy. According to the data of the Fertilizer Industry Authority, 32 per cent of GNP in 1970 was derived from agriculture and forestry. The agricultural sector contributed to about 35 per cent of the gross national income. Also, 70 per cent of export goods was occupied by agricultural and forestry products.

- (2) The urgent need in the Philippine agriculture is how to achieve self-sufficiency in foods such as rice and corn, etc. and to expand export of coconuts, sugar and bananas, etc. The area under paddy cultivation reaches 3.2 - 3.4 million hectare every year and yet the yield per hectare is extremely low, and about 300 - 500 thousand tons are imported every year.

According to a trial calculation made by the United Nations Demographic Office, it is assumed that the population of the Philippines will reach 54 million by 1980. With this in view, to cope with an increasing demand thereby and to prevent an outflow of dollars resulting from importation of rice, it is considered as an urgent necessity to accomplish the above purpose.

(3) Under these circumstances, in an effort to materialize increased production, especially in paddy and corn, the Government has taken up various national projects which were given top priority. The main projects are as follows:

1. Promotion of Irrigation Systems;
2. Securing of fertilizers,
3. Masagana 99,
4. Masagana ng Maisan,
5. Palayan ng Bayan.

(4) In the Cagayan Valley Region, the Cagayan River, the biggest River in the Philippines, flows through the vast plains from south to north and hills spread on the both sides of the river. This area covers 2.66 million hectare in total. The population in this area is estimated at 1.64 million according to the data from ADB., indicating 3.53 per cent during the recent decade which exceeds 3.01 per cent of the annual growth rate of entire population in the Philippines.

Of the total population of 41,460,000, about 70 per cent live in the rural communities. In this region, three fourths of the employment population are engaged in agriculture.

The income level in this region is the lowest in the Philippines, and the yearly average income per household is 1,322 pesos (1 peso is equivalent to 43 yen), or as low as 52 per cent of yearly average income for the entire Philippines. Further, 72 per cent of the total households belongs to a low income strata of less than 1,500 pesos a year (46 per cent for the entire Philippines). This indicates unquestionably a part of the characters of a backward region.

The average farm size is 2.75 ha and is slightly larger as compared to 2.69 ha for the entire Philippines. The farming in this region is practiced mainly on the production of such food crops as paddy and corn and other cash crops such as leaf tobacco for cigars. The greater part of the produced paddy are transported outside the region.

From the viewpoint of labor force, since there has been a great increase in population throughout the country, it is likely that there exists surplus labor force in excess of the labor demand. Even in this region, there is a trend that the population continues to increase at the higher rate than the national average. Further, it is assumed that owing to the limited opportunities for manufacturing employment, the potential labor in this region is more than the average of the entire country.

1 - 2 Regional Development

- (1) The Philippine Four-Year Development Plan (FY 1974 - 1977) is based on the progress of agricultural development. Particularly in the Philippines, the Cagayan River Basin which interlinks Manila through lands and occupies a vast extent of lands and relatively high level of agricultural techniques, is a promising region which can not be overlooked in the above mentioned Four-Year Development Plan.

In connection with the Cagayan River Basin Regional Development, the Philippines has started the development projects for road, electricity and water resources since several years ago. Also, in this region, various projects required for development are under planning. Upon completion of these projects, this region which is akin to an isolated island on land would be connected with the consuming city, Manila, and with the completion of an international trade port and an international air port at its northern extremity, the development of the region as a northern entrance of the country can be expected.

- (2) With regard to roads, the Philippine-Japan Friendship Highway is now under construction between Manila and Camalaniugan, and 75 per cent of the total construction has been completed. This road has two lanes on each side and is a express way to be entirely paved. It is scheduled to complete at the end of 1976.

The Second-Package Road Plan which will be for branch roads for the trunk road was also worked out. Upon its completion the road networks will extend to an international trade port at Casambalangan and its western coast. Further, roads to make up

for insufficient parts were planned and put into execution by the Provincial Government. These supplementary roads are normally called provincial roads or feeder roads. These roads branch off from the trunk road running along the Cagayan River, connecting large cities and towns. At present, the Provincial Government is planning to build a road running through the hilly area parallel with the trunk road; the construction work on the right bank of the Cagayan River was partially completed. Accordingly, when the road network project is completed, the traffic and the marketing in this region will be improved.

Generally the extension lines of the feeder roads are still less and there are many dotted places with no access to roads. However, due to lack of roads which connect field plots with markets, there may appear a difficulty in managing and transporting the farm crops.

- (3) At present, as a shipping base for agriculture and forestry products as well as agricultural inputs, an international trade port is under construction at Casambalangan and it is scheduled to complete a berth at the end of 1975 to open the port. Further, the planning of an international airport at the hilly sections of Santa Maria was completed and the construction work is tentatively scheduled to commence this fiscal year. The international air port at Ilagan is expected to be completed at the end of 1975.

As has been indicated previously, when the airport to be a traffic base and the seaport to be a commercial base are completed one after another and the improvement works of roads are made on a continuing basis, all factors required for the development of this region would be fully arranged. In line with this plan, the Philippines has adopted the Five-Year Program for the improvement of marketing service in cooperation with the Government of Canada.

- (4) With regard to electricity in this region, there are private power plants in large communities and thereby inhabitants are supplied with electricity. For example, there are 6 power plants in the province of Cagayan and the output is 1,691 kw. However, the operating output in practice is as low as 270 kw. This is mainly because the cost of oil is rising and faulty parts of equipment can not be replaced.

The power transmission hour lasts from 6:00 p.m. to 11:00 p.m. With such a power generation facility, electricity can not be used for rice-cleaning and farm mechanization. At present, it can be said that the electric power for an industrial use is not available. The project for transmission lines is now under way and it is scheduled to be completed at the end of 1977. There is every reason to expect that the project will greatly contribute to the future development. The United States is giving economic aid every year at a certain amount for the construction of the terminal distribution network in the Philippines and possibly this American economic aid will be applicable to the Cagayan Region sooner or later.

- (5) Although an improvement of social environment is required for the regional development, any large-scale project can not be found in the development programs within this region. Particularly, the fact that electricity is not available for development in this region is hindering the improvement of the social environment. Accordingly, rural village electrification and improvement of waterworks deserves high priority among the long-term programs in future.

1 - 3 Natural Conditions

- (1) The three provinces in the Cagayan Valley are located at the northeast of the Luzon Island (121°45' E Long, 16° - 18°20' N Lat) and have the total land area of 2.66 million ha. Since they are bounded on the north by the Babuyan Channel and on the east by the Pacific Ocean and are surrounded by the Cordillera Central Mountains on the west, while on the south by the Caravallo Mountains and a part of the Sierra Madre Mountains, the three provinces are geographically isolated from the other regions in the Luzon Island.

The Cagayan River is the largest in the Philippines and drains the basin of 28,110 km². The main river is 380 km long. The Cagayan River originates from the Caravallo Mountains on the south side of the river basin, on the halfway joins the Magat River, Siffu River, Chico River and Ilagan River, and empties into the Babuyan Channel at Aparri. The river basin was repeatedly uplifted by diastrophism. While forming the river terrace due to the crustal movement, the river was

gradually narrowed its range of flood, turbulent flow and meandering, having shifted to a relatively stabilized status at present.

On the river side, along the lower reaches toward the middle reaches of the main river and at the lower reaches of tributaries, a low and flat alluvial plains are developed, and in other areas gently sloped, low and rolling alluvial plains are spread. The flat part covers 30 per cent (8,300 km²) of the river basin and the hilly part the remaining 70 per cent (19,800 km²) of which 12,800 km² are covered by a good stand of forest, and the rest is an unforested land. The unforested lands are located mainly in the west of the river basin. Since the function of the forest for water conservation therein is poor, they cause some fear for erosion.

The Cagayan River and its tributaries are wild rivers and there are a vast plain on their coasts formed by the deposit of silts and sand of the river.

On the plains along the Cagayan River, such crops as paddy rice, corn, and tobacco are widely cultivated. The hilly area higher than the plains is almost unforested, forming grassland. This area is partly cultivated with upland rice and corn, but the cropping rate is low, leaving much wasteland.

According to the result of soil survey, it is estimated that of 2.66 million ha of the total area about 830 thousand ha can be used for crop production. These farmlands are mostly classified into Classes A and B.

- (2) With regard to the rainfall in the Cagayan Valley, as previously stated in the report submitted by the First Survey Mission, the annual average rainfall at the upper, middle and lower reaches are 2,200 mm, 1,700 mm and 2,200 mm respectively. Regarding the number of days, with precipitation, the same trend is indicated, that is, 129 days in the middle reaches, 163 days at the lower reaches. (Mean value for 1902 - 1939 and 1947 - 1960)

As one of the specific climates in this region, typhoon is cited. According to the data collected by the Mission, about 40 per cent of the typhoons which pass the entire land of the Philippines pass through this region. The passing time of typhoons is concentrated in October and November. The velocity of the wind was recorded at

15 m - 35 m per second, and the rainfall at that time was recorded at 50 mm - 200 mm.

- (3) The monthly mean temperatures at the representative 3 points in this region are indicated in the Appendix 3 - 4. As shown in the table, the highest temperature is over 40°C, occurring during the period of March - September. The lowest temperature is between 15°C - 20°C, and the average is between 20°C - 30°C.
- (4) There are about 12 main observation points for discharge and water level in the Cagayan River. However, there are few points for the discharge observation, including Naguilian, Bayombong, Magat Dam, and Alcala on the Pared River.
 - (a) The discharge of the mainstream of the Cagayan River has enough supplying capacity as a water source for the project area. As indicated in Appendix 3-3-2, the discharge of the Pared River is not sufficient.
 - (b) With regard to the flood discharge, the runoff at the degree of 1.50 m³/sec/km² frequently occurred. Accordingly, it is estimated from the total area of the river basin that about 40,000 m³/sec of discharge occurs around the estuary.

1 - 4 Agriculture

- (1) In view of the total harvested area in this region in 1973, paddy is overwhelmingly high at 65 per cent and followed by corn at 19 per cent, tobacco at 9 per cent, coconuts at 1 per cent and other crops at 5 per cent. Comparing to the total harvested area throughout the Philippines in 1973 which stands at 35 per cent for paddy, 26 per cent for corn, 23 per cent for coconuts, 5 per cent for sugar cane and 11 per cent for other crops, it is a characteristic in this region that food crops such as paddy rice and corn are predominant. Tobacco is worthy of attention as a special product in this region with the total cultivated area of 10,000 ha in 1973 in the Cagayan Province, accounting for about 9 per cent of the total cultivated area.
- (2) Paddy rice is a most important crop in the three provinces. Production of paddy during the period 1973 - 74 was recorded at 550 thousand tons in the three provinces. The output of paddy was 290

thousand tons between 1968 - 69, 390 thousand tons between 1969 - 70, 470 thousand tons between 1970 - 1971, 460 thousand tons between 1971 - 72, and 530 thousand tons between 1972 - 73, showing a remarkable increase in recent years. This increase seems to be ascribable to irrigation and an increase in total cultivated area by land reclaiming to paddy field rather than to yield increase per unit area. In 1971, 54 per cent of the total products in the three provinces was transported to other regions. In view of this, there is a close relation between the spread rate of high yielding variety and the rate of irrigated field.

- (3) Corn is the principal food crop to feed 25 per cent of the population in the three provinces in the Cagayan Valley. Fifty (50), per cent of the output is consumed as food within the region, 10 per cent as feed stuff and the rest is transported to other regions.

Tobacco is grown on the flat land along the river as succeeding crop for paddy or corn in a dry season, and the greater part of the cropping is concentrated on the province of Isabela. The average yield per hectare is a little less than one ton and this production amount reaches to about 40 per cent of the national total produce.

1 - 5 Agricultural Infrastructure

- (1) According to the data of the First Survey Mission, the total cultivated area in three provinces in the Cagaya Valley stands at 725,000 ha in 1972, of which the area under paddy cultivation is 52.9 per cent. Accordingly, the total area under paddy cultivation in the same year can be regarded as about 384,000 ha.

According to the other data, the area of paddy field was recorded at 289,000 ha. Hence, about 33 per cent of the total paddy field was cultivated with paddy as the second crop for the year. On the other hand, the irrigated area for the paddy fields actually covered 126,000 ha. Accordingly, the percentage of the irrigated area to the total paddy field area can be estimated at about 44 per cent.

The figures in each province are indicated as follows:

Table 2 Existing Paddy Field under Irrigation

Name of province	Paddy field area	Irrigated area	Percentage
Cagayan	125,000 ha	40,000 ha	32 %
Isabela	129,000	66,000	51
Nueva Vizcaya	35,000	20,000	57
Total	289,000	126,000	44

- (2) The types of irrigation by sponsorship in this region are classifiable into the following 4 categories:

- National Irrigation
- Communal Irrigation
- Private Irrigation
- Government-subsidized pump Irrigation
- Private Irrigation

In view of the irrigated area by sponsorship, National Irrigation is the largest in the area, followed by Communal Irrigation and Pump Irrigation. The percentage of area is as follows:

Table 3

National Irrigation	55,000 ha
Communal Irrigation	41,000
Government-subsidized Pump Irrigation	27,000
Private Irrigation	3,000
Total	126,000 ha

- (3) The irrigation system in this region is practiced by means of gravity irrigation, and pump irrigation which has been introduced recently. However, the scale of irrigation is still small, with only about 10 ha of irrigated area per block. The problematical points which are confronted with difficulties in these irrigation systems were reported as follows:

1. Pump Irrigation: Since there are no proper repairing workshops around the project area, it causes great inconvenience in the operation and maintenance.
2. Private Irrigation: The operation and maintenance costs and charge for improving super-annuated facilities burden upon the owner, causing an obstacle to the expansion of the irrigation scale.

(4) The drainage facilities in this region are steadily carried forward in the national irrigation project areas, however, in other irrigation project areas, great importance is not placed on this matter. Particularly, in the area where no irrigation system is organized, it is assumed that the facilities are almost negligible.

There have been some cases where naturally formed creeks are utilized for a drainage canal. However, even in this case, artificial cross section enlargement and the improvement to connect terminal drainage canal in the area with these creeks have not yet be done.

1 - 6 Marketing

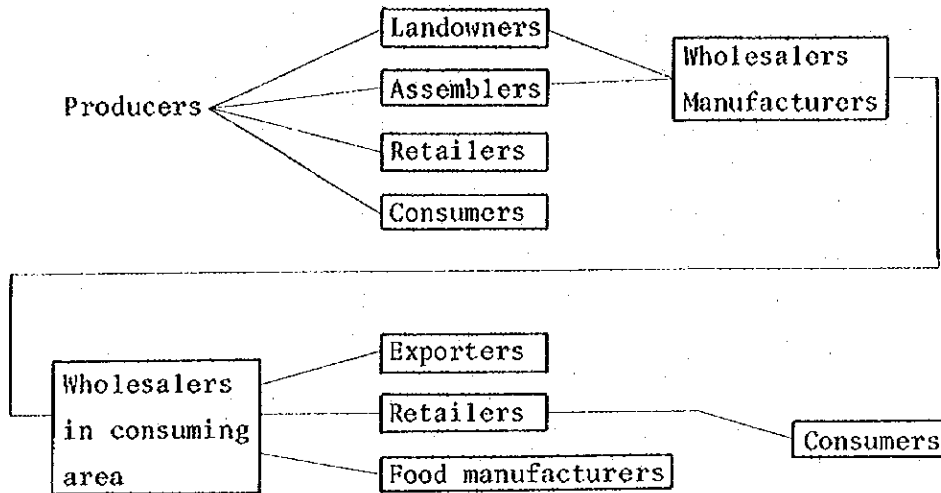
(1) As regards marketing channel of farm products in the project area, the greater part of the marketing amount is in the hands of private dealers.

Intervened by the Government, agricultural cooperatives (FaCoMa) and public corporations are not given much weight in the share of farm products marketing excluding virginian tobacco. The price control by means of purchase, storing, importing and selling of rice and corn by National Grain Authority as a representative governmental purchase of farm products is much noted; however, the share against the total marketing amount is so low that the Government purchase can not control the market price yet. Further, the activities of local agricultural cooperatives (FaCoMa) are stagnant, and in the Cagayan province no activities of cooperatives are seen.

As for the native variety of tobacco for cigars there is PTA, but the dealers are holding a dominant position in the handling volume of tobacco marketed.

The flow-chart of marketing principal farm products is indicated as follows:

Fig. 1 Marketing Channels of Principal Products



(2) The problematical points are cited as follows:

1. Since the growers themselves do not have any transportation means, most farm products are sold at the farmyard, resulting in a failure to select a most desirable buyer for his sake.
2. Since the marketing volume per farm household is very little, the dealers hold a dominant position in dealing products.
3. Since most growers do not have storing facilities of their own, the greater part of the farm products are marketed at cheap prices during the harvest time.
4. Since livestock such as hogs, carabao, chickens are all marketed at the farmyard and on top of that they are marketed alive, the terms of transaction are vague and are unfavorable to the growers.
5. Due to want of information on marketing, the growers are obliged to depend on information only from the assemblers and are always placed in a disadvantageous position.
6. Since the processing plants are very few in this area, most farm products are marketed as raw materials and sell at an unfavorable price to the growers.
7. The activities of the agricultural cooperatives (FaCoMa) is a voluntary marketing organization for the growers are being stagnated

and the initiative in the marketing channel is taken by the dealers.

- (3) In the project area there are very few land owners, and as is shown in Appendix 2-2-3, 92 per cent of all landlords are those who have less than 7 ha.

In view of the result of agrarian reform in the Cagayan Province, 1,528 pieces of certificate of land transfer have been issued to 8,633 tenant farmers by the end of April, 1975. This corresponds to 25 per cent of the total area or 16,969 ha. Whereas, from the viewpoint of liberation of landowners with more than 24 ha, the certificate of land transfer has already been issued to 86 per cent of the tenant farmers, showing a higher rate of progress than the national average.

1 - 7 Life Environment

- (1) About 1,640,000 of population inhabit the three provinces in the Cagayan Valley. This number corresponds to 4 per cent of the total population of the Philippines. The population density in this area is 61.7 persons per km² and it is very little as compared with the density of 138 persons per km² in the entire Philippines.

This area is divided into two main areas; the hilly area along the river and the mountainous area. Most inhabitants are engaged in farming on the plain along the Cagayan River and its tributaries. A part of inhabitants settle in the hilly area and are doing farming and livestock farming. In the mountainous area, the Philippine aborigines live, leading primitive lives on hunting and shift farming. Accordingly, there are many variations in the living environment for inhabitants as a result of local differences between the plain and the mountainous areas. However, it is assumed that the plain region inhabited by the majority of people represents the life environment in general in this area. When the road network is developed and the development projects in the plain is carried forward, it is quite natural that backwardness in the mountainous area would be affected by culture in the plain region.

(2) Culture in the project area has been developed at the upper reaches of the Cagayan River, having been affected by the road from Manial. That is, from the north to the south along the Cagayan River, culture is advanced. Accordingly, from the viewpoint of city formation, living conditions and life environment, etc., the Nueva Viscaya Province is much advanced in culture and the Cagayan Province is most backward in this region. This regional tendency is also noticeable in terms of agricultural infrastructure construction. In that sense, the general situation of the life environment will be stated hereunder with its emphasis on the Cagayan Province.

(3) In the main cities there are public hospitals and private clinics. In case of the Cagayan Province, there is a public hospital at Tuguegarao which has 100 beds and 8 doctors. In other three small cities there are three public hospitals with 25 beds and three doctors respectively.

The medical cost is generally high as compared with living cost and it is difficult for farmers to undergo medical care even at a public hospital.

Average life span in the Philippines is 56 years of age and the infant mortality is 6.2 per cent. It is surmised that the figure corresponding in this region must be a little less than the above. The number of citizens per doctor is about 9,000 persons and the number of citizens per bed is 822 persons in the entire region. In the project area the figure on the average is more than the twice.

(4) In the provincial capitals and well-planned cities, waterworks are laid. However, these facilities are not well managed and the water is taken in from the tributaries. Since the intake is often covered with sedimentation resulting from the flood, it is not always working in favorable conditions. For this reason, the capacity of the facilities is not fully displayed. As a result, water is taken in from the well of their own or the well for common use. Particularly, ordinary households or farming households are securing their drinking water from rainwater.

The waterwork planning are going to be made by the Provincial Governments and the Department of Social Welfare, but it seems to be the most urgent to improve those faulty facilities for the improvement

of public health and sanitary conditions.

- (5) The telecommunication facilities in this country are considerably poor except at the outskirts of Manila. Particularly in the project area, it is almost impossible to get in touch with the Central Government through the facilities.

The imperfect means of communication facilities which affect the economic marketing structure, hinders the development of this region.

Even within the same province, it is difficult to communicate with each other through telephone owing to the shortage of the telephone circuits and its inadequate management.

- (6) The industry in the region is agriculture and no factories are practically found. Recently, forestry has become flourishing and sawmills are found here and there.

Accordingly, the outflow of labor which is not employed in agriculture, in this region into factories and cities around Manila is increasing. On the other hand, since there are still more reclaimable fields left unexploited, settlers from other regions are engaged in clearing the forest land.

Such being the case, there are enough room for absorbing labor, however, there are so many school graduates and laborers who want to migrate into the city. As a result, even in this region there is a shortage of labor.

- (7) The daily necessities in this region are carried in from Manila through the highway. Accordingly, there are shopping streets in each town and even in hamlets there are at least one to two shops to sell these daily necessities.

Further, farm products in the outskirts of cities sell at the joint market which is opened once or twice a week. These shops and markets have many kinds of goods and have a large stock of them. However, with respect to the income accruing from goods transaction, it is generally low. Therefore, it can not be said that the market there is brisk.

- (8) The plain area around the Cagayan River habitually floods and is damaged to some extent every year. Particularly, the flood occurred in November of 1972 did great damage to this area.

In the flood damage in the Cagayan Province in 1974 three persons were dead, about 17,000 families and about 103,000 people were suffered from the flood. The amount of damage was about 3 million pesos in public buildings, 1.3 million pesos in roads and bridges and about 32 million pesos in farm and fishery products. Consequently, it can be learned that damage caused by floods is great, a part of the loss is charged up against the producer and economic burden falls heavily on the inhabitants. Particularly, it is felt that an awareness of the damage among inhabitants in the flat land at the lower reaches of the Cagaya River have been worn off and declined their willingness to work.

Chapter 2 OUTLINE OF THE PROJECT PLANNING

2 - 1 Development Strategy

2 - 1 - 1 General

As pointed out by the First Survey Mission it is obvious that in the development of the project area, top priority must be placed on agricultural aspects. That is to say, upon natural conditions such as favorable rainfall and atmospheric temperature, water resources which are obtainable from affluen t discharge of the Cagayan river, fertile soil carried down by the Cagayan River, and the dwellers' long term experience in agriculture; the decision of priority in this project will mostly depend.

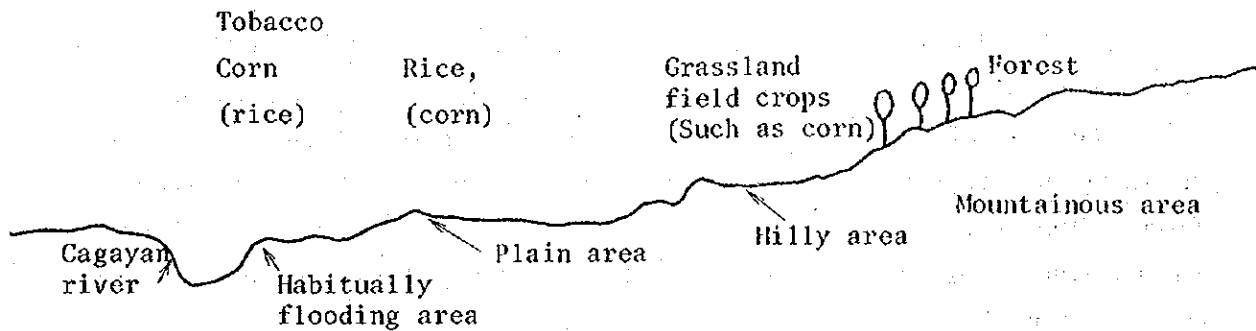
By attempting to introduce new agricultural techniques and to improve economic marketing while making the best use of these favorable conditions, the plan must be made aiming at the final goal to achieve an effect of this regional development.

In view of this, the agricultural integrated development project is required and the following items should be incorporated into the project:

1. Agricultural Infrastructure Construction
Development of water resources, expansion of field plots and improvement of farm roads and drainage canals.
2. Improvement of Agricultural Technique
Improvement of varieties, fertilization, pest control, drafting of high economic cropping patterns.
3. Modernization of Agricultural organization
Strengthening and rationalizing cooperatives, costdown of farm products by means of mechanization and cooperative transportation, and rationalization of marketing structure by perfecting information systems.
4. Expansion of Farmers' Income
Increased production of commercial crops and livestock as a side business of farmers,
5. Improvement of life environment
Settlement of farmers and acceleration of employment by means of rural community electrification and spread of waterworks.

Since the most effective use of land became necessary to achieve the above goals, a keynote should be set up as follows:

Fig. 2



Particularly, in the object area for development, the project must be first started in the area where many people live in the paddy field zone on the plain and where an effect of the project can equally be shared by the majority of the inhabitants. Further, it is necessary to select areas where the yield of staple food is increased, the products thereof are easily transported to a large consuming city, Manila through the Philippine - Japan Friendship Highway, and the areas which certainly affect the self-sufficiency of staple food and the economic growth in the Philippines.

2 - 1 - 2 Planning of Farm Product Increase

In order to increase the yield of food crops in agricultural development, the policy to give immediate effect is needed.

With regard to paddy cultivation along the Cagayan River, double cropping of paddy will become possible by converting the rainfed field cultivated only in a wet season into irrigated paddy fields and thus will sharply increase cultivated areas.

On the other hand, by putting in the production materials such as fertilizer, pesticide, farm machinery and the introduction of high yielding varieties, it is expected to increase the yield per hectare. As a result of both the increased cultivated area and the increased yield per hectare, the rice production will be increased by leaps and bounds.

For rooting the new technique of double cropping of rice, it is required to distribute new variety seeds, to improve production technique for the increased amount of fertilizers and pesticide utilization, to organize irrigation association to secure required amount of irrigation water at the right time and farmers' association for common works, and to improve facilities of farm products processing and storage.

The irrigation rate of paddy field in the project area is the lowest in the Cagayan Province. Also, the extension rate of high yielding varieties is as low as about 60 per cent being inferior to other provinces.

As indicated in Appendix 2-4-3, the yield per hectare is in a close relation to the irrigation rate and the extension rate of high yielding varieties; the Cagayan Province, however, is the lowest. This implies that Cagayan Province has the highest potentiality in raising the yield of crops, that is; the Cagayan Province has high potentiality in agricultural development.

Further, it would be clearly stated here that in the introduction of high yielding varieties, dense transplanting, water management, sufficient fertilization, and pest control are required.

While in upland crops, increased yield of corn is needed. Corn is a crop which requires the eargest amount of fertilizer among upland crops, holding the key to the increased yield. Although it is not necessary to give heed in a dry season, adoption of a high yielding crop and a resistant variety against dowing mildew in a rainy season is required. Irrespective of paddy field or upland field, it is important to raise cropping intensity. However, in the project area, flood damage frequently occurs in October - November caused by torrential rains on typhoon. At this time of the year, it would be safer not to plant in paddy fields and the upland fields along rivers.

For establishing cropping pattern, it should be considered not to plant crops in such a risky season.

2 - 1 - 3 Cropping Pattern

As shown in Appendix 5 - 1, it is a general rule to use a variety which is non-sensitive to light and high yielding and has a growth duration of 120-125 days. That is to say, for the first crop of rice, it is sown in mid-May, transplanted in mid-June, and harvested in early September, and in October and November of risky months for flood, the field is to be put in

fallow. For second crop of rice it is sown in mid-December, transplanted in early January, and harvested in mid-April.

During the first cropping, the nursery bed at the early growing stage and the main field at the early stage, require irrigation water, however, at the middle and latter stages of growth, the requirement of irrigation water is to be furnished with rainfall.

During the second cropping, irrigation water is required excluding the nursery period at the early growing stage. Particularly, at the middle and latter stages of growth lacking rainfall, paddy culture becomes impossible without complete irrigation facilities. Since there is abundant solar radiation during the second cropping, about 10 per cent increase of yield as compared with that during the first crop can be ensured. When the irrigation facilities in the Cagayan Province is well-equipped and the required materials are put in, about average fo 3.5 tons per ha (3.3 - 3.7 tons/ha) at least to be doubled in yield per hectare can be expected in the proposed project area where rainfed paddy culture is prevailing.

It is estimated that the total production becomes about 2.5 times more than that of present production. For this purpose, the use of nitrogen of 65 kg per ha, P_2O_5 of 50 kg per ha and pesticide to be sprayed twice per crop are required.

While in rainfed paddy fields, it is recommended to keep mung bean and corn in January - March as a second crop by using the remaining water in the wet season. Particularly, in the case of mung bean, there is "a two-month growing variety" which can be successful as a second crop. In case of the second crop of rice, there are only 40 days of interval between the harvest time of the second crop and the transplanting time of the first crop. In order to complete the main field preparation in this short period, it requires to use machinery such as tractors in plowing. Further, since the harvest time of the first crop falls in rainy September, special care must be taken in drying paddy.

2 - 1 - 4 Improvement of Organization and System for Agricultural Technique

An effect of the project may not be manifested until the new agricultural planning for the future is prevailed to terminal groups and it is in gear

with the infrastructural construction of farm land. Accordingly, in order to extend this agricultural planning among farmers, it is necessary to set up a pilot center of 150 ha or so. It is important to have farm leaders and large-scale farmers understood the necessity of improvement and upgrading of agricultural technique.

Increase of farmers' income will be made possible by acquiring new agricultural technique, by promoting cooperation of farming and mechanization, and by rationalizing farm management such as joint forwarding and cooperative selling including livestock farming, and thus the project can reach the full completion. For this purpose, collecting centers, connecting roads, rural electrification and farm products processing plants must be perfectly developed.

2 - 2 Selection of the Project Areas

2 - 2 - 1 General

The three provinces in the Cagayan Valley were the proposed areas at the beginning. However, as a result of the joint conference with the counterparts of the Philippine side and of negotiation with the Assistant Administrator of NIA in Manial, it was agreed between the Philippine side and the Japanese Mission to take up the Cagayan Province as a proposed area because the Isabela and Nueva Vizcaya Provinces have already been planned out for some projects, having no adequate project to be newly requested. Thereby the Cagayan Province due to its backwardness of development was agreed to be taken up as the object of the survey. That is to say, on the left bank of the Cagayan River, the commitments on the Magat and the Chico River irrigation projects are given by ADB and IBRD, respectively. (see Appendix 4 - 1) According to this commitment, the greater part of the left bank will be covered by the anticipated project and only small lot in area will be found in-between, causing a difficulty to adopt the project therein. Further, on the right bank except the Cagayan Province there is no sizable areas at present time except the areas under construction works of NIA.

2 - 2 - 2 Proposed Areas for Agricultural Infrastructure Construction Project

Concretely speaking, the nine irrigation projects covering 31,222 ha in total were proposed by the Government of the Philippines as the project areas for CIAP. As indicated in Table 4, of the above total area under the

project, 1,000 ha is in completion, 4,000 ha is under construction, and 15,900 ha is under contemplation, respectively. The details are indicated as follows:

Table 4 List of Proposed Irrigation Projects in the Cagayan Province

Name of Project	Potential area	Stage of project	Contents
(On right bank)			
(1) Banurbur Creek Irrigation system	1,000 ha	Existing	Completed in decade of 1960.
(2) Solana-Tuguegarao Pump Irrigation	4,320	On-going	All canalization has been completed. Pumping station, however, has not.
(3) Baggao River Irrigation Project	4,000	On-going	More than 2,000 ha in left is irrigated from 6/15,1975. More than 2,000 ha in right will be irrigated from 1976.
(4) Dummon River Irrigation (By weir 4-5 m high)	3,000	On-going	Office is under construction. Budget was released from 1974.
(5) Bawa River Irrigation (By free intake)	3,000	On-going	Although budget was released in 1974, canal construction is difficult due to big boulders.
(6) Iguig Pump Irrigation	800	Proposed	Survey was completed. Implementation schedule has not yet been decided.
(7) Pared River Irrigation Project	1,500	Proposed	Survey has not yet been started.
(8) Pinacanauan River Irrigation Project	1,600	Proposed	Survey was suspended due to other urgent project (80% only).
(9) Lower Cagayan River Basin and Lallo Pump Irrigation	10,000 and 2,000	Newly proposed	No survey has been implemented.
Total: 31,220	(Existing 1,000 ha (On-going 14,320 (Proposed 15,900		(The information was given by Mr. A.D. Coloma Chief of Cagayan Provincial Office)

Although the survey mission was requested by the Government of the Philippine to give every consideration to the selection of proposed areas including the

projects under construction, the following proposed areas were judged inadequate to be adopted into the project areas according to the reasons mentioned below:

(1) Solana-Tuguegarao Area

All irrigation channel works have been completed and only the installment of pumps are left unfinished. It is judged the works can be completed by the Philippine Government alone.

(2) Baggao River Area

The work on the left bank has been completed in June, 1975 and the right bank is scheduled to be completed in 1976. Similarly to item (1), not much fund is needed any more from now on.

(3) Dummon River Area

Since, in this area, the project has just been started from 1975, a fact-finding survey was made with the feeling that there will be possibility to adopt this area in the project. However, there are irrigated fields by small-sized pumps found in the proposed area, and the design of proposed headworks (30 m wide x 5 m high) are already authorized and are ready to set about soon. On top of that, since the contents of works is relatively simple, it was discerned that the single-handed construction works by the Government of the Philippines is possible.

(4) Bawa River

Since this area is geographically far from the Cagayan Main River, it could not be adopted. With regard to 4 projects under planning, the judgement was made as follows as a result of investigation:

1. Pinacanauan River Area

This project is to irrigate the farmland of 1,600 ha on both the banks of the river by constructing a free intake from Pinacanaun River. However, the irrigated area is a deluvial upland field and is high in permeability and it was judged difficult to covert it into a paddy field. For this reason, it was decided not to take up in CIAP and was judged to leave it for future development including agriculture plus non-agricultural sectors.

2. Iguig Area

This area is a flat rainfed paddy field stretching along the right

bank of the main Cagayan River about 15 km north of Tuguegarao, covering 800 ha of paddy field in a group. It is presumed to be able to easily supply irrigation water when water is pumped up about 15-20 m high after setting up a pumping station along the main stream. Nevertheless, there is a mark of an old small pumping station remained there, and it is likely that the spot is fitted to a pumping station. Further, it is a great convenience to have a public highway running through the area. For the above reason, it was decided to adopt this area into the present project.

3. Pared River Area

This area is crossed by the public highway about 32 km north of Tuguegarao and further is a diverging point of the main road leading to Baggao. The area covers 1,500 ha of flat and slightly sloped rainfed paddy fields and upland fields and is easily irrigated by pumping up water 15-20 m high from the Pared River.

At the upper reaches of the river, there is the Baggao area with a land of 4,000 ha which has just been completed the construction. Although the relations between the water requirement in the Baggao area and the droughty discharge of the Pared River should be fully investigated, it was decided first to be adopted into the present project. With regard to the flooding conditions, it is recorded that the above two areas were damaged by floods only three times during the past 50 years.

4. Aparri and Lallo Area

The Aparri area is a flat area with rainfed paddy and swampy area of 10,000 ha extending eastward to Aparri at the elevation of less than 15 m.

The Lallo area is also a flat area with rainfed paddy field of 2,000 ha lies in the back of Lallo community.

The above whole area can be irrigated through the main irrigation canal of about 30 km in length by pumping up water about 20 m in height from the Cagayan main stream, near the point most upstream of Lallo area. Since, from October to December are the rainy seasons, the low land of Aparri area is flooded every year, and the cropping schedule at this time of the year should be avoided.

Further, it requires to set up drainage works. However, it is presumed to be adequate to adopt this area into the present project as large, irrigable, and promising paddy fields capable of double cropping, but left unexploited in the Cagayan Province up to date.

2 - 2 - 3 Proposed Area for Agricultural Technical Cooperation Project

In order to carry out the integrated agricultural development effectively in the project area, it is necessary to secure an area in the above-mentioned irrigation project area, in which a technical cooperation project of about 150 ha or so is needed to implement an agricultural policy to support agriculture. The Pared area has to be selected as a proposed project area for the following reasons:

1. This area is about 32 km far from the Cagayan provincial capital, Tuguegarao, along the public highway and is quite convenient to traffic. This area is located at the center of the four irrigation project areas. Further, it is located at the diverging point of the road leading to Baggao area (4,000 ha) which was recently completed. In this sense, a practical effect on demonstration will be great.
2. This area is endowed with favorable factors such as natural conditions suitable to the model area (namely, pilot scheme) which was proposed in the report previously submitted by the First Survey Mission. That is, the natural conditions are most favorable, the local people are most enthusiastic with the project, the size of farmers' holding is large and it is conveniently located for the use of irrigation water.
3. Topographically, there are undulations. Besides paddy culture, the land use mainly for upland crop is possible within the area. Further, rice seed can be produced in the same pilot center. Since the Aparri area is large in size, it is presumed to be effective if a technical extension work could be performed by setting up a technical extension farm in the pilot center. However, in case the above-mentioned conditions in the Pared area are found not to be met as a result of future investigation, or in case the coordination with the Canadian technical aid project becomes difficult, the pilot center will have to be changed to Aparri area.

2 - 2 - 4 Upper Magat Development Program

With regard to flood control, land reclamation and irrigation projects upstream of the Magat river in Nueva Vizcaya which was requested by the Government of the Philippines at the joint conference at Manila, it was decided not to adopt as a project but to re-examine the program due to the following reasons:

1. Basic data (catchment area, flood discharge, suspended and bed loads, benefitted area, its elevation, etc.) are not available. Therefore, the required data must be collected and arranged.
2. The contents of the program concern the flood control, but the water retarding structures which can control flood discharge are not included. Since the plan is made mainly for river improvement (maintenance of river channel, revetment, erosion control), it is too small to effectuate flood control measures reaching to the lower reaches.
3. With regard to land reclamation, it is planned to implement land reclamation by setting up groin works. Sand and gravel is deposited on one hand but they are scoured on the other hand. Under such circumstances, it will become difficult to make sand and gravel deposited at the lower reaches and thus it will cause difficulty in developing a new land, even though river improvement and irrigation projects are planned by setting up a weir at the upstream side.
4. The present plan to use irrigation channel as flood way (by-pass at the time of flood) is not realistic, because there is a great difference between flood discharge (1,500 cubic meter per second) and discharging capacity of water way (30 cubic meter per second).
5. Since the anticipated area for new irrigation facilities are located in a higher place than the present benefitted area, an attempt to use the old main canal for irrigation seems to be a little difficult, so a new water channel should be built on a higher place on the hill side.
6. It is foreseeable that the irrigation project area (Cooperation with ADB, IBRD) downstream of Magat river will be affected in the dry season. Accordingly, a full investigation on droughty discharge is required and at the same time it is indispensable to obtain a consent from the authority (NIA in Magat area) in charge of the downstream

project.

2 - 3 Irrigation and Drainage

2 - 3 - 1 Basic concept

Under such circumstances mentioned so far, three areas, namely Iguig, Pared and Aparri-Lallo, were selected this time to be covered by the present irrigation plan. Land to be irrigated in these areas are 800 ha, 1,500 ha and 12,000 ha respectively to make a total of 14,300 ha.

Adoption of pump irrigation is deemed inevitable for all the areas on account of difference in elevation between the irrigation areas and water level in a dry season at points for taking water from its source; the Cagayan river and its tributary, the Pared river.

Type of motive power will hold the key to the efficiency in operating a pump irrigation system. Though two types of motive powers, electric motor and Diesel engine, are conceivable in this regard, the former is being employed in this plan in anticipation of an easy availability of electric power: toward the end of 1977, construction works of the Cagayan Transmission Line Project, covering the areas from Manila to Aparri via Tuguegarao, will be completed, financed by a Japanese government loan. However, if the said project is not carried out as blueprinted, necessity to consider the power source will arise afresh.

As regard the type of pump, the vertical axis diagonal flow type is adopted tentatively in this plan, contemplating, at the same time, adoptability of the double suction centrifugal type according to the circumstances. Final decision in this respect is hereby entrusted to the next survey team which will make an elaborate comparative study on the pros and cons as well as on the economic aspects between the two.

Further, an important point of consideration in the practice of pump irrigation is the measures to prevent earth and sand inflow which can cause various hindrances such as abrasion of pumping equipment, sedimentation in canals, and so forth. Accordingly, it will be necessary to plan sedimentation basin in this case, which is to be determined in view of the actual conditions of locomotive movement of river-bed deposits in the rivers to be diverted, water quality, difference in level between diversion canal sills and river-beds, flowing courses and so on. Although the field

survey conducted this time was incomplete to clarify all these conditions satisfactorily, no large-scale facilities for sand deposit is felt necessary synthetically judging from information obtained from the people living in the vicinity of prospective sites of pumping stations. Rather, it will be necessary to think out some means of removing trash, driftwood etc. which might be encountered during and after the floods.

Besides, structure from main to terminal irrigation and drainage canals is planned to be of earth canal in principle. However, it is probable that there will be many places topographically where such concrete structures as siphon, culvert and others are required. And, also concrete lining will be required for some parts of open canals where the soil quality is inferior. Considerable necessity for concrete lining is foreseen especially for main canals. In the stage of this planning, it has been impossible to grasp conditions fully in detail in this regard and, therefore, due allowance was given for unit costs, a constituent of

In compliance with the Planning Standard presently used by NIA, length of canals are planned to be as follows: 20 m/ha for branch canal, 40 m/ha for terminal canal and 20 m/ha for terminal drainage canal.

2 - 3 - 2 Plan for Aparri-Lallo area

The area is situated in the central part of the northern extremity of Cagayan province and its western side is contiguous to the most lower courses of the Cagayan river. The southern side is abutted on a hilly area of 100 - 200 meters above the sea level, originated from which are several medium and small rivers running through the planned area from the north to the south. The planned area is a plain with a gentle slope of 2 m - 0.5 m altitudes toward the north. On the other hand, its northern end faces directly the Pacific and there are many long and narrow dunes which rise to ground elevations ranging from 2 to 5 meters. And large swamps are formed along the coast under the influences of the run-off carried away by streams from hilly area as well as floods of the Cagayan River that practically occur every year. Moreover, the estuary of the river is in a tidal area influenced by tidal level and, so, it will be no use to seek for a place to obtain irrigation water for this area at anywhere near the estuary. Due to such reasons, this area has so far been forsakenly remained

without a systematic irrigation system and, subsequently, its agricultural productivity has been very low. In view of such circumstances, the plan is worked out placing special emphases on security of irrigation water, and removal of excess water in a rainy season.

Prospective irrigation area is approximately 12,000 ha. and its total water requirement will be 18 cubic meter per second ($18 \text{ m}^3/\text{sec}$) and necessary caliber and number of pumps for it will be 1,200 mm x 7 sets.

As for location of pumping station, a point of 20 km up the estuary is selected in consideration of no influence of saline water to irrigation water, bearing force of ground to support heavy structures, meandering condition of the river, high water level in flooding period etc. At the said point, the river meanders to the right, narrows in width and the river-bed rocks (lime stone) creep out indicating that it is the most suitable site for a pumping station.

Besides, there is the Cagayan River crossing point of the Philippine - Japan Friendship Highway shortly down the river and the bridge is now under construction. Total lift required for pumping up and distributing water is to be 21 m. Pump to be adopted will be of the vertical axis diagonal flow type same as those of the other areas. As regard the size of the pumping station, differently from those of the other areas, it will be very large on account of the number and caliber of pumps etc. and, therefore, its tersely-drawn plane figure and profile are provided herewith (Appendix 7-3). However, a safe and economical structure and its construction method are to be decided by the next survey mission after making a deliberate study on this matter. Respective lengths of main, branch and terminal irrigation canal are to be about 30 km, 240 km and 480 km. As for standard sections of these canals, please refer to Appendix 7-4. canal density will be 60 m/ha ($720 \text{ km} \div 1,200 \text{ ha}$).

As mentioned earlier, due consideration is required concerning the problem of excess water removal in a rainy season particularly in this area, and in this connection, a large-scale network of drainage canals is designed as shown in Appendix 7-1. Accordingly, lengths of the main, branch and terminal drainage canal are about 20 km, 30 km and 360 km respectively. The lengths of the main and branch drainage canal are determined referring to a topographical map on the scale 1/50,000. The length of the terminal drainage canal is planned to be 30 meters per ha

(30m/ha) similarly to the other areas.

Drainage canal section is determined in compliance with the planning standard used by NIA and its unit discharge per hectare is 5 liters per second (5 liters/sec). Yet, it is felt necessary to reconsider this unit discharge in future on the basis of actual survey results: it is converted into daily rainfall intensity of 43.2 mm per day which is feared to be relatively low even for paddy fields alone. Furthermore, this area has a mountainous area of about 100 square km at the back and the effluence coming out of which should also be taken into consideration in the course of planning and design.

Referring to the main drainage canal, as may be understood by the drainage canal standard section shown in Appendix 7-5, it is so designed as to have a discharge of 60 cubic meters per second, canal-bed width of 25 m and water depth of 2.5 m. It is perhaps very difficult to make the water depth deeper from the viewpoints of co-relation among ground elevation, water level at the estuary and tidal level. Further consideration with respect to these points should be made hereafter. Tidal level curve at the port of Aparri is shown in Appendix 3-6. In the next feasibility study it is also necessary to consider, in the light of all that were mentioned above, the question whether or not the natural drainage in this area is practicable and to what extent it requires mechanical drainage.

2 - 3 - 3 Plan for Pared area

This area is situated on the left side of the Pared River, a tributary of the Cagayan, and is a plain which includes a hilly area spreads alongside about 6 km up the confluence of the Cagayan and Pared Rivers. Its western side forms mountain skirts of about 30 m above the sea level, and on the eastern side runs the Philippine - Japan Friendship Highway now under construction, through the area from the south to the north. In other words, this area descends at a gradual slope from the mountain skirts toward the highway. Field survey has found that the eastern side, higher portion of the planned area, is dotted with farms where corn and other dry field crops are cultivated.

Approximately 1,500 ha of land area is planned to be irrigated in this sector. The Pared River which flows down on the right side of the

planned area is to be utilized as water source for irrigation. If the use of the Cagayan is planned, though rich in flux, the cost of construction works will be foreseeably very high being forced to have an extremely long water conveyance distance and high water conveyance lift. Pumping method is defined to be used for taking irrigation water. Water quantity required will be about 2.3 cubic meter per second and necessary caliber and number of pumps for it will be 600 mm x 4 sets (see Appendix 7-3).

As for length of main canal, determination is made on a topographical map with the scale of 1/50,000 based upon a field survey. Total length required for it is about 17 km. Length of branch and terminal irrigation canals, and terminal drainage canal are 30 km, 105 km and 45 km respectively (see Appendix 7-1). Standard sections of these canals are as shown in Appendix 7-4.

2 - 3 - 4 Plan for Iguig area

This area is a plain situated about 15 km north of Tuguegarao and spreads on both the sides of the Philippine - Japan Friendship Highway, occupying the southernmost sector among the three areas under this plan. Due to inadequate supply of irrigation water demanded by about 800-ha planned irrigation area, it is decided to take water from the Cagayan River directly. Unit amount of water to be required is 1.2 cubic meter per second. Judging from the elevation difference between the irrigation area and water in the Cagayan River (see Appendix 7-2), pumping method is adopted for taking water. As for type of the pump, vertical axis diagonal flow is tentatively adopted. Required caliber and number of the pumps will then be 450 mm x 4 sets (see Appendix 7-3-3). Elevation difference between irrigation water in the area and fluctuated water of the Cagayan River is regarded to be over 10 m and, if water conveyance loss is taken into account, the total lift required will be 17 m as shown in Appendix 7-2.

Length of main irrigation canal is determined using a topographical map with the scale of 1/50,000, taking all the results of field survey into account; the total length is to be about 4.5 km. Accordingly, as shown in Appendix 7-1-3, respective lengths of branch and terminal irrigation canals, and terminal drainage canal are to be 16 km, 56 km and 24 km. Standard sections of these canals are as shown in Appendix 7-4. From results of a site survey, canal-bed slope will be 1/4,000 - 1/6,000 with an assumptive velocity

of flow of 0.4 m per second. Since no significant problem concerning drainage in this area is present consideration is given only to the terminal drainage canal in this context.

2 - 4 Marketing and Feeder Road

2 - 4 - 1 Purpose

Agriculture in the Cagayan Province is expected to play a role of food supply base in the Philippines. While, presently, their agricultural products such as rice, corn, tobacco and livestock, etc. are collected by private traders and forwarded to the suburbs of Manila mostly in the shape of raw materials. This practice leads to miss the main chances of increasing employment which may naturally result from the processing of the products within the region and also chances of raising prices of goods to be sold to buyers, with the value added after the products are processed. Their inter provincial processing industries remained underdeveloped as such are attributable to the following drawbacks: 1) being undeveloped area, 2) poor condition of roads, road network and means of transportation, 3) lacking in energy source such as electric power, etc. 4) tardiness in capital investment, 5) immaturity of economic concept among provincial people. Therefore, it is probable that there will be some changes in the aspects of primary processing and marketing channel of agricultural products in the wake of completion of the Philippine-Japan Friendship Highway and the Cagayan Transmission Line Project which ensure a great power source.

Prerequisite to the reformation of marketing channel of agricultural products is to raise farming productivity and farmers' economic standard. To attain this purpose, the farmers should preserve and process their products, and select buyers at their own discretion. In fact, the cooperatives, now a farmers' voluntary organization, are hardly taking root in their communities. Presumably, it is after all a question of farm economy; poverty compel them to borrow money in advance from traders and/or landowners who, in turn, collect farm produce mostly in kind out of them and remainder in the hands of farmers is scanty with which no much merit is obtainable from joint marketing carried out by a marketing cooperative.

They will have a growing interest in agricultural marketing channel if rice productivity is heightened owing to an improved irrigation system and, in addition, credit system for them is shall be organized. Only after all these conditions are fulfilled, necessity and will, in a genuine sense, for establishing cooperative will emerge from among farmers.

2 - 4 - 2 Improvement of marketing channel

Farmers joint marketing through cooperative will not only shorten marketing route and heighten farmers clear selling price, but also bring about improvement of marketing channel by dint of taking the initiative to select buyers with potentiality of being in possession of preservation and processing facilities. As touched upon earlier, in order to carry out marketing of agricultural products under the lead of farmers, it is essential to have a system with which the farmers are able to handle their products throughout the stages from production to sales, availing themselves of a cooperative as nucleus. For the implementation of such system, necessary steps to be taken are to 1) provide profusely low interest loans for farmers, 2) give long-term loans of low interest for cooperatives so that they may obtain preservation and processing facilities, 3) furnish funds for introducing large- and medium-sized farm machinery, 4) give farmers through guidance of production technique and 5) guide them thoroughly in farm management. The Philippine Government is organizing the farmers step by step under the names "Compact Farm", "Samahang Nayon" and "Kilusang Bayan" and utilizing them as bases for production guidance, financing and marketing channel improvement in an attempt to raise agricultural productivity and farmers economic strength. The Agricultural Cooperative Development Program jointly designed with Canada, which will be mentioned afterwards intends, though the name is different from those mentioned above, to reach basically similar goal that is deemed proper. However, if a cooperative is purposed only to do joint marketing of agricultural products, it will inevitably become inactive as exemplified by the local cooperative (FaCoMa). As aforementioned, a cooperative taking a unit farming community as its unit is superior as a driving influence in this stage; the cooperative is so designed as to guide the unit community farmers in production technique and farm management while furnishing funds to them and, further, to collect, preserve and process the products with their

own facilities and, consequently, strengthen their economic power.

Along with popularization of "two crop paddy farming" to dry unhulled rice in the sun will become increasingly impracticable and need for rice mill center in each town or village will arise. However, farmers' organization in a town or village may not be powerful enough to bring about the improvement of marketing channel in rivalry with private traders rich in funds. To cope with them, a provincial federation constituted by some associations, each of which is composed of several units of community cooperatives, is to be organized, and it is to assume the responsibilities for establishment of rice mill center, selection of buyers and transportation of products. And, going a step further, a central level federation of the cooperatives is to be formed and it is to undertake responsibilities for market research, distribution of information and negotiation with the central government.

The pyramidal four grades system of cooperatives is analogous to that of the Agricultural Cooperatives in Japan. However, with this regard, a special emphasis was placed on the aspects of guidance in production technique and finance for the sake of cooperatives, judging from the productive capacity of agriculture in the Philippines today. Unless the betterment of economic level of farming households is materialized it will practically be impossible to systematize and improve situation in the sphere of marketing their products.

Appendix 4-2 deals with an outline of the Cooperative Development Program intended to cover five provinces (including three provinces of Cagayan) in the northern part of Luzon, which is presently contemplated, including the following four cooperatives in the Cagayan Province.

Table 5 Proposed Project Areas in the Cagayan Province

Municipality	Villages	Farmers	Area in ha
Baggao	10	500	1,000
Gattaran	7	350	700
Lallo	5	250	500
Sto Nino	5	250	500

Source: B C D "The Regional Cooperative Development Program for Cagayan Valley" March 1974

2 - 4 - 3 Road plan

The most influential factor to a marketing system of agricultural products is the condition of road network. Within the areas under this plan is the Philippine-Japan Friendship Highway being constructed alongside the Cagayan River. Arterial roads in the planned areas will be made substantial upon completion of construction of all the roads presently under construction and those under planning by the provincial government. Nevertheless, roads for connecting communities and, also, feeder roads to connect farming fields and villages are so small in number that a lot of them require to be planned out hereafter. Feeder roads are quite essential in order to carry, by vehicle, harvested crops from farming fields to collecting places in villages and forward them to the provincial capital or other cities. These sorts of roads require the effective width of 5 m with road shoulder of 50 cm on both sides (6 m in total) and to be of two lane road. Arrangement of communication roads as mentioned above is an important project from the viewpoint of life environment as well; such as to facilitate children to go to school and/or women to go to market and the like. The said communication roads are found scarce particularly in the three areas selected this time, viz. Iguig, Pared and AparriLallo, to the extent that some villages are accessible only on foot.

For this reason, the said sorts of communication roads are intended for the three areas. For a smooth progress of the construction works and to economize the cost, such roads are planned to be constructed alongside of main irrigation and drainage canals as far as circumstance permit. Besides, water in these canals will also serve as water for some miscellaneous purposes in daily life of people such as for washing clothes, farm crops etc. Road from each village is planned to be connected with the communication roads constructed alongside of the canals. Length of the said communication roads is tabulated as follows:

Table 6

Area	Along Main Irrigation Canal	Along Drainage Canal	From Community	Total	Area Benefited
Iguig	4.5km	--	7.5km	12km	800ha
Pared	8.0km	--	19.5km	27.5km	1,500ha
Aparri-Lallo	30.0km	32.0km	46.0km	108.0km	12,000ha
Total	12.5km	32.0km	73.0km	147.5km	14,300ha

Mostly, communication roads are being constructed in the plain areas, and they will require to lay earth on the ground. Resultant remaining earth from excavation works of the irrigation and drainage canals will be available as the earth to be laid on. However, as for roads to be constructed on clayey land in the lowly elevated portion in Aparri area, it is intended to raise the ground level about 50cm with mountain earth as their upper road-beds. Road surface will be covered with lime stone (coral) to the thickness of about 20cm and pressing treatment is given by roller.

In addition, branch communication roads along branch and terminal irrigation drainage canals are intended to be constructed. The roads are divided into two kinds; one is a single lane road or 3 m wide with 50 cm shoulders on both sides (total width of 4m), which serves also as an agricultural road, and the other is a footpath of 2m in width. Length of these roads will be about 70m/ha because they are designed in association with irrigation network.

2 - 5 Agro-Industries and Rural Electrification

2 - 5 - 1 Necessity of processing and treating facilities

Agricultural products in Cagayan province, except those for inter-provincial consumption, are mostly carried out of the province as raw materials. As formerly touched upon, unhulled rice (Paddy) collected by collecting agents and/or wholesale dealers is cleaned at large-scale rice mills called Cono (10 mills in the Cagayan Province) or at rice mills scattered in towns and villages. But, cleaned rice in a small portion and paddy in greater portion are transported. Tobacco, too, is carried out as raw material to processing plants outside the province. Livestock as well sent alive (on foot) extra-provincially bringing with such disadvantages as

decrement in weight and/or death in transit, carriage (₱. 150/head for water buffalo from Cagayan Valley to Urdanede) and so forth. These losses all inclusive, it requires greater expenses by ₱. 78 than in case it is made into carcase and transported. Transportation after inter-provincial slaughtering and processing can cut down expenses by ₱. 0.45 per km by carcase of buffalo, and ₱. 0.48 in case of beef cattle. (Note: Alunan, J. A. and L. B. Darrah: "Some Legal and Economic Aspects of Livestock Marketing") It is said, on this ground, that it will be beneficial to the local economy to establish livestock processing plant in these areas.

2 - 5 - 2 Plan for livestock industry

Main products of the planned areas are such feed crops as yellowcorn and sorghum. Due to total absence of commercial feed processing facilities in the areas, they are brought out to feed mills in Greater Manila for processing and, thereafter, carried back into the areas. The majority of feed millers buy materials from middlemen and resultant feed price is accordingly high. If feed mills are established within the areas, they can buy the materials directly from farmers and thereby will be released from paying transportation expenses both ways, enabling swine and poultry farmers in the areas to buy formula feed at a cheaper cost. According to data in 1973, approximately 6,600 bags (40 kg/bag) per month of formula feed were brought into the areas and cost of transportation at the beginning of 1973 was ₱. 4.20/bag. If transportation cost of raw materials (yellowcorn and rice bran) is inclusively calculated, inter-regional processing saves as much as ₱. 6.93/bag. An estimation based on the amount of feed carried into the areas in 1973 suggests that it can economize ₱. 551,600 in a year only from the transportation of formula feed to and from the city. Transition in raising number of swine and poultry are as shown in Appendix 2 - 5. From such reasons, they say that to establish feed processing plants in the Cagayan Province will be beneficial to the local economy.

As regards construction cost, operation program and balance trial calculation pertaining to livestock processing facilities and feed mills are precisely dealt with in the following two reports issued by NFAC.

- 1) "Feasibility on a Feed Mill in Cagayan Valley" May 1974
- 2) "Feasibility of a Livestock Processing Plant in Ilagan Area" April 1974

2 - 5 - 3 Necessity of intra-areal processing of local agricultural produce

The Philippine government intends to unify government policy of industrialization of foreign funds, placing a special emphasis on the betterment of medium and small industries taking the aims at 1) increasing employment opportunity and 2) decentralizing industries. Administrative set-up has also been substantialized in the wake of establishment of the National Economic and Development Authority as well as the Department of Industries in 1973. As for rice mill, it is included in the list of Investment Priority Program of the Investment Committee. And, moreover, local banks are ordained to allocate at least 75% of the total deposit to the accommodation of funds for inter-regional projects. In such ways, due regard is paid to supporting system on the side of finance. However, as a matter of course, it is prerequisite to arrange well the sectors of electric power and road networks in order to realize such industrial decentralization.

2 - 5 - 4 Electrification plan

Electrification in the Philippines is limited to a part of Luzon centering Manila plus a portion of Mindanao and, reportedly, only a little over 20% of the total population is benefited by electric power at present.

Needless to say, as the electrification is indispensable for decentralization of industries, furtherance of irrigation system and modernization of farming life should be made. For rural electrification, there is a set-up, the National Electrification Administration which takes charge of enforcing their electrification program. According to the program, there will be established electric power cooperatives, in charge of construction works of terminal facilities and power distribution as well, in each unit area. (Institute of Developing Economies; Annual Report, 1973)

Presently, power supply wanted in the planned areas for farm product processing plants and rice mills is practically nil. Upon the completion of the Cagayan Power Transmission Line, however, toward the end of 1978, there will be transmitted 66,000-volt current from Ambuklao near Baguio to sub-station in Tuguegarao and, through which, 3,300-volt current further to Aparri. Around the three areas under the present irrigation plan there are six private electric companies and installed capacity of each company appears in the following table.

Table 7

Area	Installed Capacity	Available Capacity
Aparri	460kw	75kw
Baggao	60kw	60kw
Camaluniugan	30kw	30kw
Gonzaga	90kw	90kw
Pamplona	27kw	15kw
Tuguegarao	1,024kw	--
Total	1,691kw	270kw

The capacity presently available is only 270kw due to shortage of spare parts and insufficient operation since the oil crisis. The power condition will take a favorable turn following the completion of the Cagayan Power Transmission Line which is capable of supplying power to the said companies as well as the electrification cooperatives. On the other hand, rural areas outside the coverage of these companies are totally devoid of terminal power supply facilities and, accordingly, it is necessary for them to begin afresh to found electrification cooperatives and to construct the said terminal facilities. Construction costs pertaining to wiring works of terminal transmission lines extended to farming households as well as of those regarded as power lines to rice mills and farm product processing plants are duly taken into account in this plan.

2 - 6 The Agricultural Pilot Center

2 - 6 - 1 Purpose

In the introduction of double cropping into a large area by the use of pumping irrigation in the Cagayan Province with the irrigation rate of about 32 per cent in the paddy field, it is required to set up a pilot center to obtain satisfactory results of the project.

The name, the pilot center was given, in advance of CIAP, not only in consideration of agricultural technique but also of the nucleus of diversified plans involving farmers' organizations and social development factors. Particularly, in order to obtain desired results promptly and surely from the CIAP project, the pilot center is a very important project

In the pilot center, applied research will be carried out at the

experiment station to establish production technique on irrigated double cropping of rice in the Cagayan Province putting CIAP at the center and at the same time various activities such as training of agricultural extension workers, promotion of farmers' organizations, guidance for qualified seed production, selection of the site for demonstration farm and guidance for them will be conducted utilizing it as the base to spread new technique in agriculture in cooperation with associated Government agencies.

The construction work of the pilot center must be set about as soon as possible and it must be completed at least two years before the entire works of CIAP is completed. Thus, an effort must be made to fulfil its function.

2 - 6 - 2 Location and Scale

The site for the pilot center must be located along the express highway, aiming at the effective demonstration activities among the proposed area for the irrigation project, and the area must be selected so as not to overlap the base of international agencies and technical cooperation of other countries and to easily assemble the staff of associated Government agencies.

Among the proposed areas for the irrigation project at present, Pared area is considered to be a fitted one which meets satisfactoril requirements. However, in case Canadian Cooperative Association Development Project in technical cooperation with the Philippines is included in this area, it may be necessary to select another site for the pilot center or to go into counsel about the range of the share with the Philippine side. At all events, it seems to be necessary to set up a technical extension farm as a branch of the pilot center in future at Aparri-Lallo area covering the largest area.

The organization and scale of the pilot center at Pared area is as follows:

Experimental farm	10 ha
Seed farm	40
Demonstration farm	100
Total	150 ha

2 - 6 - 3 Functions

1. The experimental farm covering the project area should establish

new technique applicable to double cropping paddy field in the Cagayan Province prior to the completion of construction works in the project area of 14,300 ha.

The main activities are as follows:

- (1) Applied research
 - 1) Adaptability test for rice varieties to be recommended,
 - 2) Fertilizer trial for determining nutrients amount to be recommended,
 - 3) Water management trial on paddy fields,
 - 4) Farm mechanization trial for paddy cultivation,
 - 5) Cropping pattern trial on paddy fields,
- (2) Establishment of technology for intensive cultivation on farmers' paddy fields
- (3) Training of technicians in farm management and leading farmers

2. Seed Farm

Main activities conducted under the guidance of the staff-members of the pilot center are to produce high yielding foundation seed and registered seed to be recommended for double cropping at the project area.

In this case, by using the paddy fields of selected seed growers, 10 ha out of 40 ha are allotted to foundation seed production and 30 ha to registered seed production. Seed production aims at producing paddy rice seed, and a part of the field plots will be used to produce seed of corn and mung bean.

For a long-term storage of seed produced, a paddy dryer and low-temperature store house must be set up at the experimental farm.

3. Demonstration Farm

Main activities of the demonstration farm are to manage the paddy field by using intensive technique under the guidance of the staff-members of the pilot center so as to extend technique in farmers' paddy fields in the same size of irrigation unit.

Further, main activities at the demonstration farm are to promote irrigation associations and farmers' organization, to control irrigation water and introduce new technique, to accelerate the mechanized paddy farming and to extend technique applicable to the entire project areas. Also, at part of the demonstration farm, some facilities will be established as an annex to the demonstration farm for the purpose of training and extension service.

2 - 6 - 4 Outline of Experts and Facilities

Of all experts, one expert stays permanently in Manila. This expert performs his duty as the advisor for agricultural extension work and also as the coordinator for the local authority.

The personnel organization for the expert group to work at the Pilot Center is scheduled to have experts in paddy farming irrigation, agricultural machinery, water management, and agricultural management.

Further, as for facilities, it is required to have an office, laboratories, lecture rooms, workshops, a machine storehouse, a paddy drying room, etc. With regard to machinery it is required to have tractors and rice cleaning machine, paddy dryer, etc.

Detailed programs on the above items will be decided by the next survey mission after consultation with the Philippine side.

2 - 6 - 5 Construction Works

The designs of the irrigation and drainage canals and farm roads in the experimental farm (10 ha) and the seed farm (40 ha) will be made on the basis of the master plan of the project in principle, and it is allowed to set up facilities in higher precision, or to make the plot smaller in scale so as to reach the goal respectively.

However, at the demonstration farm (100 ha), it is important to make a design at the same level in precision as that of CIAP area outside the pilot center.

It is also necessary to build farm roads and feeder roads of 60 - 80 m per ha in length within the field plot and to build a road of 3 - 5 m in an effective width.

Rural community electrification is required to rationalize farm management. For this purpose, rice cleaning and threshing should be mechanized by laying on power lines in each community and an electric light should be installed at each farming household.

The program in connection with the improvement of marketing, agricultural credit and mechanization have already been worked out by the Government of Canada. Since this plan is considered to be a standard in the Philippines for the future, the plan must be made in accordance with the aforesaid standard. Particularly, the collection centers and storehouses should be set up in each community and the central collection center

and the central storehouse should be constructed in each of a project area.

Further, it will become necessary to plan farm product processing plant (plastic packing and processing durable for long-distance transportation) on the basis of farmers' side business; tobacco drying plants, rice mills, and a low-temperature storehouse.

The pilot center should be planned and constructed by incorporating concepts as mentioned above.

2 - 6 - 6 Operation

Among the activities of the pilot center, the results of experimental work should be reflected upon training, extension works and seed production, while being the nucleus of the pilot center.

The training and extension works should be carried out for extension workers who are the governmental personnel, and for key-farmers. It is desired that technique will be spread over the object area for CIAP by those who will be trained at the pilot farm. Some of the training which is required to conduct on-the-job practice in the field plot will be carried out at the seed farm or the demonstration farm, and operation and management of which are left to be taken care of by farmers themselves. That is to say, as the demonstration farm, fixed farming areas in a group are to be designated by CIAP.

With this in view, in case of training service for farm mechanization, key farmers will be trained first and then will act as assistants to extend the skill among ordinary farmers.

With regard to the demonstration farm, various problematical points arisen thereat need to be fed back to the pilot center for study.

The general management of the demonstration farm is performed by the associated agency of CIAP of the Government of the Philippines with the support of the pilot center.

Seed production will be carried out in the way that the pilot center propagates the breeding varieties obtained from IRRI or UP, etc. into foundation seed and will hand them to the Government of the Philippines. Thus, seed will be produced from the foundation stock to registered stock and inspected seed in order. However, it is desired

that the seed growers who produce registered stock will be located near the pilot center to facilitate an adequate guidance even at the center.

2 - 7 The Cagayan Integrated Agriculture Project

2 - 7 - 1 General

When the agricultural infrastructure construction in the three provinces in the Cagayan Valley which fall far behind other provinces in this respect are materialized, the main irrigation facilities in the entire area would be completed except the area in low potentiality for agricultural development. In this case, the World Bank, the Asian Development Bank, Japan and Canada will become the four agencies which will be responsible for financial cooperation with the Philippines.

CIAP is a complete agricultural integrated development program aiming at regional integrated development to be one step ahead of any other projects so far planned.

In view of this, it can safely be said CIAP is the first stage of Cagayan Valley Region Development Planning which was envisaged by the First Survey Mission in the true sense of the word.

For this purpose, it requires some projects to support CIAP and to improve social environment. Namely, it is possible to secure labor force in this region by improving social environment, to foster cultural life in line with economic growth, and further to move farmers' will to work.

The following is the outline of the long-term future plan which is envisaged as a second-stage program mentioned above.

2 - 7 - 2 Pinacanan Development Plan

The Pinacanan River, as stated in 2-2-2, is one of the tributaries of the Cagayan River which branches off upstream of Tuguegarao city. The river drains a basin of 450 sq km and is very high in the run-off of earth and sand.

The soil consists of lime stone in paleozoic formation. There exists a famous cavern of stalatite.

In the valley downstream of the proposed dam-site at the constricted point in the middle reaches of the Pinacanan River, the river bed is

risen and is crooked due to earth and sand carried down from the upper reaches. In line with a rise of the river bed, sediment is piled up at the confluence of the Cagayan River and the water level is risen unusually at the time of flood. For this reason, Tuguegarao city is often in danger of inundation. Further, the intake of drinking water at Tuguegarao is covered by sediment, resulting in a failure to take water in.

The farm land downstream of the proposed dam-site was turned to well-drained upland field with the sandy soil carried down from the upper reaches, but is poor in water holding capacity. Accordingly, construction of the multi-purpose dam in the middle reaches makes flood control possible. At the same time, it can be used as the water sources of drinking water for Tuguegarao city and of pipe irrigation for upland fields downstream of the dam. By doing so, a part of flood control of the Cagayan River would be borne by this plan.

The construction will bring an immediate result on the regional development in the surrounding areas of Pinacanauan River and in Tuguegarao city.

2 - 7 - 3 Upper Magat Development Plan

This plan is in contemplation by a professor of Saint Mary's College who was entrusted with the plan at the request of the Nueva Vizcaya Provincial Government.

The lower reaches of the Magat River one of the tributaries of the Cagayan River is under construction of irrigation facilities by the Asian Development Bank.

Immediately upstream of the above project site and downstream of this project the dam construction for power generation and irrigation, and irrigation facilities are under planning by the World Bank.

The present plan is to construct irrigation facilities covering about 20,000 ha of farm land, to reclaim the land of about 7,000 ha at the upper reaches and to protect Bayombong city from flood. However, the flood discharge is underestimated in the present plan and the relations between irrigation canal and the water level of the field plot, and the present plan and the irrigation project at the lower reaches are not made clear. With this in view, the plan is necessitated to make arrangement to collect basic data furthermore.

As a result of the fact-finding survey the flood discharge at this point is estimated at about 1,500 cubic meters per second. As a counter-measure for flood control against flood discharge at Bayombong city, it is presumed that construction of river dike, improvement of river channel and excavation of river bed are needed.

With regard to irrigation water, it is necessary to newly construct an irrigation channel without using a method of the combined use of irrigation channel and by-pass channel for flood. By completing this channel, irrigation covering about 20,000 ha will become possible.

Further, with the improvement and excavation of river channel, it will become possible to turn the most of the flood basin into a dry field. In this case, to irrigate the paddy field of 20,000 ha, it requires irrigation requirement at 30 cubic meter per second in a dry season. Accordingly, the storage capacity of the dam should be re-examined the irrigation plan at the lower reaches on the premise that the requirement of 30 cubic meter per second is always used at the upper reaches.

2 - 7 - 4 Cagayan River Flood Control Plan

The reason why the basin of the Cagayan River is backward, is that the area used to be influenced by frequent floods during the typhoon season. Although various development projects are being made, the matter of flood control has not been fully reviewed.

At present, irrigation facilities for paddy fields in this region is going to be set about throughout the areas. The trunk roads are almost completed. However, it is clear that roads and paddy fields used to be inundated with flood at the time of typhoon which hit this area dozens of times every year. Accordingly, flood control in this area must be started immediately by working out some program. At present, the Government of the Philippines has a plan in which large cost is appropriated in the budget for construction of the river dike. However, this is a fragmentary work and no countermeasures against the fact that the sediment flows down from the upper reaches to the lower reaches, have not yet been taken. For this reason, when the river bed is raised up due to the sediment, it requires levee raising again irrespective of the bank construction. In that sense, such a method can not be said a drastic measure. Also, the past flood discharge in terms

of the probability of flood, the river discharge at different points and the unit hydrograph should be clarified.

Accordingly, in case of planning of flood control, functions of sub-watersheds and the confluences of tributaries are obtained by the storage function method. In this case, the important point is to practice sufficient observation of river discharge and rainfall at the sites and to carry out the longitudinal and cross-sectional levelings of the river channel. After analyzing its present status by a storage function method, an effect to be caused by the dam storage is simulated. Since the programming has already been made by the computer, it will not take much time in the calculation. It is necessary to make plans of the most effective flood control dam, river channel training and embankment.

2 - 7 - 5 Soil Conservation

The mountainous sections of the project area have drastically been changed in the forest conditions by timber felling. For this reason, heavy soil erosions are found in the forest. As a result, flood becomes disastrous, causing great damage by a rushing stream of debris. Therefore, the soil conservation project must be carried out in coupling with a flood control program. In the content of the project, sabo works in a mountainous area, debris control dam, and erosion control must be incorporated.

2 - 7 - 6 Social Facilities

What is most backward in the life environment is the project for waterworks. The waterworks within the project area is being planned in the provincial capitals and the main cities by the Government, but none of these programs have been set about yet. Since in the most programs, the use of underground water was adopted, for the reason that a complete survey of the underground water has not been conducted, there are many instances where the requirement could not be secured in spite of the boring practice.

In the event, a part of pumping irrigation water could be laid on into the small water supply system, there would be no problems, but in case it is impossible, the plan must be made after making a complete survey of the underground water table for the water sources, by means of

electric sounding and aquifer test.

Like the case of Pinacanan development program, if water could be taken in from the Cagayan River by constructing a multi-purpose dam on the tributary of Cagayan river, the operation and maintenance costs will be minimized in future.

It is required to improve telecommunication facilities. However, this project should be carried forward on the national basis including Manila area.

Other facilities such as schools, hospitals and transportation facilities are relatively perfected and the expansion programs are being made by the Government. Accordingly, the present plan should be pushed forward so as to keep abreast of the progress of the regional development project.

Chapter 3. IMPLEMENTATION PROGRAM

3 - 1 Organization for Implementation

The activities of CIAP are composed primarily of irrigation and drainage, rural roads and technical improvement in agriculture, secondarily of rural electrification and development of farmers organizations, and additionally, through further examination, of participation in the Agricultural Co-operative Development Program now being assisted by Canada. Efficient administration and management of these components through CIAP, requires a central institution capable of keeping uniform and integral control of various related institutions.

(1) CCC - IRDP

The Philippine Government set up CCC (Cabinet Coordinating Committee) within the framework of NEDA in July, 1973 under the Presidential Decree 99 as a coordinating organ for such programs as Integrated Rural Development Project. (cf. appendix 5-4)

CCC comprises the Secretaries of DPWTC, DF, DLGCD, DAR, DNR, DPH, NEDA under the chairmanship of the Secretary of DA, and is in charge of (1) selection of rural areas for integrated development, (2) preparation for the projects, raising of fund from in and out of the country and supervision on implementation. In February 1974, CCC appointed an Executive Director. IACC (Inter-agency Coordinating Committee) was organized under his chairmanship and TS (Technical Secretariat) was set up to assist him.

Members of IACC comprises, in addition to representation of CCC components, those of BC (Budget Commission) and NIA. Its function is (1) to review policy recommendations prior to submission to the main committee, (2) to ensure the execution within the different departments of what was decided by CCC, (3) to make available for the use of the office of the Executive Director, manpower and facilities from the different departments.

The present staff of TS consists of five in all sent from DPWTC and DA. Its functions: (1) to perform staff functions for the Executive Director, (2) to identify and recommend project areas, (3) to examine the contents of project in priority areas, and (4) to examine financial

arrangement, etc.

(2) Some considerations on administrative organization

The following may be of importance in considering about administrative organization; (1) what are the components of those projects written at the beginning, (2)-a how to combine local executive with central institutions in carrying out projects and (2)-b how to adjust the functions of existing related institutions.

Question No. (1) about the components of the program has been explained at the beginning. To come more in detail, CIAP has been decided to widen the scope of its activities in order to better serve the higher productivity of agriculture in the planned area and further its overall regional development, by making it its major project to proceed on agricultural technical improvement and extension to be made use of by farmers for the increase of production, as well as to provide irrigation and drainage facilities as the foundation of agricultural production, especially of rice production, by means of making irrigated paddy farming possible even in a dry season.

What seems to be necessary on the local executive level with regard to the operational organization for (2)-a projects, is to establish proper number of local offices for setting up irrigation and drainage arrangement (including rural roads). Such offices may still be necessary even after completion of the construction. There is another need for something like local 'centre' which is to serve the improvement and extension of agricultural technique, because of the importance and the different nature of these activities.

As the central operational organization, it could be an idea to appoint a 'project director' with authority to integrate the whole projects and organize a committee under his chairmanship and a secretariat to assist him.

As to the question how to adjust the functions of existing institutions, it might be an answer that they have only to be coordinated and secured their functions so as to secure integration and harmony in implementing CIAP, without any positive change of their present functions.

(3) An Idea of the Operational Organization for CIAP

The idea mentioned above may be schematized as shown in Appendix 5-4, and be summarised as follows.

The project director is appointed and authorized; authority is to give every necessary instruction for the execution of projects to all related institutions by taking all responsibility for project administration and management. The project director organizes a project committee under his own chairmanship which comprises a provincial governor, representatives of related institutions and chiefs of local offices, (including the chief of 'centre' in charge of agricultural technical innovation and extension.) The committee in which they act as deputy directors discusses and decides smooth implementation of the projects and the secretariat deals with clerical affairs.

As the project area is located in wide range, it is planned to have two local offices, but, if situation requires, only one will do. The office is to have three sections; of construction, of agriculture and of office administration. Section of agriculture should keep close contact with 'pilot centre'. Section of construction is responsible for construction and maintenance of irrigation and drainage facilities, and section of agriculture for advisory and extension services and organizing farmers (mainly organizations for water control).

The current activities of 'pilot centre' may be experiments mainly on paddy farming (tests on local adaptation of new varieties, on fertilizer and insecti- or pesti-cides, on water requirement and investigation on cropping pattern), training of extension workers and farmers, and exhibition of agricultural technique on the extension farm.

(4) Future questions to be considered

1. How far should CIAP involve various institutions in connection?

What CIAP has some connection with at present are :

Irrigation, drainage and roads -----	NIA
Flood control -----	DPWTC
Agricultural technique -----	DA
Rural electrification -----	NEA
Farmers' organization -----	NIA, DA, DLGCD
As a whole -----	NEDA

2. What positions of CIAP should Japanese experts work for ?

(in a concrete way)

3. In what part and to what extent should Japan collaborate, if any, with Pilot Centre ? The following points should be taken into

careful consideration.

Pecuniary problems which might occur in selling and buying of seeds to and from seed producing farms, especially in case the centre deals with seed production. To what organization agricultural machinery should be supplied for actual use in technical cooperation. Problems which may cause trouble at the time of farm-land acquisition for the pilot center.

3 - 2 Time Schedule of Works

The Philippine Government is now preparing topographical map of the project area for irrigation (whose scale is 1/5,000 - 1/10,000). After it is completed, they set on making feasibility study; precise project plan, necessary cost, amount of foreign financial aid will be fixed in collaboration with Japanese Government. This process, thinking from the urgency of CIAP, should possibly be completed before June 1976 so that the projects can be put into practice in the new fiscal year of the Philippine Government, that is, from July 1976. Then, having one year for final design and other preparatory works, actual construction is desired to be started in FY 1977 with 3-or 4-year term for completion. Time schedule for works is shown on another sheet.

As a matter of practice, feasibility report comes first, exchange of note between the Philippine and Japanese Government follows, and, after inspection by OECF, loan agreement will be made.

The consultants employed under this loan agreement will cooperate with experts of the Philippine Government, for preparing final design, formulating forms of specification and tender for machinery and construction materials and also for ordering them. During construction works, they will, in cooperation with Philippine experts, give advice to keep the whole processes go on properly along the planned line.

The members of consultants will be fixed on the advice to be given by the next survey mission. At this moment it is considered to have 7 members for final planning, 3-5 members for supervision. In advance to the completion of construction, specialists for water control should be sent, as members of consultant team, to prepare the rules of operation and maintenance, and to train the Philippine governmental personnel for practice. All consultants are to do their best for the most effective achievement of the program in close connection and collaboration with the experts of the Pilot Centre

which is proposed to be set up in Pared area.

The construction of Pilot Centre will possibly be started in 1976 when CIAP is started, and be completed in around 1978. Sooner or later than that, the Centre will begin its technical advisory service to farmers, the effect of which is expected to come up to a certain level when construction will be completed in 1980. An effort will be made aiming at 100 % fulfilment of the target of production increase by 1982, two years after the Centre is in full function. In view of this, it may well be suggested that the term of sending experts may be about six years from 1976 to 1982.

Table 8

Additional Survey Feasibility Study and Construction Schedule

	1975	1976	1977	1978	1979	1980	1981	1982
1. Additional S	=====							
2. Data Collection	=====							
3. Feasibility Study	---	---	Preparation of Bidding & Contract					
4. Final Design		---						
5. Construction								
(1) Pumping Station								
Pumping Facilities			Factory	Transport Installation				
Excavation				---				
Concrete				---				
(2) Canalization								
Irrigation Canal				---				
Drainage Canal				---				
6. Pilot Scheme								
Plan & Design	---							
Construction			---					
O & M				---				

3 - 3 Construction, Operation and Maintenance Costs

3 - 3 - 1 Initial Investment

Initial investment of this program has been estimated on the basis of standard unit price and labor rate as of June 1975 given by NIA. Unit prices of machinery and materials corresponding to foreign fund are based on the standard ones in Japan at the same time.

The purchase cost of construction machinery which will be used for this program is all appropriated in the initial investment. The estimated value assessed to project areas is shown on another sheet. Considering 8 per cent of annual rate in price escalation the total investment is as follows:

Table 9 Table of Total Initial Investment

(Unit : US\$1,000)

Item	F.C.	L.C.	Total
Aparri-Lallo	11,923	12,530	24,453
Pared	2,158	2,418	4,576
Iguig	1,397	880	2,280
Total	15,478	15,831	31,309
Price escalation	4,179	5,699	9,878
Total	19,657	21,530	41,187

Out of 41,187,000 US dollars, 47.7 % is of foreign fund which includes construction machinery, pumps, and the attached motors, construction materials such as cement, steel rod, gate, and consultants' fee.

Though it is economical to complete the construction within four years, construction machinery can be used for from five to nine years, which yields over term for their depreciation. The remainder may do good for the development of the Philippines in general by using those machinery for agricultural land improvement.

The whole project is to be implemented by the Department of Agriculture and other governmental institutions under NIA's initiative. The cost for each project is allotted as follows:

NIA	Pumping facilities, canals, drains, farm roads, construction machinery	\$27,829,000
DA	Pilot center	\$ 912,000
NEA	Rural electrification	\$ 1,284,000
DLGCD	Marketing system	\$ 1,284,000
	Total	\$31,309,000

Table 10 Total Initial Investment

US\$1,000

	Aparri & Lallo		Pared		Iguig		Total		Re- marks
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	
1. Pumping facilities									
(1) Equipment	2,968	-	848	-	636	-	4,452	-	
(2) Sub-station	833	-	83	-	43	-	959	-	
(3) Building	-	625	-	166	-	145	-	936	
2. Canals									
(1) Irrigation	-	4,371	-	549	-	299	-	5,219	
(2) Drainage		2,897		94		50		3,041	
3. Feeder Roads		1,390		329		143		1,862	
4. Rural Electrification	560	240	98	42	42	18	700	300	
5. Pilot Center	-	-	30	680	-	-	30	680	
6. Marketing, etc.	588	252	70	30	42	18	700	300	
7. Materials	307	-	67	-	52	-	426	-	
Sub-total	5,256	9,775	1,196	1,890	815	673	7,267	12,338	
8. Contingency	1,051	1,955	239	378	163	135	1,453	2,468	
9. Equipment	4,816	-	573	-	344	-	5,733	-	
10. Survey & Consultants	800	800	150	150	75	75	1,025	1,025	
Total	11,923	12,530	2,158	2,418	1,397	883	15,478	15,831	
Grand Total	24,453		4,576		2,280		31,309		

3 - 3 - 2 Operation and Maintenance Cost

Operation and maintenance of irrigation facilities will be carried out by NIA or public institutions belonging to NIA.

Since the irrigation system of the project is a pumping system by the

use of a large sized pump, the pump will necessitate thorough repairs and exchange of a part of machinery for a complete one after 25 years of its economic life. Particularly, since the efficiency of the pump lowers after more than 25 years and the efficiency of the motor also goes down, the pumpage becomes lower and a wasteful use of electric power becomes inevitable. Further, since electric power is used for the power source, electric expendables should frequently be exchanged.

As the power of a pump, high-voltage electricity must be used and a vacuum pump or other machinery be used, and it is therefore required to have electric and mechanical engineers in the management office for the project. Payment of electric charge is also required.

Consequently, the pumping irrigation costs more than the gravity irrigation system in operation and maintenance. Assuming that the electric charge costs ₱ 0.20/kwh, the electric cost in the pumping system will amount to 60 per cent or so of the total operation and maintenance cost. However, owing to the necessity of large amount of electric power and high voltage electricity, the favorable unit price should be discussed with NEA. The operation and maintenance cost and the replacement and repair cost of machinery will be covered by water charge to be collected from benefited farmers. Accordingly, rational and effective management is required in their operation and maintenance. Particularly, by practicing protection of the slope surface, removal of debris in the sedimentation basin and water channel bed, and of dust at the intake, large repair works can thus be averted.

The operation and maintenance cost required for the project, as indicated in Appendix 6-3, needs ₱ 638,000 a year in Iguig and Pared areas, and Pared areas, and ₱ 3,175,000 in Aparri area, and it requires ₱ 3,813,000 (US\$530,000 ÷ 14,3000 ha = US\$ 40/ha/yr in total. This cost will account for about 1.3 per cent of the total investment for construction.

Breakdown of the cost is given as follows:

Operation and maintenance cost for channel	868	(Unit: ₱ 1,000)
Operation and maintenance cost for pump	156	
Electric charge for pump	2,650	
Personnel expenses	139	
Total	3,813	

Premising that the appropriate operation and maintenance are executed, the economic life of the facilities is estimated at 50 years. The main parts of the pumps must be renewed after 25 years. The expense is estimated at ₱ 20,551,000. It corresponds to about 60 % of the cost for new pumping facilities.

Chapter 4 ECONOMIC AND SOCIAL EVALUATION

4 - 1 Benefit of the Project

4 - 1 - 1 General Remarks of Economic Effect Arising

Land use in the three provinces in Cagayan is extremely extensive. Technically, paddy farming can be practiced twice a year as long as irrigation water is secured, however two crop paddy field is, at present, only 30 per cent of paddy fields in the area. The remaining 70 per cent is either left as fallow or used for corn and mung bean cultivation. Some parts of this region are cultivated with tobacco after paddy harvest. As for the land of 14,300 ha under the project, the actual situation of land use is to be made clear in the stage where the topographical map is prepared. Further, there is no public irrigation facilities in these three provinces, except some areas irrigated by private pumping facilities, which is a rare case. Accordingly, it is most likely that the greater part of the land under the project are rainfed paddy fields where a single crop of rice is prevailingly practiced in a rainy season, and mung bean, soy bean, corn, and sorghum are grown to some extent. Since rice is holding a dominant position among crops from the viewpoint of its profitability, it is designed so as to switch these crops into paddy after the completion of irrigation facilities. The area covered by irrigation facilities in the project is estimated at 3 per cent at Iguig Pared and lallo, 1 per cent at Aparri. The irrigated area in a dry season is presumed to be 60 % of the area with irrigation facilities. Although tobacco has been cultivated as a succeeding crop after the paddy harvest in Pared area, the exact figure in area remains to be proved in a future survey.

Since tobacco is a special and important commercial crop in this area, the plan is made so as to grow tobacco on the continuing basis in the intensive and efficient farm land fitted to it. Being located in the lower reaches of the Cagayan River, these three areas are subject to floods, particularly about 10,000 ha in Aparri seem to be always inundated from October to November in a rainy season. As a result, for this period, there appears to be a difficulty to grow crops so far as present conditions last. Therefore, the present plan is made so as to prolong the cultivable period by improving drainage by means of excavation of the drainage channel, assum-

ing that the effective cropping period can be nine and a half months. Since the farming period for one crop of a high yielding variety is roughly four months, two-crops-a-year is promising, provided advisory services in the farm management are rendered in full measure.

4 - 1 - 2 Acreage of Economic Effect Arising

The effective acreage deriving from the project is estimated at 85 per cent of the project area in each project, assuming that the acreage in effect is the remaining area after deducting the area for the sites of roads and irrigation and drainage canals from the total project area, and a comprehensive grasp of the exact area will be made by the next survey mission.

Upon completion of the project, the two-crop paddy farming will become possible all over the area in effect, but it does not always imply that the two-crop paddy farming system can be applied to the entire area. At the early stage of change, paddy could be cultivated over the entire area in a rainy season as in the past. However, the area under paddy cultivation in a dry season will be limited to 70 per cent of the area under paddy cultivation in a rainy season for the reasons that it is difficult to switch promptly the prevailing crops such as corn and mung bean to paddy because of limitation of farmer's fund and labor including animal power or the prevailing practice in farm management and that tobacco also will continuously be grown as succeeding crop in an intensive tobacco cultivation fields after the paddy harvest, though it is on a small acreage. However, the acreage for paddy farming in a dry season is expected to gradually increase because paddy yield per unit area in a dry season is 6 per cent higher than that in a rainy season so far as irrigation water is available and there is an advantage of having no danger of floods.

The rate of effective land use in the 'stable stage' in the third year after the completion of the construction, can finally, in view of above-mentioned restrictions, be estimated as no more than 180 % (95 % in a dry season, 85 % in a rainy one) the total area in effect.

4 - 1 - 3 Effect on Yield

As has been discussed before, the effect on the increase of yield will be only to rice. Present yield per hectare of paddy in rainfed paddy field is 1.2 ton/ha which will rise up 3.3 to 3.7 ton after completion of the project. The

planned yield requires to use fertilizer, while most rainfed paddy field is cultivated without fertilizer. However, to ensure projected yield it requires to apply fertilizers.

Table 11 Yield Per hectare with and without the Project
(ton)

Area	Present			Planned		
	Present		Rainfed	Irrigated		Rainfed
	Rainy season	Dry season		Rainy season	Dry season	
Iguig, Pared, Lallo	2.2	2.4	1.2	3.5	3.7	-
Aparri	1.9	2.0	1.2	3.5	3.5	-

Calculation based on Table 11 shows the effect on yield increase at 5.6 tons per ha in Aparri, 6 tons per ha in Iguig, Pared and Lallo, in the "stable stage" by using the expression "(Yield of planned two crop cultivation) - (Yield of existing rainfed paddy field)" a year. Total increase is expected to amount to 58,000 tons per year as shown in Table 14.

Table 12 Calculation Table of Yield Increase

(1) IGUIG, PARED, LALLO

Area to be planned : 4,300 ha

Area of effect arising: 3,655 ha

	Planted area		Yield per ha		Product		
	Present	Planned	Present	Planned	Present	Planned	Increase
Irrigated paddy field	129ha	3,107ha	2.2t	3.5t	384t	10,875t	10,491t
	77	3,472	2.4	3.7	185	12,846	12,661
Rainfed paddy field	4,171	-	1.2	-	5,005	-	Δ5,005
Total	4,377	6,579	-	-	5,574	23,721	18,147

Table 13

(2) APARRI

Area to be planned : 10,000 ha
Area of effect arising: 8,500 ha

	Planted area		Yield per ha		Product		
	Present	Planned	Present	Planned	Present	Planned	Increase
Irrigated paddy field	100ha	7,225ha	1.9t	3.3t	190t	23,843t	23,653t
	60	8,075	2.0	3.5	120	28,263	28,143
Rainfed paddy field	9,900	-	1.2	-	11,880	-	11,880
Total	10,060	15,300	-	-	12,190	52,106	39,916

Table 14

(3) Total Product

Area	Present	Planned	Increase
Iguig, Pared , Lallo	5,574 ton	23,721 ton	18,147 ton
Aparri	12,190	52,106	39,916
Total	17,764	75,827	58,063

Accordingly, annual increase of gross earnings can be estimated at 58 million pesos (US\$8.3 m.), present price of paddy sustained by the Government being 1 peso/kg. Hereon, calculation of internal rate of return is based on the international price through 1980 into 1985, which is presumed to be US\$290 per ton for white rice, and 1,323 peso/ton converted into the price of paddy is used as unit price in calculation.

4 - 2 Investment Program

Total cost for the whole project is US\$31,309,000, out of which foreign currency portion is US\$19,657,000 (47.7 %) and domestic currency portion \$21,530,000 (52.3 %) assuming four years for construction. Construction machinery cost amounts to US\$5,733,000. Depreciation rate of machinery is shown below.

Year	1st	2nd	3rd	4th	5th	6th	7th	remainder
rate	20	16	14	13	12	11	9	5 %

In case the term of the project is set either at 3 or 5 years, a 3-year program requires more machinery, and 5 year, less. Depreciation account of different terms is set as follows.

Table 15

(1000 US\$)

Term of construction	Required machinery	Depreciation rate	Depreciation fund
3 years	7,644	50 %	3,822
4 "	5,733	63	3,612
5 "	4,586	75	3,440

As seen above, the longer term of construction does not lead to save much more depreciation fund in this project, because, though it requires less number of machinery and less fund for them, the depreciation term for construction machinery can be estimated at 7 years on an average. Rather, the longer term requires the more management fee, which does not make much difference in lessening total depreciation cost. Accordingly, it may rightly be concluded that whether the term is 3, 4 or 5 years gives no remarkable difference on the total cost of the project. Assuming 4 years for construction, according to the process planning shown in the last paragraph including preparatory period; expenses assessed to each year are as shown in Table 16 whose detail is given in Table 17.

Table 16

1976 (final design)	820	(1,000US\$)
1977	4,565	
1978	9,162	
1979	8,593	
1980	6,048	
Total	29,188	

Note: Remainder of depreciation of machinery is eliminated out of total amount of expense.

Table 17 Annual Expenditure

(US\$1,000)

	1976	1977	1978	1979	1980	Total
1. Pumping station		2,666	2,666	1,015		6,347
2. Canal			2,478	2,891	2,891	8,260
3. Feeder road			559	652	651	1,862
4. Rural electrification			300	400	300	1,000
5. Pilot center			142	568		710
6. Marketing			300	350	350	1,000
7. Materials		85	149	149	43	426
8. Contingency		784	1,176	1,176	785	3,921
9. Equipment		722	1,084	1,084	722	3,612
10. Survey & Consultants	820	308	308	308	306	2,050
Total	820	4,565	9,162	8,593	6,048	29,188

4 - 3 Economic Evaluation

4 - 3 - 1 Existing Profit

In evaluating the increase of production effected by the project, it must be considered that two-crop paddy farming will sacrifice such crops as corn, mung bean, soy bean etc., which have been and are grown after the crop paddy farming in a rainy season. Though further detailed study is needed to see what and how much crops are grown in planned 14,300 ha, gross profit loss will be 5,105 pesos and net profit loss 3,574 pesos (profit rate 70 %), on the assumption that only corn is grown there, 60 % of land is cultivated for it, yield is 0.7 ton/ha, and the price is ₱ 0.85 peso/kg.

4 - 3 - 2 Process of Effect Arising

The project schedule indicates that pumps will be fully installed by the end of June 1979, and in test operation till the end of 1980 when irrigation and drainage facilities will be completed. So that the effect will partly start with the first crop (in the rainy season) which begins at June 1979. And 0.8 ton/ha increase of yield is expected in 3,655 ha of effect arising areas in Iguig, Pared, Lallo.

In 1980, crops in the dry season may not go further than experimental cultivation; water facilities being not completed, farmers not experienced. Yield increase can only be observed in 50 % of the effect arising area including Aparri with the yield of 2.4 ton/ha which is the present yield of irrigated paddy field in the dry season.

In the rainy season in 1980, the yield of 0.8 t/ha will be added to the present one in 70 % of effect arising area including Aparri.

Since the whole construction will be completed by the end of 1980, the project is to be in full function starting 1981. However, it is reasonable to expect the yield increase at 70 % of effect arising area with the dry season crop, and 85 % (as planned) with the rainy season crop in 1981 when the farming system seems not to have been established yet, assuming 90 % of planned yield per ha can be expected. Effect arising area in 1982 will reach the planned figures (95 % in a dry, 85 % in a rainy season). Yield per ha will be 90 % of the planned figure in a dry season and 95 % in a rainy season.

After 1983 on, planned increase of production can be expected in a good stability.

Annual increased production is as shown below:

Table 18

Year	Dry season	Wet season	Total
1979	- ton	2,924 ton	2,924 ton
1980	14,587	6,807	21,394
1981	26,802	13,845	40,647
1982	36,724	15,552	52,276
1983	40,804	7,257	58,063

The gross profit loss in each year is to be reckoned in accordance with the ratio of increase of the planted area in the dry season in respective years.

As for calculation base, for resultant effects, refer to the following.

o Calculation Basis of yearly effect arising amount

In the rainy season in 1979 : $3,655 \text{ ha} \times 0.8 \text{ t} = 2,924 \text{ t}$

In the dry season in 1980 : $12,155 \text{ ha} \times 1/2 \times 2.4 \text{ t} = 14,587 \text{ t}$

In the rainy season in 1980 : $12,155 \text{ ha} \times 70 \% \times 0.8 \text{ t} = 6,807 \text{ t}$

In the dry season in 1981 : $12,155 \text{ ha} \times 70 \% \times 3.5 \text{ t} \times 90 \% = 26,802 \text{ t}$

In the rainy season in 1981 : $(10,491\text{t}+23,653\text{t}) \times 90\% - (5,005\text{t}+11,880\text{t})$
 $= 13,845 \text{ t}$

In the dry season in 1982 : $(12,661\text{t}+28,143\text{t}) \times 90 \% = 36,724 \text{ t}$

In the rainy season in 1982 : $(10,491\text{t}+23,653\text{t}) \times 95 \% - (5,005\text{t}+11,880\text{t})$
 $= 15,552 \text{ t}$

4 - 3 - 3 Proportion of Management Fee

To gain more increased gross profit requires more management fee, which is to be deducted from gross profit in the calculation of internal profitability. Here proportion of management fee is calculated based on the figures offered by the Philippine authority. (See Appendix 6-4). In this calculation cost for self-supplied labor and rent are cut off from management fee.

This treatment is based on the consideration that cost for self-supplied labor belongs to farmers' income, and rent is concerned with the question of so-called 'distribution of profits' which means to divide products on a certain ratio between tenants and landlords. Of course, these are important items of farmers' economy. There shall be another study on the balance of farming household economy.

Proportion of management fee to increased gross profit comes from Table 19.

Table 19 Basis of Management Fee Ratio

Factors	present	future	
	rainy season	rainy season	dry season
(1) Labor	705 P	1,097 P	1,132 P
(1)' Employed Labor of (1)	(228)	(371)	(383)
(2) Materials	186	663	738
(3) Interest on Loan	14	43	47
(4) Rent	237	546	581
(5) Sundries	70	80	80
Total	1,212	2,429	2,578
(6) Gross profit	1,267	2,816	2,992
Mgt. Fee Ratio	39.3 %	41.1 %	41.7 %
((1)' + (2) + (3) + (5)) / (6)			

Weighted average 41.4 % (Appendix 6-4)

Management fee ratio on weighted average was obtained by dividing "the sum of future management fee in both rainy and dry seasons without self-supplied labor and rent" by "the sum of gross profit in both seasons".

4 - 3 - 4 Internal Rate of Return

Internal rate of return was estimated at 15 %, on the assumption that operation and maintenance costs after completion of constructions are 3,013 thousand pesos the economic life is 50 years with renewal of some parts of pumping facilities after 25 years. (Calculation basis are shown in Tables 20 and 21)

All these show the economic superiority of the project and that it is economically viable.

Economic evaluation here in this report is made on rather lower estimation of effect arising areas (85 %) and cropping ratio (180 % of effect arising areas). More accurate figures on cropping acreage should be made available through the next investigation.

Table 20 Yearly Benefit

Year	Production increase	Gross profit increase	Net profit increase	Net profit loss	Net profit	Annual maintenance & operation costs	Yearly benefit
	ton	₱1,000	₱1,000	₱1,000	₱1,000	₱1,000	₱1,000
1							
2							
3							
4	2,924	3,868	2,267	229	2,038		2,038
5	21,394	28,304	16,586	1,672	14,914		14,914
6	40,647	53,776	31,513	2,487	29,025	3,813	25,212
7	52,276	69,161	40,528	3,199	37,329	3,813	33,516
8-24	58,063	76,817	45,015	3,574	41,441	3,813	37,628
25	58,063	76,817	45,015	3,574	41,441	24,363	17,078
26-50	58,063	76,817	45,015	3,574	41,441	3,813	37,628

Note: The year of 1976 is taken as the first year.

Table 21 Calculation Table of Internal Rate of Return

Year	Expense (₱1,000)	Yearly benefit (₱1,000)	Balance (₱1,000)	15 %		14 %	
				Discount rate	Current value	Discount rate	Current value
1	5,740		-5,740	0.8696	-4,992	0.8772	-5,035
2	31,955		31,955	0.7561	-24,161	0.7695	-24,589
3	64,134		64,134	0.6575	-42,168	0.6750	-43,290
4	60,151	2,038	-58,113	0.5710	-33,229	0.5721	-34,409
5	42,336	14,914	-27,422	0.4972	-13,634	0.5194	-14,243
6		25,212	+25,212	0.4323	+10,899	0.4556	+11,487
7		33,516	+33,516	0.3759	+12,599	0.3996	+13,393
8-24		37,628	+37,628	2.2733	+85,539	2.9465	+110,871
25		17,078	+17,078	0.0304	+ 519	0.0378	+ 64
26-50		37,628	+37,628	0.1962	+ 7,383	0.2597	+ 9,772

In the case of 15 %:

⊖ 118,184 ⊕ 116,939 Sum ⊖ 1,245

In the case of 14 %

⊖ 121,566 ⊕ 146,169 Sum ⊕ 24,603

14 % + [(24,603 - (24,603 + 1,245))] ÷ 15 %

4 - 4 Farmers' Income

4 - 4 - 1 Number of Farming Households Classified by Scale of Farming

The number of farming households living in the 14,300 ha and covered by the projects will become clearer through further investigation. And 1971 statistics says that there are 9,838 farming households in six municipalities connected with the project.

Assuming that average scale of farming in those areas is 2.75 ha, about a half of the farmers, 5,000 households, seem to be eligible for the benefits from the project.

The 1971 statistics also gives the composition of farming households by scale of farming in the municipalities covering the project areas, as in Table 22.

Table 22 Proportion of Farming Households by Scale of Farming
(See Appendix 2-2-5)

Area	Total No. of household	Under 1 ha	1-3	3-5	5-10	10-25	Over 25
Aparri	4,223	5.5	55.9	26.6	10.0	1.8	0.2
Lallo	1,952	8.3	57.0	19.9	11.6	2.9	0.3
Pared	2,647	11.1	75.6	11.1	1.9	0.2	0.1
Iguig	1,016	16.6	68.8	12.0	1.8	0.8	-
Total (average)	9,838	8.7	62.8	19.6	7.3	1.5	0.1
Cagayan Prov.	53,414	11.1	59.5	20.8	7.0	1.4	0.2

As seen in the table, more than half are between 1 ha and 3 ha, and those in Aparri and Lallo seem to have a little larger scale than others. Those in Iguig may be noted of that those under 1 ha are more, compared with other areas.

4 - 4 - 2 Outline of Farming Household Economy.

The management type of most farmers in this area is only to grow one crop of paddy in a rainy season, which is followed by some corn, legume,

and miscellaneous cereals, depending on what part of the area is occupied. In a certain part of the area there are farmers growing tobacco.

Statistic materials of farm house economy in this area was not satisfactorily collected and simply further investigation can offer whole and clearer view. At any rate, the outline may be pictured according to the "Farm Management Studies in Cagayan Valley".

The studies cover outstanding farmers in three provinces of Cagayan. As to paddy growers, only two types of them are taken up ; first type who does two crops paddy farming and second type who does one crop rainfed paddy farming and the field in fallow after paddy harvest.

Table 23 Rough Balance of Farming Household Economy

Item	First type		Total	2nd type (August - February)
	first crop (Nov. - Apr.)	second crop (Apr. - Sept.)		
Households surveyed		125	ha	86
Average scale of farming	2.72 ha	2.80 ha	(2.76)	2.58 ha
Yield per ha	58.3 cav.	59.9 cav.	-	39.8 cav.
Gross profit	8,406 ₱	8,730 ₱	17,136 ₱	5,176 ₱
Total expense	6,113 "	6,168 "	12,281 "	4,354 "
Residuum (Surplus)	2,293 "	2,562 "	4,855	822 "

(Source : Special Studies Division, Planning Service, Office of the Secretary.)

It is not sure if those farmers mentioned above are properly sampled and if the surplus really shows their standard of income, because the above figures include wages for self-supplied labor in total expense. Roughly speaking, however, it seems that two-crop paddy farming group gain 3.1 times as much gross profit and 5.5 times as much surplus per ha, as those farmers of one-crop paddy farming in rainfed paddy field.

4 - 4 - 3 Increase of Farming Household Income

Though present state of farmers in the project area is supposed to be like the second type farmers mentioned above in their farm management, they are expected to advance at least to the state similar to the first type, that will bring sharp increase of farm income.

On the other hand, the project will enable farmers involved to increase their income by 58 million pesos, that is, 11,600-peso increase of gross income per household. Since gross income in this area in 1971 is 1,527 pesos, that in 1975 is estimated at 3,000 pesos.

Accordingly, once the project will have been completed, gross farming household income will be 14,600 pesos, four times as much as the existing one in a stroke. Of course, expansion of expense (management cost) goes along with income increase. In addition to increase of expense for fertilizers and agricultural chemicals, rent for farm machinery will become needed, as a result of increasing labor.

Even after deducting these expenses, more than 7,000-peso net income is estimable, which by far surpasses the present level.

Hereby it may be said that the effect of this project contribute much to an increase of farmers' income, and is attractive from the standpoint of farmer's economy.

4 - 4 - 4 Problems Left to Further Study.

The balance of farming household economy should, however, have further careful examination. There are two major reasons for this consideration. The first reason lies in the price hike of water charge and material cost. Water charge have been made to be paid in kind in proportion to the harvest after July 1st 1975, on the standard shown below. It is explained that the decision of payment in kind was based on the judgment that there may be such cases where farmers are unable to sell their rice at equitable price.

Gravity irrigation	in rainy season	2 cavans
	in dry season	3 "
Pumping irrigation	in rainy season	3 "
	in dry season	5 "

One(1) cavan is equal, statistically, to 44 kg, and virtually to 50 kg. In case of pumping irrigation, water costs 400 pesos per ha in a year. The paddy levied by NIA as water charge in kind is sold to NGA, charging the handling fee and transportation cost. The fund thus obtained finances NIA for operation and maintenance of facilities.

Prices of fertilizers and agricultural chemicals also show the trend to hike. And necessary amount of fertilizer to secure the yield as planned is 3.5 bags per ha of Ammophos (16-20-0) in both rainy and dry seasons and

Ammosul (21-0-0) of 2.5 bags in rainy and 3.0 bags in dry season, which altogether cost 1,000 pesos in a year.

Chemicals needed per ha are 1 bag of Diazinon, 33.3 kg of BHC and 1 bag of 24-D, whose annual cost amounts to 600 pesos. Annual total of these costs for water, fertilizers and agricultural chemicals amounts to 2,000 pesos per ha and 5,500 pesos per household. Taking it for granted that the above defined first-type farmers have been actually paying about 1,900 pesos for corresponding expenses, it should not be overlooked that they will be obliged to add 3,600 pesos to their management fees.

The second important point of consideration should be directed to the peak of labor. Total labor of one farming household of 'first type' is 180.98 man-days for first crop and 181.92 man-days for second crop, which, but for the peak, can be covered by one worker working every day all through the year. Labor peak appears in transplanting and harvesting. Appendix 6-5 was prepared by DLGCD to visualize labor distribution in farm management in which they cultivate one crop paddy farming followed by some legume and miscellaneous cereals. Two crop paddy farming as planned, bring forth two peaks in both transplanting and harvesting in a year, that, naturally, leads to labor increase as a whole. Present peaks are covered by employed labor, which will be replaced by mechanization in the future. Systematically mechanized farming and its cost accounting are left for future study.

The third point lies in tenant rent. Among the first-type farmers, only 36 % are owner-farmers, and the rest either tenant or lessee wholly or partly. Land Reform is discussed in another chapter, and if it is not succeeded, one third or a half of increased production through the project will belong to landlords, though there may be some increase on the part of cultivators themselves. That is sure to discourage tenant or lessee farmers. Effective proceeding of land reform now in progress has long been waited for.

4 - 5 Effects on Social Development

Economic efficiency of this project should also be evaluated in its immaterial or social aspects, while materially it is grasped in the form of internal rate of return. Cagayan province is located in northern end of

Luzon and, because of poorly-facilitated roads and harbors, as has previously been discussed, isolated from other parts of the country, left behind development, their potentiality being unrealized. Now, the highway is going to come through before long, investment in infrastructure for development such as electrification, harbors etc. is in progress. All of them will give a great change to the socio-economic circumstance of the area.

It seems to be more significant to concentrate the investment of agriculture in this area, which is the principal industry, particularly at this stage of development, because various investments are expected to effectuate each other in multiplicable ways. Present development in the Cagayan Region seems to be progressing from its southern part to the north, but it seems to be more effective to develop this vast territory from the north extending toward south in parallel with the development from south to north. The increase of production and the rise of income level caused by the project will no doubt function as the incentives for further development of three Cagayan provinces. At present, 19 % of the potential unemployed are supposed to be in these three provinces (It is difficult to find out the actual number). In the future, however, existing extensive farming will be converted into intensive one with high yield, which requires more labor time by 50 %. The potential unemployment will accordingly be absorbed in agriculture, causing a labor shortage and, on the other hand, farm mechanization will be needed to cover the labor shortage.

As the electrification of the area proceed in line with the introduction of farm machinery, mechanical repair shops, agricultural processing plants and rice mills are to be set up. Farm products in this area has hitherto been forwarded unprocessed to Manila and its suburbs. From now on, paddy will be hulled, some of the products will be processed before transportation. Referring to paddy, the amount marketed outside the area has been 50 % of total 17,800 tons, which will be raised up to 6,800 tons a year bringing roughly 68,000,000 pesos. Regional economy advances and the Government can spare foreign capital by reducing import.

7,000 pesos of net increased income per household a year may well be spent for education of children, medical care, improvement of housing and purchase of farm machinery, etc. Percentage of school attendance in rural districts seems to be far lower than that in urban ones, but the income

increase will push it up over national average, at 70 %. Moreover, the present trend that only 30 % of those who enroll high schools or colleges complete the course, because of financial difficulty, may be improved.

If rural electrification and economic advancement make it possible to improve housing conditions, particularly to set up waterworks, it will do much good to health and hygiene, and infant death rate (national average 62/1,000) and average span of life (56 years) will be revised up to Singaporean level (1-9/1,000 and 68 years). Having fields irrigated, farmers can produce more yield of crops at their own will, and their life becomes more benefited with income from farm products and thus, they will stimulate farmers toward further device and effort to produce more.

Creation of this sort of willingness is really a significant effect, which is to be magnified through awareness of farming rationalization by working together in group and of efficiency of cooperation. As the electric services spread, it becomes possible to have gatherings at night. Farmers learn, through mutual talks and by instructions given, necessity of their own organization and usefulness of extension services. All these are invaluable benefits.

To discuss a little more concrete phases of the problem ;

- (1) The basic principle of so-called 'rationalization' of agriculture lies in working together. Farmers, who have been working and have lived rather individually, should be trained toward cooperation among villagers in the smallest unit of traditional community. It will make farmers able to put their community life in better order and to exchange their opinions more smoothly. These are essentials of social development.
- (2) Betterment of social environment and farm income will prevent local youth from exodus, as it were, toward urban areas. Agricultural labor will be kept better, which, together with labor power saved by rationalization, will function in promoting side jobs, livestock husbandry or reclamation of land. That, in turn, is sure to contribute much to further social development.
- (3) Better roads, by saving the time to go to school or shopping, allow students and housewives to enjoy more spare time, that may be spent for better householding, domestic education and also for side jobs.
(Improved roads, of course, make it easier to sell fresh products in urban market at more profitable price, and to transport agricultural inputs

such as fertilizers and agricultural chemicals.)

As seen above, the favorable effect of the project is not simply economic. Farmers' willingness toward industrious labor and development is to be brought up through their participation in the project. It will function as the spring board to the next step of development. Educational level of children, health condition of villagers, and all other indices of social life, which are now inferior to urban ones, will be going on to better and better conditions, until, at last, the rural scenery appears in modern style.

Chapter 5 FUTURE PROBLEMS

5 - 1 Irrigation and Drainage Plan

5 - 1 - 1 Data To Be Surveyed, Necessary for Design

- (1) To carry out a feasibility survey for the irrigation project area, a topographic map (with a scale of 1/5,000 - 1/10,000, a contour of 0.5 - 1.0 m) is required.

The Philippine Government side promised the Japanese survey mission that after organizing three surveying groups, two will be sent to Aparri-Lallo and another to Pared and Iguig and all required data will be prepared within six months.

- (2) To establish the irrigation and drainage projects, it is required to arrange and prepare all the data for daily rainfall, daily mean river discharge and tidal water level.

The Philippine Government side has committed themselves to prepare all the necessary data.

- (3) To establish the irrigation and drainage projects, the following meteorological data are also required: That is; atmospheric temperature, humidity, wind direction, sun shining hours and solar radiation, etc.

The Philippine Government side has committed themselves to prepare all these necessary data.

- (4) A boring survey is required to be carried out at the proposed site for pumping station and a bearing capacity test should be performed, if necessary.

The Philippine Government side has committed themselves to be almost possible.

- (5) It is required to carry out a detailed soil survey about the benefited area. The Philippine Government side agreed on this.

- (6) It is required to carry out a measurement of salinity at the proposed site for the pumping station at Aparri-Lallo area and reconfirm that there is no saline water intrusion.

The Philippine Government side agreed on this.

- (7) It is required to immediately set up a benchmark at the proposed sites for the pumping stations.

The reply from the Philippine Government side was that it was the same as explained at the discussion meeting on the interim report with the counterparts on June 19, 1975.

(8) Incidentally to the main issues stated above, the following is required:

1. to collect data for the Upper Magat Project (IBRD) and to hold meeting with NIA Magat office;
2. to collect surveyed data pertaining to effects of the flooding time.

5 - 1 - 2 Problems for the Plan

- (1) The motors for the pumps are planned to be installed on the assumption that the Cagayan Transmission Line Program financed by OECF would be completed by the end of 1977 as scheduled.
- (2) Flood control should be carefully reviewed sooner or later covering the whole basin of the Cagayan River. At this juncture, however, the sites for the pumping stations should be decided after conducting more survey on the past maximum flood stage, and also a cropping pattern in the low land area should be considered excluding the flooding period to cause damage.

Further, it will be an important subject to excavate the main drainage canals so as to naturally drain the low land well.

5 - 1 - 3 Agricultural Survey required for Irrigation Project

A fact-finding survey on agriculture during the wet season at the object area for the project is required.

That is to say;

- (1) Survey on paddy growing on irrigated paddy field and rainfed paddy field;
- (2) Survey on the damage due to retarded growth occurring in paddy fields,
- (3) Survey on flood damage, and soil texture,
- (4) Surveys on the application of fertilizers and on spraying dose of agricultural chemicals which are prevailingly used by farmers, and on the relationship between growth and yield of paddy in the fields of farmers concerned.

- (5) Surveys on the growth of corn and mung bean, next crop to paddy.
- (6) Study on comparative growth between paddy fields under the Masagana 99 project and ordinary paddy fields;
That is; studies on the established area for farmers' organizations and on the effects derived from this campaign.

5 - 2 Cagayan Integrated Agriculture Project (CIAP)

5 - 2 - 1 The most important thing in the implementation of the Cagayan Integrated Agriculture Project is that this project should be accepted by the majority of inhabitants and farmers in the project area and what is wished for by the farmers should be fully incorporated into the project. It is quite natural that the Government of the Philippines should collect a share in expense of the project and water charge from farmers upon the completion of the project and that the farmers should pay the allotment into the Government with their consent. For this purpose, the Government should explain the representatives of farmers and individual farmers the purpose and the contents of the project before the project is set about, and also should lead them to understand the necessity and importance of the project. Through this explanation meeting, farmers will organize farmers' associations on the basis of each unit area and will cooperate each other in accepting the project. For example, farmers will organize their association in which they can talk over the settlement of land loss caused by the land acquisition for channel and road sites to be constructed, and land exchange and consolidation. This will bring about a great effect in the management of the joint farm operation after the project is completed.

5 - 2 - 2 The Upper Magat Flood Control Project

This project is all connected with flood control. Accordingly, it would be a good idea to establish a basic plan for flood control in the whole Cagayan Valley before the planning of this project is made.

In view of the topographical conditions and existing data, it is assumed that the storage function method would be most suitable to analyze the plan. To obtain the function, however, river profile and cross-sectional levelings should be carried out.

For surveying points, about 80 observation stations are needed, and the

river profile and cross sectional levelings of about 1,000 km are required.

To make a plan for the flood control, the site surveying must be carried on for two months by three specialists (comprising specialists in flood control, dam construction and hydrology respectively) and thereby projected site for the dam and the block setting of the basin should be decided. Then, coefficients to get the function must be obtained from the measured values resulting from the survey which is to be carried on for about six months in a rainy season on a continuing basis since that time on.

The actual status of the river should be fed back into a computer by the mathematical value according to the function which were obtained by each block in the basin, and thereby an ideal plan should be made for flood control in the river. It will require a 3-month period to complete this planning.

5 - 2 - 3 Pinacanauan River Project

When a water resources development plan for irrigation water and drinking water were made in addition to the above flood control program, the development of the Pinacanauan river would be more fruitful.

5 - 2 - 4 Domestic Water Supply

At present, domestic water supply in the project area is practically next to none. Although this is a pressing problem to be solved for the health of inhabitants, a survey for the water sources has not been clarified.

In coupling with the above-mentioned flood control, the use of water resources must therefore be taken into consideration and at the same time a survey for the underground water should be conducted at the low reaches of the river.

5 - 2 - 5 In order to produce an immediate effect on rural community electrification, electric associations must be organized by village in each area in a haste prior to the completion of the Cagayan Transmission Line at the end of 1977 and its terminal works in electrification should also be completed in haste.

5 - 2 - 6 By implementing this project, this area will take great stride in capital composition in agriculture.

With an increase of economic power, it is considered to be important to accelerate the improvement and development of upland fields for the production of grains and vegetables and of grassland for livestock production. Accordingly, in line with the preparation of irrigation projects, it is desirable to start a basic investigation and study for the next step by preparing a land use map to the scale of 1/20,000 - 1/5,000, a land classification map, and a land use planning map.

5 - 3 Marketing and Farmers' Organization

With regard to the items to be studied in marketing, it is necessary to review: (1) an organizational scope for farmers' joint marketing system on the voluntary basis (including the areal expanse and personnel organization) and to review the assembling means for the joint marketing, and the scale and capital for storage and processing facilities and (2) an investigation and an analysis of seasonal price fluctuation in farm crops and livestock products. As for items to be studied in farmers' organization, (1) it is necessary to review the feasibility of a compact farm, which is strongly colored with a joint management of 30 - 50 ha which is proposed with the center of ACA, in trading views with local leaders and farmers, and (2) it is required to make an investigation of existing farmers' organizations and also to clarify the procedures in organizing them into the superstructure of Kilusang Bayang and a sphere of the operational activities on each level.

Regarding the items to be studied in connection with the land reform, (1) it is needed to make an investigation of the progress of lease holderization for share-croppers which lie outside the object of the land reform, and (2) the members of Samahang Nayon are being directed compulsorily to deposit the sum which is equivalent to 5 per cent of a loan for the production fund as the Barrio Guarantee Fund and it is necessary to check up on actual results of the guidance and also to review whether or not the farmers' education is carried on as scheduled for the improvement of farmers' technique in production and management by the use of this fund.

With regard to the items in the credit service, (1) it is planned to start double cropping after the completion of the project. In this case, it will become necessary to introduce machinery such as power tillers, tractors, agro-chemical sprayers and dusters. For this reason, it is necessary to review financing terms in connection with the loaning regulation

which is prescribed by PNB, Rural banks and ACA. And (2) it is required to collect information as to whether or not the Government subsidy is available when machinery and facilities are introduced, and about the future program of the authorities concerned.

5 - 4 Future Investigation

5 - 4 - 1 Guideline on Investigation

- (1) A feasibility survey on the infrastructure in connection with the irrigation project should immediately be carried out in the total area of 14,300 ha covering Aparri-Lallo area, Pared area, and Iguig area which, as a result of the survey made, has been clarified.

In the feasibility survey, two tasks should be done: one is to make a comprehensive grasp of the actual conditions of the region in a rainy season and the other is to make a detailed investigation after a rainy season is gone.

Particularly, for the purpose of the latter the detailed topographical map and the various data, which are being prepared according to the present request, will be of use.

Further, as for the project expenditure to be estimated as a result of the feasibility survey upon request by Honorable Arturo Tanco, Secretary of Agriculture, a report should be submitted to the Government of the Philippines by the end of March, 1976, in order to facilitate the preparation of the local currency.

- (2) Survey on the project for agricultural technical cooperation:

As for a future survey for the agricultural cooperation project, as was proposed as a result of the made investigation, operations including the feasibility survey detailed design, and agreement on Record of Discussion should be executed in this fiscal year (by the end of 1976) in order to establish the pilot center of 150 ha in Pared area. However, since the pilot center carries more meanings to be implemented to the utmost as part of CIAP, it will be necessary to review the thought of taking precedence over the progress of CIAP unless there is a possibility of realization.

5 - 4 - 2 Organizations of the Survey Missions and their Schedules

To carry forward the cooperation project of the Japanese Government in line with the request by the Government of the Philippines and to set about CIAP immediately, the following schedules are needed:

(1) Dispatch of the Mission to explain the survey report,

- a) Period: September 15 - September 30
- b) Organization: Leader 1 person
Irrigation Engineer 1 "
Regional Agricultural Development Expert 1 person

c) Purpose:

The purpose is to submit the report made by the Second Survey Mission and to explain its content and to make counsel with the Government side of the Philippines for the project and over the subject of confirmation to be exchanged between the both countries to carry out the project in future. Particularly, it is aimed to make an adjustment so as not to overlap this project with the Canadian Government cooperation and to trade views with the Department of Agriculture, the National Irrigation Administration, the Department of Local Governments and Community Development and the National Power Corporation.

(2) Feasibility Survey Mission for the Basic Planning of CIAP

- a) Period: October 20 - November 10, 1975
- b) Organization: Regional Agricultural Development Expert 1 person
Irrigation Engineer 1 "

c) Purpose:

The purpose is to make an advice and to hold counsel with the Government of the Philippines on the selection of the area for the basic plan of CIAP and on collection and preparation of necessary survey data such as topographical maps, hydrological data and geological data, etc. At the same time, it is also aimed to arrange important reference data for making a plan after the completion of topographical maps based on a survey on flood and on the degree of damages in the project area.

(3) Implementation Survey Mission for the Pilot Center

a) Period: October 5 - October 30, 1975

b) Organization:

Leader (Agronomist)	1 person
Irrigation Engineer	1 "
Agricultural Management Expert	1 "
Expert in Extension Service	1 "
Coordinator	1 "

c) Purpose:

The purpose is to select the proper location of the pilot center to prepare the plan of facilities, machinery and personnel organization needed for the pilot center and to make counsel with the Government of the Philippines in this matter.

(4) Feasibility Survey Mission for the Basic Planning of CIAP

a) Period: January 15 - March, 15, 1976

b) Organization:

Agro-Civil Engineer	1 person
Regional Agricultural Development Expert	1 "
Mechanical Engineer (Pumps)	1 "
Civil Engineer (Canals)	1 "
Agronomist	1 "
Agricultural Economist	1 "
Coordinator	1 "

c) Purpose:

The purpose is to prepare a basic plan to facilitate the financial cooperation from foreign countries for the implementation of CIAP.

(5) Survey Mission for the Detailed Design of the Pilot Center

a) Period: January 15 - February 28, 1976

b) Organization:

Leader	1 person
Agro-Civil Engineer	1 "
Architect	1 "
Mechanical Engineer (Pump)	1 "
Agricultural Economist	1 "
Coordinator	1 "

c) Purpose :

The purpose is to prepare the detailed design of the pilot center and to conclude the Record of Discussions basing on the framework of the plan, between the Government of the Philippines and the leader of the mission.

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Appendix 1-1. List of Survey Team Members

Leader (Second half)	Mr. KANJI ENDO	Executive Director, Japan International Cooperation Agency (JICA)
Leader (First Half)	Dr. KUNIO TAKASE	Deputy Director, Economic Research and Technical Appraisal Department, Overseas Economic Coe- peration Fund
Irrigation	Mr. JUNICHI KITANURA	Chief of Development Planning Division for Agriculture and Forestry, JICA
Development Planning	Mr. YASUTO KIKUOKA	Staff of International Coope- ration Division, Ministry of Agriculture and Forestry
Regional Agri. Development	Mr. TAKASHI INOUE	Deputy Director of Planning Department, Ministry of Agriculture and Forestry
Agronomy	Dr. KATSUO SUGIMOTO	Senior Researcher, Tropical Agriculture Research Center, Ministry of Agriculture and Forestry
Agricultural Economy	Mr. FUSAZO HORIO	Senior Researcher for Agricul- ture Technical Mechanization Ministry of Agriculture & Forestry
Regional Agri. Development	Mr. KAZUNORI TAMAKI	Consulting Engineer Registered, Sanyu Consultants, Inc.
Irrigation	Mr. IKUZO IWAMOTO	Consulting Engineer Registered, Sanyu Consultants, Inc.
Coordinator	Mr. KIYOHICO KINOSHITA	Secretary, Technical Affairs Division for Agriculture and Forestry, JICA

Appendix 1-2. List of Philippine Counterparts

Project Director	Mr. FERNANDO O. UMALI	Senior Consultant, Office of the Secretary, Dept. of Agriculture
Team Leader	Mr. HEGINO ORTICIO	Director, Plans and Programs, National Food and Agriculture Council
Coordinator	Mr. ANDRES A. LINCAOCO	Technical Assistant, Office of the Sec. Dept. of Agriculture
Agricultural Extension	Mr. ANTONIO ICO	Senior Training Officer Bureau of Agricultural Extension
Agronomy	Mr. JUANITO ODEJAR	Senior Agronomist Bureau of Plant Industry
Marketing	Mr. AUGUSTO VALIENTE	Senior Marketing Researcher, Special Studies Division, National Food and Agriculture Council
Regional Agri. Development	Mr. AVELINO BUENAFE	Project Assistant Mgt. Staff, Planning and Programs, Development Office, DPWTC
Irrigation	Engr. FELIX LABAYEN	Chief, System Development Division, National Irrigation Administration
Irrigation	Engr. AMADO JUGUETA	Head, Investigation Section, National Irrigation Administration
Irrigation	Engr. DANTE MENDOZA	Agricultural Engineer Management Staff, Department of Agriculture
Socio-Economics	Mr. HENRY LIM	Special Technical Assistant, Office of the Secretary, Dept. of Agriculture

Agricultural Economics

Miss TERESITA AGUDO

**Agricultural Econo-
mist, Management
Staff, Dept. of
Agriculture**

Agricultural Credit

Mr. ALAN ORTIZ

**Economist, Mgt. Staff
Dept. of Agriculture**

Appendix 1-3. List of Personnel Interviewed

Mr. Conrado G. Mercado
Assistant Administrator, NIA

Mr. Cesar E. Gonzales
Actg. Asst. Administrator, NIA

Mr. Felix M. Labayen
Chief, Development Engineer
Project Development Office, NIA

Mr. Mauro L. Diaz
Chief of Planning Section
Project Development Office, NIA

Mr. Reynaldo G. Libatique
Chief of Region II, NIA

Mr. Alejandro D. Coloma
Chief of Cagayan Provincial Irrigation Office

Mr. Coletto A. Llanes
Chief of Isabela Provincial Irrigation Office

Mr. Tony Mojica
Chief of Nueva Vizcaya Prov. Irrig. Office

Mr. Ruperto Bayabos
Dean, Faculty of Engineering
Saint Mary's College, Bayombong, N. Vizcaya

Mr. Fabian P. Abella
Professional Agricultural Engineer
Rural Development Div., BCD, Dept. of Local Government

Mr. Alexander H. Brillantes, CPA
Assistant Director
Dept. of Local Govt. and Community

Mr. Jose C. Medina Jr.
Assistant Secretary
Dept. of Agrarian Reform

Mr. Potenciano L. Belza
Chief of Center for Operation and Transfer
Dept. of Agrarian Reform

Mrs. Teresa J. Dupaya
Governor, Cagayan Province

Mr. David M. Puzon
Vice-Governor, Cagayan Province

Mr. Procoro J. Donato
Director-General (Provincial Secretary)

Mr. Edilberto R. Fragante
Asst. Provincial Agriculturist
Bureau of Agriculture Extension, Cagayan

Mr. Julian M. Ordonez
Bureau of Agriculture Economics, Cagayan

Mr. Benedicto E. Perez
Asst. Highway Regional Director
Dept. of Public Highways, Region II

Hon. Faustino N. Dy
Governor, Isabela Province

Mr. Isidro C. Dumana
President of Isabela State
College of Agriculture

Hon. Patricio Dumlao
Governor, Nueva Vizcaya Province

Miss Felicidad C. de Leon
Director, Regional Social
Welfare Office

Mrs. Trinidad Mendoza
Engineering Director, Cagayan Regional Office
Department of Public Works

Mr. Ramon A. Ibarbia
Director, Regional Office
NEDA

Appendix 1-4. Activities of Survey Team

- May 25 - Arrived in Manila at 2:00 P.M. by JAL 767
- May 26
- o Held a meeting with Staffs of Japanese Embassy in the morning
 - o Held first a meeting with Philippine Governmental Personnel concerned at the Central Bank
- May 27
- o Held a meeting for the Japanese Survey Team in the morning
 - o Interviewed Staffs related to the Integrated Agricultural Development Program, and visited different offices in the afternoon.
 - o Held a meeting for the Japanese Survey Team.
 - o Visited the Asian Development Bank for getting information of ADB Integrated Agricultural Projects and others.
 - o In the afternoon, Dr. K. Takase, Team Leader and Mr. J. Kitamura, Irrigation Engineer met Mr. C. G. Mercado, Asst. Administrator, NIA and Mr. C. E. Gonzales, Actg. Asst. Administrator, NIA
- May 29 - Visited the International Rice Research Institute for studies and data collection
- May 30 - Interviewed personnel concerned of the offices such as NIA, DLGCD, DRB, DAR to obtain necessary information.
- May 31 - Studied NIA-ADB Anget Integrated Agricultural Development Project, Bulacan.
- June 1 - Left Manila for Tuguegarao for field investigation for the Cagayan Valley. First, visited Cagayan Provincial Capital office at Tuguegarao. All members were taken by Air Force plane.
- o Held a meeting with the Governor and Provincial Agriculture Staffs at Cagayan Provincial Capital office.
 - o Made investigation in the proposed irrigation area in Aparri.
- June 2 - Held a meeting for the Japanese Survey Team and had a discussion with the local counterparts.
- o Visited the Capital Office and different Bureau offices for interviewing staffs and for data collection.
- June 3 - Survey Team divided into two (2) survey groups, that is, an irrigation survey group and an Agro-survey group. This agro-survey group consists of agronomists and Regional development planners.
- o Irrigation group made survey in Aparri proposed area and agro-group made survey in Pinacanauan, Iguig and Pared proposed areas.
- June 4 - Irrigation group continued survey in Aparri area and agro-group made survey in Alcala, Lal-lo and Aparri proposed areas.
- o Mr. Kanji, Endro, Team Leader (for the latter half) arrived at Tuguegarao and joined the survey team at Aparri.
- June 5 - All team members made investigation of irrigation water pump station site for Aparri proposed area.

- June 6 - Interviewed at Cagayan Provincial Capital office and different Bureau offices and collected data. Had a discussion with counterparts for the Project formulation.
- June 7 - Made survey in Isabela Province. Held a meeting with the Governor and his Board Members at the Prov. Capital office.
- o Irrigation group had an interview with NIA staffs and studied the existing Magat dam.
 - o Agro-group visited the Isabela Agricultural Experiment Station.
- June 8 - Office work was done at the Provincial guest house.
- June 9 - Irrigation group studied on-going Magat Irrigation Project and visited the damsite.
- o Agro-group visited the Cagayan Valley Agricultural Experiment Station and the Isabela State College of Agriculture to obtain information and data concerned with the agricultural development.
 - o Entered into the Nueva Vizcaya Province for study on flood control.
 - o Held a meeting with the Governor and his staff at the Provincial Capital office as regards flood control and irrigation projects.
 - o Investigated the flood control proposed area.
- June 10 - Irrigation group visited NIA office for interview to find the flood control problem.
- o All Team members made observation of the upland crops in the on-going farm.
- June 11 - Traveled to Bagio and studied at the Bagio Vegetable Experiment Station.
- June 12 - Visited paddy cultivation model farmers in Tarlac area. These farmers were doing the seed production and distribution under the B.P.I Project.
- June 13 - Did indoor work for making the interim report on our survey and held meetings together with Philippine counterparts.
- 22
- June 23 - Left Manila for Tokyo.

APPENDIX 1-5. Copy of Government Letter

18th July 1975

The Honorable
The Secretary
Department of Foreign Affairs
M A N I L A

S i r :

I have the honor to enclose herewith my letters to Ambassador Masao Sawaki of Japan dated July 18, 1975 on the Cagayan Agricultural Development Project and Mr. Sinsaku Hogen, President of the Japan International Cooperation Agency also thru Ambassador Masao Sawaki of even date regarding comment on the Interim Report of the JICA Mission for the Cagayan Valley for your transmittal and information.

Thank you.

Very truly yours,

ARTURO R. TANCO, JR.
Secretary

18 July 1975

MEMORANDUM

FOR : Shinsaku Hogen, President
Japan International Cooperation Agency

THRU : Ambassador Masao Sawaki

FROM : Arturo R. Tanco, Jr.
Secretary of Agriculture and Chairman, Cabinet
Coordinating Committee on Integrated Rural Development Projects (CCC-IRDP)

SUBJECT : Comment on the Interim Report of the JICA Mission
for Cagayan Valley

BACKGROUND

At the request of the Philippine government in September 1973, the government of Japan agreed to jointly undertake an integrated rural development program for Cagayan Valley.

Subsequently, the Japan International Cooperation Agency (JICA) sent a 10-man survey mission to Cagayan in August 1974. The mission concluded that integrated agricultural projects should be the key stone of Cagayan Valley development.

In June 1975, a follow-up JICA mission arrived to identify possible project components. The mission produced an interim report recommending a US\$31.1 million agricultural project for the Cagayan province.

PROJECT AREA

The interim report is in general agreement with the findings of the Philippine counterpart team. The project areas:

1. Lower Cagayan River Basin
 - A. Aparri, Buguey, Camalaniugan 10,000 has.
 - B. Lal-10 2,000 has.
 2. Pared 1,500 has.
 3. Iguig 800 has.
- 14,300 has.

CLARIFICATIONS

The substantial agreement reached in the interim report needs only a slight alteration and some clarifications.

The cropping pattern must be changed to avoid the typhoon season. With irrigation, the first crop can be planted in April, while the second crop in November.

What needs clarification are the managing scale mentioned in page 5, the specific countermeasures in page 6 and the 4 types of farmers association in page 12.

In addition, a detailed explanation of investment efficiency and the precise terms and conditions of a tight loan is needed.

REQUESTS AND REFERRAL

The government of the Philippines has the highest priority for its food production campaign. This serves to reconfirm the urgency of Japanese technical and financial assistance for this Integrated Agricultural Project. May we request a Technical Assistance Mission with equipment for 20 man-months starting October 1975?

In addition, we would like the assistance of a Japanese irrigation engineer to assist in the evaluation of the data gathering process for the Nueva Vizcaya Magat River Erosion Control Scheme excluded by the mission due to lack of data.

As for the Regional Research Center in Isabela, please refer it to the proper department of JICA for comment and action.

COUNTERPART COMMITMENT

On the part of the Philippine government, we commit all the counterpart personnel, budget, services, facilities, equipment and basic survey data necessary for the speedy preparation and implementation of the project.

At the same time, please be assured that the organizational and managerial set-up recommended by the mission is already being implemented by the Cabinet Coordinating Committee. And for this Integrated Agricultural Project, the Department of Agriculture is sparing no effort to assure its success.

ARTURO R. TANCO, JR.
Secretary of Agriculture

MS/ast

PROPOSED TECHNICAL ASSISTANCE FOR
CAGAYAN VALLEY INTEGRATED AGRICULTURE PROJECT

I. INTRODUCTION

The Philippine Government requested the Japanese Government to undertake the study for the development of Cagayan Valley. In August 1974, a 10-member Mission from the Japanese International Cooperation Agency (JICA) headed by Mr. Koichi Baba arrived from Japan. The mission, together with its Filipino counterparts made a field survey in the provinces of Cagayan, Isabela and Nueva Vizcaya. This mission submitted a report on their findings and published a Cagayan Valley Regional Development Report.

Based on the above report, a second Japanese Mission headed by Dr. Kunio Takase and later by Mr. Kenji Endo arrived in Manila on May 25, 1975. The purpose of the Mission was to identify specific agricultural development projects for possible technical and financial assistance.

A field survey of the Cagayan Valley was undertaken June 1-11, 1975 by the said mission and its counterpart members. After the field survey and subsequent meetings, it was decided that a package project consisting of three areas in Cagayan Province merits development on an integrated agricultural approach. This project shall be known as Cagayan Integrated Agricultural Project (CIAP).

Necessary data have however to be collected and feasibility studies prepared upon which an intelligent appraisal of the project may be made. Financing institutions normally require the submittal of such project reports in evaluating the technical and economic feasibilities and viability of a project. It is in this context that a technical assistance is being sought with the JICA with whose assistance a feasibility report acceptable to the Overseas Economic Cooperation Fund of Japan (OECF) may be formulated.

II. OBJECTIVES

The main objectives of the proposed technical assistance are (a) to assist the inter-agency personnel of the Government of the Republic of the Philippines in the preparation of the feasibility report for the CIAP to a level acceptable to the OECF, Japan, for possible financing thereof, and (b) help establish and maintain a pilot farm in the Pared area of the CIAP to achieve the targetted yield in the whole project area.

III. SCOPE

In order to achieve the above objectives, the proposed technical assistance shall make provisions for expert services, training grants for local personnel and necessary equipment. The Technical Assistance Mission, consisting of a team of experts to be provided by the JICA, shall come to the Philippines at the appropriate time and with the collaboration of the local counterpart personnel gather the necessary data and prepare feasibility studies and report for the CIAP. The required equipment to support the field work and studies shall be brought in by the Mission.

The CIAP shall consist of the following areas:

Pared River - - - - -	1,500 hectares
Iguig River - - - - -	800 hectares
Lower Cagayan - - - - -	12,000 hectares

In the Pared area, a pilot farms of 150 hectares shall be established. It shall consist of an experimental station, a seed farm and a demonstration farm. Necessary equipment, instruments and facilities shall be provided for the smooth operation of the pilot farm.

IV. CONSULTING SERVICES

The Technical Assistance Mission may consist of the following experts and approximate man-months of services:

1. One (1) Irrigation Engineer - - - - -	5 man-months
2. One (1) Farm Machinery Expert - - - - -	3 " "
3. One (1) Agronomist/Soil Expert - - - - -	3 " "
4. One (1) Equipment Engineer - - - - -	3 " "
5. One (1) Agricultural Economist - - - - -	3 " "
6. Other experts as needed, such as Equipment Engineer, Flood Control Engineer, etc. - - - - -	<u>3 " "</u>
Total - - - - -	20 man-months

The terms of reference and the assignment schedule of the experts are reflected in Appendices A & B, respectively.

V. EQUIPMENT

Necessary equipment and instruments to carry out the feasibility studies under the Technical Assistance program shall be brought in by the consultants. These consist of equipment needed for the fieldwork during the data-gathering stage, instruments needed for hydrometeorological observations and equipment for the operation of the pilot farms. The list of instruments and equipment are shown in Appendix C.

VI. COST ESTIMATES

Expenditures to carry out necessary work under this proposed Technical Assistance fall under two categories, the foreign cost and the local costs. The foreign cost is to be funded by JICA and the local expenditures shall be borne by the Republic of the Philippines. The foreign component costs are as follows:

A. Consulting Services

1. Remuneration - 20 man-mos. @ 5,000 - - - - -	\$ 100,000
2. International Travel - 10 round trips @ 500 - - - - -	5,000
3. Incidental Expenses - - - - -	<u>2,000</u>
	\$ 107,000

B. Equipment and instruments (lump-sum) - - - - -	<u>13,000</u>
	\$ 120,000

VII. GOVERNMENT OBLIGATION

The Government shall make available for the Technical Assistance Mission (1) counterpart personnel, (2) counterpart budget for operational expenses, (3) services, facilities and equipment and (4) basic surveys and data as set forth in Appendix D hereof.

The Government and other agencies concerned shall cooperate with the Mission to ensure that the objectives of the technical assistance will be carried out as promptly and effectively as possible.

The Government shall exempt from, or bear the cost of, any taxes, duties, fees, levies and other impositions imposed under its laws and regulations or the laws and regulations in effect in its territories or of any political subdivision or agency thereof in respect of:

- 1) any equipment, materials and supplies brought into the Philippines for the purpose of carrying out the project; and
- 2) any property brought by the members of the Mission for their personal use or consumption or which, after being brought into the Philippines, will subsequently be withdrawn therefrom upon their departure.

The Government shall:

- (1) Make arrangements for the members of the Mission and their families to be provided promptly any necessary entry and exit visas, residence permits, exchange permits and travel documents required for their stay in the Philippines; and
- (2) Facilitate clearance through customs of any equipment, materials and supplies required for the project and of the personal effects of the members of the Mission.

A P P E N D I X

APPENDIX A

Terms of Reference

1. Irrigation Engineer

- a) To review and evaluate all available data, engineering studies and preparations made by the local counterparts;
- b) To estimate available water with seasonal fluctuation and water requirements to determine net irrigable area and cropping pattern;
- c) To review layouts of irrigation canals, drainage systems, farm ditches and other terminal facilities and recommend irrigation method to be adopted;
- d) To prepare cost estimates, construction schedule and contract procedures;
- e) To examine the preliminary designs of major engineering facilities, including pumping stations, water distribution system, drainage facilities, service roads, farm ditches and water control structures.

2. Agricultural Economist

- a) To review all available material concerning the project in the fields of agricultural economy, project economics and institutional framework;
- b) To evaluate the needs of the project in terms of national economy, sector of agriculture and irrigation, regional development of Cagayan Valley and other relevant aspects;
- c) To evaluate the soundness of the project in respect to institutional set-up especially the implication of the Government Land Reform Program;
- d) To assess the project economic feasibility as well as farmers' payment capacity to the project.

3. Agronomist

- a) To review and make recommendations on cropping patterns to be adopted in the project area;
- b) To assess present land use, farming practices, yield and agricultural research;
- c) To assess soil conditions and suggest improvement plan;
- d) To formulate an Integrated Agriculture Development Program with Pilot scheme and other relevant activities;
- e) To recommend intensified modern farming practices relating to labor, farm implements, work animals, seed supply, fertilizer and pesticides;
- f) To identify the most profitable non-rice crop on the basis of soil, water and marketing conditions.

4. Farm Machineries Expert

- a) To assess the need and potential of farm mechanization in the project areas and the feasibility of including them in the project implementation;
- b) To conduct economic feasibility study on the use of farm machineries;
- c) To determine the best suited cultivation technique in the project areas and to formulate methods of achieving optimum returns thru the utilization of farm machineries;
- d) To review the list and estimates of farm machineries required for the project.

5. Equipment Engineer

- a) To recommend construction equipment and operation and maintenance equipment best suited for the project area.
- b) To determine the types of pumps and engines for use in the project.
- c) To prepare cost estimates and specifications for these equipments.

APPENDIX B

ASSIGNMENT SCHEDULE OF CONSULTANTS

	1975				1976				MAN-MONTHS
	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	
1. IRRIGATION ENGINEER		—	—		—	—	—		5
2. FARM MACHINERY EXPERT					—	—	—		3
3. AGRONOMIST/SOIL EXPERT					—	—	—		3
4. EQUIPMENT ENGINEER					—	—	—		5
5. AGRICULTURAL ECONOMIST					—	—	—		3
6. OTHERS (FLOOD CONTROL, DRAINAGE, ROADS, ETC.)		—	—	—	—	—	—	—	3

APPENDIX C

LIST OF EQUIPMENT AND INSTRUMENTS

1. Engineering Survey
 - a. Transit
 - b. Level
 - c. Tape
 - d. Stadia
2. Meteorological Equipment
 - a. Min-max air thermometer, U-Type (O.S.K. 708)
 - b. Min-max water thermometer with metallic housing (O.S.K. 710)
 - c. Psychrometer, Std. Type, 44 x 13 x 14 cm. (O.S.K. 743)
 - d. Jordan's sunshine recorder (O.S.K. 742)
 - e. Robitzech Actinograph with chart for one year (O.S.K. 746)
 - f. Anemometer, portable with tripod, comb. wind speed-direction (O.S.K. 755)
 - g. Automatic rain gage, tipping bucket type with recorder (O.S.K. 764)
 - h. Evaporation pan
3. Hydrological Equipment
 - a. Current meter, Price, pygmy type with comp. accessories
 - b. Current meter, Price, standard acoustic with comp. accessories
 - c. Tidal gauge, roller type, 7 day/rev. (O.S.K. 772)
4. Soil Survey and Water Testing Equipment
 - a. Abney hand level
 - b. Soil auger, bi-partite with T-handle and extensions
 - c. Munsell Soil Color Chart, Standard colors
 - d. Portable water testing kit
 - e. Field EC meter, portable
 - f. Field PH meter, portable
5. Pilot Farm Equipment (assorted kinds)

APPENDIX D

COUNTERPART PERSONNEL, BUDGET, FACILITIES AND
DATA TO BE FURNISHED BY THE GOVERNMENT

1. Counterpart personnel

- a. Chief of Counterpart
- b. Coordinator
- c. Irrigation engineer (planning)
- d. Designing engineer
- e. Hydrologist
- f. Agricultural engineer
- g. Agronomist
- h. Economist
- i. Agri-institutional expert
- j. Soil technologist
- Other personnel as needed

2. Counterpart budget

a. Surveying and topo-mapping	- - - - -	\$ 55,000
b. Field and Office Engineering	- - - - -	5,000
c. Soil and Agronomic survey	- - - - -	2,000
d. Socio-economic survey	- - - - -	3,000
e. Operational expenses	- - - - -	25,000
		\$ 90,000

3. Services, facilities and equipment

- a. Suitably furnished and equipped office accommodations in Manila and the project site, including the maintenance and the cost of utilities, and such office supplies and equipment, secretarial assistance and reproduction and communication facilities as the members of the Mission shall reasonably require;
- b. Such vehicles, including the drivers and cost of operation and maintenance hereof, and such other internal transportation facilities as the members of the Mission shall reasonably require for purposes related to the project; and
- c. Such laboratory facilities, operational devices and other equipments as may be required for the effective carrying out of the Mission's work.

4. Basic data to be furnished

- a. Topographic maps scale 1:10,000 with contour interval of 1.00 meter of the project areas
- b. Topo map and cross sections at pumpsites
- c. Hydrologic and geologic data

APPENDIX E

TENTATIVE SCHEDULE OF ACTIVITIES FOR CIAP

CAGAYAN INTEGRATED AGRICULTURAL PROJECT
TENTATIVE SCHEDULE OF ACTIVITIES

	1975			1976			1977											
	WET SEASON			WET SEASON			WET SEASON											
	J	F	M	A	M	J	J	M	A	M	J	J	A	M	J	J	A	S
1. PROJECT IDENTIFICATION																		
2. SURVEYS																		
TOPOGRAPHIC																		
CANAL PROFILE & LOCATION																		
PUMPSITE																		
3. FEASIBILITY STUDY (T.A.)																		
PRELIMINARY DESIGN & ESTIMATE																		
HYDROLOGY																		
AGRONOMY																		
LAND CLASSIFICATION																		
ECONOMICS																		
PILOT FARM (ESTABLISHMENT)																		
PLANNING																		
4. APPRAISAL																		
5. LOAN NEGOTIATION TO SIGNING																		
6. RECRUITMENT OF CONSULTANTS																		
7. PREPARATORY ENGINEERING																		
8. PROCUREMENT OF EQUIPMENT																		
9. CONSTRUCTION CONTRACT																		
10. CONSTRUCTION																		

NOTE:

7. PREPARATORY ENGINEERING - Construction of Project Office, Final Design and Estimates, Right of Way, Negotiation, etc.

8. PROCUREMENT OF EQUIPMENT
 A. ADVERTISEMENT C. AWARD
 B. BIDDING D. DELIVERY

9. CONSTRUCTION CONTRACT
 E. ADVERTISEMENT
 F. BIDDING
 G. AWARD

APPENDIX 2-1. Key Indicators (1974) on Social Conditions
Key Indicators (1)

I T E M	UNIT									
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
PART A: BASIC DATA										
Population	31.77	32.73	33.71	34.73	35.77	36.85	37.92	39.04	40.22	41.46
Labor Force	11491	11886	13274	13534	12046	12297	13220	14200	15886	15204
Employed	10543	11032	12185	12481	11235	11772	12584	13217	13262	14479
Agriculture	6052	6275	6993	7202	6325	6352	6440	7166	7016	8245
Manufacturing	1221	1331	1389	1387	1291	1402	1472	1467	1418	1508
Unemployed	947	854	1089	1053	812	525	636	983	624	725
National Accounts										
GDP, factor cost (fc)	20472	22645	25264	28104	31507	37888	45539	52374	63694	85990
GDP, market prices (mp)	21963	24366	27267	30308	33804	41239	49756	56724	70009	94349
GDP, 1967 fc	22813	23874	25264	26711	28280	29548	30966	32606	35159	36968
GDP, 1967 mp	24488	25695	27267	28801	30337	32159	33845	35315	38603	40598
GNP, mp	21840	24222	26962	29902	33505	40460	49168	55859	69559	94800
GNP, 1967 mp	24361	25546	26962	28390	30041	31679	33540	34932	38403	40651
Gross Domestic Savings	4828	5080	6260	6647	6924	8605	10280	11358	14199	24101
Index of Production 1970=100										
Agriculture	75.6	80.1	82.8	93.0	95.0	100.0	102.0	100.6	103.3	107.3
Mining	52.4	56.9	63.9	75.2	85.3	100.0	115.5	120.3	127.5	...
Manufacturing	78.7	84.0	91.1	95.7	98.5	100.0	110.6	120.9	134.5	...
Electricity										
Production	3827	4274	4679	5443	6211	6527	7100	7918	8718	8782*
Consumption	2514	2998	3183	3998	4812	4771	4932	6914	8319	8316*
External Trade										
Trade Balance	-40	-25	240	-293	-277	-28	-50	-124	296	-418
Exports (fob)	768	828	822	857	855	1062	1136	1106	1886	2725
Copra	170	157	129	123	87	80	114	110	166	140
Sugar (Centrifugal)	132	133	142	144	149	188	212	209	275	737
Copper Concentrate	47	75	75	89	133	185	185	191	275	393
Logs and Lumber	162	205	212	217	226	250	226	174	339	246
Coconut Oil	68	75	59	77	51	96	103	84	151	381
Imports (fob)	808	853	1062	1150	1132	1090	1186	1230	1597	3143
Mineral Fuels, Lubricants and Related Materials										
Machinery Other than Electric	76	84	94	106	107	119	141	149	188	653
	141	151	229	258	258	255	255	240	296	424

Source: Economic Office, ADB in 1975

Key Indicators (2)

I T E M	UNIT									
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Base Metals	78	84	106	110	116	144	91	112	150	296
Electric Machinery	48	36	47	61	60	59	66	54	71	105
Transport Equipment	87	110	130	144	125	106	122	124	102	265
Quantum Index 1970=100	87.3	92.6	89.5	90.7	87.7	100.0	114.6	126.1	142.6	109.0
Exports	80.8	85.9	102.3	111.7	106.9	100.0	100.8	100.6	107.5	118.2
Imports	83.0	83.7	85.2	89.5	91.1	100.0	93.0	83.1	123.7	231.4
Unit Value Index 1970=100	91.7	93.2	95.3	94.8	97.2	100.0	109.3	117.4	136.8	238.7
Exports	90.5	89.8	89.4	94.4	93.7	100.0	85.1	70.8	90.4	96.9
Imports										
Terms of Trade 1970=100										
Balance of Payments \$ Mn	39	65	-211	-385	-389	-149	-125	-176	323	-481
Goods and Services	784	844	839	876	874	1083	1148	1108	1871	2694
Merchandise Exports	-808	-853	-1062	-1150	-1131	-1090	-1186	-1230	-1597	-3143
Merchandise Imports	-24	-9	-223	-274	-257	-7	-38	-122	274	-449
Trade Balance	-25	11	18	-20	-11	67	38	98	60	41
Travel	-31	-37	-76	-97	-78	-130	-101	-125	-112	-55
Investment Income	119	100	70	6	-43	-79	-24	-27	101	-18
Other Services	99	97	187	134	154	119	134	188	234	271
Unrequited Transfers	138	162	-24	-251	-235	-30	9	12	557	-210
Current Balance	-81	-21	31	399	223	181	123	174	186	395
Capital Flows	-17	-1	48	186	133	65	-38	-39	41	91
Private Long-Term Capital	-118	-13	12	178	67	76	91	56	64	194
Private Short-Term Capital	54	-7	-29	35	23	40	70	157	81	110
Government Capital	-72	-83	-72	-196	-125	-147	-143	-107	-78	-75
Net Errors and Omissions	-15	58	-65	-48	-137	4	-11	79	665	110
Overall Balance	-	-	-	-	-	18	17	16	-	-
Allocation of SDRs										
Monetary Movements										
(- = Increase in Assets)	15	-58	65	48	137	-22	-6	-95	-665	-110
Public Finance (FY) \$ Mn	1967	1850	2416	2650	2963	3151	4305	5095	7119	10230
Revenue (National Government)	1524	1561	1916	2162	2494	2726	3825	4367	6239	8580
Taxes	443	289	500	488	469	425	480	728	910	1650
Non-Taxes	2077	2228	2531	2944	3611	4053	4429	5588	7941	13953
Expenditure (National Gov't.)	1791	2020	2151	2457	2940	3327	3765	4377	5784	8307
Current	286	208	380	487	671	726	664	1211	2157	5626
Development	-110	-378	-115	-294	-648	-902	-124	-493	-822	-3703
Surplus/Deficit (-)										

Key Indicators (3)

I T E M	UNIT or BASE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
External Public Debt	\$ Mn										
Outstanding		447	429	441	433	556	830	955	1294	1356	...
Service Payments		58	75	88	61	52	100	98	145	207	...
International Reserves	\$ Mn	197	194	180	161	121	251	382	551	1038	1504
Monetary Gold		38	44	60	62	45	56	73	71	45	45
Foreign Exchange		155	122	120	99	76	195	309	456	964	1425
Reserve Position in IMF		4	28	-	-	-	-	-	-	-	-
SDRs		-	-	-	-	-	-	-	24	29	34
Exchange Rates	₱/\$										
Official		3.91	3.90	3.93	3.93	3.93	6.48	6.48	6.73	6.78	7.07
Trade Conversion Factor			3.90	3.900	3.900	3.900	5.990	6.410	6.642	6.734	6.758
Price Indices	1970=100										
Wholesale (Manila)		72.6	75.7	77.7	79.8	80.9	100.0	115.7	127.4	158.6	245.1
Consumer (Manila)		74.8	78.8	83.8	85.7	87.4	100.0	114.6	126.3	140.2	188.4
Money and Banking (Outstanding) ₱ Mn											
Money Supply		3067	3371	3782	3982	4754	5047	5567	6797	8152	10220
Currency in Circulation		1483	1543	1756	1778	2119	2410	2650	3435	3452	4311
Peso Deposits Subject to Check		1584	1828	2027	2204	2635	2637	2917	3362	4700	5909
Commercial Banks											
Time Deposits		1054	1215	1417	1310	1259	1470	1890	2559	3044	4032
Savings Deposits		1402	1925	2456	2762	3128	3757	4410	4670	6865	8281
Loans and Discounts		2656	3242	4188	4800	5562	6422	8406	10569	13923	20516
Transport											
Railway Traffic											
Passenger	Mn Pass-Km	881	983	1024	894	584	752	698	665	798	...
Freight	Mn Ton-Km	142	143	139	116	115	47	83	40	57	...
Aviation Traffic											
Passenger	Mn Pass-Km	729	839	1041	1320	1559	1456	1497
Freight	Mn Ton-Km	14	19	25	27	30	26	26

Appendix 2-2. Agricultural Conditions

Appendix 2-2-1. Land Tenure

Tenure of Farm Operator	Cagayan		Isabela		Nueva Viscaya		Cagayan Valley	
	No. of Farm	Area	No. of Farm	Area	No. of Farm	Area	No. of Farm	Area
Full Owner	25,536	81,833	35,184	135,332	11,399	37,085	72,119	254,250
Part Owner	12,576	37,548	10,912	36,933	3,580	9,412	27,068	83,893
Tenants	14,858	29,863	21,654	52,286	4,825	10,503	41,337	92,652
Cash	39	95	149	331	78	123	266	549
Share of Production	13,589	26,392	18,673	43,805	3,741	7,376	36,003	77,573
Fixed Amount of Production	849	2,649	862	2,309	135	246	1,846	5,204
Rent Free	235	360	1,127	3,118	778	1,585	2,140	5,063
Others	146	367	843	2,721	93	117	1,082	4,259
Manager	57	52,586	32	4,502	4	400	93	57,485
Other Forms of Tenure	387	1,367	1,922	5,735	450	1,585	2,759	8,687
Total	53,414	203,200	69,704	234,788	20,258	58,985	143,376	496,970

Source: 1974 Preliminary Census of Agriculture

Appendix 2-2-2. National Land Holding Structure in Tenanted Rice and Corn Areas

Land Size Category	No. of Landowners (%)		Area (%)		No. of Tenants (%)		Ave. Farm Holding Tenant
Below 7 has	183,238	83	316,027	18	395,034	37	0.80
7 - 12 "	18,075	8	253,804	15	170,893	16	1.50
12 - 24 "	12,022	5	269,722	15	189,722	18	1.40
24 - 50 "	4,118	2	202,248	12	89,499	8	2.30
50 - 100 "	2,064	1	139,030	8	69,515	6	2.00
100 over "	1,524	1	560,386	32	164,154	15	3.40
Total	221,041	100	1,743,217	100	1,078,817	100	1.60

Source: DAR 1974

Appendix 2-2-3. The Land Holding Structure in Tenanted Rice and Corn Areas in Cagayan Valley

Land Size Category	No. of Landowners (%)		Area (%)		No. of Tenants (%)		Ave. Farm Holding Tenant
Below 7 has	37,167	92	76,581	54	51,538	62	1.49
7 - 12 "	1,963	5	16,825	12	9,827	12	1.71
12 - 24 "	1,083	3	16,265	12	8,771	11	1.85
24 - 50 "	148	-	5,096	4	3,235	4	1.50
50 - 100 "	68	-	4,775	3	2,987	3	1.60
100 over "	42	-	21,412	15	7,006	8	3.06
Total	40,471	100	140,954	100	83,364	100	1.69

Source: DAR 1974

Appendix 2-2-4. The Land Holding Structure in Tenanted Rice and Corn Areas

Cagayan Province:

Land Size Category	No. of Landowners (%)		Area (%)		No. of Tenants (%)		Ave. Farm Holding Tenant
Below 7 has	19,879	96	38,533	57	25,093	66	1.53
7 - 12 "	472	2	4,377	6	3,062	8	1.42
12 - 24 "	334	2	5,326	8	3,477	9	1.53
24 - 50 "	55	-	1,830	3	1,432	4	1.27
50 - 100 "	26	-	1,904	3	1,520	4	1.25
100 over	20	-	15,779	23	3,548	9	4.44
Total	20,786	100	67,749	100	38,132	100	1.77

Isabela:

Land Size Category	No. of Landowners (%)		Area (%)		No. of Tenants (%)		Ave. Farm Holding Tenant
Below 7 has	12,957	86	29,382	48	19,912	55	1.47
7 - 12 "	1,305	9	11,020	18	5,585	15	1.97
12 - 24 "	660	4	9,750	16	4,484	12	2.17
24 - 50 "	88	-	2,918	5	1,554	4	1.87
50 - 100 "	39	1	2,649	4	1,334	4	1.98
100 over "	22	-	5,633	9	3,458	10	1.62
Total	15,071	100	61,352	100	36,327	100	1.68

Nueva Vizcaya:

Land Size Category	No. of Landowners (%)		Area (%)		No. of Tenants (%)		Ave. Farm Holding Tenant
Below 7 has	4,331	94	8,666	73	6,533	73	1.33
7 - 12 "	186	4	1,428	12	1,190	13	1.21
12 - 24 "	89	2	1,189	10	810	9	1.47
24 - 50 "	5	-	348	3	249	3	1.40
50 - 100 "	3	-	222	2	133	2	1.67
100 over	-	-	-	-	-	-	-
Total	4,614	100	11,853	100	8,915	100	1.33

APPENDIX 2-2-5. No. of Farm Households by Scale of Farm Management
in Each Municipality

Area	Municipality	Total No. of F.H.	(1971. 4.) (Unit: household)						
			Below 1 ha	1-5 ha	3-5 ha	5-10 ha	10-25 ha	25-50 ha	Over 50 ha
Aparri	Aparri	1,848	93	1,033	487	202	32	1	-
	Buguey	1,368	90	791	396	79	11	1	-
	Camalanivgan	1,007	50	538	242	142	33	1	1
Lal-lo	Lal-lo	1,952	163	1,112	388	227	56	4	2
Pared	Alcala	2,647	294	2,002	295	50	4	1	1
Iguig	Iguig	1,016	169	699	122	18	8	-	-
Total		<u>9,838</u>	<u>859</u>	<u>6,175</u>	<u>1,930</u>	<u>718</u>	<u>144</u>	<u>8</u>	<u>4</u>
Cagayan Province		53,414	5,903	31,757	11,134	3,737	734	77	72

Appendix 2-3. Agricultural Production

APPENDIX 2-3-1. Total Crop Area (1,000 ha) (including intercropping)

Crops	Cagayan		Isabela		Nueva Vizcaya		Cagayan Valley					
	1960	1973	1960	1973	1960	1973	1960	1973				
Palay	60.11	125.56	70	108.42	129.60	59	22.22	35.40	73	190.75	290.56	65
Corn	22.71	31.50	18	33.03	51.53	23	1.59	3.19	7	57.33	86.22	19
Tobacco	6.56	11.40	6	18.64	29.24	13	0.61	1.70	4	25.81	42.34	9
Coconut	3.58	2.30	1	0.99	0.95	0	0.49	0.70	1	5.06	3.95	1
Others	4.49	9.15	5	4.46	8.22	4	3.45	7.24	16	12.40	24.61	5
Total	97.45	179.91	100	165.54	219.54	100	28.36	48.23	100	291.34	447.68	100

Source: 1960-1973 Agricultural Census - BAEEx, BAEcon.

APPENDIX 2-3-2. Area Harvested and Production of Principal Crops in the Philippines (Preliminary figures in 1973)

Crops	Total Area 100ha	%	Quantity 1,000t	Mean Yield t/ha	Value	
					million pesos	%
Palay	5,246.4	34.7	5,100.1	1.57	3,190.1	31.0
Corn	2,431.7	25.9	2,012.6	0.83	1,043.5	10.1
Coconut	2,125.5	22.7	1,813.4	0.85	1,386.7	13.5
Sugarcane	446.7	4.8	2,559.7	5.73	1,897.3	18.4
Banana	243.8	2.6	980.1	4.02	781.2	7.6
Fruits	159.9	1.7	823.9	5.15	600.0	5.8
Rootcrops	258.5	2.8	1,217.7	4.71	446.7	4.3
Abaca	145.2	1.6	110.1	0.76	102.6	1.0
Others	297.5	3.2	575.3	1.93	857.0	8.3
Total	9,355.2	100.0	15,192.9		10,305.1	100.0

Source: NEDA Statistical Yearbook 1975.

Appendix 2-4. Rice Production

Appendix 2-4-1. Area Harvested and Mean Yield of Rice

		Cagayan Province*		Masagana 99			
Item	Total Area 1,000 ha	Production 1,000 t	Yield t/ha	Item	Total Area 1,000 ha	Production 1,000 t	Yield t/ha
1973/74 1st and 2nd Crop							
Irrigated	55.4	2,241	1.78	1973/74 1st Crop (Wet Season)	5.4	271.5	2.21
Rainfed + Upland	77.9	1,918	1.08	Irrigated	1.0	47.1	2.07
				Rainfed	6.4	318.6	2.19
				Total			
				2nd Crop (Dry Season)			
				Irrigated	22.7	1,231.5	2.39
				Rainfed	7.0	232.5	1.46
				Total	29.7	1,464.0	2.17
Total	133.3	4,159	1.37				
1974/75 1st Crop (Wet Season)							
Irrigated	38.2			1974/75 1st Crop (Wet Season)			
Rainfed	54.0			Irrigated	4.61	299.8	2.86
Upland	5.5			Rainfed	0.92	40.1	1.92
Total	97.7			Total			
					5.53	339.9	2.72

Source: Bureau of Agricultural Extension

* including Masagana 99

APPENDIX 2-4-2. Area Harvested and Production of Rice
in Cagayan Valley

Item	Cagayan		Isabela		N. Vizcaya		Cagayan Valley	
	Area 1,000ha	Yield t/ha	Area 1,000ha	Yield t/ha	Area 1,000ha	Yield t/ha	Area 1,000ha	Yield t/ha
1968/69								
Wet season irrigation	17.7	1.85	48.9	2.14	7.8	1.48	74.4	2.00
Dry season irrigation	16.0	2.07	24.2	2.04	7.5	1.49	65.6	1.96
Rainfed	44.6	0.56	16.0	0.45	5.0	1.43	65.6	0.60
Upland	7.0	0.49	10.1	0.70	2.2	0.85	19.4	0.55
<u>Total</u>	<u>85.2</u>	<u>1.10</u>	<u>99.2</u>	<u>1.70</u>	<u>22.6</u>	<u>1.41</u>	<u>207.0</u>	<u>14.2</u>
1970/71								
Wet season irrigation	30.0	2.18	52.2	2.26	11.3	2.98	93.4	2.32
Dry season irrigation	22.8	2.30	27.2	2.34	9.8	2.31	59.7	2.32
Rainfed	52.4	1.31	17.8	1.15	6.1	1.88	76.3	1.32
Upland	5.4	1.02	11.1	0.81	8.6	0.53	25.2	0.76
<u>Total</u>	<u>110.6</u>	<u>1.73</u>	<u>108.3</u>	<u>1.95</u>	<u>35.7</u>	<u>2.02</u>	<u>254.6</u>	<u>1.86</u>
1972/73								
Wet season irrigation	38.1	2.61	50.5	2.05	10.9	2.05	99.5	2.26
Dry season irrigation	28.2	2.07	50.4	2.06	10.3	2.75	89.0	2.14
Rainfed	55.4	0.88	15.1	1.68	5.6	2.75	76.1	1.18
Upland	3.9	0.44	13.5	1.06	8.6	0.51	26.0	0.79
<u>Total</u>	<u>125.6</u>	<u>1.66</u>	<u>129.6</u>	<u>1.90</u>	<u>35.4</u>	<u>1.98</u>	<u>290.6</u>	<u>1.81</u>
1968/69 - 1972/73 ever.								
Wet season irrigation	27.5	2.19	50.8	2.20	9.3	2.22	87.6	2.20
Dry season irrigation	21.9	2.21	31.0	2.01	9.3	2.82	62.2	2.13
Rainfed	54.8	1.11	16.7	1.00	5.7	1.84	77.2	1.41
Upland	5.8	0.69	11.6	0.85	6.1	0.57	23.5	0.74
<u>Total</u>	<u>110.0</u>	<u>1.58</u>	<u>110.1</u>	<u>1.82</u>	<u>30.4</u>	<u>1.85</u>	<u>250.6</u>	<u>1.72</u>

Source: BAEcon, BAEx and Provincial Agriculturist

APPENDIX 2-4-3. Area Harvested and Mean Yield of High Yielding Varieties and Other Varieties of Rice (1973/74)

Item	Irrigated		(1)		Rainfed		(2)		Upland	(1)+(2)	HV/(3)	(1)/(3)
	HV	OV	Total	Total	HV	OV	Total	Total				
Cagayan	Area	42.6	12.8	55.4	37.9	37.0	74.8	3.0	130.3	62	43	
	Yield	1.86	1.51	1.77	1.35	0.84	1.00	0.69	1.39			
Isabela	Area	96.5	4.1	100.6	16.3	33.2	49.5	5.6	150.1	75	67	
	Yield	2.12	2.12	2.12	1.53	1.56	1.55	0.92	1.93			
N. Vizcaya	Area	22.0	2.0	24.0	3.7	0.7	4.3	1.5	28.3	91	85	
	Yield	2.68	1.38	2.57	1.93	2.77	2.06	0.71	2.49			
Total	Area	161.1	18.9	180.0	57.8	70.8	128.6	10.1	308.6	71	58	
	Yield	2.13	1.63	2.07	1.44	1.20	1.31	0.82	1.75			
Philippines	Area	1,194.5	299.2	1,493.7	982.1	551.8	1,533.9	409.2	3,027.6	72	49	
	Yield	2.05	1.89	2.01	1.53	1.25	1.43	0.94	1.72			

Source: Bureau of Agricultural Economics.

Area 1,000ha Yield t/ha

Note: HV — High Yielding Varieties

OV — Other Varieties

Appendix 2-5. Trend of Livestock

Hog and Poultry Population in Cagayan Valley

Province	Animal	1970	1971	1972	1973	1974	1975
Cagayan	Hog	285	319	358	400	448	502
	Poultry	1,929	2,050	2,180	2,318	2,463	2,618
Isabela	Hog	508	545	587	433	485	543
	Poultry	1,967	2,091	2,223	2,363	2,512	2,670
Nueva Viscaya	Hog	96	108	121	136	152	170
	Poultry	760	808	859	913	971	1,032

(unit: 1000)

Source: Bureau of Animal Industry (The annual growth rate is 12 % per year)

Appendix 2-6. NFAC

Market Days and Number of Vendors, 28 Public Market,
in Cagayan Valley, 1973-74

Province	Town	Major Market Days	Number of Vendors		Total
			Permanent	Transient	
<u>Cagayan</u>					
	Algala	Sunday	*	*	*
	Amulung	Tues. & Friday	3	40	43
	Aparri	Daily	500	200	700
	Calamaniugan	Sunday & Thurs.	200	300	500
	Iguig	-	-	5	5
	Lallo	Thues. & Saturday	25	25	50
	Penablanca	Thues. & Friday	25	15	40
	Solana	Sunday	14	300	314
	Sta. Teresita	Tues. & Friday	10	20	30
	Tuguegarao	Daily	536	520	1,056
<u>Isabela</u>					
	Alicia	Mon., Wed., Fri., Sun.	231	450	681
	Cabagan	Sun., Wed.	120	150	270
	Cabatuan	Sun., Thurs., Sat.	97	100	197
	Cauayan	Sun., Thes., Thurs., Sat.	141	50	191
	Cordon	Mon., Wed., Fri.	18	100	118
	Echague	Daily	46	350	396
	Gamu	Thes., Thurs., Sun.	-	50	50
	Ilagan	Daily	100	-	100
	Jones	Tues., Thurs., Sat.	33	200	233
	San Mateo	Sun., Wed.	350	20	233
	Naguillan	Sun., Wed., Fri.	4	60	64
	Santiago	Tues., Thurs., Sat., Sun.	504	300	804
	Tumauini	Tues., Thurs., Sun.	75	150	225
<u>Nueva Vizcaya</u>					
	Aritao	Sun., Wed., Fri.	28	300	328
	Bagabag	Mon., Wed., Fri.	31	261	292
	Bambang	Tues., Thurs., Sat.	225	100	325
	Bayombong	Mon., Wed., Fri.	171	500	671
	Dupax	Sun., Fri.	14	300	314
	Solano	Tues., Thurs., Sat.	300	150	450

Note: * Not available

Source: NFAC "Marketing of Major Agricultural Products in Cagayan Valley" October 1974

APPENDIX 2-7. Land Reform

Land Reform in the Philippines is said to have been initiated by the Land Reform Act of 1955, which was amended in 1971. It aimed at converting sharecroppers into lease holders. However it did not run in full effect because of administrative inefficiency and the failure in replacing the credit function of landlords by some other credit institution. Consequently it is generally understood that Land Reform was virtually set forward since Presidential Decree No. 27 was enacted after the Marshal Law in September, 1972.

As to the administrations in charge of Land Reform, there established the Department of Agrarian Reform on the national level, then downwards, regional office, district office, team office. Procedures on grassroot level are carried out by the team office set up in the municipality. Certificate of Land Transfer is registered and issued by the Department of Agrarian Reform which is one of the governmental offices. The Act is to cover 691,387 tenant farmers and 1,105,784 ha tenanted land, both amounting to 63 % of their total figures. As of August 1974, 251,991 certificates were issued to 180,386 tenants, which stands for 319,285 ha. By checking the result concerning landlords of 24 ha on over holdings, considerable success with nearly 77 % of households and nearly 70 % of land are found. However, far more difficult situation is expected in the cases with landlords under 24 ha who own 839,553 ha, that is, 48 % of total planned area.

The calculation method of the price to buy farm land has been referred to before, which sets average estimated price of 7,500 - 9,500 pesos for irrigated paddy field, 6,500 pesos for non-irrigated paddy field and 5,000 pesos for upland field. The tenant farmers whose land is to be reformed are obliged to join either Barrio Association or Samahang Nayan. Those tenant farmers who accepted Certificate of Land Transfer pay in instalments covering 15 years, and in case it falls into arrears. Barrio Association or Samahang Nayan will act for it. The members of those associations are also obliged to make deposit of one cavan/ ha/ one crop, will it is reported that there are only few instalments payment now going on, as the price of land has well be fixed.

As for the tenant farmers who are not under this scheme are to be converted from share-cropper to lease holder.

There are 16,455 Samahang Nayon Societies with 720,583 membership and 26,319 thousand pesos all over the country, as of January 1975. It is planned to have 21,000 societies organizing 1,250,000 farmers by the end of 1975.

Although Land Reform is, as discussed here, carried on as the major policy of Agrarian Reform, there are further questions of promoting legal assistance, co-operatives, farmers' education, irrigation, roads, electrification, land consolidation and financing under the name of Agrarian Reform, in order to achieve self-sufficiency in food and to raise the standard of living of farmers.

APPENDIX 2-8 Credit to Farmers

The fund loaned by Agricultural Credit Administration is centered on short term loans such as loans for production and for commodities, for instance, wage, materials for production, crop storage of farmers' cooperative marketing. The annual interest rate is 12 %, same as other governmental loans. ACA is faced with such problems that its fund falls short to meet all demand of farmers, and accordingly its function is only to supplemental to Rural Bank and Philippine National Bank.

Rural Bank, which was legitimated by Rural Bank Act in 1962 under the auspices of the Central Bank, is a credit institution that gives loan to peasant farmers and minor merchants and manufacturers by collecting small capitals from among the people. It has shown steady development. Those who are eligible to this fund should be farmers of less than 50 ha holding and merchants and manufacturers of less than 50,000-peso capital, and the loans can be made only for farming materials, machinery, facilities, etc. The term of loan for ordinary farm management is 3 months. Another credit connected with Masagana 99, which is the most important of Governmental credit system with loan covering average 6 months on the condition to repay within two months after harvest: the interest rate is 1 % per month.

Rural Bank is able to cover its shortage of fund by advantageous investment from the Government, supply of low interest loan by PCB, PNB, DBP (interest rate of PCB is 1 % per three months), and re-discount of bill. Being strongly supported by the Government, though it is civil by nature, Rural Bank functions hand in hand with Governmental credit institutions like Masagana 99 (whose loan per ha in 1975 amounts to 1,200 peso). PCB directs and supervises Rural Bank on its fund supplementation and legal affairs, though which they seem to plan strengthening Governmental administration.

The upper limit of interest rate is 12 %. In case of ordinary loans real estates such as land and others are required for mortgage, while Governmental loans like Masagana 99 can do with growing crops.

As previously mentioned, business management of Rural Bank is stable and steady because its loans are made with strict checking and sure mortgage. However, this, in turn, has come to set obstacles for poor farmers who do not have anything to mortgage to borrow their farming fund.

APPENDIX 2-8-2. Total of loan provided by Rural Bank
in Cagayan Valley

	<u>Total of loan (A)</u> P	<u>Non-repayment (B)</u> P	<u>(B)/(A)</u> %
Cagayan	22,481,292	4,626,632	29.48
Isabela	70,721,315	11,870,043	16.78
Nueve Vizcaya	22,900,572	1,567,855	6.85
Total	<u>116,103,179</u>	<u>20,064,530</u>	17.28

Source: Data collected from Central Bank

APPENDIX 2-8-3. Masagana 99 loans extended by phase

	<u>Amount</u> P	<u>No. of Farmers</u>
Phase I	11,120,678	17,370
Phase II	6,133,300	5,892
Phase III	14,253,978	9,785
Phase IV	13,388,877	8,400
Total	<u>44,461,373</u>	<u>41,224</u>

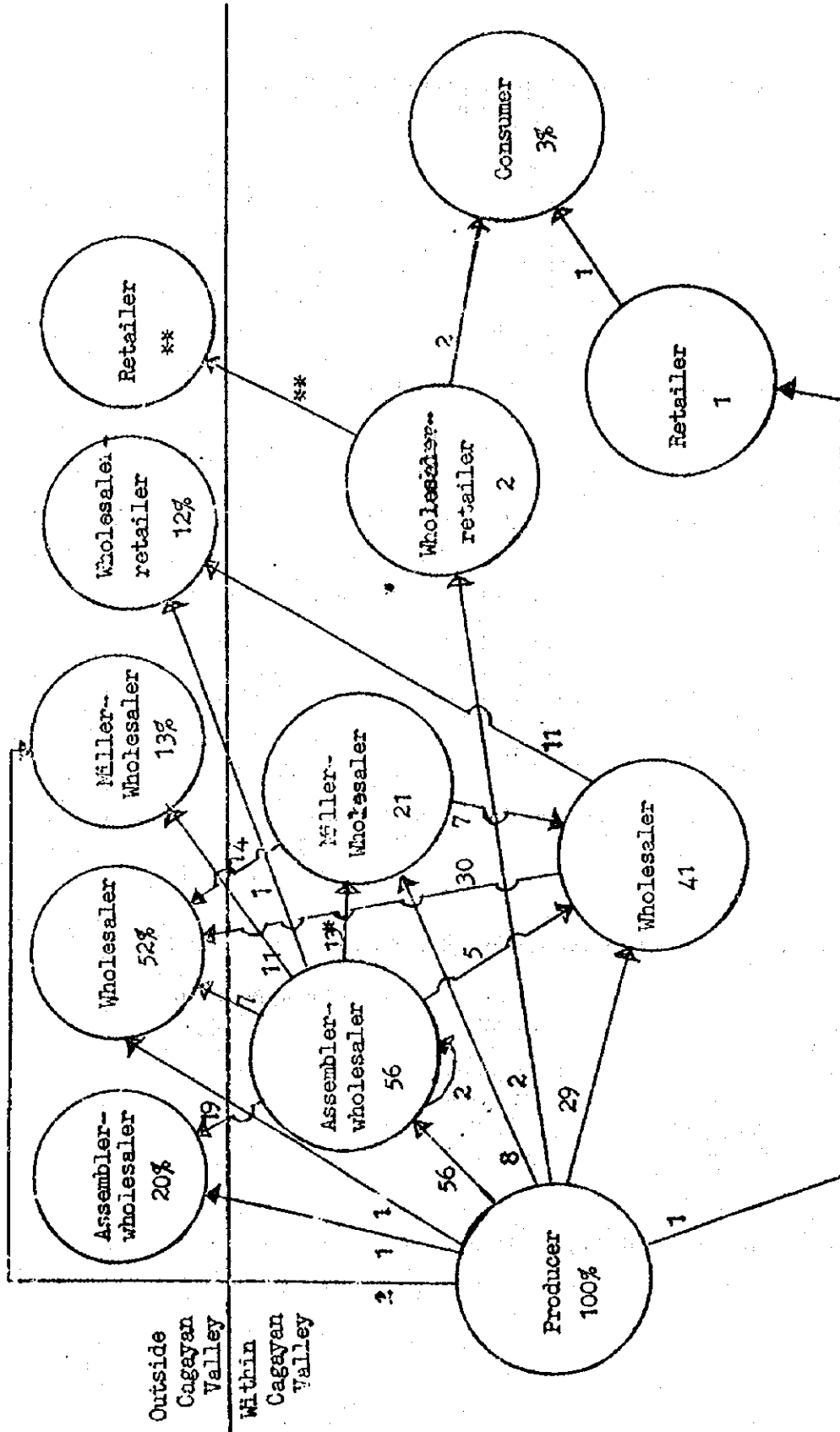
Source: The Regional office of BAEX

APPENDIX 2-8-4. Repayments by phase (as of April 1975)

	<u>Amount</u> P	<u>Repayment to loans due</u> %
Phase I	8,162,605	77.07
Phase II	1,810,285	29.00
Phase III	3,442,058	24.00
Phase IV	188,951	0.11
Total	<u>13,603,899</u>	<u>30.55</u>

Source: The Regional office of BAEX

APPENDIX. 2-9-2. Market Channels for Palay, Cagayan Valley, 1974

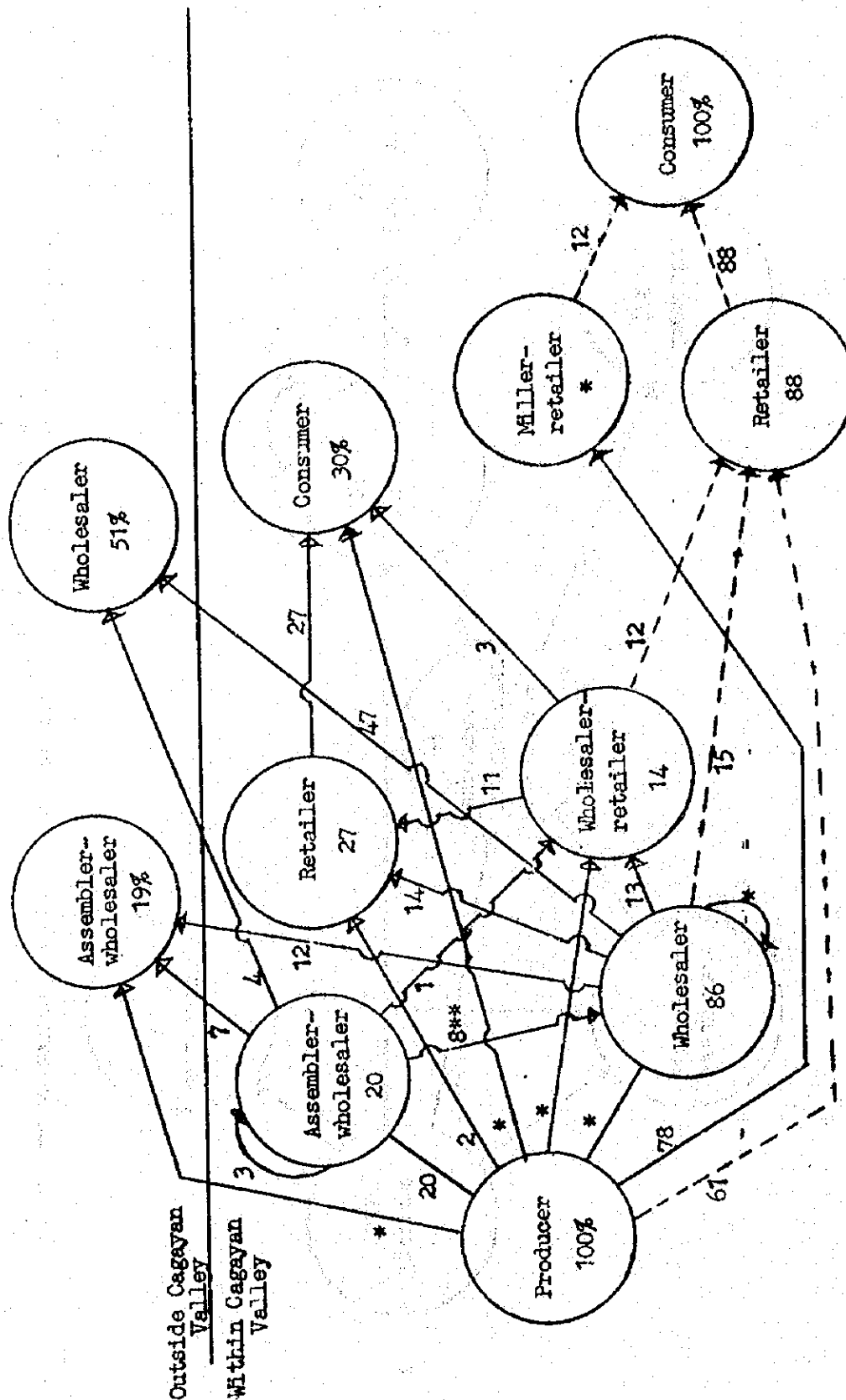


*Less than 0.5 percent.

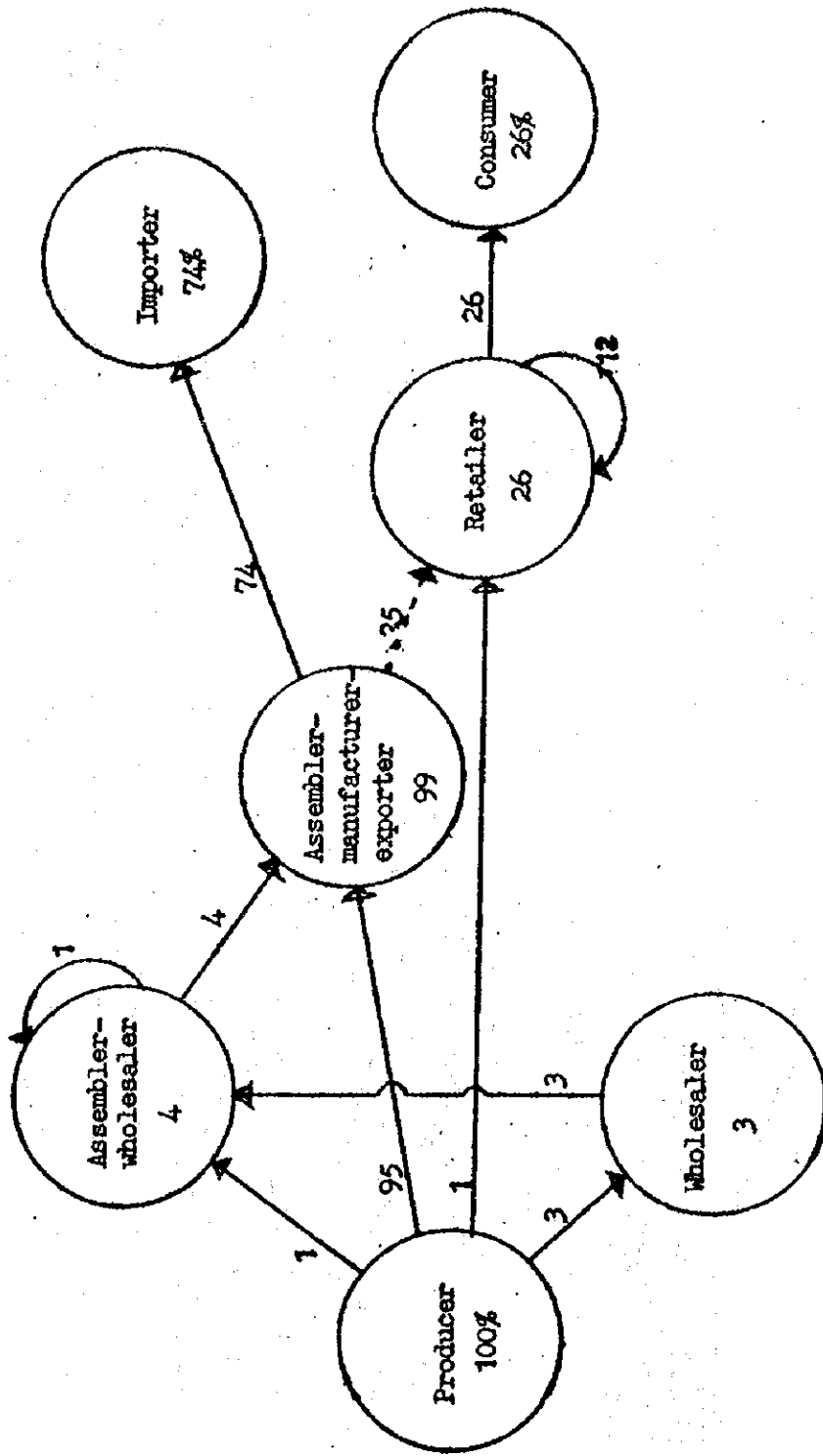
**Net flow, meaning there was trade both ways.

Data Source: NFAC, Marketing of Major Agricultural Products in Cagayan Valley, 1974

APPENDIX. 2-9-3. Market Channels for White Corn and Corn Grits Cagayan Valley, 1974

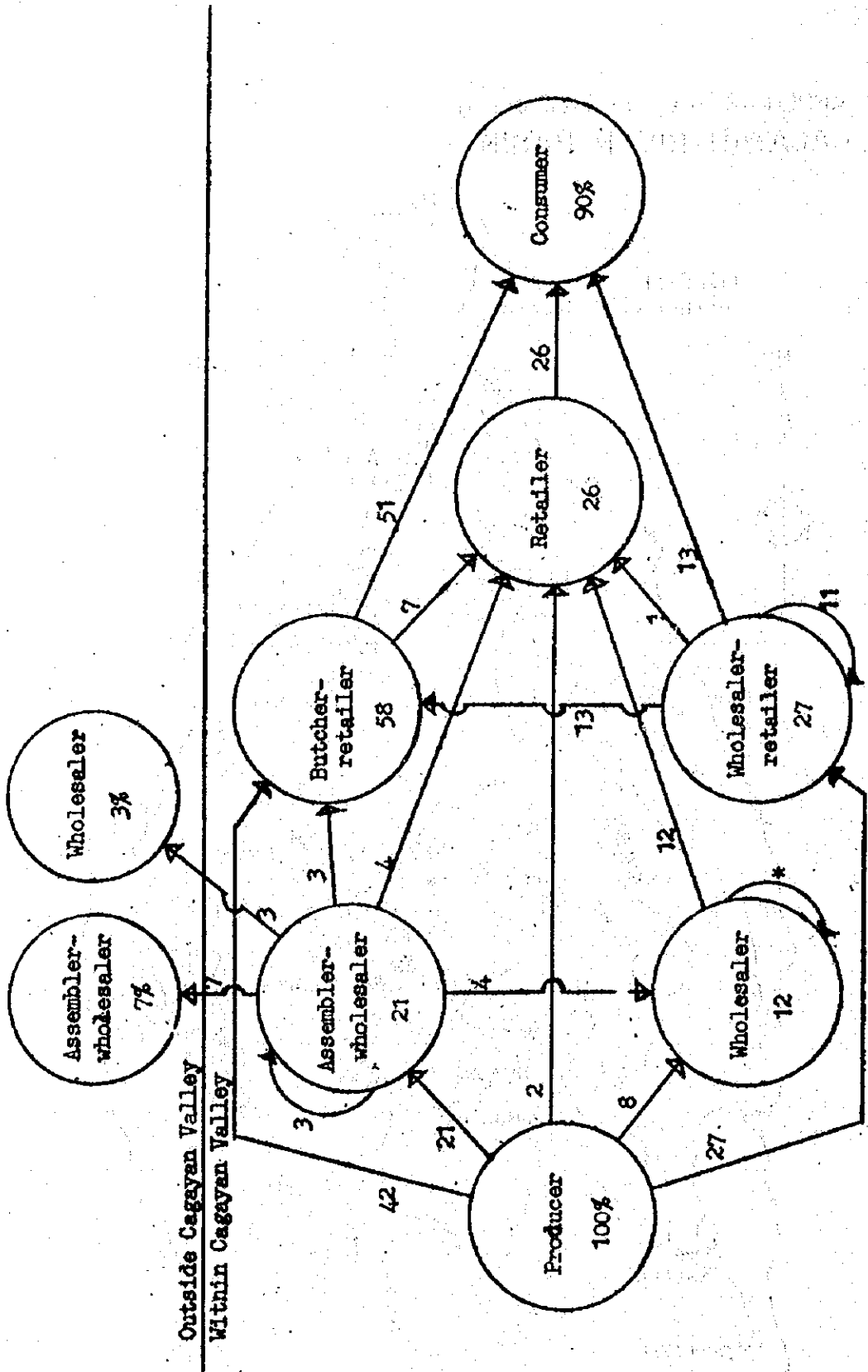


APPENDIX. 2-9-4. Market Channels for Tobacco Cagayan Valley, 1974

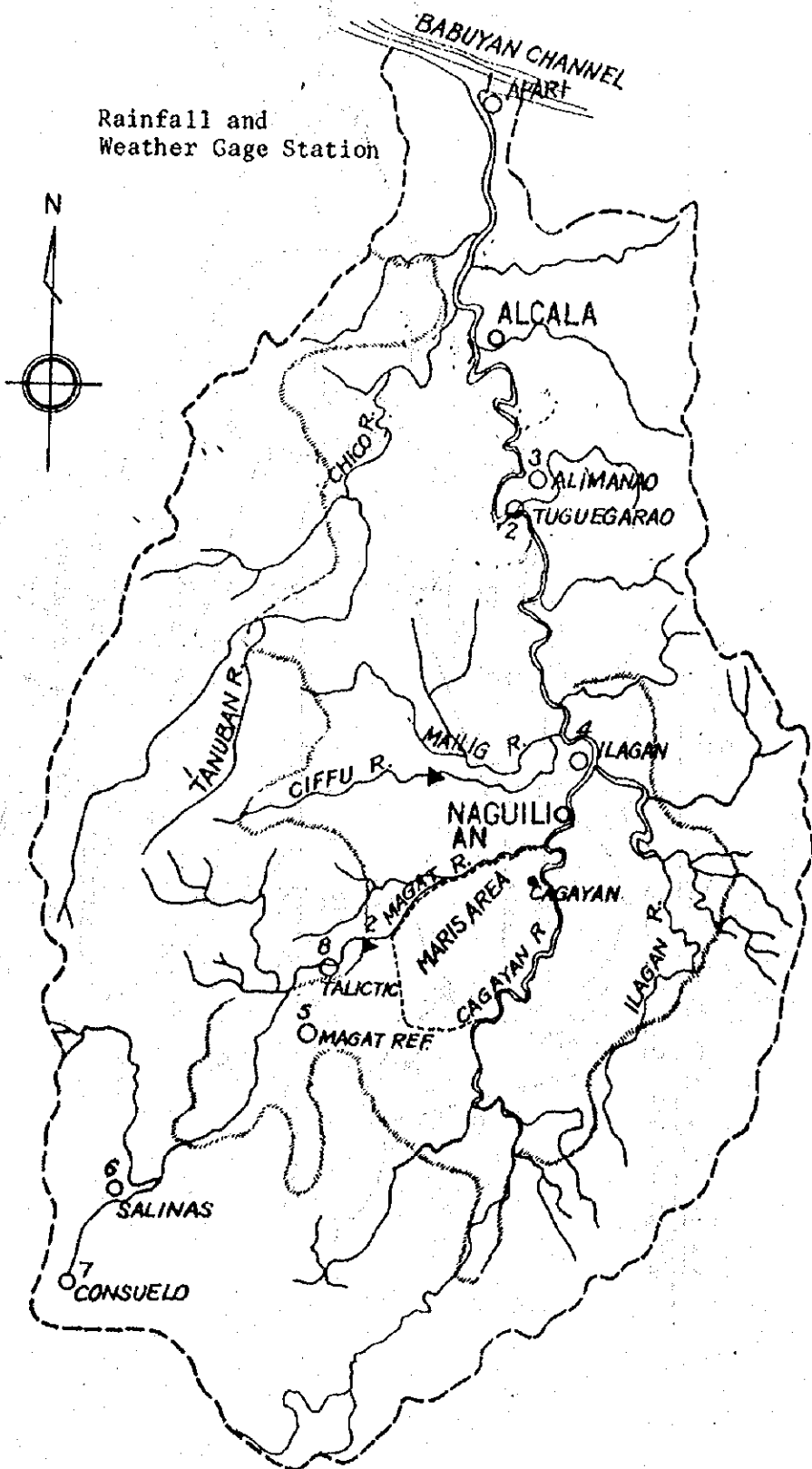


---> Processed
 Data Source: NFAC, Marketing of Major Agricultural Products in Cagayan Valley, 1974

APPENDIX 2-9-5. Market Channels for Hog/Pork, Cagayan Valley, 1974



APPENDIX 3-1. Station Map in
CAGAYAN RIVER BASIN



Appendix 3-2. Rainfall

Appendix 3-2-1. Yearly Maximum Rainfall

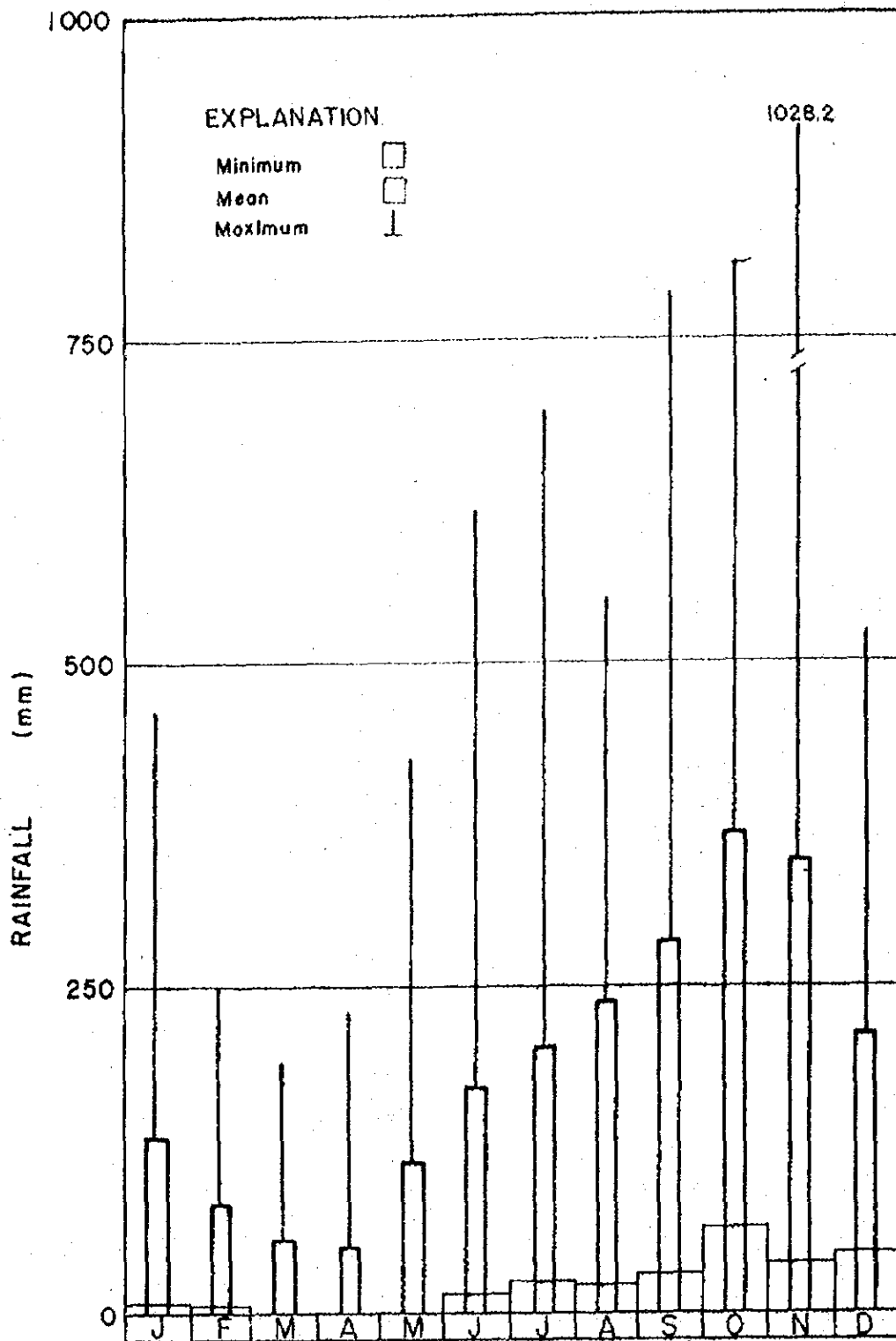
	<u>Downstream (1906) mm</u>	<u>Middle stream (1934) mm</u>	<u>Upstream (1948) mm</u>	<u>Remarks</u>
1	465	26	7	
2	119	4	52	
3	23	68	17	
4	15	73	223	
5	238	200	219	
6	101	68	176	
7	161	119	1,021	
8	212	142	549	
9	784	750	505	
10	485	512	257	
11	379	1,316	103	
12	295	135	246	
Total	3,277	3,413	3,375	

Appendix 3-2-2. Yearly Minimum Rainfall

	<u>Downstream (1914) mm</u>	<u>Middle stream (1914) mm</u>	<u>Upstream (1959) mm</u>	<u>Remarks</u>
1	101	14	26	
2	72	0	24	
3	25	0	94	
4	12	17	23	
5	11	124	137	
6	90	159	86	
7	35	99	170	
8	223	98	245	
9	209	182	176	
10	177	101	96	
11	187	82	214	
12	73	59	82	
Total	1,215	935	1,373	

APPENDIX 3-2-3.

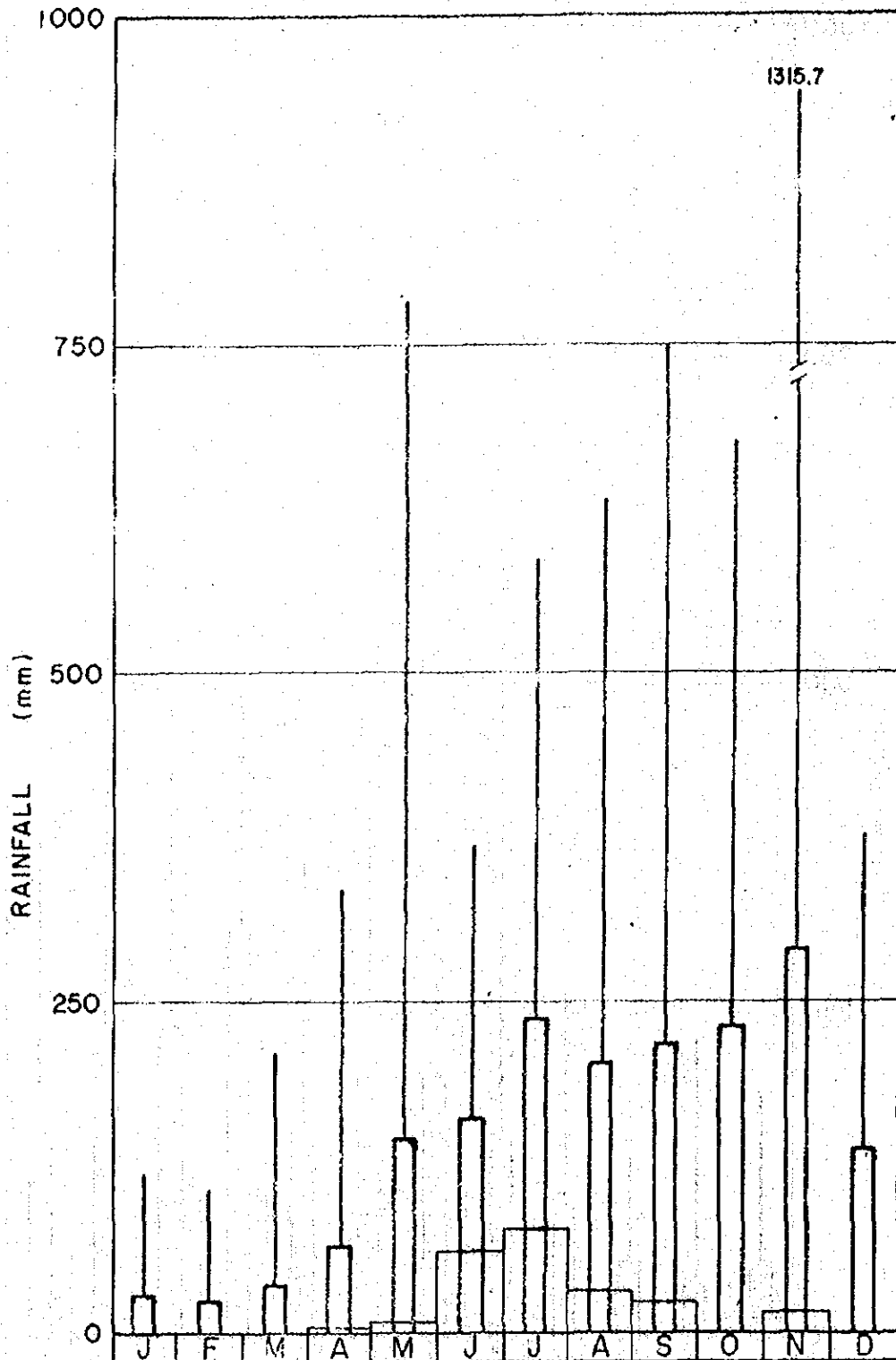
MAX, MIN AND MEAN MONTHLY RAINFALL
in APARRI, CAGAYAN



Period: 1902 - 1939
1947 - 1970

Data Source: Angat Magat Feasibility Report

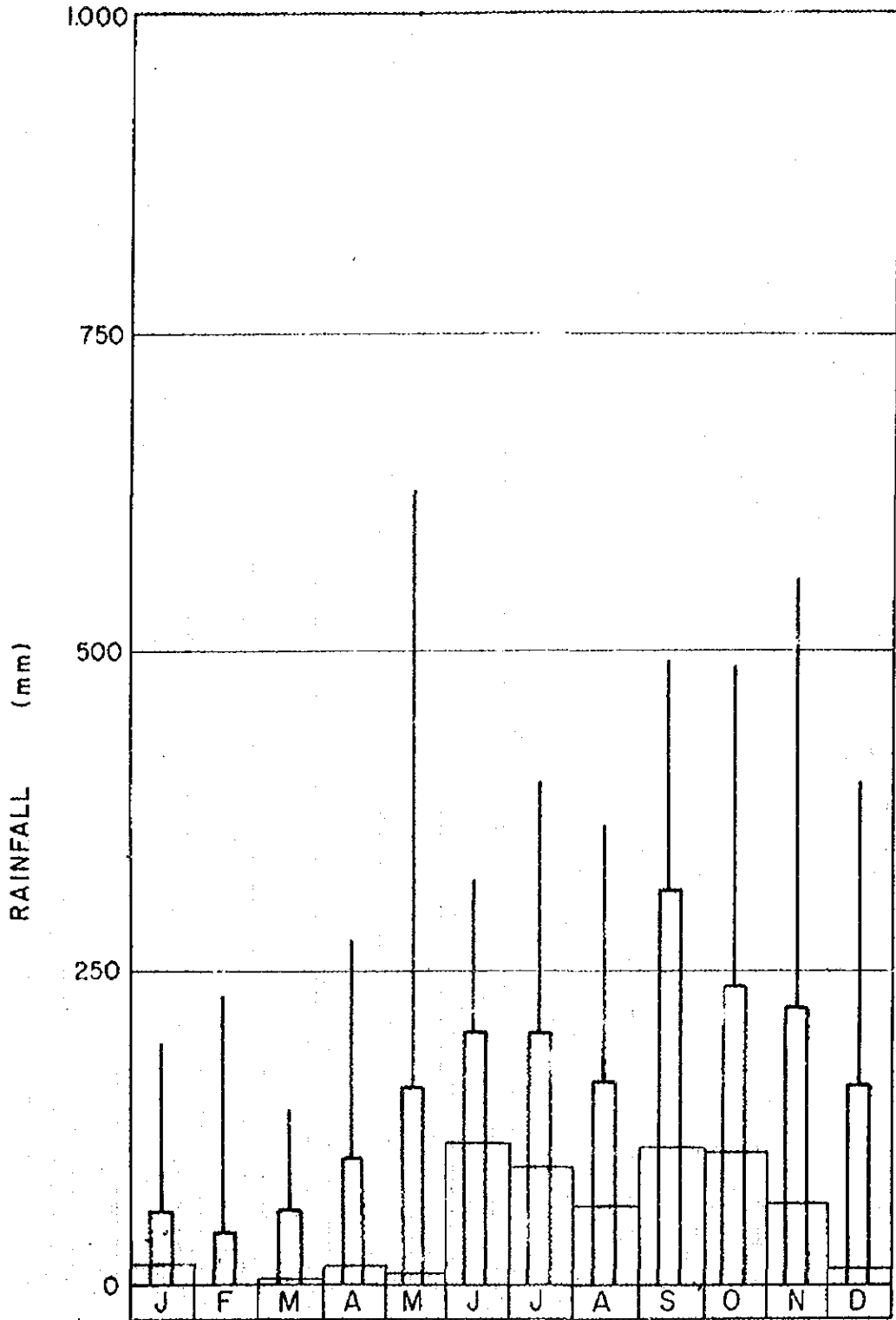
TUGUEGARAO, CAGAYAN



Period : 1903 - 1939
1947 - 1970

Data Source: Angat Magat Feasibility Report

MAGAT REF, BAGABAG

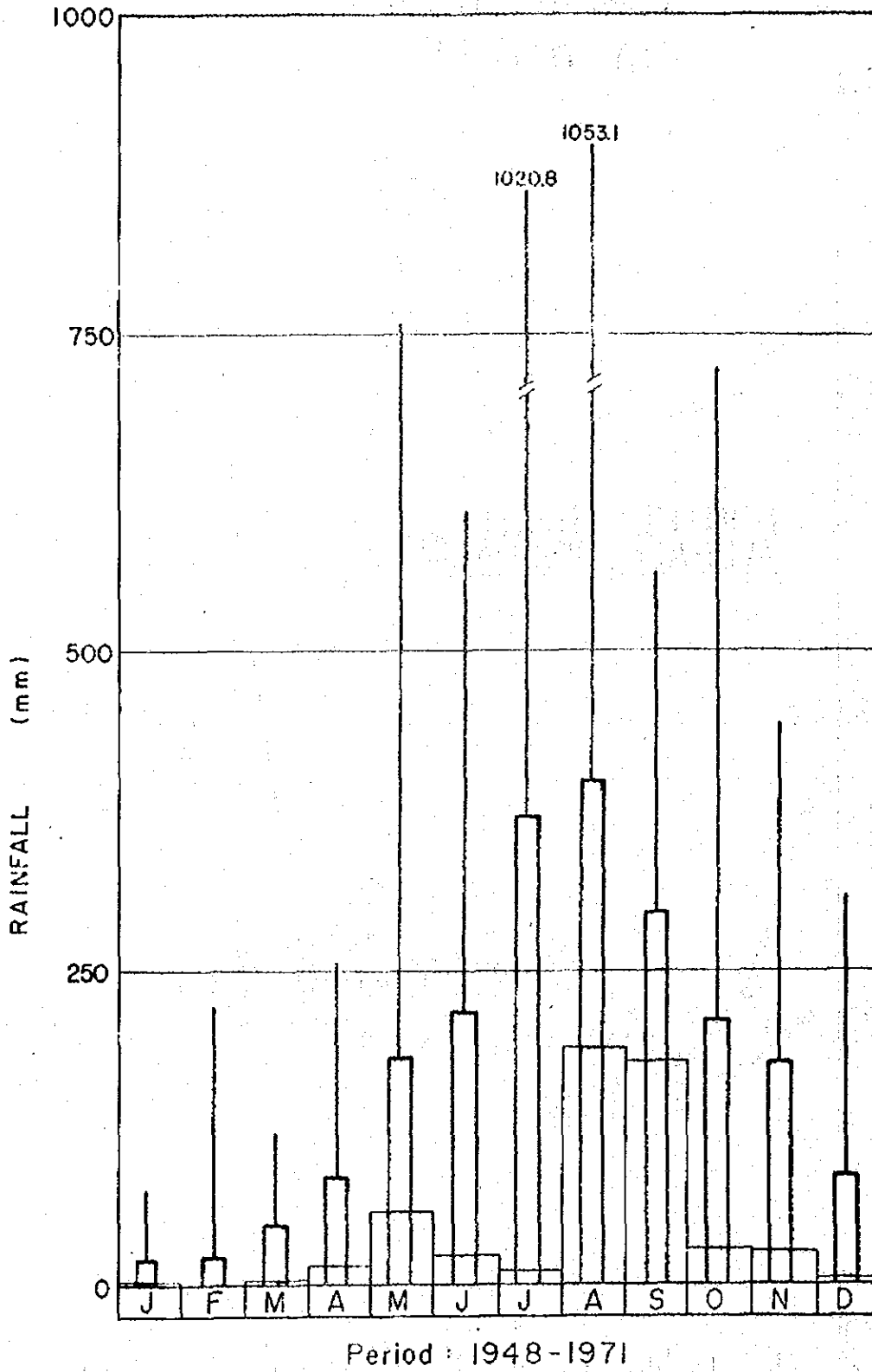


Period : 1948 - 1969

Data Source: Angat Magat Feasibility Report

APPENDIX 3-2-6.

CONSUELO STA. FE, NUEVA VIZCAYA



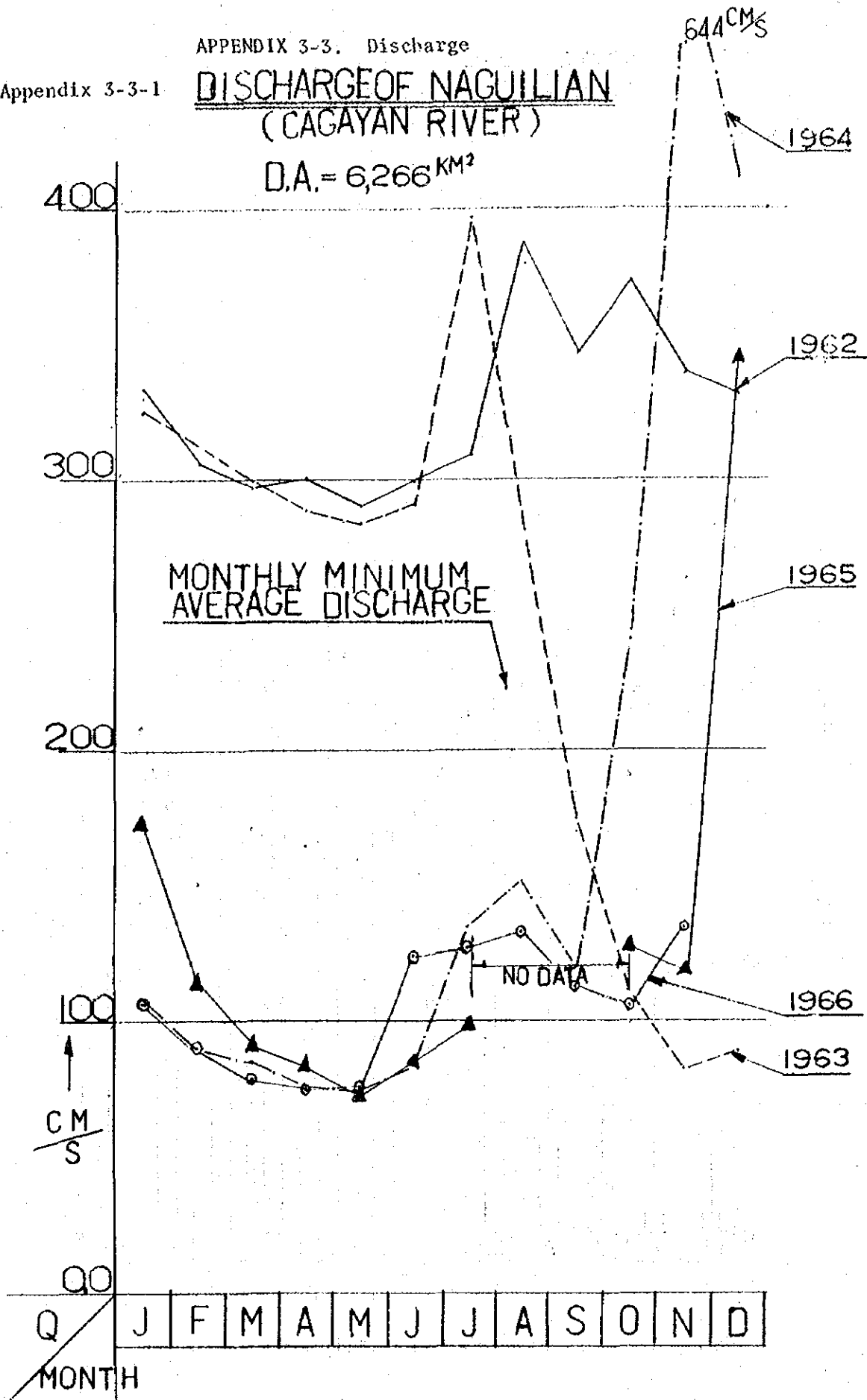
Data Source: Angat Magat Feasibility Report

APPENDIX 3-3. Discharge

Appendix 3-3-1

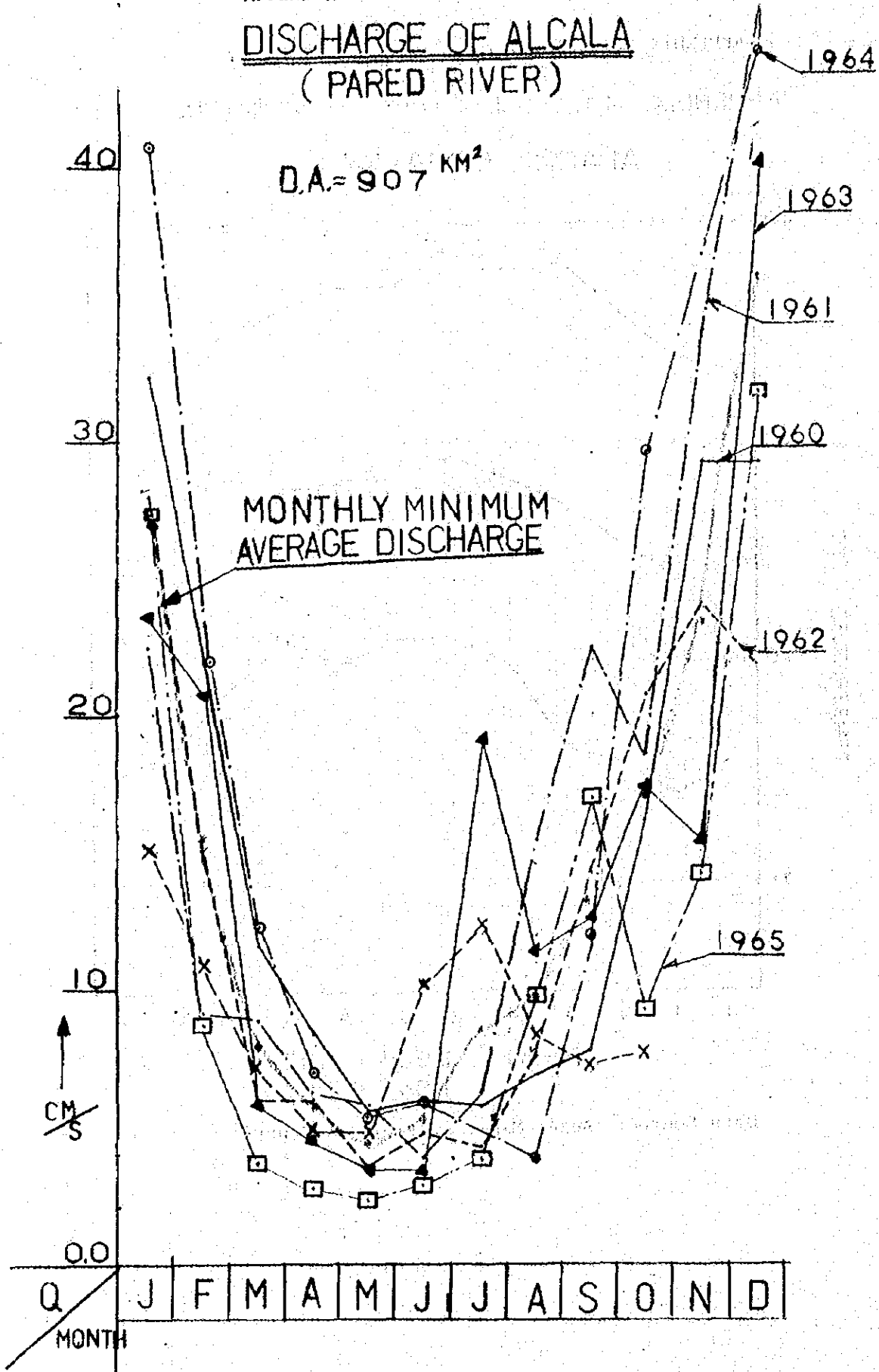
DISCHARGE OF NAGUILIAN
(CAGAYAN RIVER)

D.A. = 6,266 KM²



DISCHARGE OF ALCALA (PARED RIVER)

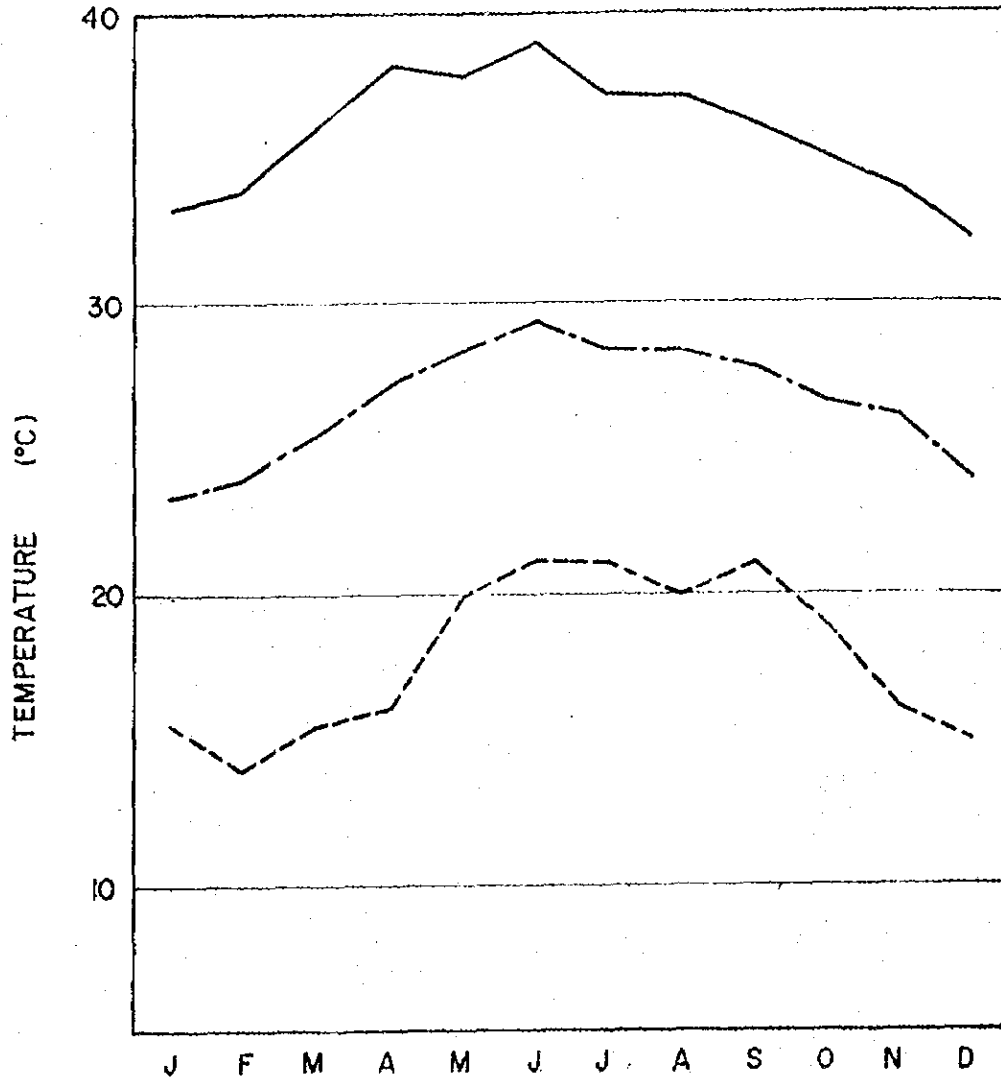
D.A. = 907 KM²



APPENDIX 3-4. Temperature

APPENDIX 3-4-1. MONTHLY TEMPERATURE

APARRI CAGAYAN

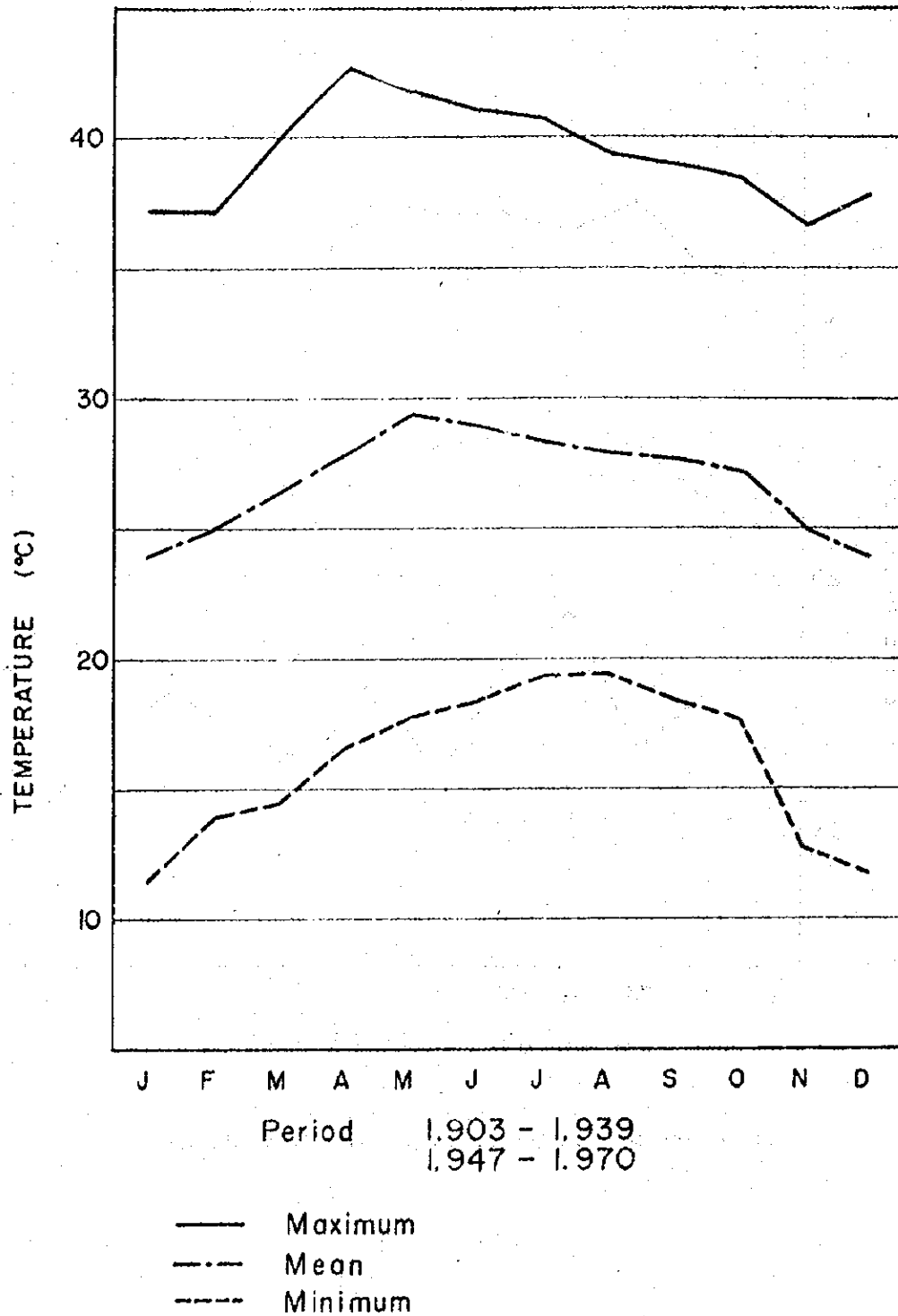


Period 1.903 - 1.939
1.947 - 1.970

Data Source: Angat Magat Feasibility Report

APPENDIX 3-4-2.

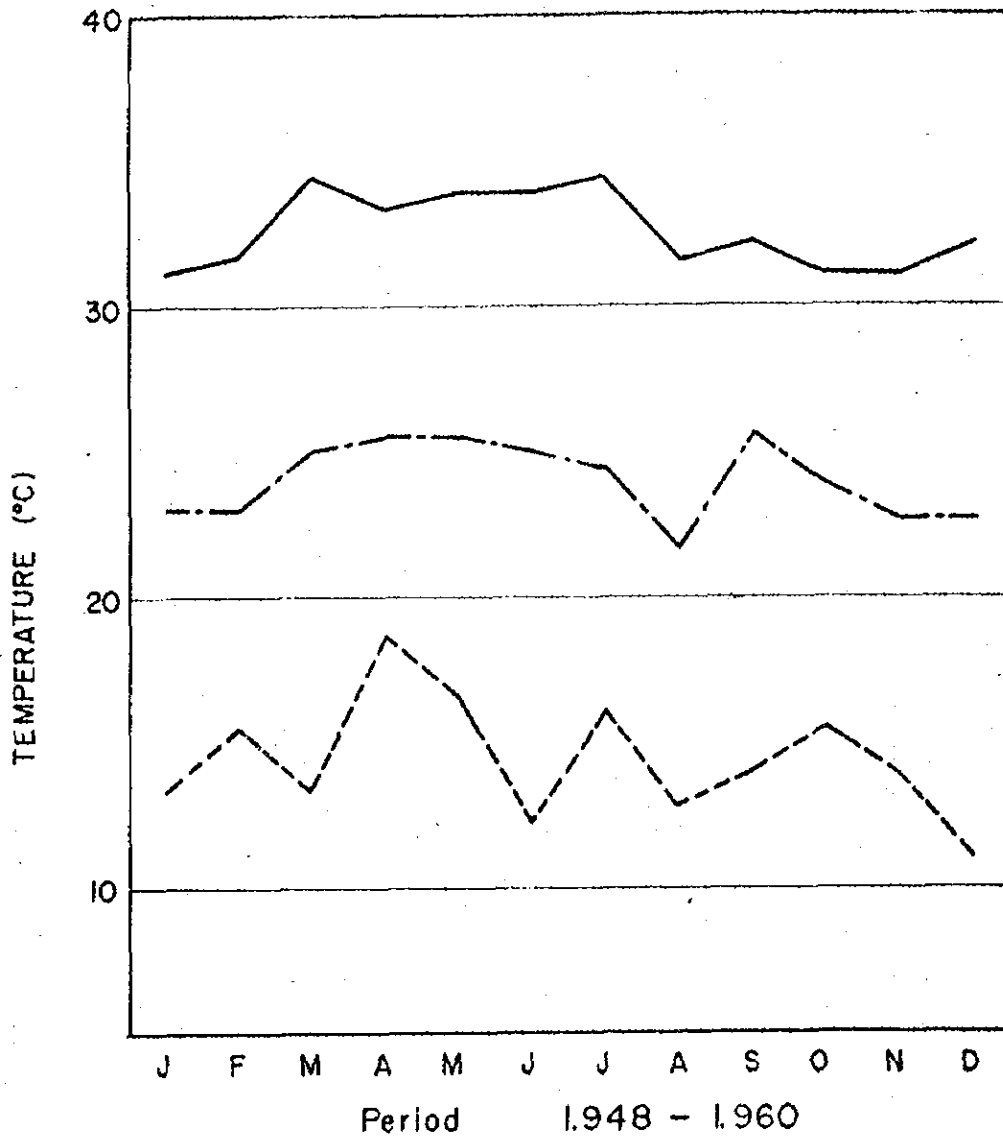
TUGUEGARAO CAGAYAN



Data Source: Angat Magat Feasibility Report

APPENDIX 3-4-3.

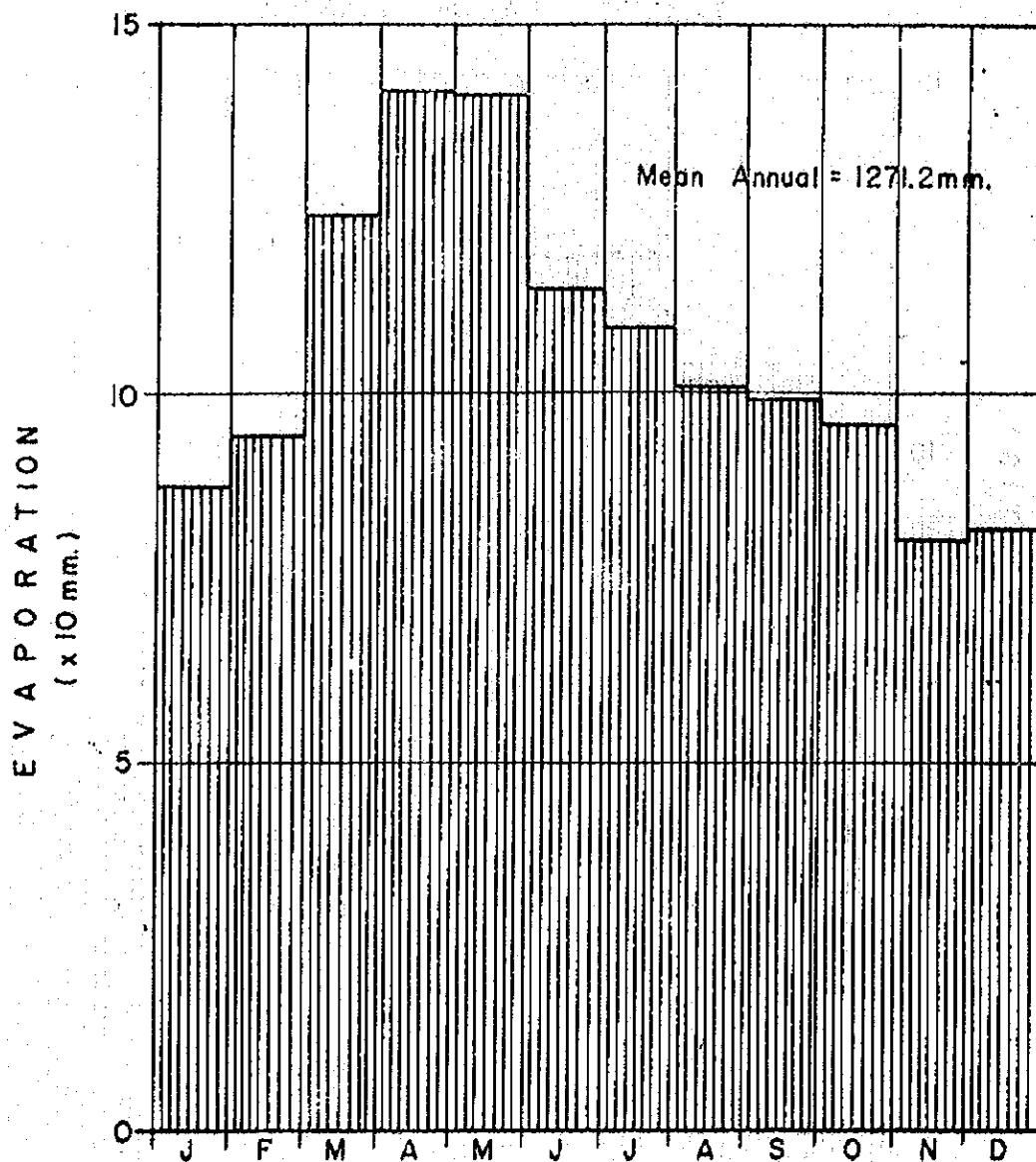
CONSUELO. STA. FE, NUEVA VIZCAYA



Data Source: Angat Magat Feasibility Report

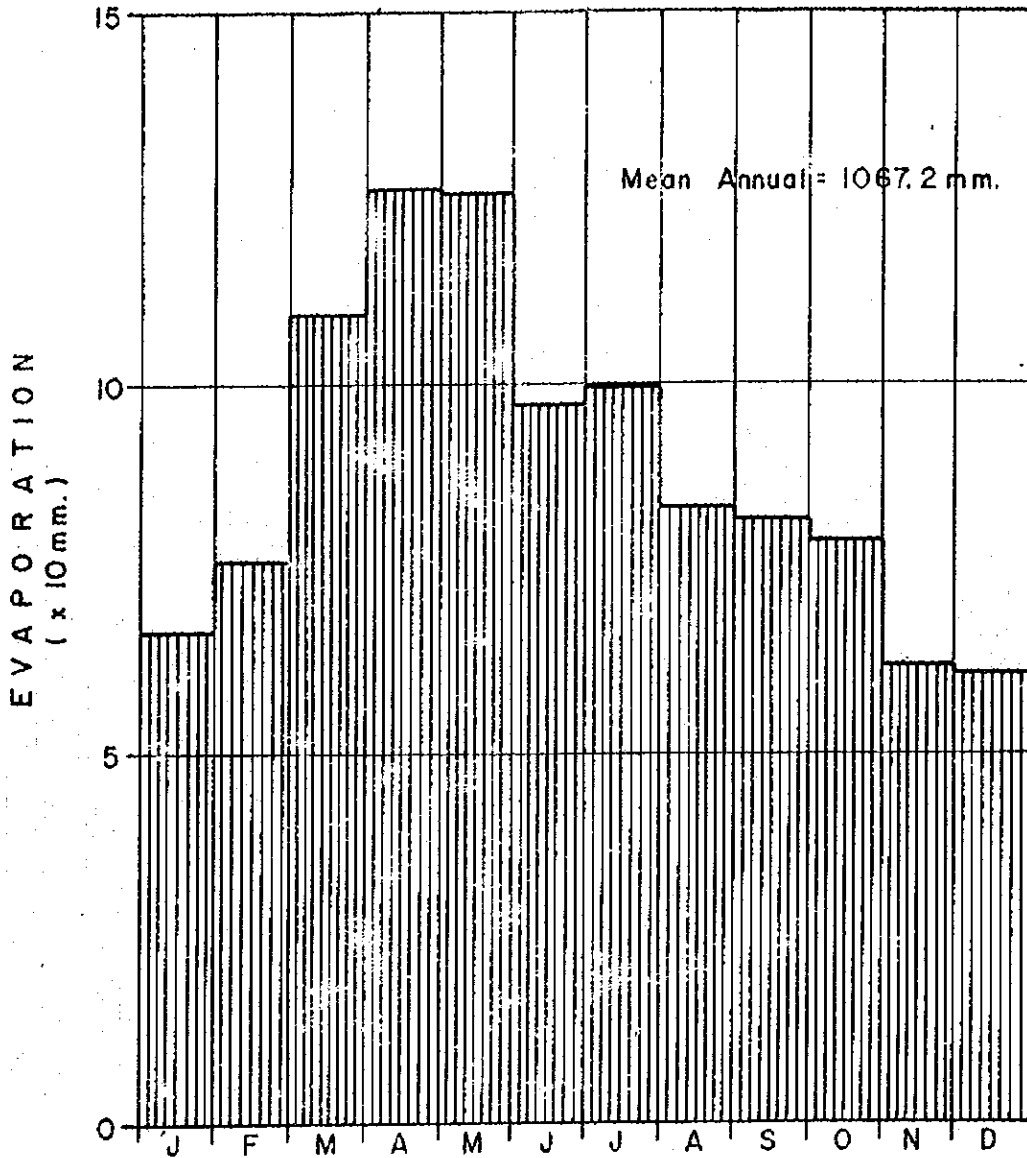
APPENDIX 3-5. Evaporation

Appendix 3-5-1. **AVERAGE MONTHLY EVAPORATION.**
ALIMANAO RESERVOIR, TUGUEGARAO, CAGAYAN



Data Source: Angat Magat Feasibility Report

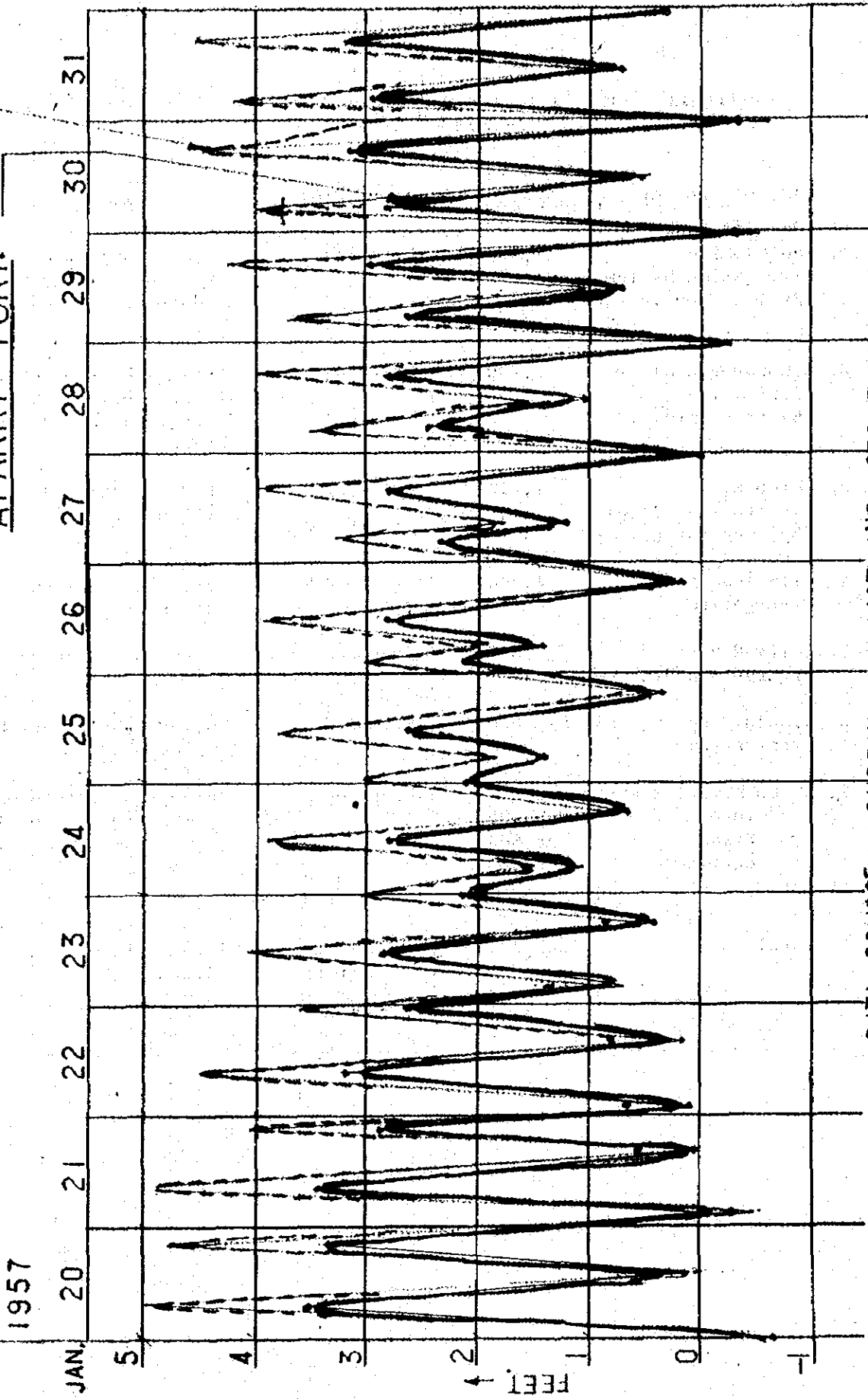
AVERAGE MONTHLY EVAPORATION TALICTIC, RAMON, ISABELA



Data Source: Angat Magat Feasibility Report

TYPICAL TIDE CURVES IN LEGASPI PORT.

APARRI PORT.



DATA SOURCE: BUREAU OF COAST AND GEODETIC SURVEY.

APPENDIX 4-1. List of Proposed and On-going Irrigation Project
(In Cagayan Province)

<u>Name of Project</u>	<u>Potential Area</u> ha	<u>Stage of Project</u>	<u>Contents</u>
(On Left Bank)			
1. Abulug River Irrigation System (By two free intakes)	11,628	Existing	It was completed in decade of 1950. Survey was started for extension to 13,000 ha.
2. Zinundungan River Irrigation (By free intake)	3,200	On-going	It will be completed in 1977. There is trouble in carrying materials over river.
3. Chico River Irrigation System (By free intake)	1,712	Existing	It was completed in decade of 1960.
4. Allacapan Pump Irrigation	4,000	Proposed	Survey has not yet been carried out.
5. Allig River Irrigation Project	2,500	Proposed	Survey was started
6. Alcalá Pump Irrigation	600	Proposed	Survey has not yet been implemented
7. Chico River Extension		Proposed	Survey was completed and it was committed by IBRD
Tuao	9,000		
Liwan	8,500		
Enrile	4,000		
Total	<u>45,140</u>	(Existing On-going Proposed	13,340 ha 3,200 28,600

APPENDIX 4-2. Co-Operative Development Program by Canadian Government

The Cagayan Valley Cooperative Development Program, a five-year plan being made by Canada, covering five provinces and thirteen municipalities in Northern Luzon including three provinces of Cagayan (which contain 95 hamlets with 4,750 farming households), is to establish a cooperative association in order to provide such economic services as, (1) provision of found for production, (2) supply of agricultural materials, (3) marketing and processing, and (4) savings. It aims at raising farmers' income per annum from present 1,500 up to 10,000 peso. Total expenditure for the program is estimated to be 137,206 million peso for five years, out of 99.4 million of the long-term fund a 54 % is to be shared by the Philippine side and the rest 46 % is to be shared by Canada for production materials, facilities and technical assistance. It is noteworthy that an integral program for agricultural cooperation is carried out on regional scale, while there is the Samahang Nayan organization, as mentioned in the separate paragraphy on nation wide scale.

The program suggests three organizations : primary level - village or hamlet Samahang Nayan, Secondary level - area cooperative and rural cooperative bank on the municipality level, tertiary level - regional cooperative, as shown in Chart 1. To explain, individual farmers are enrolled in Barrio Samahang Nayons which in turn organize Areal Marketing Co-operative on the municipality level where Rural Banks are set up. These secondary institutions are federated into Regional Cooperative. Areal Marketing Co-operative collects farm products through Samahang Nahon and market them, and, on the other hand, advances loans or accepts Barrio Guarantee Fund (1 cavan/ one crop/ha) and Automatic Instalment Savings (compulsory savings, five % of loan) through Rural Bank both in municipality level. Regional Cooperative is to be run efficiently being equipped with large storages, processing facilities and trucking services.

Further, it is emphasised that collaboration among various institutions and organizations and training of membership and staff to raise their level of knowledge are indispensable for the program to succeed.

So far the outline of Cagayan Cooperative Development Program, has been described and as a result of detail examination on machinery and facility supply project, crop planning, financial balance and economic efficiency it has been proved practicable.

Chart 1. Cagayan Valley Cooperative Structure

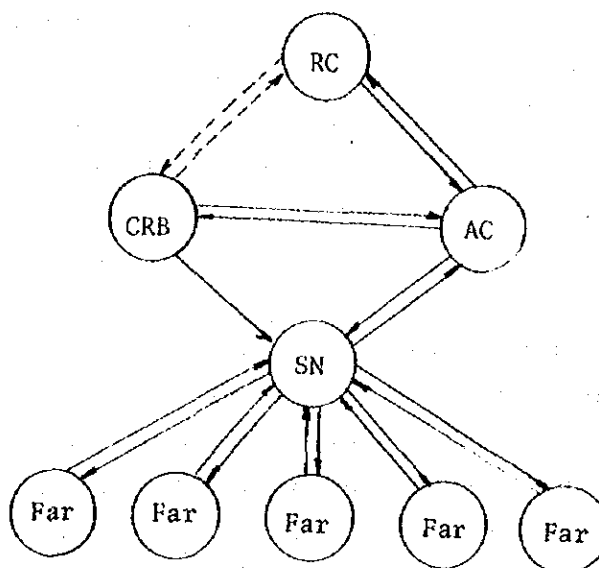
Levels of Organization, Network of Interrelationships

1. Regional

2. Area

3. Samahang Nasyon

4. Farmer



Legend

- RC : Regional Cooperative
- AC : Area Cooperative
- CRB. : Cooperative Rural Bank
- SN : Samahang Nasyon
- Far. : Farmer

Source: BCD "The Regional Cooperative Development Program for Cagayan Valley" March 1974

Note: 1

Area of Responsibility

<u>Year</u>	<u>Bureau of Cooperatives Development</u>	<u>Cooperative</u>
1st	Organize the project, establish capital structures. Recruit personnel, set up plan for 5 years, guidelines for action. Administer all project activities, assume responsibility for provision of credit and loan repayments. Set up the Cooperative Rural Banks.	Organize all levels of cooperative organization and coordinate with the Project Staff on the formulation of the 5 year plan.
2nd	Set up other infrastructure, organize training program administer the project except for trucking and warehousing activities.	Area Cooperative takes over trucking activities and warehousing facilities.
3rd	Continue project administration except for areas of responsibility taken over by the cooperative sector.	Regional Coop and Area Coop assume all marketing activities including marketing and production facilities.
4th	Continue Project administration, especially loan repayments, and supervise implementation of cooperative rules and regulation.	Continue to coordinate with project staff.
5th	Organize tie-up with the regional cooperative for supervision and regulatory purposes	Regional coop, Area coops and Samahang Nayon assume major responsibility of project administration including management of facilities.
6th	Bureau of Cooperatives Development Project Staff phased out completely. Supervision to be continued by the Bureau's regular staff in the region.	Cooperative taken full responsibility for the project.

Source: BCD "The Regional Cooperative Development Program for Cagayan Valley" March 1974.

The following are the specific functions of the Regional and Area Marketing Cooperatives, the Cooperative Rural Banks, the Samahang Nayon and the farmers within the cooperative structure:

Regional Cooperative

- Plan and set guidelines for Area Marketing Cooperative and Samahang Nayon.
- Provide trucking service for out of region marketing
- Haul needed supplies into the region
- Provide bulk storage for produce and supplies
- Set up and manage a rice central for the region
- Set up and maintain a feed mill.
- Set up and manage a tobacco factory to serve the entire region
- Exchange information and consult with Cooperative Rural Bank

Area Marketing Cooperative

- Set guidelines and targets for Samahang Nayon
- Recommend loans for farmers
- Remit all payments for loans to the Cooperative Rural Bank.
- Provide farm supplies
- Provide irrigation service
- Maintain a tractor pool
- Provide trucking service
- Provide warehousing service
- Provide drying and milling services

Cooperative Rural Bank

- Act on loan recommendations of the Samahang Nayon
- Address purchase orders for supplies to the Area Marketing Cooperative
- Remit cost of labor to farmer through the Samahang Nayon
- Exchange information and consult with the Regional Cooperative

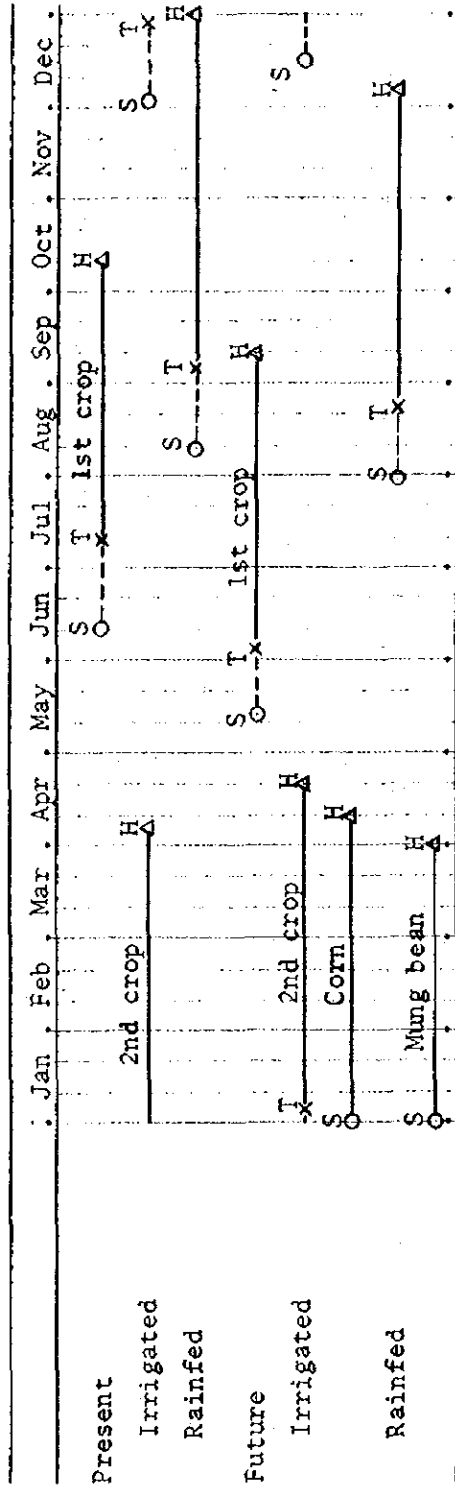
Samahang Nayan

- Plan and set guidelines and targets for farmers.
- Insure systematic farm production through trained farm managers.
- Receive all goods from Area Marketing Cooperative.
- Assemble farmers' produce for delivery to the Area Marketing Cooperative.
- Receive cost of labor loans from Cooperative Rural Bank for the farmers.
- Collect all loans, fees premiums, etc. from the farmers for remittance to the Area Marketing Cooperative.
- Receive all supplies from the Area Marketing Cooperative for the farmer.
- Collect the Barrio Guarantee Fund.
- Monitor the 5 percent automatic savings on production loans.
- Facilitate the implementation of the Agrarian Reform Program According to Presidential Decree No. 27.
- Maintain discipline among the farmers.

Source: BCD "The Regional Cooperative Development Program for Cagayan Valley" March 1974.

APPENDIX 5-1. Agricultural Planning

1. Proposed Cropping Pattern



S : Sowing, T : Transplanting, H : Harvest

Present and future cropping system in the paddy fields of proposed area

2. Paddy Yield with and without Project

Mean yield of paddy in proposed areas		Target paddy yield	
t/ha		t/ha	
Present paddy yield		Irrigated in wet season	3.0 (2.8*)
Irrigated in wet season	2.2 (2.0*)	Irrigated in dry season	5.2 (3.0*)
Irrigated in dry season	2.4	Rainfed	1.4
Rainfed	1.2		

* In Aparri-Lallo Project area

Input of chemicals is as follows;

N = 50

P₂O₅ = 50 kg/ha and twice application of insecticide.

APPENDIX 5-2.

Increment of Agricultural Production

	<u>Cropped Area</u>		<u>Yielding/ha</u>		<u>Total Production</u>		
	<u>Present</u> ha	<u>Future</u> ha	<u>Present</u> ton	<u>Future</u> ton	<u>Present</u> ton	<u>Future</u> ton	<u>Increase or</u> <u>Decrease</u> ton
1. Iguig Pared & Lallo							
Irrigated Areas							
Wet	129	3,107	2.2	3.5	384	10,875	10,491
Dry	77	3,472	2.4	3.7	185	12,846	12,661
Rainfed	4,171	-	1.2	-	5,005	-	Δ 5,005
Total	<u>4,377</u>	<u>6,579</u>	-	-	<u>5,574</u>	<u>23,721</u>	<u>18,147</u>
Remarks:	Gross Areas 4,300 ha						
	Net Areas 3,655 ha						
2. Aparri							
Irrigated Area							
Wet	100	7,225	1.9	3.3	190	23,843	23,653
Dry	60	8,075	2.0	3.5	120	28,263	28,143
Rainfed	9,900	-	1.2	-	11,880	-	Δ 11,880
Total	<u>10,060</u>	<u>15,300</u>	-	-	<u>12,190</u>	<u>52,106</u>	<u>39,916</u>
Grand Total							<u>58,063</u>
Remarks:	Gross Areas 10,000 ha						
	Net Areas 8,500 ha						

Annual Rice Production

<u>Years</u>	<u>Dry Season</u>	<u>Wet Season</u>	<u>Total</u>
1979	-	2,924	2,924
1980	14,587	6,807	21,394
1981	26,802	13,845	40,647
1982	36,724	15,552	52,276
1983	40,804	17,259	58,063

Note: 1979 (Wet) 3,655ha x 0.8ton = 2,924 ton
 1980 (Dry) 12,155ha x 1/2 x 2.4ton = 14,587ton
 1980 (Wet) 12,155ha x 70% x 0.8ton = 6,807ton
 1981 (Dry) 12,155ha x 70% x 3.5ton = 26,802ton
 1981 (Wet) (10,491ton + 23,653t) x 90% - (5,005t + 11,880t) = 13,845ton
 1982 (Dry) (12,661t + 28,143t) x 90% = 36,724ton
 1982 (Wet) (10,491t x 23,653t) x 95% - (5,005t + 11,880t) = 15,552ton

APPENDIX 5-3. Outline of the Project

1. Pumping Facilities

<u>Name of Project</u>	<u>Irrigable Area</u>	<u>Water Requirement</u>	<u>Total Head</u>	<u>Number of Pump</u>	<u>Diameter of Pump</u>	<u>Total Power</u>
(1) Iguig	800 ha	1.2 m ³ /s	17 m	4 set	450 mm	410 kw
(2) Pared	1,500 "	2.3 "	17 "	4 "	600 "	720 "
(3) Aparri & Lallo	12,000 "	18.0 "	21 "	7 "	1,200 "	6,170 "
<u>Total</u>	<u>14,300 ha</u>	<u>21.5 m³/s</u>		<u>15 set</u>		<u>7,300 kw</u>

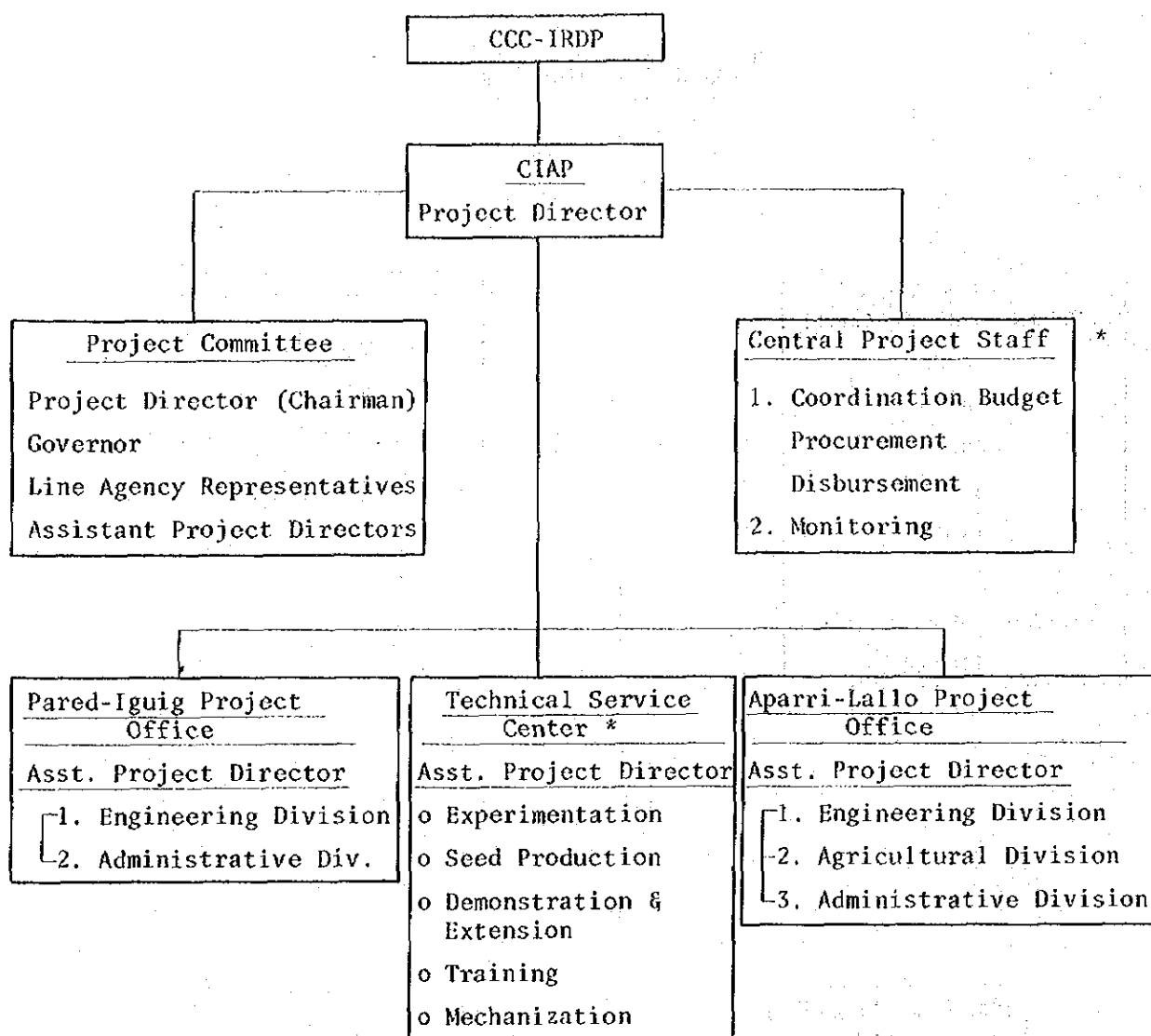
2. Irrigation Canal

<u>Name of Project</u>	<u>Main Canal</u>	<u>Lateral Canal</u>	<u>Farm Ditches</u>
(1) Iguig	4.5 km	16.0 km	32.0 km
(2) Pared	8.0 "	30.0 "	60.0 "
(3) Aparri & Lallo	30.0 "	240.0 "	480.0 "
<u>Total</u>	<u>42.5 km</u>	<u>286.0 km</u>	<u>572.0 km</u>

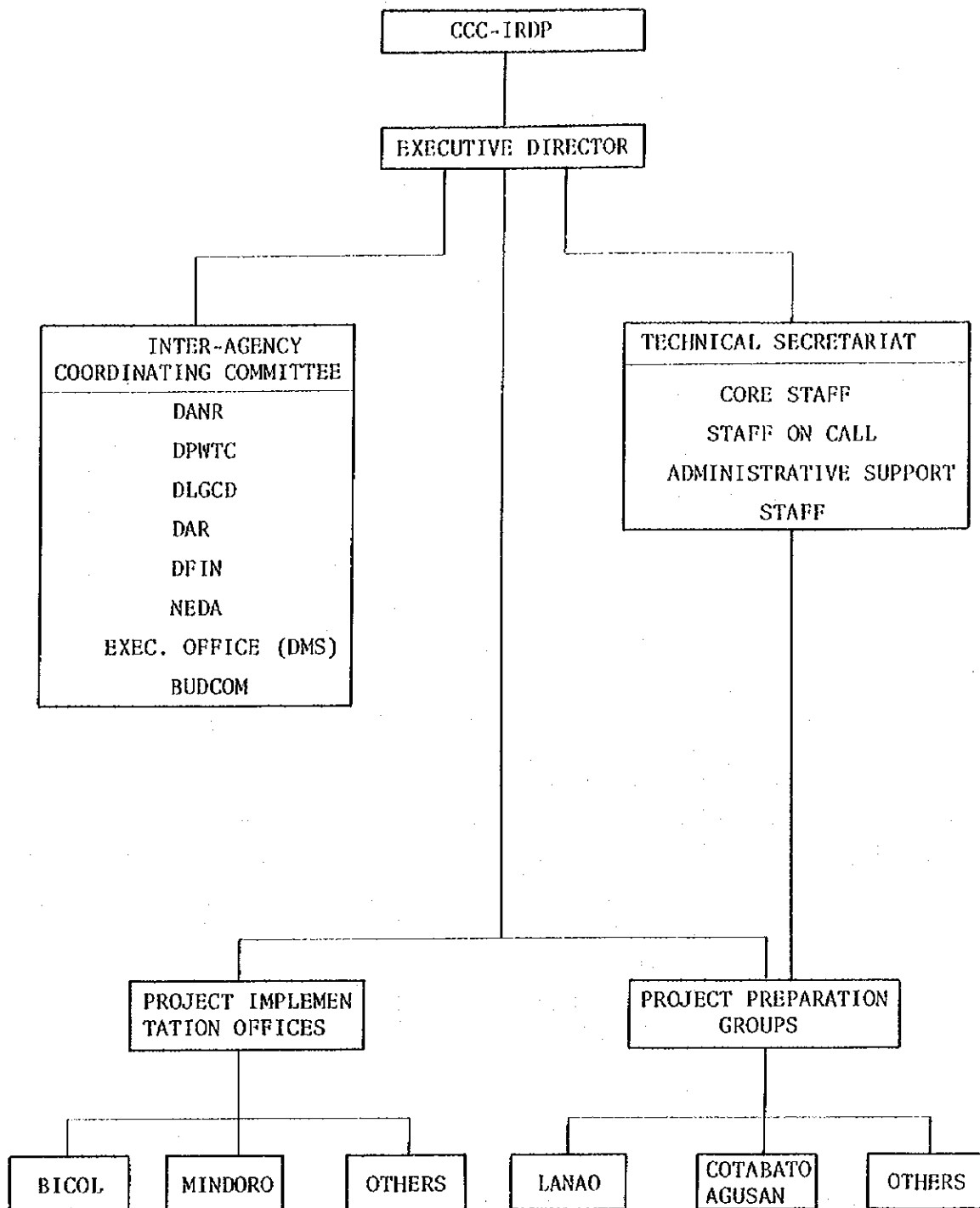
3. Drainage Canal

<u>Name of Project</u>	<u>Main Canal</u>	<u>Lateral Canal</u>	<u>Drain Ditches</u>
(1) Iguig	-	-	16.0 km
(2) Pared	-	-	30.0 "
(3) Aparri & Lallo	20.0 km	30.0 km	240.0 km
<u>Total</u>	<u>20.0 km</u>	<u>30.0 km</u>	<u>286.0 km</u>

APPENDIX 5-4. Proposed Chart of Organization



Note: * Japanese senior asst. may join.
 * Japanese senior asst. should join.



Appendix 6-1.

Breakdown of Project Cost

1. Pumping Station

(Unit: ¥'000 & US\$'000)

(1) Aparri & Lallo	1,200mm x 100 x 7	=	840,000	
	Transportation 1 %		8,400	
	Installation 5 %		42,000	
	Sub Total		<u>890,400</u>	(US\$2,968)
(2) Pared	600 x 100 x 4	=	240,000	
	Transportation 1 %		2,400	
	Installation 5 %		12,000	
	Sub Total		<u>254,400</u>	(US\$848)
(3) Iguig	450 x 100 x 4	=	180,000	
	Transportation 1 %		1,800	
	Installation 5 %		9,000	
	Sub Total		<u>190,800</u>	(US\$636)
	Total		<u>1,335,600</u>	

2. Building

Unit: Peso

(1) Aparri & Lallo	Concrete	5,000m ³ x 363	=	1,815,000
	Excavation	23,000m ³ x 39	=	897,000
	Housing	624m ² x 1,500	=	936,000
	Others	20 %		729,600
	Sub Total			<u>4,377,600</u>
(2) Pared	Concrete	1,100m ³ x 363	=	399,200
	Excavation	9,100m ³ x 20	=	182,000
	Housing	210m ² x 1,500	=	315,000
	Others	30 %		268,860
	Sub Total			<u>1,165,060</u>
(3) Iguig	Concrete	900m ³ x 363	=	326,700
	Excavation	11,300m ³ x 20	=	226,000
	Housing	153m ² x 1,500	=	229,500
	Others	30 %		234,660
	Sub Total			<u>1,016,860</u>
	Total			<u>6,559,520</u>

3. Irrigation Canal

(1) Main Canal

(Unit: . Peso)

Iguig	4,500 x 180 =	810,000
Pared	8,000 x 180 =	1,440,000
Aparri & Lallo	30,000 x 380 =	11,400,000
Sub Total		<u>13,650,000</u>

(2) Lateral Canal

Iguig	16,000 x 50 =	800,000
Pared	30,000 x 50 =	1,500,000
Aparri & Lallo	240,000 x 50 =	12,000,000
Sub Total		<u>14,300,000</u>

(3) Farm Ditch

Iguig	32,000 x 15 =	480,000
Pared	60,000 x 15 =	900,000
Aparri & Lallo	480,000 x 15 =	7,200,000
Sub Total		<u>8,580,000</u>

Total 36,530,000

4. Drainage Canal

(1) Main Canal

Iguig		-
Pared		-
Aparri & Lallo	20,000 x 480 =	9,600,000

(2) Lateral Canal

Iguig		-
Pared		-
Aparri & Lallo	30,000 x 180 =	5,400,000

(3) Drain Ditch

Iguig	16,000 x 22 =	352,000
Pared	30,000 x 22 =	660,000
Aparri & Lallo	240,000 x 22 =	5,280,000

Sub Total 6,292,000

Total 21,292,000

5. Construction Cost for Pilot Scheme Facilities

<u>Name of Building</u>	<u>Acroage</u>	<u>Cost</u>
Main Offices	400 m ²	₱ 600,000
Laboratory & Lecture's Rooms	200 m ²	300,000
Warehouse of Equipments & Spare Parts	330 m ²	198,000
Maintenance Office for Experi- mental Farm	330 m ²	198,000
Dormitory	170 m ²	170,000
Workshop Building	100 m ²	60,000
Generator's House	70 m ²	70,000
Storage House of Seeds Equipment	170 m ²	136,000 500,000
Others (Facilities and Equipment)		368,000
Management Cost 30-man 6 year		2,160,000
Total		₱4,760,000 (US\$680,000)

6. Feeder Road

(1) Aparri-Lallo

Main Road 62 km x 105,000 ₱	=	₱ 6,510,000
Access Road 46 km x 70,000 ₱	=	3,220,000
Total	=	₱ 9,730,000 (US\$1,390,000)

(2) Pared

Main Road 8 km x 105,000 ₱	=	₱ 940,000
Access Road 19.5 x 70,000 ₱	=	1,365,000
Total	=	₱ 2,305,000 (US\$329,000)

(3) Iguig

Main Road 4.5 x 105,000 ₱	=	₱ 472,500
Access Road 7.5 x 70,000 ₱	=	525,000
Total	=	₱ 997,500 (US\$143,000)

7. Rural Electrification

(1) Aparri-Lalo - 4,000 houses x 1,400 ₱	=	₱ 5,600,000 (US\$800,000)
(2) Pared - 700 houses x 1,400 ₱	=	₱ 980,000 (US\$140,000)
(3) Iguig - 300 houses x 1,400 ₱	=	₱ 420,000 (US\$60,000)

APPENDIX 6-2.

List of Equipment & Cost

<u>Name of Equipment</u>	<u>Specification</u>	<u>Number of Equipment</u>	<u>Unit Cost</u>	<u>Aggregate Cost</u> (¥'000)	<u>Remarks</u>
Bulldozer	14 ton	27	10,000	270,000	
"	27 ton	2	27,700	55,400	with Ripper
Back Hoe	B.C 0.6 m ³	13	17,100	222,300	} B.C= Bucket Capacity
"	B.C 1.2 m ³	13	38,700	503,100	
Dump Truck	10 ton	40	6,980	279,200	
Steak-Body Truck	6 ton	8	3,300	26,400	
Motor Grader		4	7,800	31,200	
Diesel Pile Hammer		1	6,800	6,800	
Tired Roller		6	6,000	36,000	
Trailer	30 ton	1	5,050	5,050	
Concrete Mixer	2.0 m ³	3	3,000	9,000	
"	0.5 m ³	17	1,750	29,750	
Concrete Vibrator		20	62	1,240	with Engine
Pick Hammer		10	380	3,800	
Leg Drill		2	1,000	2,000	
Compressor	250 HP	2	2,200	4,400	
Lubricating Car		1	10,000	10,000	
Repairing Workshop Car		1	15,000	15,000	
Pumps	D=50 mm	20	78	1,560	
Jeep		3	1,500	4,500	Wagon Type
"		10	1,400	14,000	
Motor-Cycle	125 cc	20	166	3,320	
Generator	100 KVA	3	4,260	12,780	
"	7.5 KVA	2	696	1,392	
Spare-Parts				155,000	10 %
Transportation Fee				16,808	1 %
Total				1,720,000	
(US\$)				5,733	1\$/¥300
				(\$'000)	

APPENDIX 6-3

OPERATION & MAINTENANCE COST

1. O & M Cost of Canals
 - Unit Cost/Hectare : ₱60.7
 - (a) IGUIG-PARED PROJECT
 - Irrigable Area - 2,300 hectares
 - Unit Cost : ₱60.7
 - Total Cost : ₱140,000
 - (b) APARRI-LALO PROJECT
 - Irrigable Area - 12,000 hectares
 - Unit Cost : ₱60.7
 - Total Cost : ₱728,000
2. Maintenance Cost of Pumping Station
 - Purchasing Cost x 0.5%
 - (a) IGUIG-PARED PROJECT
 - $10,353,488 \times 0.005 = 52,000$
 - (b) APRARRI-LALLO PROJECT
 - $20,706,978 \times 0.005 = 104,000$
3. Operation Cost of Pumping Station
 - Operation Period - 5 months
 - Unit Cost (Power Charge) - ₱0.2 per KWH
 - (a) IGUIG-PARED PROJECT
 - $849.6 \times 0.6 \times 3,600 \times 0.2 = ₱367,000$
 - (b) APARRI-LALLO PROJECT
 - $5,284.2 \times 0.6 \times 3,600 \times 0.2 = ₱2,283,000$
4. Laborer Cost
 - (a) IGUIG PARED PROJECT - ₱79,000
 - (b) APARRI-LALLO PROJECT - ₱60,000

5. Total Cost O & M

(a) IGUIG-PARED PROJECT

Canals	140,000
Maintenance for Pumps	52,000
Operation Cost	367,000
Labor Cost	79,000
Sub-Total	<u>₱ 638,000</u> per year

(b) APARRI-LALLO

Canal	728,000
Maintenance for Pumps	104,000
Operaton Cost	2,283,000
Labor Cost	60,000
Sub-Total	<u>₱ 3,175,000</u>
TOTAL	<u>₱ 3,813,000</u>

APPENDIX 6-4.

COST ESTIMATE
TYPICAL PROJECT USING 8" Ø PUMP

Various Provinces - Palay

Item	Without Project	With Project	
	Present-Wet	Wet	Dry
(Peso per hectare)			
<u>I. Costs</u>			
A. Labor Costs			
1. Land preparation, seedbedding transplanting, care of crops etc.	452	534	534
2. Harvesting & threshing charges	253	563	598
B. Materials			
1. Seeds	68	70	70
2. Fertilizer	75	378	453
3. Insecticide & weedicide	32	190	190
4. Containers	11	25	25
C. Food for Laborers	40	50	50
D. Interest on Cash Investment	14	43	47
E. Irrigation fee	-	-	-
F. Land charges	237	546	581
G. Others	30	30	30
Total	<u>1,212</u>	<u>2,429</u>	<u>2,578</u>
<u>II. Return</u>			
A. Physical Product			
1. Cavan	36	80	85
2. Metric Ton	1,584	352	374
B. Value Product	1,267	2,816	2,992
<u>III. Net Return</u>			
Above all costs	55	387	414

BASES OF ESTIMATES

I. Costs

A. Labor Cost

1. Without Project (Present)

- a. No. of man-days = 62 at ₱6/m-d = ₱372
- b. No. of animal-days = 16 at ₱5/a-d = 80

2. With Project (Future)

- a. No. of man-days = 74 at ₱6/m-d = ₱444
- b. No. of animal-days = 90 at ₱5/a-d = 90

B. Materials

1. Fertilizer

- a. Without project - 2 bags of 21-0-0 at ₱37.50/bag = ₱75

- b. With project

- b.1. Wet season (60 + 50 + 0)

- b.1.1. 2 bags of 21-0-0 at ₱37.50/bag = ₱75.00

- b.1.2. 5 bags of 16-20-0 at ₱60.50/bag = 302.50

- b.2. Dry season (80 + 50 + 0)

- b.2.1. 4 bags of 21-0-0 = ₱150.00

- b.2.2. 5 bags of 16-20-0 = 302.50

2. Insecticide & Herbicide

- a. Without project - assumed at ₱32.00

- b. With project

- b.1. Insecticide (Gamma BHC) - 1.33 bags at ₱102.50/bag

- b.2. Weedicide (2, 4-D) - 25 kg bag at ₱52.25/bag

- 3. Containers - No. of sacks = Gross produce in cavans less harvesting & threshing charges and land charges. Costs per sack is ₱1.50 divided by 3.

4. Seeds

- a. Without project - 1 cavan of good seeds at ₱68/cav.

- b. With project - 1 cavan of certified seeds at ₱70

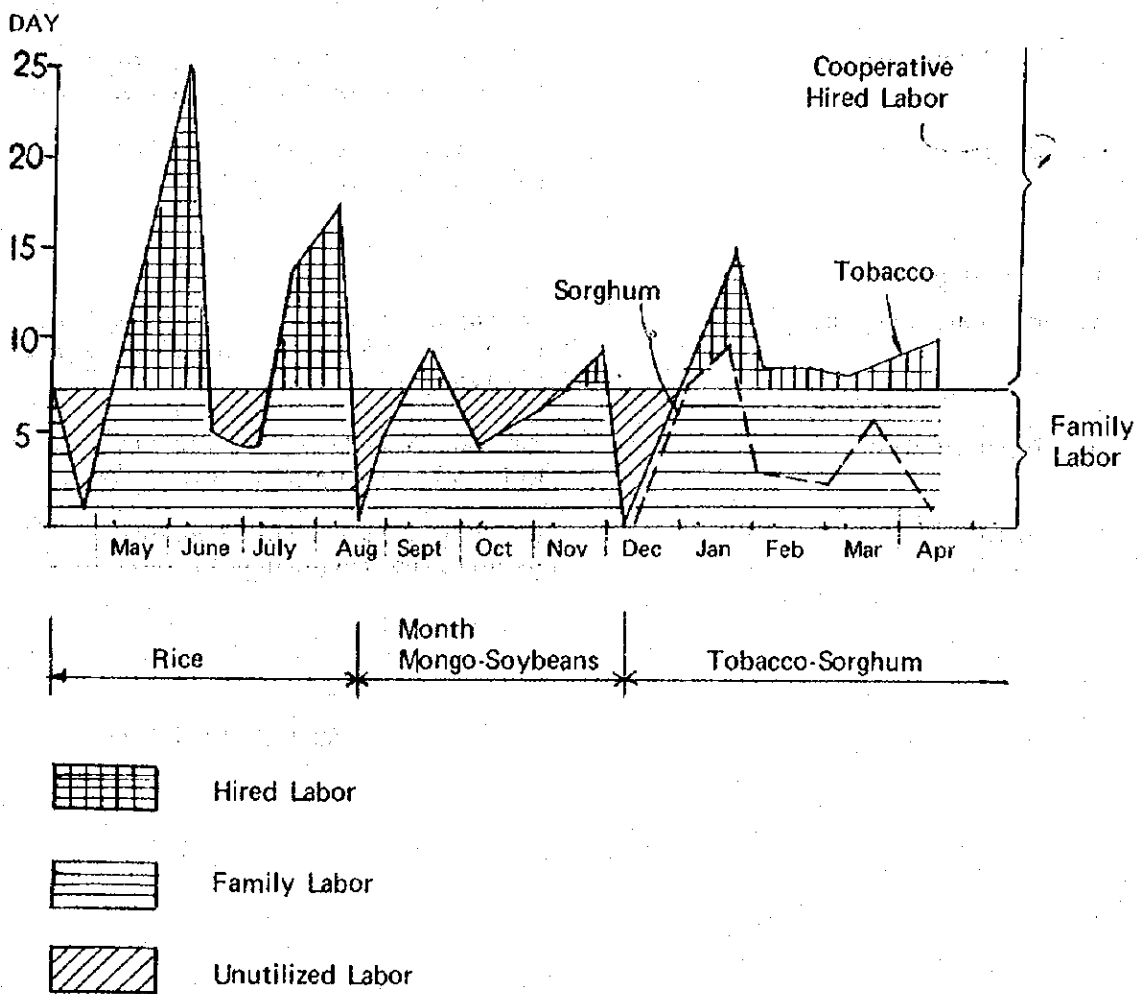
- C. Food for Laborers
 - 1. Without project - 20 laborers (man-day) with 1 meal each at ₱2.00/meal
 - 2. With project - 25 laborers (man-day) with 1 meal each at ₱2.00/meal
- D. Interest on cash expenses - 6% of cash expenses
- E. Harvesting & threshing charges - 20% of gross produce
- F. Land charges - 25% of gross produce less expenses for harvesting and threshing seeds
- G. Other costs - includes depreciation of farm equipment, etc.

II. Returns

- A. Without project - 26 cavans (1.584 m.t) per hectare based on average yield/hectare for Cagayan Valley
- B. With project - 80 and 85 cavans per hectare for wet and dry season, respectively
- C. Value - ₱0.80 per kg. - the present government farm support price.

— August 1974 —

APPENDIX 6-5. Labor Distribution








Labor Distribution of Recommended Cropping Pattern for Cagayan and Quirino Province

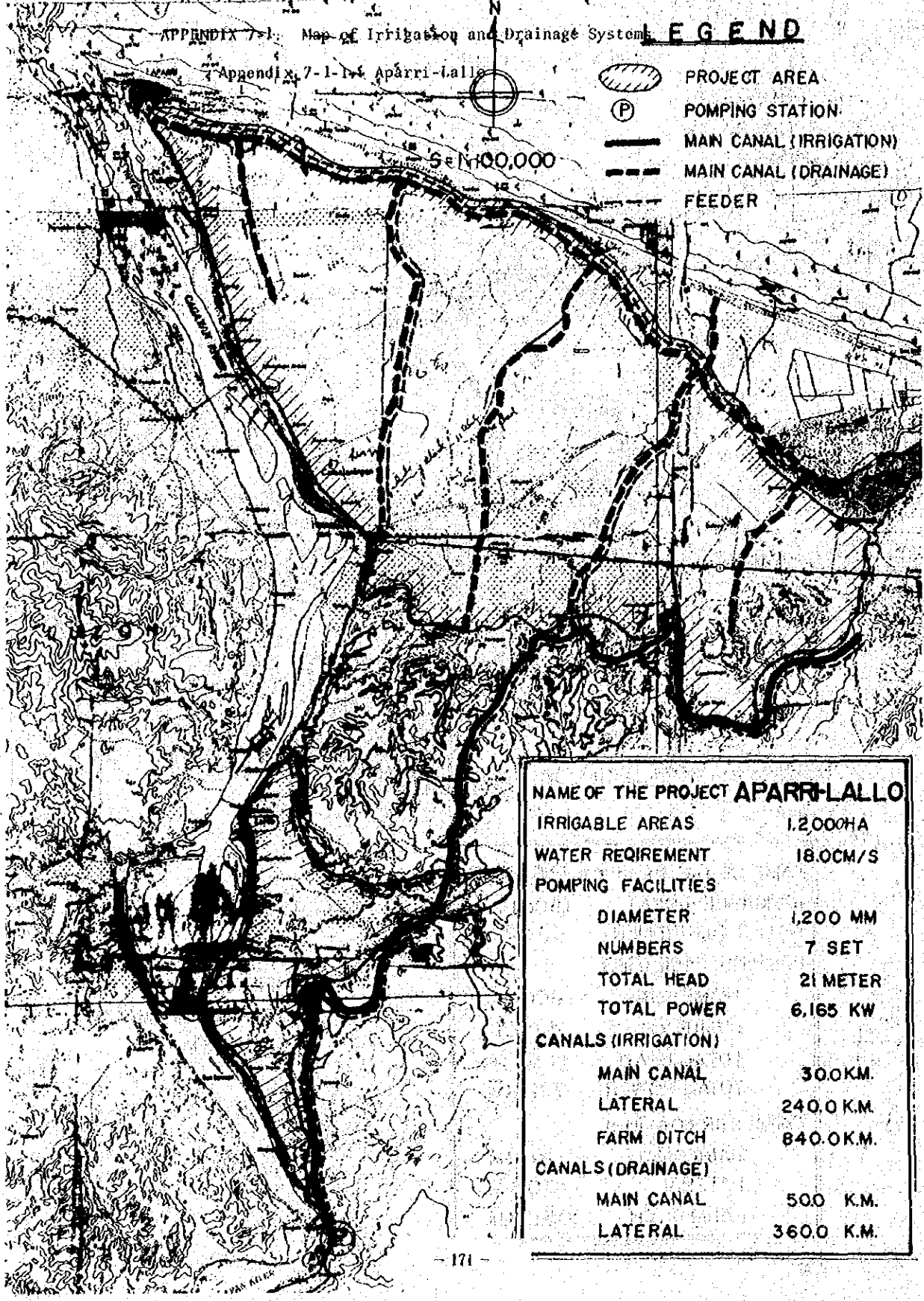
— Bureau of Cooperatives Development —
1974 by CanadaTeam

APPENDIX 7-1: Map of Irrigation and Drainage System

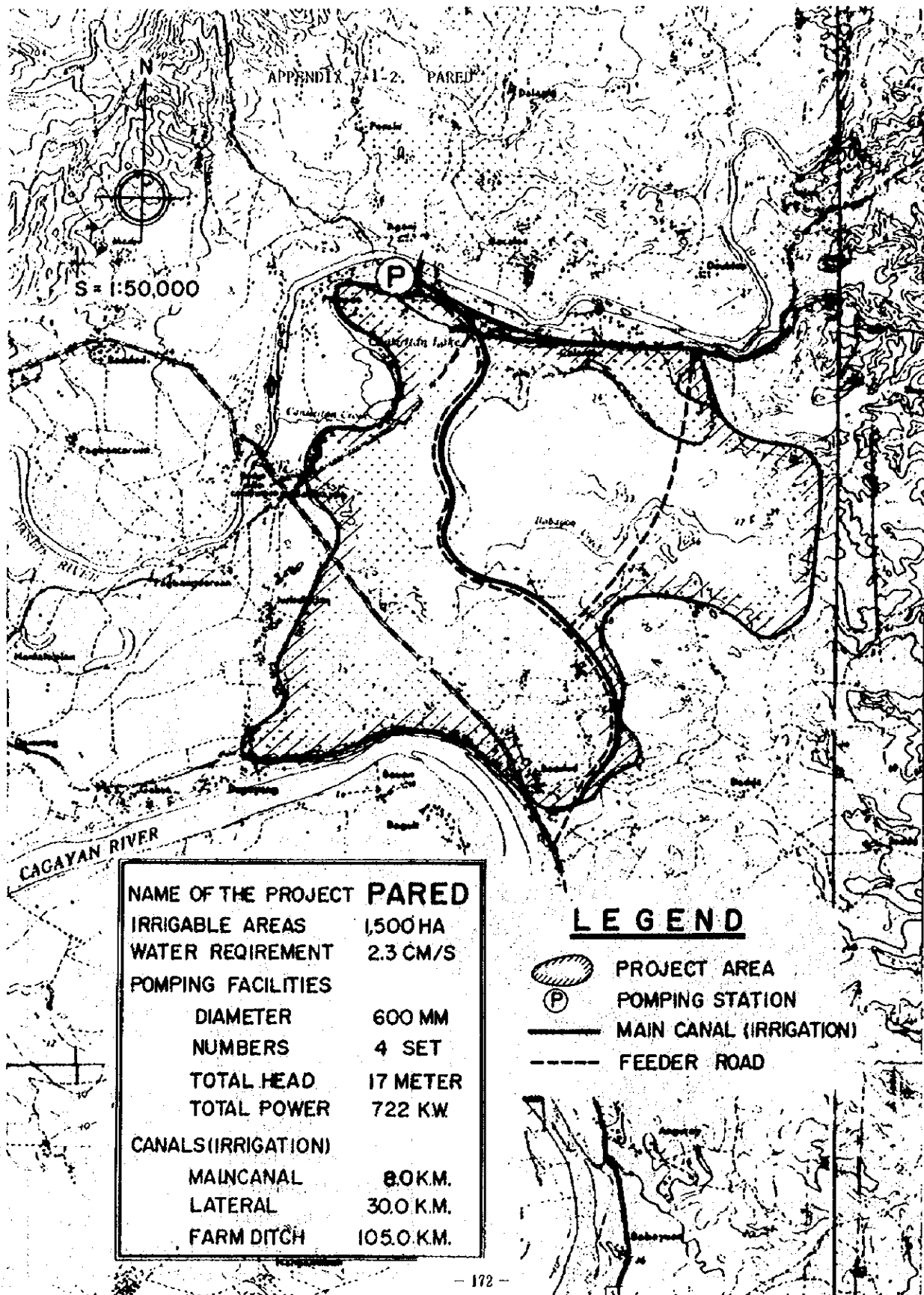
Appendix 7-1-1: Apárri-Lallo

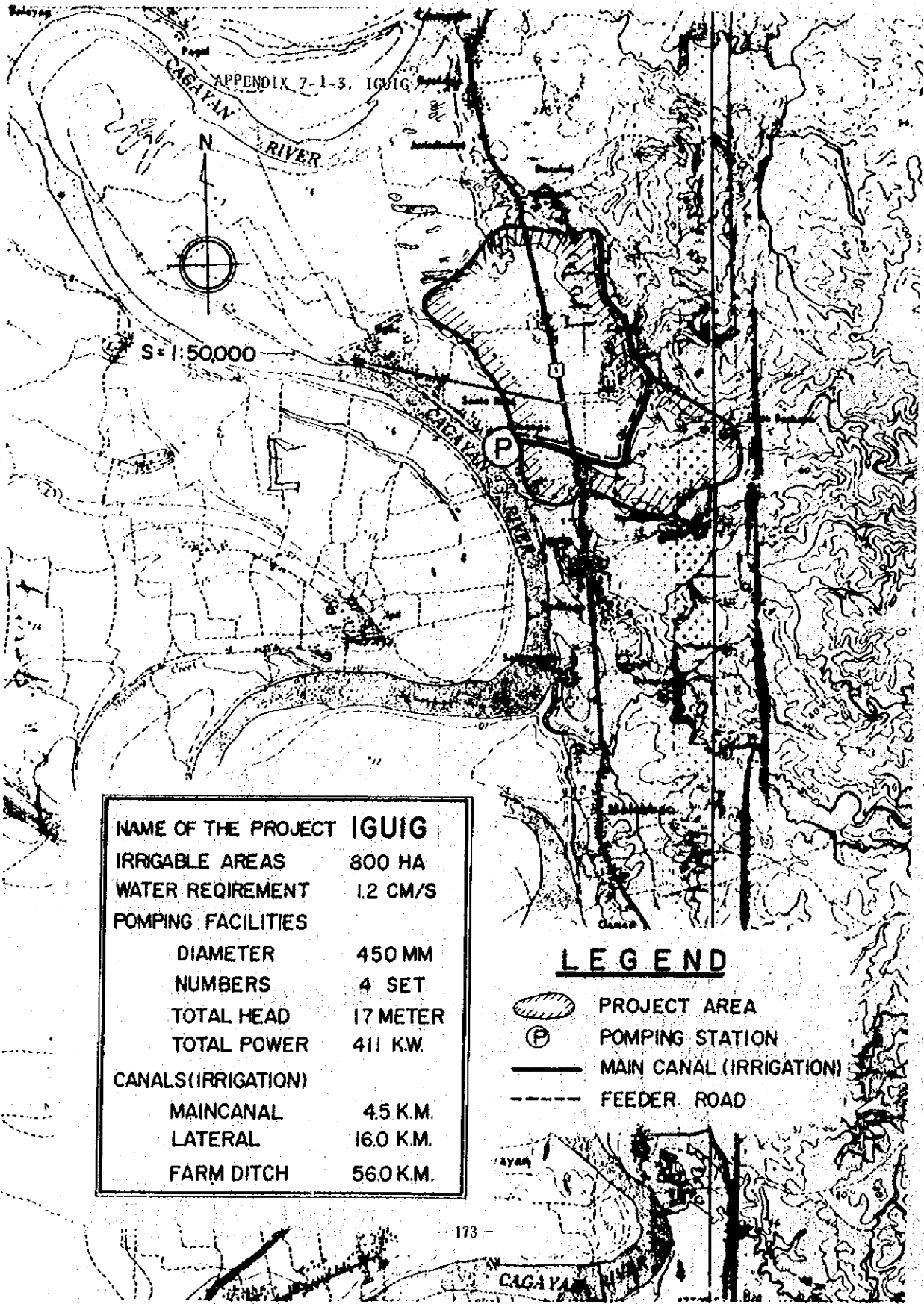
LEGEND

-  PROJECT AREA
-  PUMPING STATION
-  MAIN CANAL (IRRIGATION)
-  MAIN CANAL (DRAINAGE)
-  FEEDER



NAME OF THE PROJECT APARRI-LALLO	
IRRIGABLE AREAS	1,200HA
WATER REQUIREMENT	18.0CM/S
PUMPING FACILITIES	
DIAMETER	1,200 MM
NUMBERS	7 SET
TOTAL HEAD	21 METER
TOTAL POWER	6.165 KW
CANALS (IRRIGATION)	
MAIN CANAL	30.0KM.
LATERAL	240.0 K.M.
FARM DITCH	840.0K.M.
CANALS (DRAINAGE)	
MAIN CANAL	500 K.M.
LATERAL	3600 K.M.





NAME OF THE PROJECT IGUIG

IRRIGABLE AREAS 800 HA

WATER REQUIREMENT 1.2 CM/S

PUMPING FACILITIES

DIAMETER 450 MM

NUMBERS 4 SET

TOTAL HEAD 17 METER

TOTAL POWER 411 KW.





CANALS (IRRIGATION)

MAINCANAL 4.5 K.M.

LATERAL 16.0 K.M.

FARM DITCH 56.0 K.M.

LEGEND

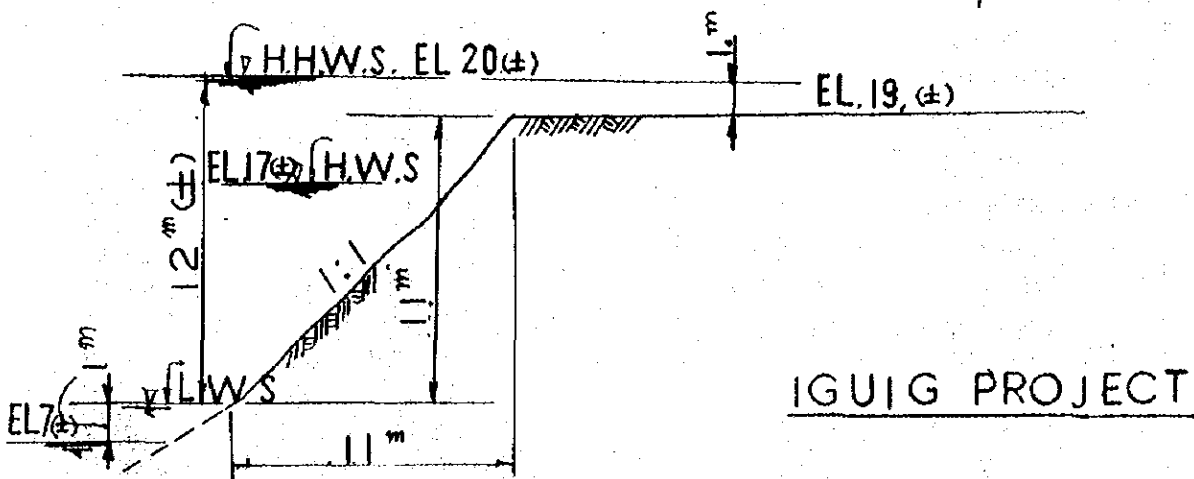
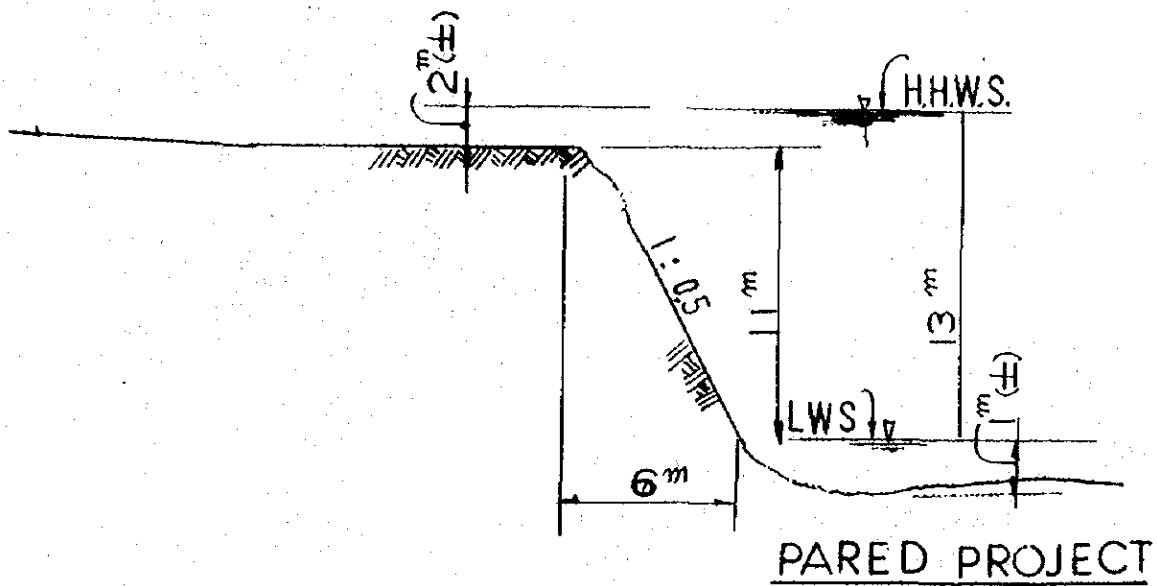
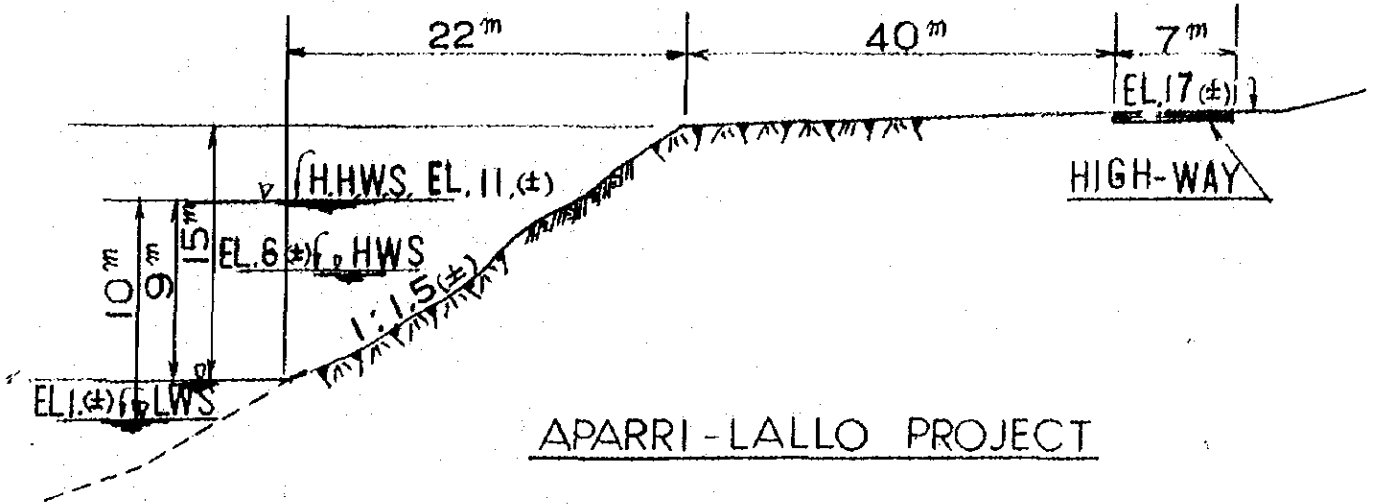
-  PROJECT AREA
-  POMPING STATION
-  MAIN CANAL (IRRIGATION)
-  FEEDER ROAD

PROFILE OF PROPOSED PUMPING SITE

(L.B)

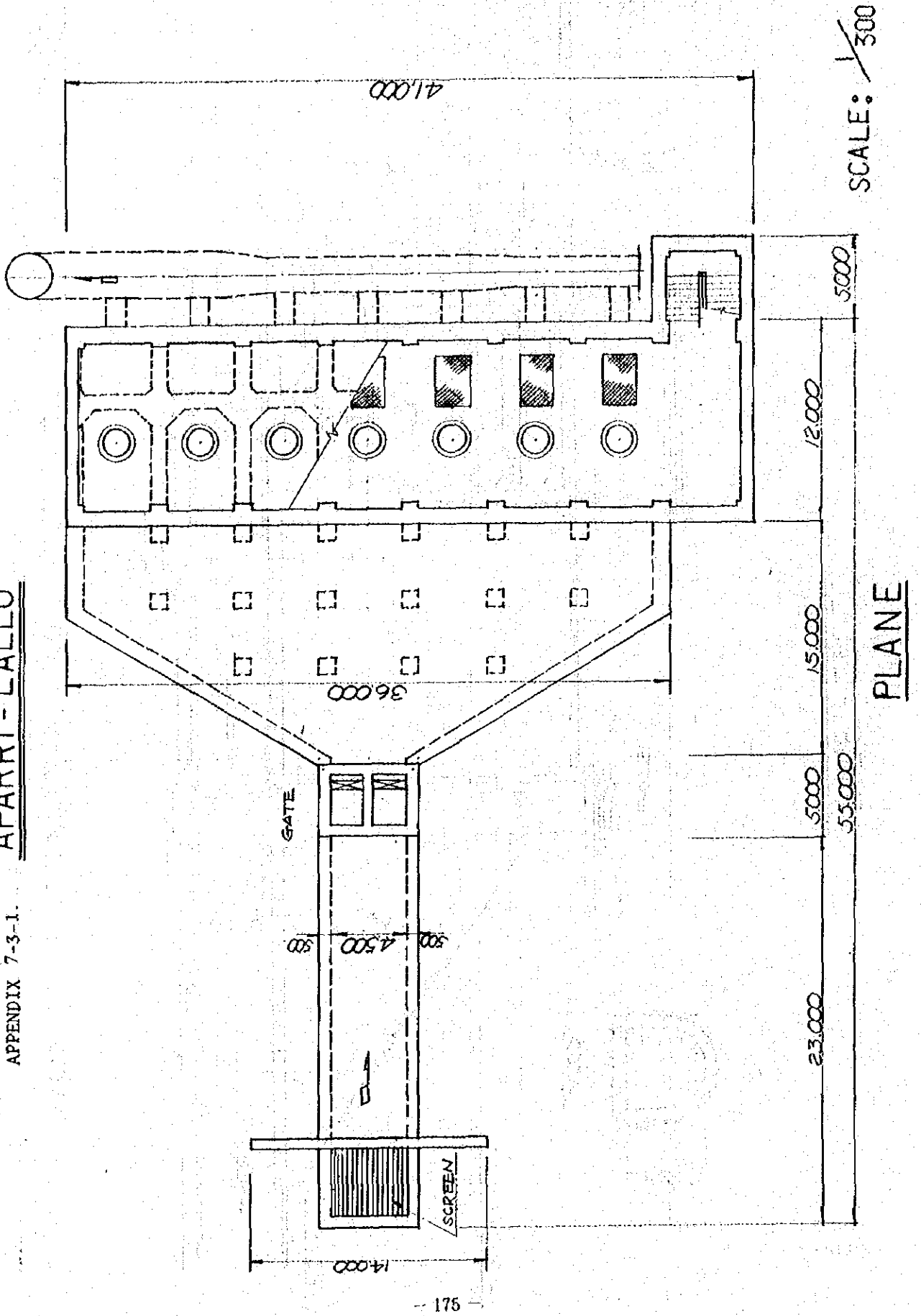
(SKETCH)

(R.B)

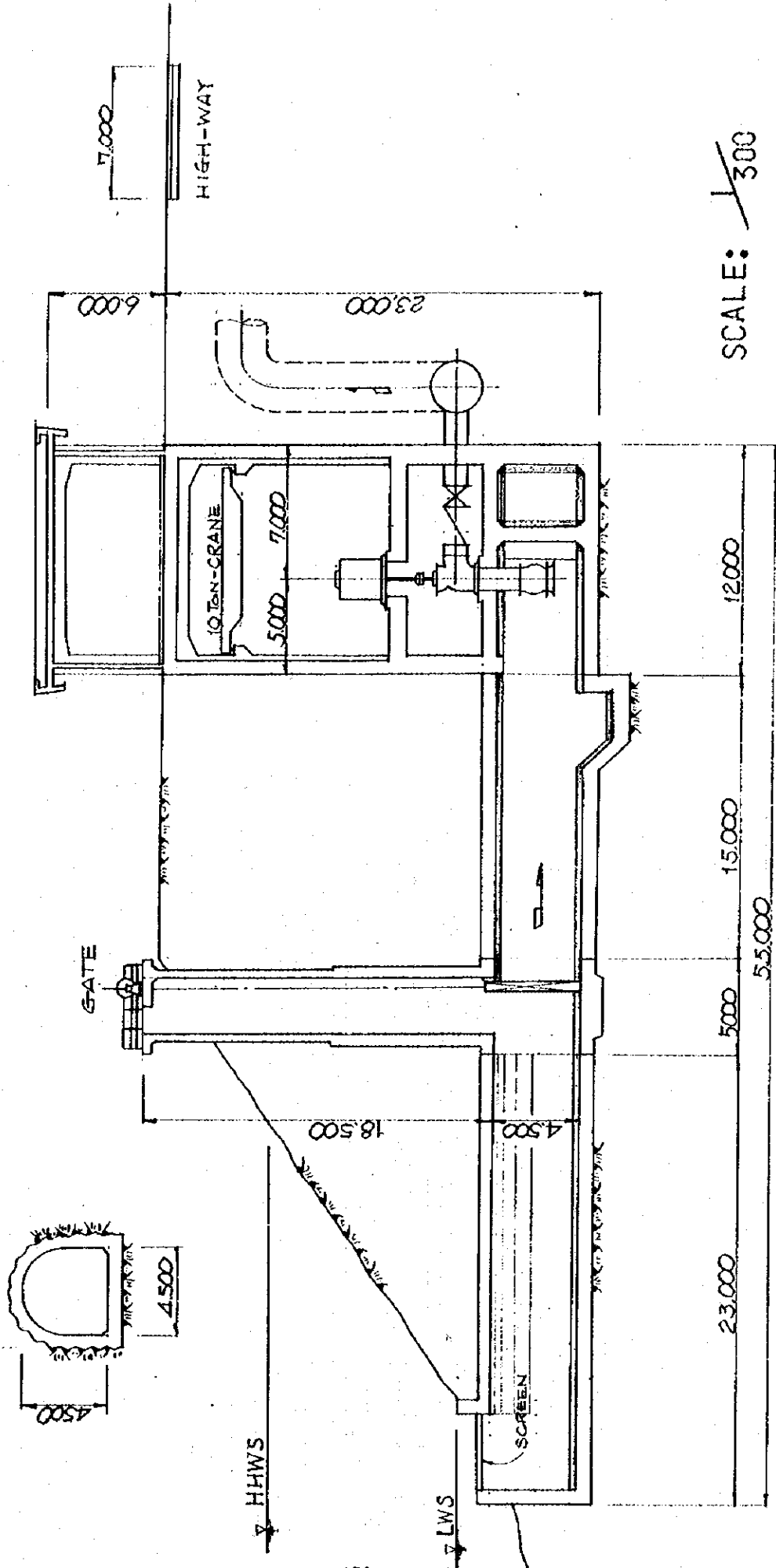


APPENDIX 7-3. Plane and Profile of Pumping Station

APPENDIX 7-3-1. APARRI-LALLO

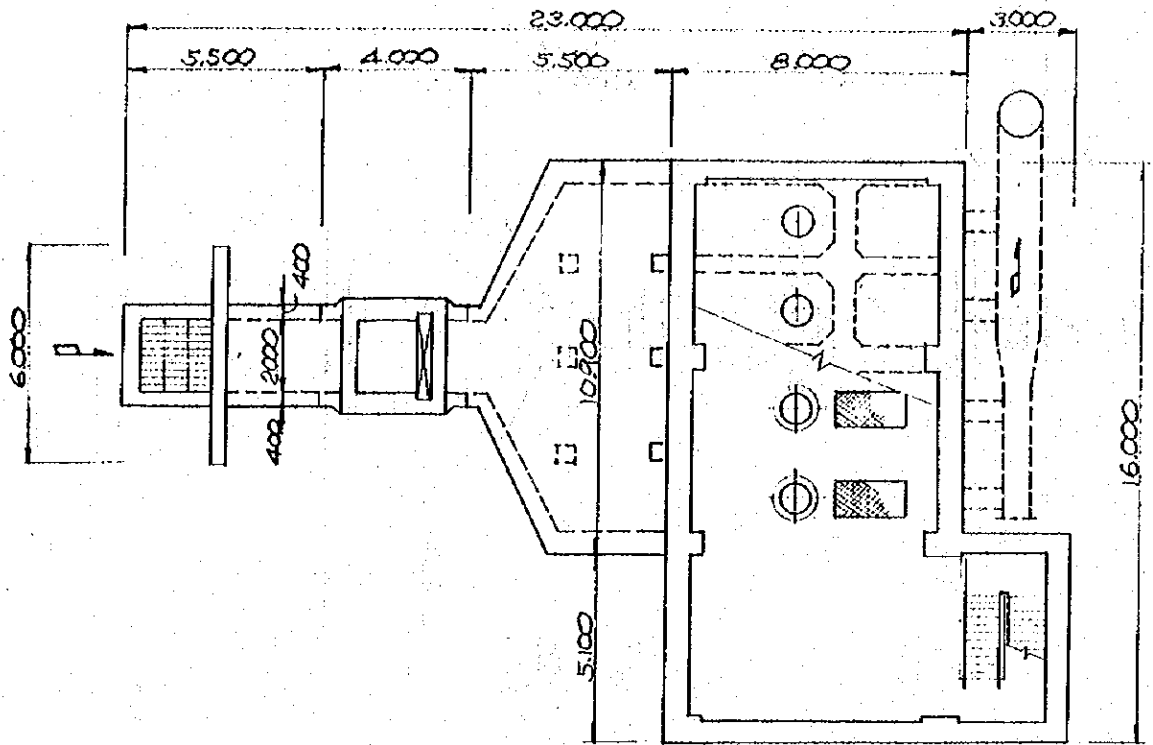


APARRI-LALLO



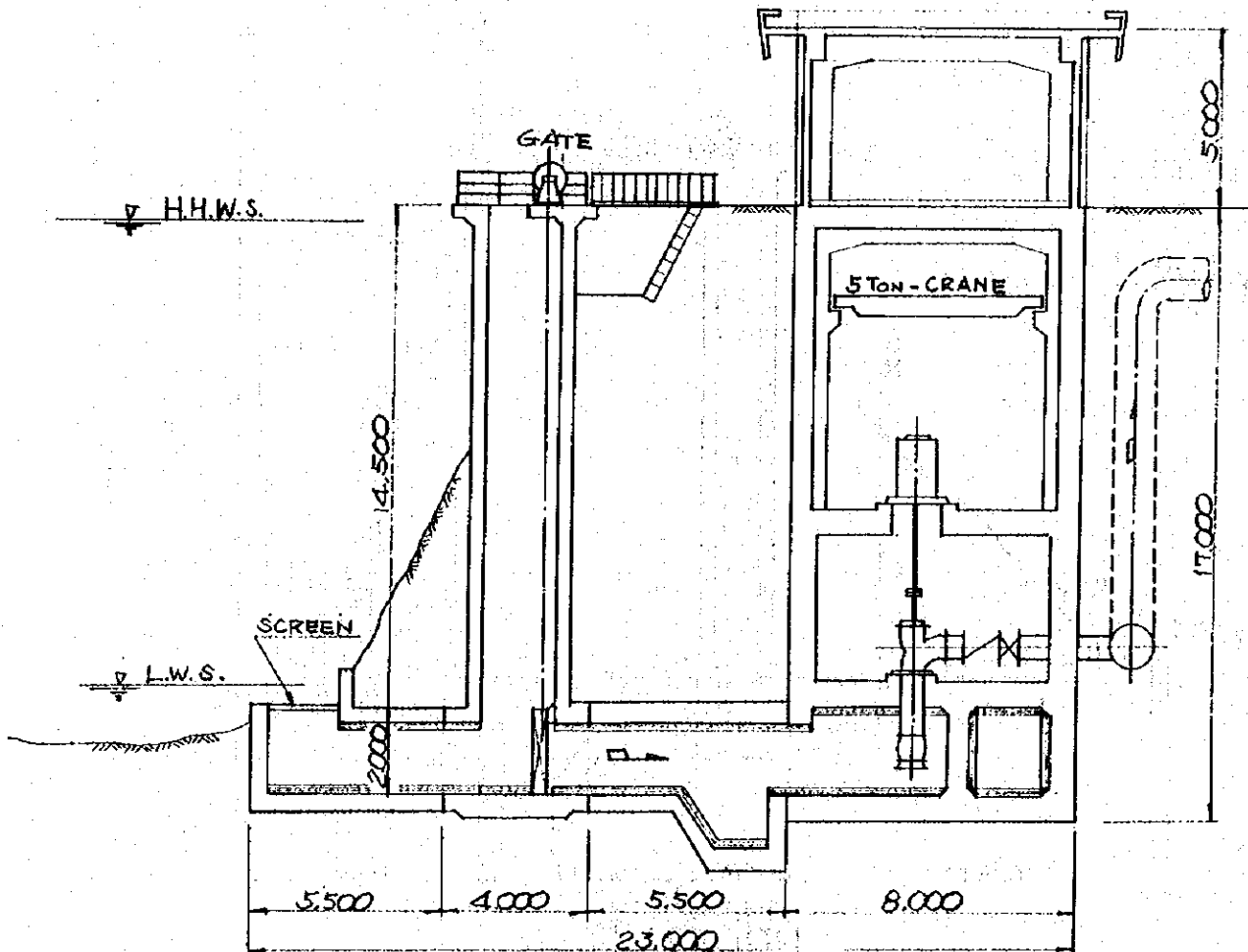
PROFILE

PARED



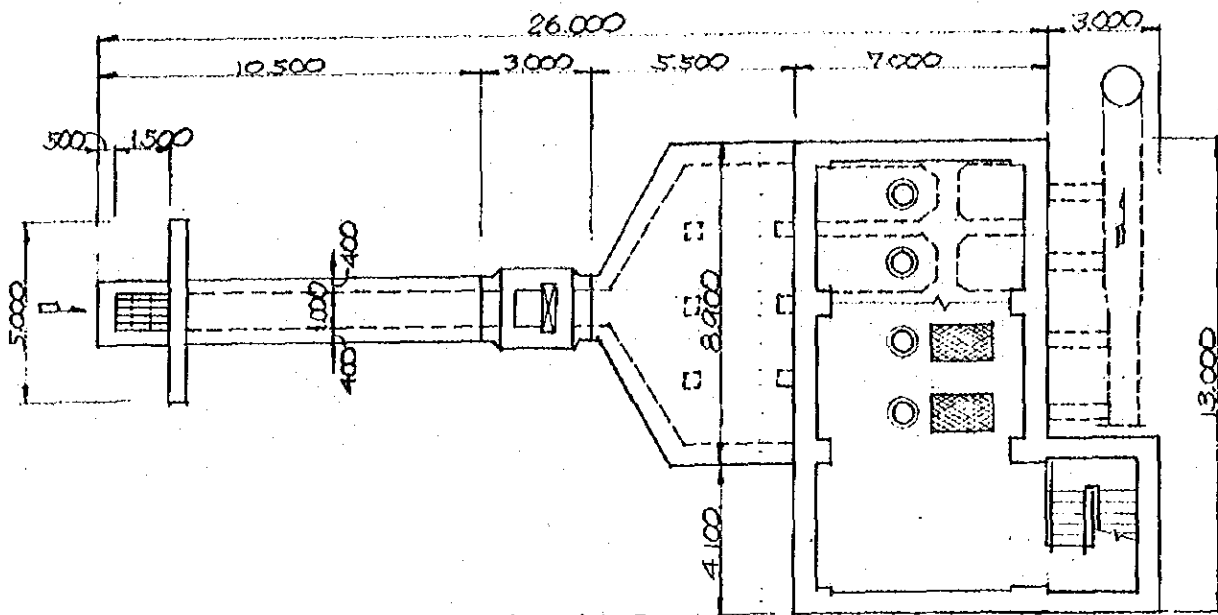
PLANE

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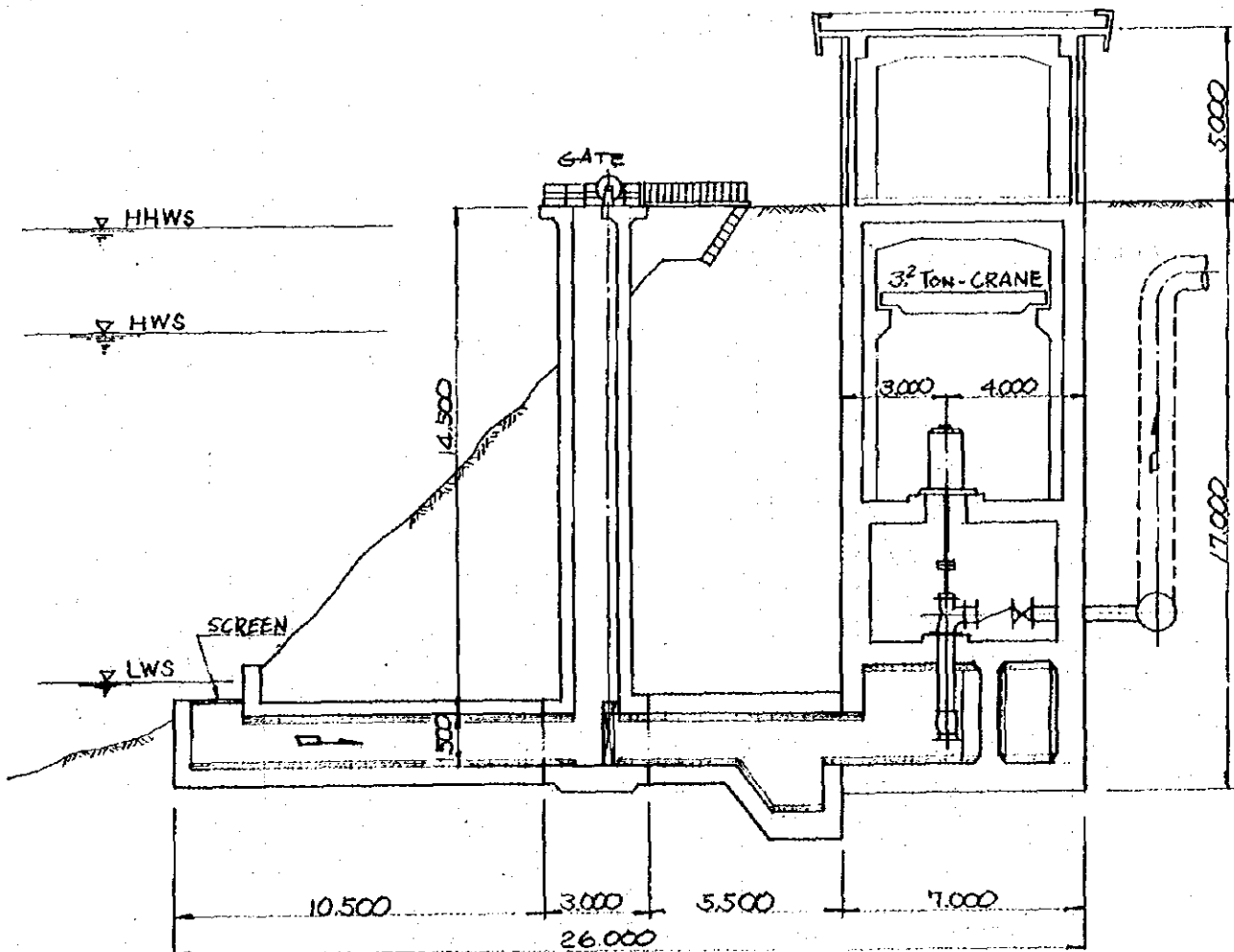
PROFILE

IGUIG



PLANE

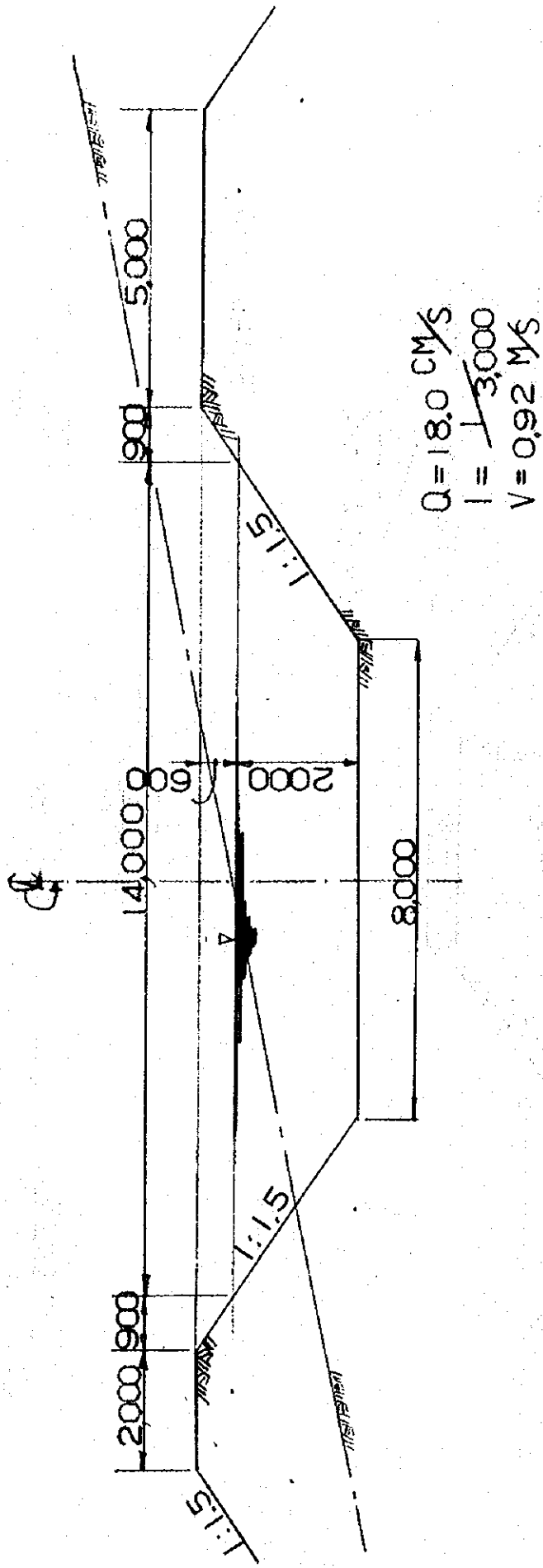
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PROFILE

APPENDIX 7-4. TYPICAL SECTION OF IRRIGATION

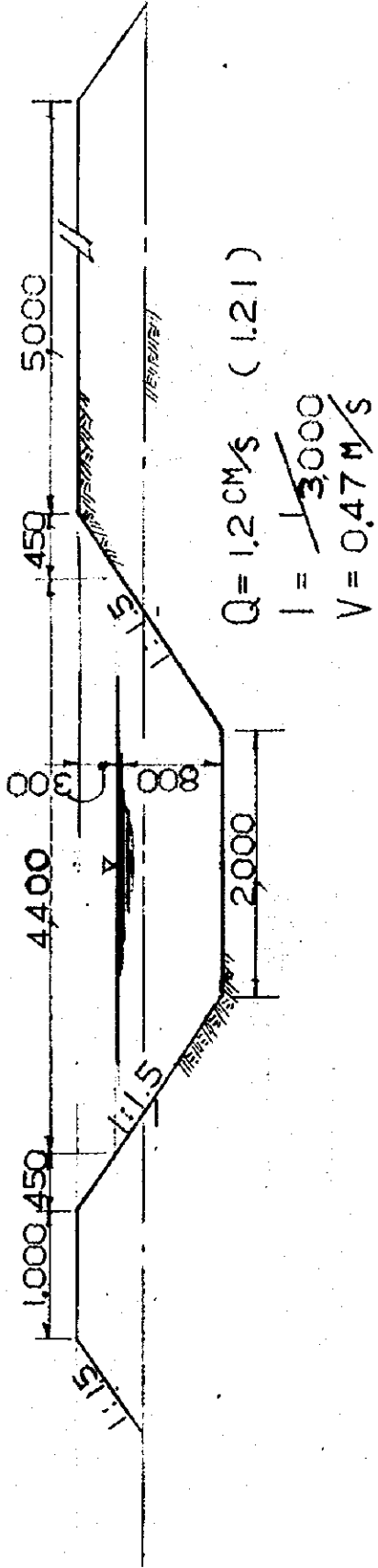
Appendix 7-4-1. APARRI - LALLO (MAIN CANAL)



SCALE. 1 : 100

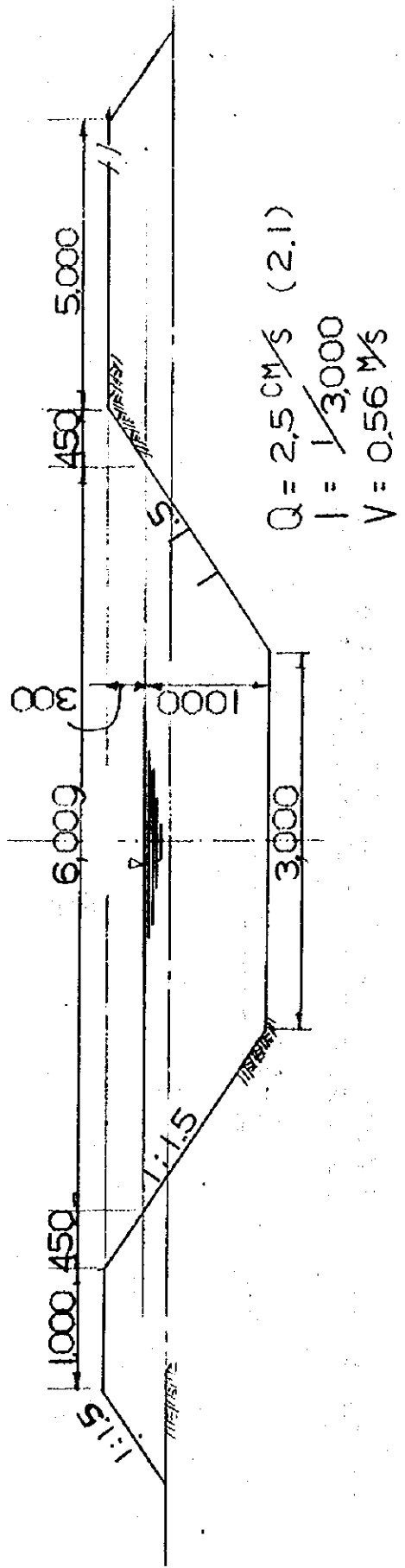
Appendix 7-4-2.

IGUIG (MAIN CANAL)

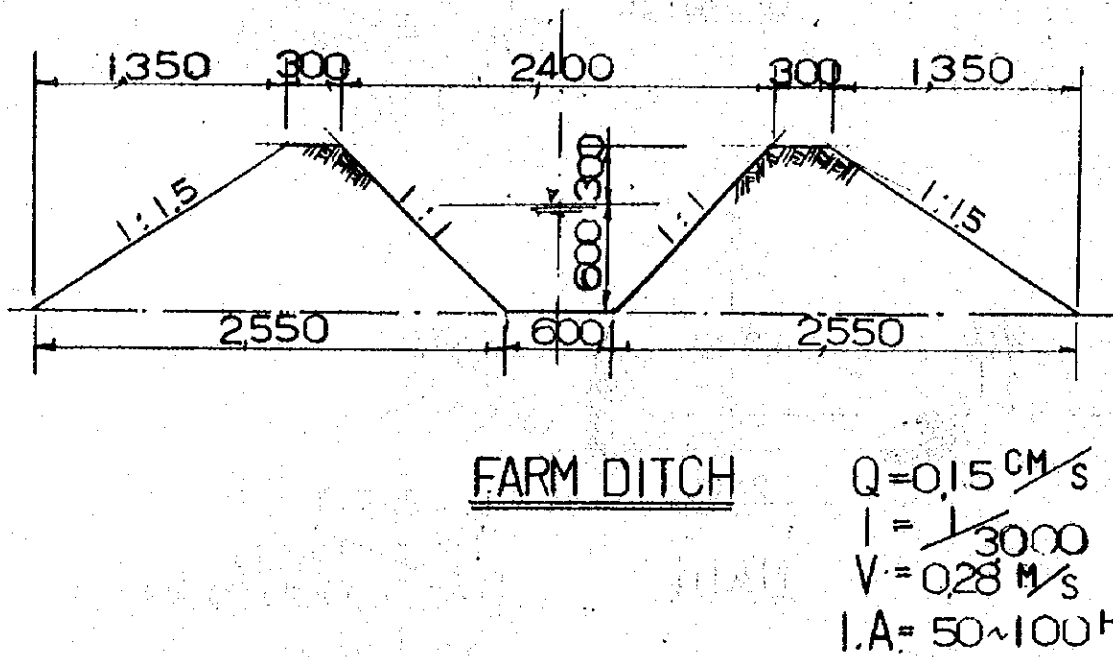
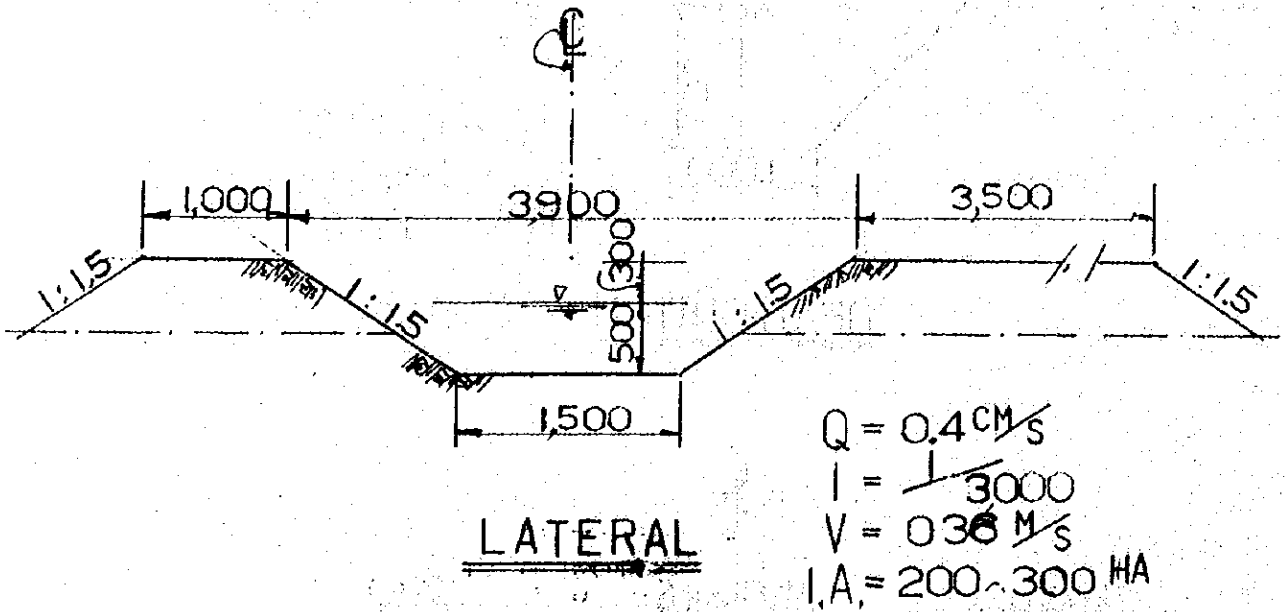


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PARED (MAIN CANAL)



APPENDIX 7-4-3. Lateral and Farm Ditch



TYPICAL SECTION OF DRAINAGE

