NO. 01

JAPAN INTERNATIONAL COOPERATION AGENCY
NATIONAL IRRIGATION ADMINISTRATION
THE REPUBLIC OF THE PHILIPPINES

BASIC DESIGN STUDY REPORT
ON
THE OPTIMUM WATER UTILIZATION
AND RURAL DEVELOPMENT PROJECT
IN
AGANAN RIVER IRRIGATION SYSTEM
IN
THE REPUBLIC OF THE PHILIPPINES

MARCH 1994

NIPPON KOEI CO., LTD.

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JAPAN INTERNATIONAL COOPERATION AGENCY
BASIC DESIGN STUDY REPORT ON THE OPTIMUM WATER UTILIZATION AND RURAL DEVELOPMENT

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PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a basic design study on the Optimum Water Utilization and Rural Development Project in Aganan Irrigation System and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team headed by Mr. Akira Nakazawa, General Manager of Technical Information, Design Division, Agricultural Structure Improvement Bureau, Ministry of Agriculture, Forestry, and Fisheries, and constituted by members of Nippon Koei Co., Ltd , from November 2 to December 1, 1993.

The team held discussions with the officials concerned of the Government of the Philippines, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to the Philippines in order to discuss a draft report, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the teams.

March 1994

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

March 1994

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Optimum Water Utilization and Rural Development Project in Aganan River System in the Republic of the Philippines.

This study was conducted by Nippon Koei Co., Ltd. under a contract to JICA, during the period from October 26, 1993 to March 25, 1994. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of the Philippines and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, and the Ministry of Agriculture, Forestry and Fisheries. We would also like to express our gratitude to the officials concerned of the National Irrigation Administration of the Philippines, JICA Philippines Office, and the Embassy of Japan in the Philippines for their cooperation and assistance throughout our field survey.

Finally we hope that this report will contribute to further promotion of the project.

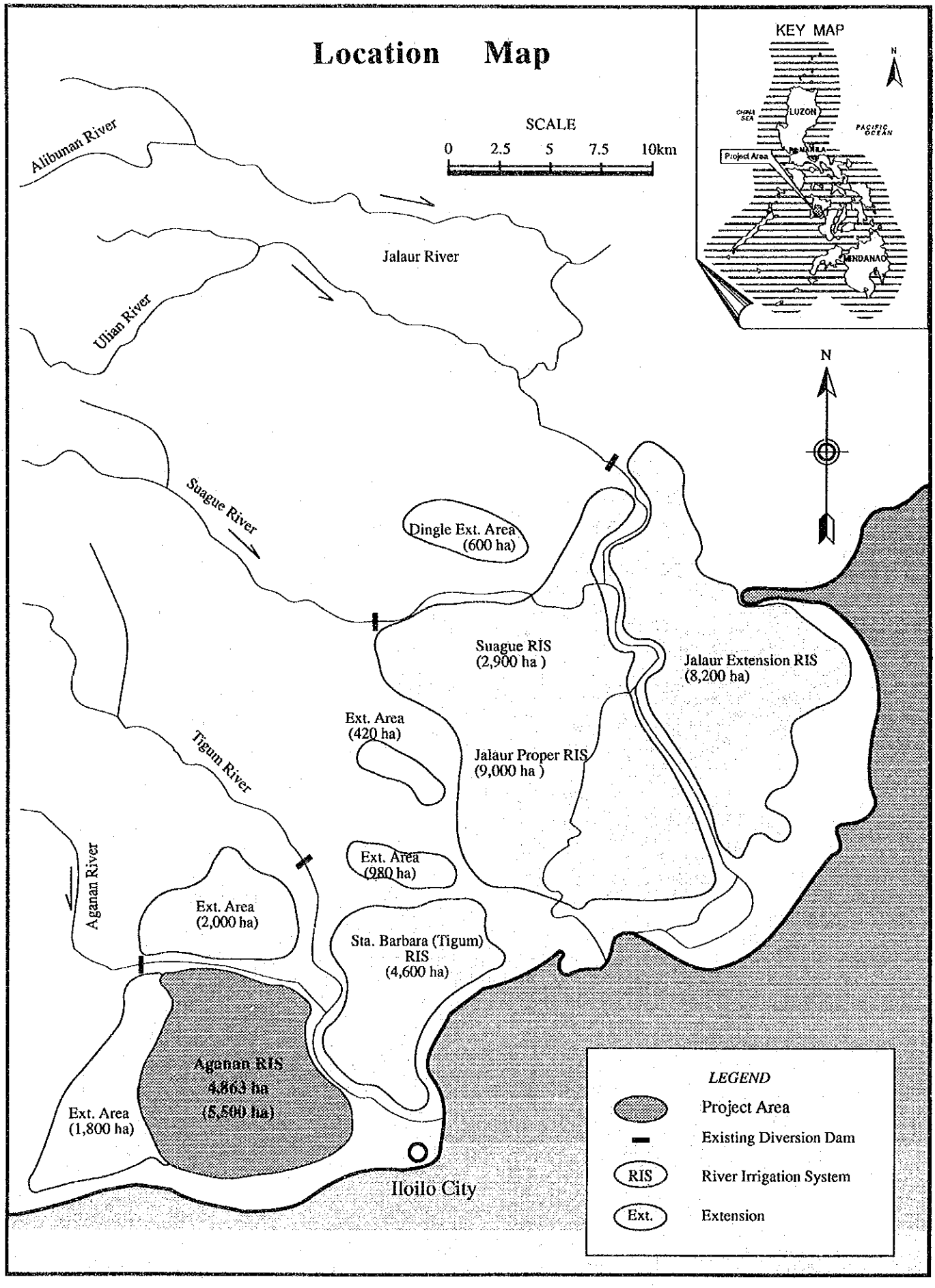
Very truly yours,

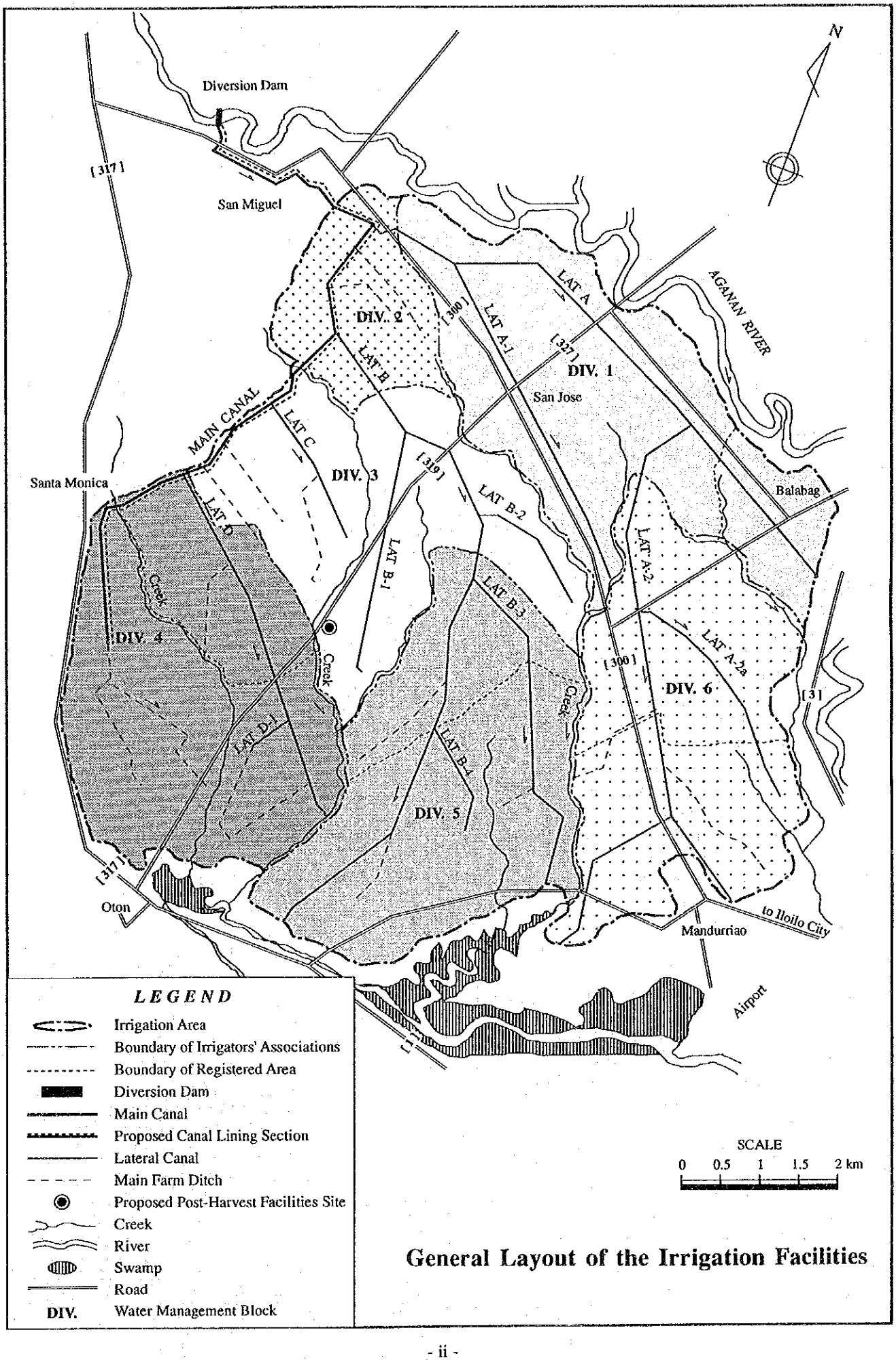
T. Higashikawa

Toshikazu Higashikawa

Project Manager,
Basic design study team on
the Optimum Water Utilization and
Rural Development Project
in Aganan Irrigation System

Nippon Koei Co., Ltd.


Location Map
KEY MAP
LUZON
MINDANAO
Project Area
PACIFIC OCEAN
SCALE
0 2.5 5 7.5 10km
N
Alibunan River
Jalaur River
Ulian River
Suague River
Dingle Ext. Area (600 ha)
Suague RIS (2,900 ha)
Jalaur Extension RIS (8,200 ha)
Ext. Area (420 ha)
Jalaur Proper RIS (9,000 ha)
Tigum River
Aganan River
Ext. Area (980 ha)
Ext. Area (2,000 ha)
Sta. Barbara (Tigum) RIS (4,600 ha)
Aganan RIS 4,863 ha (5,500 ha)
Ext. Area (1,800 ha)
Iloilo City
LEGEND
Project Area
Existing Diversion Dam
RIS
River Irrigation System
Ext.
Extension



General Layout of the Irrigation Facilities

SUMMARY

Summary

The agricultural sector in the Philippines is a major pillar of the national economy. It accounts for about 20 % of GDP, about 60 % of export earnings, and about 50 % of the total employment. Two-thirds of the population reside in the rural areas, and are dependant, either directly or indirectly, on the agricultural sector for their main source of livelihood. The majority of the rural residents, especially the small farmers, live in poverty. The rural areas have a higher incidence of poverty (49 %) than the urban areas (32 %). The rural - urban family income inequality has tended to worsen. The circumstances of rural people have changed for the worse because of the drop in the price of agricultural products for export on the international market, and the occurrence of natural disasters such as earthquakes, droughts, and floods. In the early 1980s the Philippines attained rice self-sufficiency , but due to the population increase, the Philippines has turned into a rice importing country. Economic development of the agricultural sector remains staggered, and farmers in the Philippines have found themselves in economic difficulty.

In order to improve situation, the Government of the Philippines (GOP) established the Medium-Term Development Plan (1993-1997), aiming at "World Economic Competitiveness through People Empowerment". On the basis of the said plan, the National Irrigation Administration (NIA) has presented the Corporate Plan (1993-2002), and is making efforts to enhance agricultural productivity as the basis for self-sustaining economic growth, attaining self-sufficiency in agricultural products, and enhancing small farm income.

At present, NIA is operating 165 national irrigation systems. The irrigation facilities in these systems have deteriorated and some have been damaged by natural disasters, such as floods and earthquakes. Due to the inadequate irrigation facilities, adequate water management could not be carried out and expected agricultural benefits have not accrued. Under these conditions, GOP recognized the necessity of urgent rehabilitation works and formed a program in the Corporate Plan. Top priority was given to the Optimum Water Utilization and Rural Development Project located in Iloilo province in Region 6.

The objectives of the Project are : i) improvement of agricultural productivities, ii) improvement of farm income, iii) activation of IAs, and iv) efficient utilization of water and land resources. GOP requested Grant Aid from the Government of Japan for the implementation of the Project.

In response to this request, the Government of Japan decided to conduct a study to examine the viability of the Project. The Japan International Cooperation Agency (JICA) sent a Study Team to the Philippines from November 2, 1993 to December 1, 1993. The Team surveyed the Project area and had discussions with the executing agency, NIA, of GOP, to clarify the present conditions of the irrigation facilities and post-harvest facilities and confirm the background and contents of the request, organization of the executing body, and operation & maintenance plan of the Project. This is the final report prepared on the basis of the survey and discussions in the Philippines and analyses in Japan.

NIA will be the executing agency for the Project, and the Region 6 Office and Aganan River Irrigation System (Aganan RIS) Office will coordinate all the activities with the other government agencies and all IAs in the Project area.

The Project consists of three components, namely : i) improvement of the irrigation facilities to increase agricultural productivities, upgrade farm income, activate 6 IAs and efficiently utilize water and land resources , ii) construction of post-harvest facilities to improve farm income and activate 6 IAs, iii) procurement of equipment for the operation and maintenance activities of the irrigation and post-harvest facilities to ensure the benefit derived from the Project. The improvement of the irrigation facilities is composed of i) improvement of the diversion dam, ii) improvement / rehabilitation of the irrigation canal structures including rehabilitation of the road, and iii) concrete lining of the main irrigation canal.

The implementation period of the Project is estimated at one year, considering the work volume, type of works, and climatic conditions. The facilities and equipment which will be improved / constructed and purchased under the Project are summarized below:

I. <u>Improvement of the irrigation facilities</u>

1) Improvement of the diversion dam
   - Right bank protection works in the downstream
   - Left bank protection works in the downstream
   - Apron works in the downstream
   - Riverbed protection works in the downstream
   - Entrance works

2) Improvement / rehabilitation of the irrigation canal structures
   - Replacement of gates for headgates and checks (13 sets)
   - Replacement of gates for turnout structures (22 sets)
   - Rehabilitation of the irrigation canal structures (2 nos.)

New construction of an irrigation canal structure (1 no.)
Rehabilitation of the O & M road (1.7 km)

3) Concrete lining of the main irrigation canal (10.2 km)

II. Construction of the post-harvest facilities

Multipurpose pavement (1,800 m^2)
Glass house (500 m^2)
Paddy warehouse (1,500 m^2)
Administration office (120 m^2)
Equipment shed (181 m^2)
Other relevant facilities

III. Procurement of equipment

1) For the O & M activities of the irrigation facilities
2) For the O & M activities of the post-harvest facilities

The direct Project benefits are : i) improvement of agricultural productivity, ii) improvement of farm income, iii) activation of IAs, and iv) efficient use of water and land resources, and the indirect benefits are ; i) support of the implementation of the NIA's Corporate Plan (1993-2002), ii) contribution of rice production in the Philippines to the attainment of rice self- sufficiency, and iii) activation of rural social and economic activities.

The implementation of the Project under the Grant Aid is judged viable for the following benefits and impact.

1) The major beneficiaries are the general people including the poor class in Aganan RIS, who are suffering from the deteriorated irrigation facilities, water shortage in the dry season, and low farm income. The population which will directly benefit from the improvement of the irrigation facilities and construction of the post-harvest facilities, will be at least 12,600.

2) The diversion dam which is the most important structure in Aganan RIS, has been damaged by floods and people fear the destruction of the main irrigation canal. The Project will remove such fear from the farmers' minds and insure improved / rehabilitated irrigation facilities necessary for the agricultural activities of the farmers.

3) The Project will activate IAs in the area, the rural economy, and social development.

4) NIA is the executing agency of the Project in the Philippines, which has much experience of irrigation projects financed by not only local funds but also foreign funds. NIA is capable of carrying out the O & M activities of the facilities using its own budgets, personnel, and engineering knowledge. There will be no problems with the implementation of the Project even under the Japanese Grant Aid System.

5) It is expected that the Project will contribute to the accomplishment of the Philippines' Medium Term Development Plan (1993-1997) through the NIA's Corporate Plan. The objectives of the Project are to improve / rehabilitate the irrigation facilities and construct the post-harvest facilities, not to earn commercial profits. Therefore, the Project is suitable for the Grant Aid concept.

The construction supervision and O & M capabilities of GOP is high and there are no problems with the finances, manpower, and engineering know-how of GOP. However, for the smooth implementation of the Project, it is recommended that the Philippine side takes the following actions immediately :

1) Acquisition of land for the construction, office, temporary stockyard, quarry sites, borrow pits, and soil disposal areas in advance of the commencement of the construction

2) Completion of a power supply system to the post-harvest facilities to be undertaken by GOP

3) Budgetary and administrative arrangements for the Project implementation and O&M

4) Conclusion of the agreement on the following matters with the 6 IAs:
   - Farmers' cooperation with the construction works
   - No water use from the irrigation facilities during the construction period
   - Impartial water use by the 6 IAs
   - O & M of the post-harvest facilities by the 6 IAs

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CHAPTER 1
INTRODUCTION

1 . INTRODUCTION

The Government of the Philippines (GOP) regarded the Optimum Water Utilization and Rural Development Project in Aganan River Irrigation System (the Project) as one of the top priority rehabilitation projects in the Philippines, and requested grant aid assistance from the Government of Japan (GOJ) in the implementation of the Project in September 1992. In response to this request, the Ministry of Foreign Affairs of Japan deemed the Project's objectives roughly appropriate for the Japanese Grant Aid Program and decided to conduct a study to examine the viability of the Project. The Japan International Cooperation Agency (JICA), the government organization in charge of international cooperation with developing countries, sent a Study Team, headed by Mr. Akira Nakazawa from the Ministry of Agriculture, Forestry and Fisheries to the Philippines from November 2, 1993 to December 1, 1993.

The Team surveyed the Project area and had discussions with the executing agency, the National Irrigation Administration (NIA) of GOP, to clarify the present conditions of the irrigation facilities and post-harvest facilities and confirm the background to and contents of the request, organization of the executing body, and operation & maintenance (O & M) plan of the Project. As a result, the Team recognized the necessity and rationale, and judged that all of the items requested by GOP should be the subjects of the study. It was agreed between NIA and the Team that the Study should cover : i) improvement of the irrigation facilities (diversion dam, irrigation canals, irrigation canal structures, and O & M roads), ii) construction of post-harvest facilities (multipurpose pavement, glass house, paddy warehouse, administration house, and equipment shed), and iii) procurement of equipment for the O & M of the irrigation and post-harvest facilities.

The Minutes of Discussions are attached in Appendix-4. The members of the Team and itinerary of the field survey in the Philippines are given in Appendixes - 1 and - 2, and a list of personnel contacted is given in Appendix - 3.

After full utilization of the results of the field investigations and discussions, the Team examined the rationale and viability of the Project and carried out the Study, including the selection of the required equipment, estimation of the implementation cost, and formulation of a basic plan for O & M of the Project. This report presents the comprehensive results of the Study.

CHAPTER 2
BACKGROUND TO THE PROJECT

2. BACKGROUND TO THE PROJECT

2-1 Background to the Project

The Philippines consists of about 7,000 islands with an area of 300,000 km^2 and had a population of 64.25 million in 1992. The population growth rate during the last decade was 2.3 %, and Gross National Product (GNP) per capita in 1992 was estimated at US$ 770.

Economic development in the Philippines was seriously limited during the early 1980s because of the depression of the export market. However, economic growth accelerated in 1986 and the economic growth rate rose by 6 % annually for three years from 1987 to 1989, with the main impetus coming from a strong recovery in personal consumption as a result of tax reform, higher wages, and the spending program of the Government.

The agricultural sector is a major pillar of the Philippine economy. It accounts for about 20 % of GDP, about 60 % of export earnings, and about 50 % of the total employment. Two-thirds of the population reside in the rural areas, and are dependant, either directly or indirectly, on the agricultural sector for their main source of livelihood. The majority of the rural residents, especially the small farmers, live in poverty. The rural areas have a higher incidence of poverty (49 %) than the urban areas (32 %). The rural - urban family income inequality has tended to worsen. The circumstances of rural people have changed for the worse because of the drop in the price of agricultural products for exports on the international market, and the occurrence of natural disasters, such as earthquakes, droughts, and floods.

In order to improve the situation, GOP established the Medium-Term Development Plan (1993-1997), aiming at "World Economic Competitiveness through People Empowerment". On the basis of the said plan, NIA has presented the Corporate Plan (1993-2002), and is making efforts to enhance agricultural productivity as the basis for self-sustaining economic growth, attaining self-sufficiency in agricultural products, and enhancing small farm income.

The Philippines has a potential irrigable area of about 3,100,000 ha. During the past 6 years, NIA generated new irrigated areas of about 122,420 ha and rehabilitated about 713,070 ha. As of 1992, NIA had developed about 46 % of the total potential irrigable area. However, the production of the main foodstuff, rice, still falls short of requirements by about 435,000 tons, and farmers' income is still at a low level. Under these

conditions, NIA is implementing the Corporate Plan (1993-2002) consisting of new development of about 437,620 ha and rehabilitation of about 586,680 ha with the following objectives.

- To develop irrigation systems which support the national food production program
- To provide an adequate level of services
- To enhance economic and social growth in the rural areas
- To maintain NIA as a stable and autonomous corporate entity

2-2 Outline of the Request

At present, NIA is operating 165 national irrigation systems. The irrigation facilities in these systems have deteriorated and some have been damaged by natural disasters, such as floods and earthquakes. Due to the inadequate irrigation facilities, adequate water management could not be carried out and expected agricultural benefits have not accrued. Under these conditions, GOP recognized the necessity of urgent rehabilitation works and formed a program in the Corporate Plan. Top priority was given to the Optimum Water Utilization and Rural Development Project located in Iloilo province in Region 6, considering the following:

- Iloilo province is one of the most important areas for national food supply in the Philippines.
- Serious deterioration of the irrigation facilities caused by 70 years of operation
- Serious damage to the irrigation facilities caused by floods
- Cropping intensity of the Project is lower than that of the other irrigation systems in the province due to the water shortage in the dry season, and farm income is also lower than that of the other systems.
- Farmers in this system are more eager to cultivate is higher than farmers in the other irrigation systems in the province.
- Cooperation of irrigators' associations (IAs) in the area with NIA is better than that of IAs in the other irrigation systems in the province.

The objectives of the Project are : i) improvement of agricultural productivities, ii) improvement of farm income, iii) activation of IAs, and iv) efficient utilization of water and land resources. GOP requested Grant Aid from GOJ for the urgent implementation of the Project.

Through a series of discussions with NIA, the contents of the request made by GOP were confirmed as follows:

(1) Improvement of the irrigation facilities

1) Improvement of the diversion dam
- Shortening of the upstream river channel
- Bank protection in the upstream
- Bank protection in the downstream
- Improvement of the apron works in the downstream
- Improvement of the riverbed protection works
- Improvement of the entrance to the diversion dam site

2) Improvement / rehabilitation of the irrigation canal structures

- Replacement of the gates for headgates and checks	13 sets
- Replacement of the gates for turnouts	22 places
- Rehabilitation of the irrigation canal structures	2 nos.
- New construction of an irrigation canal structure	1 no.
- Rehabilitation of the O & M road	1.7 km

3) Concrete-lining of the main irrigation canal 10.2 km

(2) Construction of the post-harvest facilities

- Multipurpose pavement
- Glass house
- Paddy warehouse
- Administration office
- Equipment shed

(3) Procurement of equipment

1) Equipment for O & M of the irrigation facilities

i) Hydro-meteorological station equipment
- Automatic water level recorder
- Automatic rain gauge
- Evaporation pan

ii) Data processing and communication equipment

- Personal computer
- Printer
- Uninterrupted power supply
- Electric photocopier
- Radio transceiver set

iii) Construction equipment

- Bulldozer
- Loader / backhoe
- Motorgrader
- Hydraulic excavator(backhoe)
- Dump truck
- Pick-up
- 4-wheel drive car
- Motorcycle
- Electric generating set
- Portable centrifugal pump
- Spare parts

2) Equipment for O & M of the post-harvest facilities

- Portable dryer
- 4-wheel farm tractor including attachments
- Cargo truck
- Forklift
- 4-wheel drive car
- Trailer (towed type)
- Platform weighing scale
- Generator
- Spare parts

2-3 Outline of the Project Area

(1) General conditions

The Project area with approximately 10° 44 ' North Latitude and 122°30' East Longitude, is located on the right bank of the Aganan river adjacent to the western area of Iloilo city in Iloilo province on Panay island. Since Iloilo city, with a population of about 310,000, is the capital of Iloilo province and administrative and commercial center of Region 6 (which consists of Iloilo, Aklan, Antique, Capiz, Guimaras and Negros Occidental provinces) , there are several all weather roads, such as National Roads Routes No.1 and No.3, and Provincial Roads Routes No. 300, No. 317, No.319 and No. 327 in and around the Project area. (These roads are shown in the attached general layout of the irrigation facilities.)

Iloilo province is favored with abundant water and land resources, and a suitable climate for agriculture. Therefore, agricultural and irrigation developments have taken place for a long time and the province has the reputation of the " Food Basket of the Nation ", as one of the largest producers of several agricultural and fishery products such as rice, maize, coconuts, sugarcane, fruits, and rootcrops. However, the income level of people in the province is still below the average of the country, since about 70 % of the paddy fields are not provided with irrigation facilities and the irrigation facilities in the remaining 30 % of the paddy fields are mostly vulnerable to floods and droughts. Therefore, improvement and expansion of the irrigation facilities are required for agricultural development .

The Project area is 4,863 ha in net and administratively consists of San Miguel, Oton, Pavia, and Sta. Barbara minucipalities. The number of households in the area is about 2,300, population is about 12,600, and average family size is about 5.5. Irrigation in the area commenced in 1923 and O & M has been conducted by the NIA ARIS Office under the supervision of the NIA Region 6 Office. The water management has been carried out by the following 6 IAs under the supervision of the ARIS Office.

	Names of IAs	Irrigation Area (ha)	Potential IA Households (nos.)	Registered IA Households (nos.)
1	Pasamisba	922	608	389
2.	Samicasa	372	260	248
3.	Macabitu	892	429	315
4.	Salambitu	943	351	228
5.	Lampaca	808	360	342
6.	Jipadusa	926	271	206
	Total	4,863	2,279	1,728

Note: The number of each IA means the Division Number shown in the attached general layout of the irrigation facilities.

(2) Natural conditions

The area is located on the right bank of the Aganan river, with a slope of about 1/300 towards the southeast. The altitude varies from about EL 36 m around the diversion dam site to about EL 5 m at the end of the Project area. A large number of natural streams and channels provide a fairly good drainage system and no serious drainage problems have been reported.

The climate in the Project area is characterized by a wet season from June to November and a dry season from December to May. Mean annual rainfall is 2,082 mm, of which about 83 % falls in the wet season according to the rainfall data of Iloilo airport. The mean temperature is 27.4 ° C and the mean relative humidity is about 85 %.

The Aganan river has a catchment area of about 104 km2 at the diversion dam site and the water is used for the irrigation of the Project. Although irrigation has been carried out for 70 years, no runoff data has been recorded. The only available hydrological data are the following intake discharge data from 1983 to 1993.

Unit : lit/sec

J	F	M	A	M	J	J	A	S	O	N	D
632	392	170	385	3,071	3,025	2,640	2,573	2,923	2,065	2,176	1,120

The geological formation of the Project area consists of Quaternary alluvial deposits and Tertiary sediments on the basis of the complex of igneous and metamorphic rocks. The surface layer depth of the Quaternary alluvial deposits varies from place to place. It is generally about 30 m and consists of mudstone, silt, and clay. A part of the mudstone is exposed in the river, and this mudstone is the foundation of the diversion dam. The mudstone is fairly good for the foundation, but it has characteristics of slaking, and is strong under the water or ground, but becomes very weak if it undergoes alternate wet and dry conditions. The silt and clay available on the surface layer are not suitable for embankment materials.

(3) Agriculture

The main crop in the Project area is paddy. In the wet season, paddy is cultivated in 4,863 ha. Land preparation starts in May and the harvest starts in August. In the dry season, paddy is cultivated in about 1,120 ha. Land preparation starts in October and the

harvest starts in February. The irrigation area in the wet season is 4,863 ha and that in the dry season is about 1,120 ha. The average cropping intensity is 123 %.

About 80 % of the paddy cultivation in the area is carried out by the direct sowing method and the remaining 20 % is carried out by the transplanting method, because of shortage of labor in the area. In spite of the shortage of labor, land preparation is mainly accomplished by man power since farmers cannot afford to buy agricultural machinery, such as tractors. The main variety of paddy is an improved one, such as IR 64 or IR 36, and local high quality variety is rare, since farmers prefer the improved variety due to its short cropping period. The unit yield of paddy in the area is about 3.8 tons / ha corresponding to the average of the country. The annual production of paddy in this area is about 22,700 tons. In addition to paddy, watermelon, tomatoes, and green gram are partly cultivated in the dry season, without irrigation water, utilizing soil moisture and rainfall. The present cropping pattern of paddy is shown in Fig. 1.

(4) Existing social infrastructures

Telecommunication facilities such as local and long distance telephone and facsimile systems are available in the area. The electricity in the area which is generated by geothermal, thermal, and hydropower plants, is supplied by Iloilo Electric Cooperative I (ILECO I). The drinking water in the area is groundwater lifted by pumps. Systematic drinking water supply facilities and sewerage facilities are not provided in the area. The following public facilities are available in the area;

Facilities	No.
Hospital	1
Primary school	43
Junior high school	7
Post office	4
Bank	4
Police station	4

(5) Existing irrigation facilities

At present, NIA operates 4 national irrigation systems i.e., Jalaur, Suage, Sta.Barbara, and Aganan RISs with a total area of 23,071 ha on the outskirts of Iloilo city. The

irrigation areas of these four systems are 11,550 ha for the Jalaur RIS, 2,928 ha for the Suage RIS, 3,730 ha for the Sta. Barbara RIS and 4,863 ha for the Aganan RIS, although the proposed areas in the Jalaur Multipurpose Dam Project have been 17,200 ha for the Jalaur RIS, 2,900 ha for the Suage RIS, 4,600 ha for the Sta. Barbara RIS and 5,500 ha for the Aganan RIS. (These irrigation systems are shown in the attached location map.)

The water source for the Aganan RIS is the Aganan river. The water is diverted by an ogee type diversion dam, and taken by an intake with 7 slide gates. The design capacity of the intake is 7.29 m^3/sec. All of the irrigation water is conveyed through main and lateral canals with unlined trapezoidal open channels. The main features of the existing irrigation facilities of ARIS are as follows:

1) Diversion dam

Design flood discharge	: 1,500 m^3/sec
Design intake discharge	: 7.29 m^3/sec
Type of diversion dam	: Ogee type
Length of the weir	: 81.5 m for the lower channel
	136 m for the floodway
Height	: 2.85 m
Crest elevation	: EL 36.21 m
Sluice	: Sluice gate (4.5 m x 3.2 m x 1 set)
Intake	: Slide gates (1.6 m x 1.4 m x 7 sets)

2) Irrigation canals and related structures

Main irrigation canal (1 no.) : 10.20 km in total

Lateral irrigation canals (12 nos.) : 41.87 km in total

Lateral A	7.26 km	Lateral A-1	2.80 km
Lateral A-2	6.18 km	Lateral A-2a	2.84 km
Lateral B	8.26 km	Lateral B-1	2.04 km
Lateral B-2	1.40 km	Lateral B-3	3.56 km
Lateral B-4	1.48 km	Lateral C	1.17 km
Lateral D	4.36 km	Lateral D-1	0.52 km

Related structures : 423 nos.in total

Headgate structures : 13 nos.

Turnout structures : 142 nos.

Check structures	: 114 nos.
Crossings	: 92 nos.
Drainage inlets	: 51 nos.
Others	: 11 nos.

(6) Post-harvest facilities

The post-harvest processing of paddy consists of threshing, drying, milling and storage. Most of the paddy produced in the area is threshed by threshers owned by the farmers. Since the threshing is done on the harvested paddy fields and open spaces of farmers' house yards, impurities are mixed into the threshed paddy. In order to remove such impurities, winnowers are used. The threshed paddy is laid on the roads, open spaces and yards of farmers' houses, and dried by solar energy. Since the drying area is very limited in the Project area, about 60 % of the threshed paddy is sold to middlemen at 4 Peso/kg, immediately after the threshing is done. The dried paddy is also sold to middlemen for storage and milling, since there is no room for the storage of dried paddy in farmers' houses. The National Food Authority (NFA) buys dried paddy from farmers' groups at 6 Peso/kg. However, since the NFA's budget only covers about 10 % of the produced paddy, farmers who have no drying and storage facilities, have no choice but to sell their paddy to the middlemen. Thus the farmers are losing some of their farm incomes.

CHAPTER 3
OUTLINE OF THE PROJECT

3 OUTLINE OF THE PROJECT

3-1 Objectives

The Project consists of three components i.e., i) improvement of the irrigation facilities, ii) construction of the post-harvest facilities, and iii) procurement of equipment for O & M of the facilities. The objectives of each component of the Project are as follows :

(1) Improvement of the irrigation facilities

The objectives of this component are to improve agricultural productivities, increase farm income, activate 6 IAs and efficiently utilize water and land resources through improvement of the irrigation facilities. The Project is also expected to contribute to the implementation of the NIA Corporate Plan (1993-2002), increase in rice production in the Philippines, improvement of rural living standards, and activation of the rural economy. The Project will improve and rehabilitate the diversion dam, irrigation canals, irrigation canal structures, and O & M road.

(2) Construction of the post-harvest facilities

The objectives of this component are to raise farm income and activate 6 IAs through construction of the post-harvest facilities. The Project is also expected to contribute to the activation of rural economy and society. The Project will construct the post-harvest facilities, consisting of multi-purpose pavement, glass house, paddy warehouse, administration office, and equipment shed.

(3) Procurement of equipment for O & M of the facilities

The objectives of this component are to support the smooth O & M of the irrigation and post-harvest facilities to be completed and maintain the benefits derived from the O & M of the facilities through procurement of the equipment. The Project will provide the construction equipment, dryer, tractor, cargo truck, forklift , etc.

3-2 Study and Examination of the Request

(1) Improvement of the irrigation facilities

1) Improvement of the diversion dam

The diversion dam is the most important structure of all the irrigation facilities in the Aganan RIS which takes water from the Aganan river. In spite of its importance, the dam has deteriorated considerably, and parts of it have been seriously damaged by recent floods. In particular, the right bank in the downstream has been eroded so seriously that the stability of the dam and main irrigation canal are in danger. It is anticipated, in the worst case, that irrigation might be terminated by destruction of the dam and main irrigation canal. Urgent rehabilitation of the dam is necessary. The Project will recover the stability of the dam, and remove the danger of destruction of the main irrigation canal. Finally, the irrigation of 4,863 ha will be ensured in the future.

The requested items for the diversion dam are classified into two parts: improvement for upstream of the dam and that for downstream of the dam. Considering the necessity, urgency, magnitude of importance, and available budget, it was judged that the improvement of the downstream of the dam such as bank protection works, apron works, and riverbed protection works by concrete blocks and gabions should be carried out under the Project and that the improvement of the upstream of the dam should be excluded from the Project.

2) Improvement / rehabilitation of the irrigation canal structures

The objectives of the improvement / rehabilitation of the irrigation canal structures are to control the water level and discharge, protect the canals, and provide a crossing over the irrigation canals. However, about 70 years have passed since the commencement of the irrigation services and the canal structures have deteriorated. As a result, this deterioration has hindered farmers from conducting proper water management and the expected crop benefit has not accrued from the irrigation area. In addition, the O & M road provided on either side of the irrigation canal bank have also deteriorated and this has limited agricultural and rural social activities of farmers. The requested items for the irrigation canal structures were examined and it was judged that all of the requested items should be included in the Project, such as the replacement of the gates for headgates, checks, and turnout structures, rehabilitation of the existing canal structures, new construction of a canal structure, and rehabilitation of the O & M road.

3) Concrete lining of the main irrigation canal

The Aganan river has plenty of water in the wet season, but the runoff in the dry season is very limited. The farmers in the area suffer from shortages of irrigation water in the dry

season. In addition, the limited water in the dry season is used by farmers in the upstream area and farmers in the downstream area have no irrigation water. The farmers in the upstream area say that when the water is used in the downstream area, irrigation water is lost because of conveyance or seepage, and the water should be used in the upstream area in view of the efficient use of the water resource. In order to cope with this situation, concrete lining for the main irrigation canal is required to decrease the water loss in the canal, so that more water can be used for irrigation. The concrete lining can convince farmers in the upstream area of impartial water use in the dry season since the water loss by conveyance and seepage will decrease. At present, the irrigation area is 1,120 ha and this area will increase to 1,261 ha due to the concrete lining. The concrete lining will also activate 6 IAs in the area. Subsequently, impartial water use will be started and each farmer will be able to use the irrigation water in the dry season once every four years by rotation irrigation. Considering these benefits and the impact, it was judged that the concrete lining for the main irrigation canal should be included in the Project.

(2) Construction of the post-harvest facilities

After the harvest, about 60 % of the paddy in the Project area is generally sold to middlemen at Peso 4 / kg without drying. About 10 % of the paddy is used as wages for the seasonal laborers, conventional gifts to relatives and acquaintances, and losses. About another 10 % of the paddy is dried in the yards of farmers' houses and used for self-consumption and seed. About 20 % of the paddy is dried on the roads, harvested paddy fields, and open spaces, and sold to NFA and/or middlemen at about Peso 6 / kg. Of the 60 % of the paddy which is sold soon after the harvest, 35 % is sold in order to pay debts and save funds for preparing for the coming cultivation and daily life. The remaining 25 % of the paddy is sold without choice, since the farmers do not have drying and storage facilities. Considering these present conditions, the necessity, urgency, benefits, and budget, it was judged that the post-harvest facilities should be constructed under the Project, and that the proper capacity for the post-harvest facilities should be 25 % of the paddy produced in the Project area in the wet season, which corresponds to the paddy sold to middlemen soon after harvest without choice. The Project will increase farm income by about Peso 1,900-3,800 / year. In addition, the Project will activate 6 IAs and the effect will be reflected on the impartial water use, since O & M of the post-harvest facilities will be carried out by cooperation of the 6 IAs.

The requested items for the post-harvest facilities are multipurpose pavement (drying field by solar energy), glass house, paddy warehouse, administration office and equipment shed. All of the items are conventional and very simple in type and specifications.

(3) Procurement of the equipment

All of the requested items are classified into two parts: the equipment necessary for the O & M activities of the irrigation facilities, and that for the O & M activities of the post-harvest facilities. The equipment is considered necessary for ensuring the benefit derived from the Project. Considering the urgency, available equipment, magnitude of importance, and budget, the following equipment were judged essential for the O & M activities of the irrigation and post-harvest facilities.

1) Equipment for the O & M activities of the irrigation facilities

	Item	Unit	Purpose
1.	Automatic water level recorder (Battery type)	2	To measure the runoff of the river and intake discharge for efficient water management
2.	Bulldozer (Swamp type)	1	For O & M of the diversion dam and irrigation canals
3.	Loader / backhoe	1	For removal and transport of sediment from the canals
4.	Motorgrader	1	For repair of the O & M road
5.	Spare parts		

2) Equipment for the O & M activities of the post-harvest facilities

	Item	Unit	Purpose
1.	Portable dryer	2	For continuous rainy day use
2.	4-wheel farm tractor (attachments)	2	For transport of paddy around the facilities site
3.	Cargo truck	2	For transport of paddy from the farmers' houses to the facilities, and from the facilities to NFA or rice millers
4.	Forklift	2	For lifting rice bags in the warehouse
5.	4-wheel driven car	1	For business trips on the collection/sale of paddy and procurement of O & M materials
6.	Trailer (towed type)	2	For transport of paddy around the facilities site
7.	Platform weighing scale	2	For measurement of paddy weight
8.	Spare parts		

(4) Impact on the environment

The operation of the Aganan RIS commenced in 1923 and it has a long O & M history. In the past, no serious environmental problems were reported. With the implementation of the Project, the construction works may produce noise caused by the operation of a crushing plant and the driving of sheet piles and muddiness in the river caused by the improvement works of the diversion dam. However, the crushing plant will be located in the paddy fields where houses are not located and the driving of piles will be carried out in the river where there are no houses. The muddiness in the river will occur for a short period of the improvement works and the degree of muddiness will be less than that caused by flooding. Considering these matters, the effect on the environment by the implementation of the Project will be very small. Study results on the environmental impact of the improvement of the irrigation facilities and construction of the post-harvest facilities under the Project are summarized in Table-2.

3-3 Project Description

3-3-1 Executing Agency and Operational Structure

NIA will be the executing agency for the Project, coordinating all of the activities with the other government agencies and all of the IAs in the area. NIA's Region 6 Office and the Aganan RIS Office are directly involved in executing the Project. An operational structure for the Project is shown in the Minutes of Discussion (Appendix-4). Organization charts of the entire NIA, Region 6 Office and Aganan RIS Office are shown in Fig.2, Fig.3 and Fig.4, respectively.

NIA is operating 165 National Irrigation Systems in the Philippines, and has sufficient experience, engineering capabilities and staff for executing the Project. The administration costs necessary for the execution of the Project are estimated at about Peso 4.06 million at the construction stage and Peso 2.73 million at the O & M stage. NIA will be able to prepare the budget prior to the Project, since the budget in 1993 was about Peso 2.72 million and additional costs for the Project are about Peso 1.34 million. Considering the past experience, engineering capabilities, staff, and budget, it was judged that no problems will occur in the construction works and O & M activities of the Project.

3-3-2 Plan of Operation

The Project consists of three components, namely, i) improvement of the irrigation facilities to increase agricultural productivities, upgrade farm income, activate 6 IAs and efficiently utilize water and land resources , ii) construction of the post-harvest facilities to improve farm income and activate 6 IAs, iii) procurement of equipment for the O & M activities of the irrigation and post-harvest facilities to ensure the benefits derived from the Project. The improvement of the irrigation facilities is composed of : i) improvement of the diversion dam, ii) improvement / rehabilitation of the irrigation canal structures, including rehabilitation of the O & M road, and iii) concrete lining of the main irrigation canal. The Project will greatly contribute to stable irrigated agriculture for farmers in the area, who are suffering from deteriorated/ flood-damaged irrigation facilities, water shortage in the dry season, and low farm income.

3-3-3 Outline of the Facilities and Equipment

The facilities and equipment which will be improved / constructed and purchased under the Project are summarized below:

Items	Contents
I. Improvement of the irrigation facilities	
1) Improvement of the diversion dam	Right bank protection works in the downstream
	Left bank protection works in the downstream
	Apron works in the downstream
	Riverbed protection works in the downstream
	Entrance works
2) Improvement / rehabilitation of the irrigation canal structures	Replacement of the gates for headgates and check structures
	Replacement of the gates for turnout structures
	Rehabilitation of the irrigation canal structures
	New construction of an irrigation canal structure
	Rehabilitation of the O & M road
3) Concrete lining of the main irrigation canals (10.7 km)	
II. Construction of the post-harvest facilities	Multipurpose pavement

Glass house
Paddy warehouse
Administration office
Equipment shed
Other relevant facilities

III. Procurement of equipment

1) For the O & M activities of the irrigation facilities

Automatic water level recorder (2 units)
Bulldozer (1 unit)
Loader / backhoe (1 unit)
Motorgrader (1 unit)
Spare parts

2) For the O & M activities of the post-harvest facilities

Portable dryer (2 units)
4-wheel farm tractor with attachment (2 units)
Cargo truck (2 units)
Forklift (2 units)
4-wheel drive car (1 unit)
Trailer (2 units)
Platform weighing scale (2 units)
Spare parts

3-3-4 Operation and Maintenance Plan

(1) Irrigation facilities

All of the irrigation facilities belong to NIA. The O & M activities of the irrigation facilities will be carried out by the Aganan RIS Office under the control of the NIA's Region 6 Office. The Aganan RIS Office will consist of four sections at the construction stage, namely, i) Engineering Project Implementation section, ii) Institutional Development section, iii) O & M section and iv) Administration section, as shown in Fig.4, and two sections at the O & M stage, namely, i) O & M section, and ii) Administration section. The operation of the irrigation facilities will be carried out by 6 Water Resource Facility (WRF) technicians, 2 WRF operators, and 15 WRF ditch tenders. Under the supervision of such technical staff, the member farmers of the 6 IAs will receive irrigation services.

Prior to irrigation in each cropping season, all of IAs will prepare a cropping schedule and water use plan, and submit them to the Aganan RIS Office. The Office will finalize them and inform IAs of the final water use plan. Before the commencement of irrigation, all the member farmers will remove sediment and weeds from the canals and clean all of the irrigation canals under the supervision of the Aganan RIS Office. The Project will make possible the double cropping of paddy once every four years. Irrigation Service Fee (ISF) is 100 kg of paddy / ha for wet season irrigation, and 150 kg of paddy / ha for dry season irrigation. If all of the farmers pay this ISF, the revenue will be 675,900 kg of paddy, equivalent to about Peso 4 million. The annual O&M cost of the Aganan RIS Office at the O & M stage is estimated at about Peso 2,733,000, consisting of Peso 2,413,000 for salaries/allowances and Peso 320,000 for materials, gasoline, electricity, laborers, repairs, etc.

(2) Post-harvest facilities

The post-harvest facilities also belong to NIA, but NIA will entrust the 6 IAs for with O & M of the facilities after completion of the facilities. The IAs will operate the post-harvest facilities under the supervision of NIA's Aganan RIS Office and Region 6 Office. NIA's Region 6 Office has operated the post-harvest facilities in the Jalaur and Suage RISs which are similar to the proposed facilities, and has long experience of O & M of post-harvest facilities. Therefore, no difficulties with O & M of the post-harvest facilities are foreseen.

The post-harvest facilities will be managed by a general manager, selected / approved by the federation of the 6 IAs. The organization of the post-harvest facilities will consist of an O & M section and Administration section as shown in Fig. 5. The collection, processing, and sale of paddy will be carried out under this organization. The annual O&M cost of the post-harvest facilities is estimated at about Peso 3,108,800 as shown below:

Salaries/allowances	1,468,800
Gasoline,oil,electricity etc.	123,000
Materials (bags, consumables etc.)	1,260,000
Repair of the facilities	200,000
Others	50,000
Total	3,108,800

In order to secure the above O & M cost by the organization of the post-harvest facilities, the organization will have to buy harvested paddy at Peso 5.071 / kg, and collect post-harvest service fee of Peso 0.271 per kg of harvested paddy from the farmers shown below. This means that farmers will earn Peso 4.8 / kg in net by selling paddy to the organization, and will get incremental benefit of about Peso 0.8 / kg owing to the proposed post-harvest facilities of the Project, since they sell paddy at Peso 4.0 / kg to middlemen at present. The average household with 2.1 ha of agricultural land in the area will earn about Peso 1,900 for wet season paddy as incremental benefit of the Project, and Peso 3,800 for the double cropping of paddy.

1) Annual total income of the organization by selling dried paddy
   4,863,000 kg x 2 times x Peso 6 / kg = Peso 58,356,000

2) Annual O & M costs : Peso 3,108,800

3) Post-harvest service fee (at harvested paddy) :
   Peso 3,108,800 ÷ (4,863,000 kg x 2 times ÷ 0.845) = Peso 0.271/ kg
   0.845 : conversion factor of paddy weight when the moisture content of harvested paddy is 25 % and impurity content of harvested paddy is 3 %.

4) Feasible buying price of harvested paddy from farmers
   { 1) - 2) } ÷ (4,863,000 kg x 2 ÷ 0.845) + 0.271= Peso 5.071 / kg
   0.845 : conversion factor of paddy weight when the moisture content of harvested paddy is 25 % and impurity content of harvested paddy is 3 %.

5) Increment of farm income (in the case of the single cropping of paddy)
   4,477 kg / ha x 2.1 ha x 1/4 x Peso (5.071-0.271-4.0) / kg = Peso 1,880
   4,477 kg /ha : Equivalent unit yield of 3,800 kg /ha in harvested paddy

3-4 Technical Cooperation

It is considered that the facilities and equipment to be provided by the Project are not special or complicated, and will be maintained in a good condition and managed in a routine manner by NIA and IAs. However, in order to smoothly carry out the O & M activities of the facilities, ensure the benefits derived from the facilities, and improve farm

income, the technical cooperation of the following three Japan Overseas Cooperation Volunteers (JOCV) is proposed :

1) Irrigation Engineer for the O & M activities of the irrigation facilities
2) Institutional Expert for strengthening IAs for the O & M activities of the post-harvest facilities
3) Horticulturist for advising and assisting farmers in vegetable cultivation in the area where no irrigation water is available in the dry season.

CHAPTER 4
BASIC DESIGN

4. BASIC DESIGN

4-1 Improvement of the Irrigation Facilities

4-1-1 Basic Design Conditions

The basic design of the irrigation facilities i.e., i) improvement of the diversion dam , ii) improvement / rehabilitation of the irrigation canal structures, and iii) concrete lining of the main irrigation canal, was conducted based on the following basic design conditions:

1) Climate, natural features, lifestyle, and other peculiarities prevailing in the Project area should be carefully considered and adopted for the basic design.

2) Considering the level of construction engineering, construction method, and laborers' skill in the Philippines, the designed facilities should be easily constructed and economical.

3) For easy maintenance of the facilities, locally available construction materials should be used as much as possible.

4) The irrigation facilities should be rehabilitated or improved in such a manner that they can suitably function with the existing facilities and present water management system.

5) The design criteria for the irrigation facilities should be NIA's and/or those of the Ministry of Agriculture, Forestry and Fisheries of Japan.

4-1-2 Improvement of the Diversion Dam

(1) Design concept

The design concept for the improvement of the diversion dam is as follows:

1) The diversion dam that has deteriorated and been damaged by floods should be improved so that the structural stability of the dam can be recovered and the intake function of the dam can be ensured for the irrigation of the Project area.

2) The dam consists of a weir, intake with gates, sluice with gates, bank protection in the upstream, bank protection in the downstream, apron in the downstream, riverbed protection in the downstream, and entrance to the dam site. Considering the degree of deterioration and flood damage, magnitude of importance, urgency, and budget, the design should be conducted for the bank protection in the downstream, apron in the downstream, riverbed protection in the downstream, and entrance to the dam site.

3) The first section of the main irrigation canal is located on the right bank of the dam. The canal is in danger of destruction, since the right bank has been eroded by floods. In order to protect the canal from the erosion and stabilize it, the right bank protection of the diversion dam should be strengthened.

4) The right bank protection of the diversion dam will be partly finished by NIA under the Irrigation Operation Support Project (IOSP) - II fund prior to the improvement works. The basic design should be conducted in consideration of the design of the preceding works.

5) The bank protection works will consist of a reinforced concrete retaining wall and slope protection by plain concrete. The retaining wall should be provided for the seriously damaged portion of the right bank, and the other bank should be rehabilitated by the plain concrete slope protection.

6) The design should be conducted based on the results of the topographic survey and drilling works which were conducted during the field survey period.

(2) Study and examination of the design conditions

1) Design flood discharge

Since no flood or runoff data for the Aganan river are available, the design flood discharge is estimated at 1,500 m3/sec, by considering the farmers' flood memory, flood marks, rainfall data, drainage area, and NIA's flood discharge for the existing dam. The coefficient of roughness of the river is 0.030 and coefficient of overflow is 1.70. The estimated flood elevation is EL 37.5 m in the upstream of the dam and El 34.10 m in the downstream of the dam.

2) Main dimensions of the diversion dam

The main dimensions of the diversion dam are listed below:

Apron length	L= 19.5 m (by Bligh's formula)
Thickness of the apron	T = 1.00 m in the upstream and 0.75 m in the downstream (by empirical formula)
Length of the river protection	L = 70 m (by Bligh's and Lane's formulas) Concrete blocks 50 m, Gabions 20 m
Unit weight of the concrete blocks	3 ton / piece (by empirical formula)

3) Basic plan

The basic plan for the improvement of the diversion dam is shown below:

	Items	Features
1.	Right bank protection works	
	Type	Reinforced concrete T-shaped retaining wall & plain concrete slope protection
	Height	Retaining wall : 3.7-6.25 m Slope protection: 6.25 m
	Length	Retaining wall : 62 m Slope protection: 49 m
	Steel sheet pile (type-II)	110 m
2.	Left bank protection works	
	Type	Plain concrete slope protection
	Height	5.5 m
	Length	98 m
	Steel sheet pile (type-II)	50 m
3.	Apron works	
	Type	Reinforced concrete (EL 27.85 m-EL 29.40 m) Plain concrete (EL 33.35 m)
	L x B x t	19.5 m x 71.5 m x 1.0 m to 0.75 m (Reinforced concrete) 10 m x 132 m x 0.5 m (Plain concrete)
	Steel sheet pile (type-II)	144 m

4.	River bed protection works	
	Type	Concrete blocks (4,440 m^2)
		Gabions (1,440 m^2)
	Steel sheet pile (type-II)	114 m
5.	Entrance works	
	Gate	1.5 m x 1.8 m x 2
	Access	4 m wide x 170 m long
	Others	Repair of the operation deck and steps, etc.

4-1-3 Improvement / Rehabilitation of the Irrigation Canal Structures

(1) Design concept

The design concept of the improvement / rehabilitation of the irrigation canal structures is given below:

1) The irrigation canal structures which have deteriorated or been damaged, should be rehabilitated so that such structures can function under proper water management.

2) The irrigation canal structures which are not provided at present but are required for proper water management , should be constructed.

3) The O & M road provided on either side of the canal, which has deteriorated and is not passable, should be rehabilitated so that the NIA 's staff and farmers can use them for O & M of the irrigation facilities and agricultural activities, respectively.

(2) Study and examination of the design conditions

1) Design water requirement

The design water requirement of paddy is estimated at 1.5 lit / sec /ha by applying the following NIA formula.

$$WR = \{ (Et + P - Re) + Fw + Dl \} \div C$$

where,

WR : Water requirement of paddy
(In the case of Re=0, WR is 13 mm /day or 1.50 lit /sec /ha)

Et : Evapotranspiration (6 mm / day)
P : Percolation (2 mm / day)
Re : Effective rainfall (Monthly rainfall data of Iloilo airport)
Fw : Farm waste
Dl : Distribution loss
Fw + Dl = (Et + P) x 0.30 = 2.4 mm / day
C : Conveyance efficiency (80 %)

Based on the above requirement and average monthly intake discharge for 1983-1993, a balance sheet of water available at the intake site was made as shown in Table 3. As a result, the present irrigation areas in the wet season and dry season are estimated at 4,863 ha and 1,123 ha, respectively.

2) Hydraulic formula and hydraulic conditions

The hydraulic formula and hydraulic conditions applied to the basic design for the improvement / rehabilitation of the irrigation canal structures are as follows:

Hydraulic formula

$$Q = A \times V \qquad V = 1/n \times R^{2/3} \times I^{1/2}$$

where,

Q : Discharge (m3 / sec)
V Mean velocity (m / sec)
A : Cross sectional area (m2)
n : Coefficient of roughness
R : Hydraulic radius
I : Hydraulic gradient

Hydraulic conditions

Items	Earthen Canal	Concrete Canal
Allowable velocity (m / sec)	0.4 -0.9	0.4 -2.0
Coefficient of roughness	0.025	0.018
Freeboard (m)	0.5	0.5
Inner slope	1: 1.5	1: 1.5
Outer slope	1: 1.5	1: 1.5

3) O & M road

The O & M roads provided on the main and lateral canals are almost in a good condition and only the O & M road provided on Lateral canal A has deteriorated for a length of 1.7 km. The design criteria for a width of the O & M road are as follows:

Items	Discharge (m3/sec)	Road Width (m)	Berm Width (m)
Main canal	10-5	6	2.5
	5-3	6	2.0
	3-1	4	1.5
	1-0.3	4	1.0
Lateral canal A	2-1.5	3.5	1.5

(3) Basic plan

The basic plan for the improvement / rehabilitation of the irrigation canal structures is as follows:

Items		Features
1.	Replacement of the gates for headgates and check structures	
	Type	Steel slide gate with bevel gear or screw gear
	Size of gates	0.9 m x 0.9 m - 1.5 m x 1.5 m
	Nos. of gates	11 sets for the main irrigation canal (with bevel gear)
		1 set for lateral canal B (with screw gear)
		1 set for lateral canal D (with screw gear)
2.	Replacement of the gates for turnout structures	
	Type	Steel plate slide gate
	Size of gates	0.46 m x 0.35 m & 0.60 m x 0.60 m
	Nos. of turnouts	6 sets for the main irrigation canal
		4 sets for lateral canal A-2
		11 sets for lateral canal B
		1 set for lateral canal D
3.	Rehabilitation of the irrigation canal structures	
	Structures	Thresher crossing with check (lateral canal A-2)
		Check with drop (lateral canal B)

4. New construction of an irrigation canal structure

Structure	Thresher crossing with check (lateral canal A-2)

5. Rehabilitation of the O & M road

Road	O & M road of lateral canal A
Length	1.7 km (3.5 m wide)
Pavement	Gravel pavement (20 cm thick)

4-1-4 Concrete Lining of the Main Irrigation Canal

(1) Design concept

The design concept for the concrete lining of the main irrigation canal is as follows:

1) The concrete lining should be made in order to decease the water loss by conveyance and seepage through the earthen canal, since farmers suffer from water shortage in the dry season.

2) The water to be saved by the concrete lining should be used for increasing the irrigation area in the dry season. When the main canal is concrete-lined, the conveyance efficiency should be 90 % . The irrigation area in the dry season would be 1,264 ha an increase of 141 ha, in comparison with that of "Without Project" as shown in Table 3.

3) When the earthen canal is concrete-lined, the cross sectional area of the concrete-lined canal should be theoretically smaller than that of the earthen canal, since the coefficient of roughness for the concrete-lined canal is smaller than that for the earthen canal. However, if the earthen canal is theoretically concrete-lined under the Project, the works will require a huge amount of embankment material for inside the canal to make a smaller cross sectional. The embankment works will be very costly since there are no suitable soils for the embankment in and around the Project area, and transportation of the soils and treatment of the soils, such as drying, stockpiling, and mixing are required. Considering the budget and present operation method of the irrigation canals , the earthen canal section for concrete-lining should be, in principle, formed by cutting the canal. Embankment works inside the canal should be avoided as much as possible. The concrete-lined canal will have a larger flow capacity than required.

4) The water level and discharge in the canal should be controlled by gates as is the case at present.

5) In order to protect the concrete-lined canal, under-drains and side-drains should be provided under the lining panels of the concrete.

(2) Study and examination of the design conditions

The design water requirement, hydraulic formula, and hydraulic conditions should be the same as those shown in 4.1.3. The thickness of the concrete lining should be as follows:

Items	Discharge (m3/sec)	Canal Base Width (m)	Thickness (cm)
Main canal	10-3	more than 4 m	10
	3-0.3	less than 4 m	8

(3) Basic plan

The basic plan for the concrete lining of the main irrigation canal is as follows:

Items	Features
Concrete lining	
Canal	Main irrigation canal
Concrete-lined part section	Base and both side slopes of the trapezoidal canal
Length	10.2 km
Thickness	8 - 10 cm

4-2 Construction of the Post-Harvest Facilities

4-2-1 Basic Design Conditions

The basic design conditions for the construction of the post-harvest facilities are as follows:

1) Climate, natural features, lifestyle, architectual style and other peculiarities prevailing in the Project area should be carefully considered and adopted for the basic design.

2) The O & M cost should be minimized by using natural ventilation, natural lighting, and sunlight effectively.

3) Considering the level of construction engineering, construction method, and laborers' skill in the Philippines, the facilities should be easily constructed and economical.

4) For easy maintenance of the facilities, locally available construction materials should be used as much as possible.

5) The post-harvest facilities of the Project should include multipurpose pavement (concrete floor for drying), glass house, paddy warehouse, administration office, and equipment shed. Construction of rice mill should not be included in the post-harvest facilities under the Project, since there are many rice mills in and around the Project area.

6) The design capacity of the post-harvest facilities is 1/4 of the paddy produced in the Project area as shown in 3.2 (2).

4-2-2 Design of the Post-Harvest Facilities

(1) Site plan

The post-harvest facilities site is located about 4 km south of San Jose along Provincial Road No. 319 as shown in the attached general layout of the irrigation facilities. The site is almost in the center of the Project area, and is convenient for the operation of the post-harvest facilities. Since the site is now paddy fields, the surface soil, which is unsuitable for the foundations, should be removed. Soils suitable for the foundation should be placed and the embankment should be constructed. On the embankment, the post-harvest facilities should be constructed. The area necessary for the construction of the post-harvest facilities is 1.21 ha (110 m x 110 m), while the effective area is 1 ha (100 m x 100 m).

When the foundation is constructed, the following method should be applied:

1) The embankment, by mechanical compaction, should be completed before the wet season.

2) The embankment should undergo rainfall in the wet season to cause natural compaction.

3) After the natural compaction, mechanical compaction should be carried out.

4) All the excess water from the embankment should be drained to the nearest natural stream.

(2) Layout plan

By considering the location of the road, function of the facilities and natural conditions, the layout plan of the post-harvest facilities was completed. The following points were examined when the layout plan was drawn up.

1) The entrance should be located facing the Provincial Road No.319 and only one entrance should be built in order to minimize the cost and maintain easy security control.

2) The paddy warehouse should be located in a convenient place for bringing in and taking out paddy.

3) The multipurpose pavement should be placed so that solar energy can be used to the maximum extent.

4) The multipurpose pavement should have a road on all four sides for easy spreading and collection of paddy.

5) The administration office and equipment shed should be located near the entrance for the convenience of the office staff.

6) The glass house should be located nearby the multipurpose pavement so that the movement of paddy from the pavement to the glass house and from the glass house to the pavement can be easily conducted when it starts to rain.

(3) Facility plan

The capacities of the multipurpose pavement, glass house, paddy warehouse, administration office, and equipment shed were determined based on the following conditions:

1)	Unit yield of paddy	: 4.0 tons/ha of dried paddy (The present yield is 3.8 tons/ha. Some future increase in the yield is included.)
2)	Amount of paddy to be processed under the Project	: 1/4 of paddy produced in the wet season 4,863 ha x 4 tons/ha x 1/4 = 4,863 tons 97,260 bags in total (1 bag = 50 kg)
3)	Amount of paddy to be processed per day	: Harvest period is 60 days. 4,863 tons ÷ 60 days = 81 tons/day Since harvested paddy includes water (25 %) and impurities (3%), 81 tons/day in dried paddy comes to 98 tons/day in harvested paddy, equivalent to 122 m^3/day.

The determined capacities of the post-harvest facilities are as follows:

Facilities	Capacities	Basic values / Computation
1. Multipurpose pavement	450 m^2 x 4 = 1,800 m^2	Spreading thickness is 13.5 cm. Two days are necessary for one drying batch. 122 m^3÷ 0.135 m x 2 days=1,807 m^2
2. Glass house	250 m^2 x 2 = 500 m^2	Piling of paddy is done in four layers. 1,800m^2 ÷ 4 = 450 m^2 Working space of 50 m^2 is added.

3.	Paddy warehouse	750 m^2 x 2 = 1,500 m^2	Max.storage capacity is 1/2 of dried paddy. Max. piling is 20 bags. 1bag: 0.8m x 0.5m x 0.5m = 0.2m^3 Efficiency of floor use is 2/3. 97,260 bags÷ 2 x (0.5 m x 0.8 m)÷20 bags÷2/3=1,460 m2
4.	Administration office	120 m^3	
	Office	64 m2	16 persons x 4 m^2 =64 m^2
	Meeting room	20 m2	8 persons x 2.5 m^2=20 m^2
	Store room	10 m2	Minimum space
	Entrance hall	10 m2	Minimum space
	Corridors	6 m2	Minimum space
	Toilets etc.	10 m2	Minimum space
5.	Equipment shed		
	With roof	100 m^2	6 units x 3.2 m x 5 m= 96 m^2
	Without roof	81 m^2	5 units x 3.2 m x 5 m= 80 m^2

(4) Structural plan

The basic design of the post-harvest facilities was conducted by referring to the design standards of buildings in the Philippines and/or Japan. The foundation and structures of the facilities are as follows:

	Facilities	Foundation	Structure
1.	Multipurpose pavement	Concrete slab	Concrete slab
2.	Glass house	Concrete individual footing	Steel structure
3.	Paddy warehouse	Concrete individual footing	R.C. & steel structure
4.	Administration office	Concrete continuous footing	Concrete block struct.
5.	Equipment shed	Concrete individual footing	R.C. & steel structure

In order to select the finishing materials for the proposed facilities, the following items were considered:

- Durability, corrosion resistance and waterproofing
- Easy maintenance
- Philippines' customs, conventions, and standards for post-harvest facilities

- Concrete pavement on the road in the post-harvest facilities because of the economical O & M cost, easy maintenance, and sand / dust prevention

(5) Supporting facilities

1) Basic design condition

The supporting facilities such as the power supply system, water supply system, drainage system, and ventilation system were determined, by considering the activities in the proposed facilities, and those in similar facilities in the Philippines. The principles for the design are as follows:

- Economical and energy saving
- Ease of operation and safety
- Easy maintenance and repair

2) Power supply system

Power	: 3-phase, 240 V, 60 Hz
Power supply	: from the existing distribution line (by NIA)
Power sources	: ILECO-I or other authorities
Power facilities	: Indoor & outdoor lighting, motor power supply for pump etc.

3) Water supply / drainage system

Water source	: New tubewell in the site
Water supply system in the site	: from an underground reservoir to an elevated water tank lifted by pumping
Water treatment	: none
Drainage system	: Surface water is drained to a ditch and natural stream. Waste is disposed in a septic tank.

4) Ventilation system

Ceiling fans	: Installed in the office
Ventilators	: Installed in the toilets
Roof ventilators	: Installed in the paddy warehouse

4-3 Procurement of the Equipment

The necessary equipment for O & M of the facilities is classified into two parts: i) equipment for O & M of the irrigation facilities and ii) equipment for O & M of the post-harvest facilities. The selection of the equipment was based on the following considerations:

- Economical and energy saving
- Ease of operation and safety
- Easy maintenance and repair

The proposed equipment and specifications are as follows:

1) Equipment for the O & M activities of the irrigation facilities

	Item	Unit	Specifications
1.	Automatic water level recorder	2	Battery type
2.	Bulldozer	1	Swamp type, 11 tons, 105-114 HP
3.	Loader / backhoe	1	Wheel type, 0.5-0.8 m^3, 50-60 HP
4.	Motorgrader	1	Blade width 3.1 m, 110-135 HP
5.	Spare parts	Lump Sum	

2) Equipment for the O & M activities of the post-harvest facilities

	Item	Unit	Specifications
1.	Portable dryer	2	2 tons
2.	4-wheel farm tractor with attachment	2	Wheel type, diesel, 70-85 HP, attachments: disc harrow, front-blade, rotavator disc plow, seeder, paddy-wheel
3.	Cargo truck	2	Diesel, 2 tons
4.	Forklift	2	Diesel, 1 ton
5.	4-wheel drive car	1	Diesel
6.	Trailer	2	Towed type, 1 ton
7.	Platform weighing scale	2	100 kg
8.	Spare parts	Lump Sum	

4-4 Implementation Plan

4-4-1 Implementation Method

The executing agency of the Project is NIA as described in 3-3-1. The works covered under the Japanese Grant Aid will be executed by a Japanese contractor selected through competitive bidding, and the construction supervision will be rendered by the Japanese consultant. The construction will be carried out with the cooperation of NIA, other government agencies, and the 6 relevant IAs.

The general construction materials will be mostly procured in the Philippines. Special construction materials, such as the sheet piles, elastic filler, corking materials, water gauge staff, etc. will be imported from Japan. Most of the required construction equipment is available on the lease system in the Philippines. However, the concrete batching plant and crushing plant will be imported from Japan since those available in the Philippines do not meet the construction requirements of the Project.

The concrete aggregates, such as sand and gravel, and other natural materials required for construction will be procured through local suppliers near the Project area.

The climate of the Philippines is divided into the wet season and dry season. In the wet season from June to November, the structural works will be concentrated on, and the earth works will be executed in the dry season from December to May. The annual workable days are estimated at 164 on the basis of the annual rainfall, soil conditions, and national/local holidays in the Project area.

The construction works required for the Project are scattered over the Project area. However, each of them can be executed separately without any limitation on the construction sequence of the respective facilities. All of the Project component works will be executed in parallel.

4-4-2 Conditions of Construction

The construction works will be carried out based on the following conditions:

1) The improvement works for the diversion dam will be carried out , by paying attention to flooding in the wet season. The important works will be the construction of the retaining wall for the right bank, the apron and riverbed protection works by the concrete blocks and gabions. These works will be carried out in the dry season and the other works will be done in the wet season.

2) In order to maintain the quality of the works and carry them out smoothly the construction works, improvement / rehabilitation of the irrigation canal structures, and concrete lining works will have to be done without any water in the canals. During the period of improvement / rehabilitation of the irrigation canals and structures, the intake gates of the diversion dam should be closed, thus no irrigation water enters the canals, in cooperation with all of the IAs.

3) The only access to the construction sites in the Project area will be the O & M roads of the irrigation canals. During the construction period, heavy traffic by the contractor is anticipated and traffic control will be necessary, in cooperation with all of the IAs.

4) The Project requires some embankment works. However, most of the soil material in and around the Project area is silt and clay with a high moisture content and there are few soils suitable for the embankment. Therefore, solar drying, stockpiling and mixing of the soils will be necessary.

5) A lot of excavated materials will be produced under the concrete lining works. A temporary stockyard and soil disposal area for such soils will be necessary.

6) There are many crossing facilities over the irrigation canals which are owned by farmers, such as logs, planks, etc. Since these facilities will be a hindrance to the construction works, farmers will withdraw them before the construction works at their own cost.

7) For power supply system of the post-harvest facilities, NIA should provide a power source from the existing distribution lines of ILECO-I or the other authorities.

8) The contractor's office and consultant's office will be installed as the construction office on the land along Provincial Road No.300 as shown in the basic design drawings.

4-4-3 Construction and Supervisory Plan

(1) Detailed design and tender works

Prior to the implementation of the Project, the detailed design and tender works will have to be carried out. Immediately after the conclusion of the Exchange of Notes (E/N), the consulting services agreement will be contracted with NIA, and the consultant will start the detailed design. The consultant should discuss with NIA at the detailed design stage, the design and implementation schedule of the works. NIA is requested to acquire the land required for the construction of the Project facilities, temporary construction office , soil disposal area, and temporary stock yards, and to collect other necessities prior to the commencement of the Project works. For the electric power supply to the post-harvest facilities, the required arrangements, through discussions with ILECO-I and the other authorities concerned should be conducted to avoid any difficulties with their operation at the completion of the works.

The works involved in the detailed design are as follows:

1) Additional investigation / survey
   - Topographic survey of the post-harvest facilities site
   - Topographic survey of the entrance to the diversion dam site
   - Soil mechanical survey of the embankment materials
   - Geological survey of the post-harvest facilities site
     including a pumping-out test in the post-harvest facilities site
   - Concrete tests

2) Detailed design
   - Review of the basic design through the additional investigation / survey
   - Review of the Project cost through the detailed design

3) Preparation of the tender documents
   - Preparation of the tender drawings
   - Preparation of the tender documents for the construction works and supply of equipment and materials to be granted

The tender for selection of a contractor for the construction works will be conducted after approval from NIA of the tendering process. The first step is the pre-qualification tender, and notice of this will be published in the major daily newspapers on construction and the economy in Japan on behalf of NIA.

The pre-qualification documents will be distributed by the consultant to the tenderers and the tender documents will be distributed by the consultant to the pre-qualified tenderers.

The quoted tenders will be received by the consultant and opened in the presence of the representatives of NIA. After the opening, the tender evaluation will be carried out by the consultant in collaboration with the representatives of NIA, and the draft contract will be prepared by the consultant based on the tender evaluation result.

(2) Construction supervision

Once the contract has been concluded for the construction works, the consultant will clarify the construction methods and time schedule in discussions with the contractor. The resident engineer of the consultant will be assigned to supervise the construction works with the commencement of the construction, and will regularly report on the work progress to both JICA Philippines office and NIA. The resident engineer of the consultant will also coordinate the agencies concerned with the Project, including the contractor, to smoothly implement the Project.

Since the Project comprises many kinds of work components, the consultant's construction engineers, in addition to the resident engineer, will be assigned to supervise the construction works for the irrigation facilities and post-harvest facilities.

Through these arrangements, the Project works will be completed on schedule with sufficient results.

The scope of the construction supervision is outlined below:

1) Evaluation and approval of the construction drawings
   Evaluation and approval of the construction drawings, application for commencement of the works, sample of materials, specifications of the equipment, etc. submitted by the contractor

2) Construction progress and quality control
Checking and guidance on the construction plans and time schedules ; progress and quality control of the construction works and necessary inspection of the construction methods

3) Approval of the payments to the contractor
Checking and evaluation of the performance of works necessary for issuing payment certificates and completion certificates to the contractor

4) Report on the construction progress
Regular reporting to and discussing with NIA and agencies concerned of GOJ on the construction progress to ensure smooth execution of the works

5) Handing-over of the completed facilities
Attendance at the handing-over of the completed facilities to NIA after confirming the completion of the works and fulfilment of the contract.

4-4-4 Procurement Plan

Of the equipment and materials necessary for the construction works, those available in the Philippines will, in principle, be procured from the local market. However, the equipment and materials for which procurement is not so easy because of different specifications, limited quantity in the market, difficulty of timely procurement, etc., will be imported from Japan. The major materials to be imported from Japan are sheet piles, elastites, corking materials and water gauge staffs. The common materials for the construction works such as cement, reinforcing steel bars and structural steel are purchased in the local market. In principle, special construction machinery is not necessary. Concerning the necessary equipment, those available in the local market will be rented and the other equipment of which the quality, condition and/or specifications do not satisfy the requirements, will be imported from Japan. The main construction equipment to be imported from Japan are concrete batching plant and crushing plant.

The equipment and materials imported from Japan will be unloaded at the Manila sea port, and transported by local ships to the Iloilo sea port and by trucks from there to the Project area. The period necessary for the transport of the equipment and materials from Japan to the Project area is estimated to be two (2) months, including marine transport, customs clearance at the Manila sea port and inland transport in the Philippines.

4-4-5 Implementation Plan

After conclusion of E/N between GOJ and GOP, the consulting services agreement will be immediately signed with NIA. The detailed design will be performed by the consultant in a period of 1.5 months in the Philippines including the additional investigation / survey, and in a period of 2.5 months for the detailed design in Japan including preparation of tender documents, which is followed by the pre-qualification, tender, tender evaluation, and contract for the construction works. The construction period is set to be 12 months.

The implementation schedule for the Project is shown in Fig. 6.

The works to be done by the Philippine side are summarized below:

1) Supply of data necessary for the detailed design
2) Land acquisition required for the construction works
3) Land compensation required for the construction office, borrow area, disposal area, and temporary stock yard
4) Arrangement for supply of electric power required for the post-harvest facilities
5) Assurance of prompt unloading and custom clearance at ports of disembarkation in the Philippines and internal transport of the equipment, materials, vehicles, tools, and spare parts necessary for the Project works
6) Banking arrangement for payments, issuance of Authorizations to Pay, and bearing all expenses on such arrangements
7) Permission for Japanese nationals to enter and stay in the Philippines and other necessities for the performance of their works under the verified contracts
8) Exemption of Japanese nationals from custom duties, internal taxes, and fiscal levies which may be imposed in the Philippines with respect to the supply of products and services under the verified contracts
9) Assurance of the operation and maintenance of the facilities, plant, and equipment constructed or installed under the Grant and their proper and effective use for the Project
10) Bearing all the expenses, other than these covered by the Grant, necessary for the Project

CHAPTER 5
PROJECT EVALUATION AND CONCLUSION

5 PROJECT EVALUATION AND CONCLUSION

5-1 Project Benefits

The direct Project benefits are : i) improvement of agricultural productivity, ii) improvement of farm income, iii) activation of IAs, and iv) efficient use of water and land resources; and the indirect benefits are : i) support of the implementation of the NIA's Corporate Plan (1993-2002), ii) contribution of rice production in the Philippines to the attainment of rice self- sufficiency, and iii) activation of rural social and economic activities. The present conditions and problems in the Project area, countermeasures against such problems under the Project, and beneficiaries/benefits of the Project are listed below:

	Present Conditions and Problems	Countermeasures	Beneficiaries/ Benefits
1	Increase in rice production is one of GOP's national targets. NIA is endeavouring to attain the target by implementing the Corporate Plan (1993-2002). However, it is apprehended that the Plan will not be attained due to the shortage of budget.	Improvement of the irrigation facilities	Contribution to the implementation of the NIA's Corporate Plan
2	National irrigation systems, such as ARIS and JRIS in Iloilo province are very important in view of the national food supply strategy of the Philippines. However, irrigation facilities of ARIS have deteriorated and been damaged by floods, and proper water management cannot be conducted.	Improvement of the irrigation facilities	The Project will make ARIS a stable food supply base for about 23,300 tons of rice per year and contribute to the national food supply program. The Project will provide improved and rehabilitated irrigation facilities and contribute to the improvement of farm income for about 12,600 beneficiaries (2,300 families)
3	The quantity of water in the Aganan river is limited in the dry season. For improvement of farm income, efficient use of water and land resources is urgently required. Irrigation water in the dry season is used in the upstream area,water use in the downstream area will increase conveyance and seepage loss of the water. In order to solve such problems, concrete lining is required.	Concrete lining of the main irrigation canal (about 10.2 km) under improvement of the irrigation facilities	The Project will make possible the activation of 6 IAs and impartial water use to the 6 IAs. The Project will also promote the efficient use of water and land resources. The irrigation area in the dry season will increase by 141 ha, and the double cropping of paddy once every four years will be possible. About 530 tons of rice per year will be increased and the farm income will be increased.

	Present Conditions and Problems	Countermeasures	Beneficiaries/ Benefits
4	Since there are no drying and storage facilities owned by farmers in the area, they are forced to sell to middlemen about 60 % of paddy soon after harvest at Peso 4 / kg. If the harvested paddy is dried and sold to the middlemen, the price will be Peso 6 / kg. Farmers require their own post-harvest facilities to improve their income.	Construction of the post-harvest facilities	The Project will increase farm income by Peso 1,900-3,800 per household per year. Since the facilities are operated by IAs, cooperation of the 6 IAs will be strengthened, and this will reflect on the conduct of impartial water management.
5	ARIS has been operating for 70 years. The farmers are willing to improve traditional methods and upgrade their farm income by adopting new irrigation management, farming practises, and operation of the post-harvest facilities. For this purpose, improvement of the irrigation facilities and construction of post-harvest facilities are badly required.	Improvement of the irrigation facilities and construction of the post-harvest facilities	The Project will provide agricultural infrastructure to activate IAs and improve agricultural productivities. If farmers improve their agricultural productivity by utilizing the BPI's extension services, carrying out engineering based-irrigation, making efforts in the selection of seed / fertilizers, and the weeding and insect prevention , unit yield of paddy will increase from 3.8 tons/ha to 4.5 tons/ha. Then, about 4,800 tons of rice will be increased in the area, and farm income also will be increased by at least 20 %.
6	The O & M road provided on either side of the irrigation canals are important for the O & M activities of the irrigation facilities, agricultural activities and rural life. Because of the deteriorated road, proper O & M cannot be carried out and some farmers in the Project area suffer from the suspension of traffic.	Rehabilitation of the O & M road under the improvement of the irrigation facilities	The Project will rehabilitate the O & M road, and make possible proper O & M activities and rural and social activities of the farmers.

5-2 Justification of the Project Implementation

The implementation of the Project under the Grant Aid is judged viable for the following reasons:

1) The major beneficiaries are the general people including the poor class in Aganan RIS, who are suffering from the deteriorated irrigation facilities, water shortage in the dry season, and low farm income. The population which will directly benefit from the improvement of the irrigation facilities and construction of the post-harvest facilities, will be at least 12,600.

2) The diversion dam which is the most important structure in Aganan RIS, has been damaged by floods and people fear the destruction of the main irrigation canal. The Project will remove such fear from the farmers' minds and insure improved / rehabilitated irrigation facilities necessary for the agricultural activities of the farmers.

3) The Project will activate IAs in the area, the rural economy, and social development.

4) NIA is the executing agency of the Project in the Philippines, which has much experience of irrigation projects financed by not only local funds but also foreign funds. NIA is capable of carrying out the O & M activities of the facilities using its own budgets, personnel, and engineering knowledge. There will be no problems with the implementation of the Project even under the Japanese Grant Aid System.

5) It is expected that the Project will contribute to the accomplishment of the Philippines' Medium Term Development Plan (1993-1997) through the NIA's Corporate Plan. The objectives of the Project are to improve / rehabilitate the irrigation facilities and construct the post-harvest facilities, not to earn commercial profits. Therefore, the Project is suitable for the Grant Aid concept.

5-3 Conclusions and Recommendations

After the field survey in the Philippines and analyses in Japan, it was concluded that the implementation of the Project was suitable for Japan's Grant Aid, because the Project will significantly contribute to rice self-sufficiency, improvement of farmers' living standards, and activation of rural social and economic activities in line with the objectives of the nationwide development plans and in addition to the direct and indirect benefits already described. Furthermore, the O & M capability of the Philippines is high and there are no problems with the finances, manpower, and engineering know-how of GOP.

For the smooth implementation and O&M of the Project, it is recommended that the Philippine side takes the following actions immediately :

1) Acquisition of land for the construction, office, temporary stockyard, quarry sites, borrow pits, and soil disposal areas in advance of the commencement of the construction

2) Completion of a power supply system to the post-harvest facilities to be undertaken by GOP

3) Budgetary and administrative arrangements for the Project implementation and O & M

4) Conclusion of the agreement on the following matters with the 6 IAs:
   - Farmers' cooperation with the construction works
   - No water use from the irrigation facilities during the construction period
   - Impartial water use by the 6 IAs
   - O & M of the post-harvest facilities by the 6 IAs

TABLES & FIGURES

Table 1 Meteorological Condition in and around the Project Area

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Temperature (℃)*													
Mean	26.0	26.6	27.9	28.1	29.2	28.0	27.5	27.3	27.4	27.3	27.0	26.5	27.4
Relative Humidity (%)*													
Mean	85.7	82.5	79.5	77.9	78.4	84.3	88.2	88.6	88.6	88.7	87.8	86.3	84.7
Wind Velocity (km/hour)*													
Mean	6.9	6.3	6.5	5.3	3.8	4.1	3.6	5.3	3.5	3.2	4.2	5.0	4.8
Rainfall (mm)**													
Mean	55.2	24.9	29.6	46.6	111.1	280.4	340.5	381.3	277.4	270.7	183.4	81.1	2,082.2

* BPI West Visayas Experiment Station
** Iloilo Airport

Table 2 Environmental Check List

(Irrigation Facilities)

Check Item		Judgment of Effect				Problems	Action and Countermeasures	Remarks
		Serious	Little	None	Not clear			
Pollution	1. Air pollution caused by the operation of facilities			x				No environmental problems have been caused by the past 70 years operation of the project.
	2. Effect on aquatic organisms, fisheries and other water utilization changes in water system resulting from the project			x				It has been strictly prohibited to take gravels and sands in the Aganan river to prevent lowering of the river bed.
	3. Water pollution and soil contamination caused by drainage from the facilities and the project sites			x				
	4. Noise and vibration around the facilities			x				
	5. Subsidence, etc. caused by the project			x				
Natural Environment	1. Effect on the ecology caused by operation of the facilities			x				
	2. Effect on landscape			x				
Human Environment	1. Effect on the historical and cultural heritage caused by construction and operation of facilities			x				There is no cultural and historical heritage in and around the project area.
	2. Effect on the existing social infrastructures			x				
	3. Effect on relocation of people in the project area			x				
Others	1. Effect on environment during construction period		x			Operation of crushing plant and driving piles will cause noise and vibration. Muddiness of river water will be caused by the construction.	During construction period, the monitoring will be done.	Crushing plant will be installed in the area with few houses, and driving piles will be done in the river bed where there are no houses. Muddiness of the river water is less than that caused by flood and it will happen only in short time. Furthermore, there is no water use plan in the downstream of the project area. Considering these matters, the effect is very little.

(Post-Harvest Facilities)

Check Item		Judgment of Effect				Problem	Action and Countermeasures	Remarks
		Serious	Little	None	Not clear			
Pollution	1. Air pollution resulting from post-harvest activities			x				There is no facilities which causes pollution, since the post-harvest facility consists of drying area by solar energy and warehouse.
	2. Soil pollution resulting from post-harvest activities			x				
	3. Noise and vibration resulting from post-harvest activities							
	4. Lowering of groundwater table			x				
Natural Environment	1. Effect on construction and operation of the facilities on the ecology			x				
	2. Effect on landscape			x				
Human Environment	1. Effect on the historical and cultural heritage caused by construction of the facilities			x				There is no cultural and historical heritage in and around the project area.
	2. Effect on existing existing infrastructures			x				
	3. Effect on other water users			x				
Others	1. Effect on environment during construction period			x				There is no houses in and around the proposed site for the post-harvest facilities.

Table 3 Water Balance of Water Requirements and Diversion Water at the Intake

	J	F	M	A	M	J	J	A	S	O	N	D
Wet season paddy												
1 Puddling area					0.188	0.250	0.063					
2 Planted area					0.063	0.500	0.938	0.938	0.500	0.063		
3 Puddling water (150 mm): mm/day					1.875	2.500	0.625					
4 Crop water req.(8 mm/day): mm/day					0.500	4.000	7.500	7.500	4.000	0.500		
5 3+4 : mm/day					2.375	6.500	8.125	7.500	4.000	0.500		
6 Effective rainfall: mm/day					3.584	9.347	10.983	12.300	9.247	8.732		
7 Farm water requirement, ((5-6)x1.3) : mm/day					0.000	0.000	0.000	0.000	0.000	0.000		
8 Diversion water requirement (7/0.8/8.64) :lit/sec/ha					0.000	0.000	0.000	0.000	0.000	0.000		
Dry seasoon paddy												
1 Puddling area										0.047	0.125	0.078
2 Planted area	1.000	0.750	0.250							0.016	0.375	0.859
3 Puddling water (100 mm): mm/day										0.625	1.667	1.042
4 Crop water req.(8 mm/day): mm/day	8.000	6.000	2.000							0.125	3.000	6.875
5 3+4 : mm/day	8.000	6.000	2.000							0.750	4.667	7.917
6 Effective rainfall: mm/day	1.781	0.889	0.955							8.732	6.113	2.616
7 Farm water requirement, ((5-6)x1.3) : mm/day	8.085	6.644	1.359							0.000	0.000	6.891
8 Diversion water requirement (7/0.8/8.64) :lit/sec/l	1.170	0.961	0.197							0.000	0.000	0.997
Available water at intake : lit/sec	632	392	170	385	3,071	3,025	2,640	2,573	2,923	2,065	2,176	1,120
Irrigable area : ha (Present)	540	408	865		4,863	4,863	4,863	4,863	4,863	4,863	4,863	1,123
Irrigable area : ha (With Project)	608	459	973		4,863	4,863	4,863	4,863	4,863	4,863	4,863	1,264

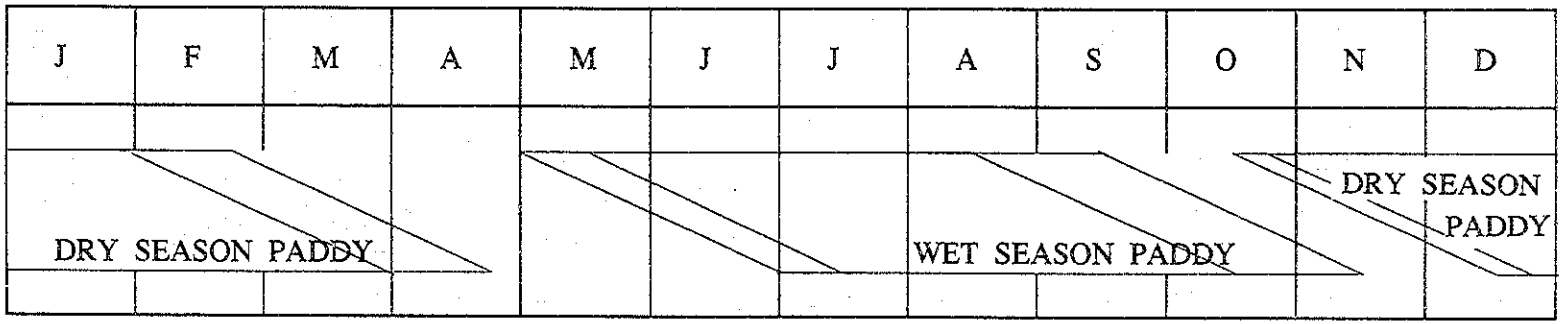
Table 4 Annual Costs of Salaries / Allowances of ARIS Office

Unit : Peso

	Salaries and Allowances	(persons)	(monthly)	(annual)
*	Irrigation superintendent	1	9,076	117,988
	Secretary	1	2,497	32,461
*	Assistant superintendent	1	5,818	75,634
	Clerk processor B	1	3,883	50,479
*	Engineer A	1	5,487	71,331
*	Agriculturist	1	5,457	70,941
*	WRF technician	6	4,668	364,104
*	WRF operator B	2	3,883	100,958
*	WRF ditch tender	15	3,650	711,750
*	Cashier C	1	4,842	62,946
*	Sr. Accounting processor B	1	4,459	57,967
*	Property officer B	1	4,519	58,747
*	Collection representative A	1	4,459	57,967
*	Clerk processor B	2	3,883	100,958
*	Driver mechanic	3	4,016	156,624
*	Industrial security guard	3	4,165	162,435
*	Accounting processor B	4	3,823	198,796
*	Utility worker	1	3,346	43,498
	Supervising inst. development officer	1	5,131	66,703
	Institutional development officer	1	3,539	46,007
	Clerk peocessor B	2	3,883	100,958
	Utility worker	1	3,346	43,498
	Senior engineer A	1	4,834	62,842
	Engineer A	3	5,487	213,993
	Clerk processor	1	3,883	50,479
	Draftsman	1	2,752	35,776
	Utility worker	1	3,346	43,498
	Total (Construction Stage)	58		3,159,338
	Total of figures with * (O & M Stage)	44		2,412,644

Fig. 1 Present and Proposed Cropping Pattern of Paddy

CROPPING PATTERN
(DOUBLE CROPPING OF PADDY)



CROPPING PATTERN
(SINGLE CROPPING OF PADDY)

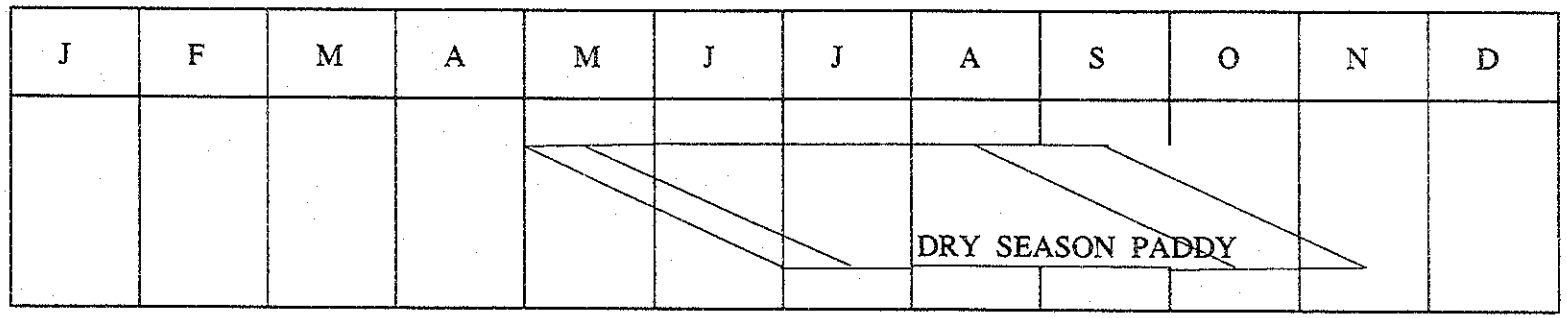
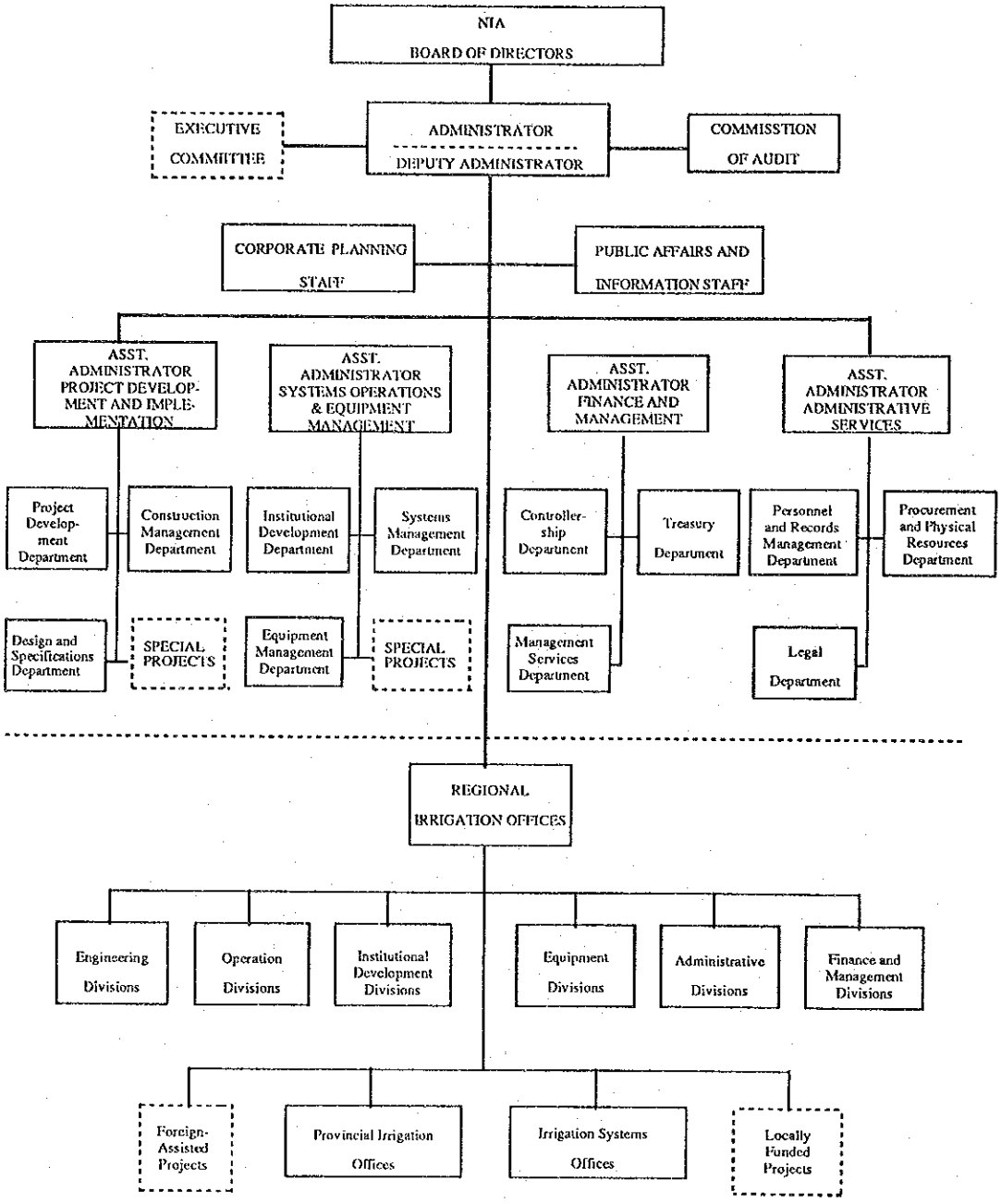
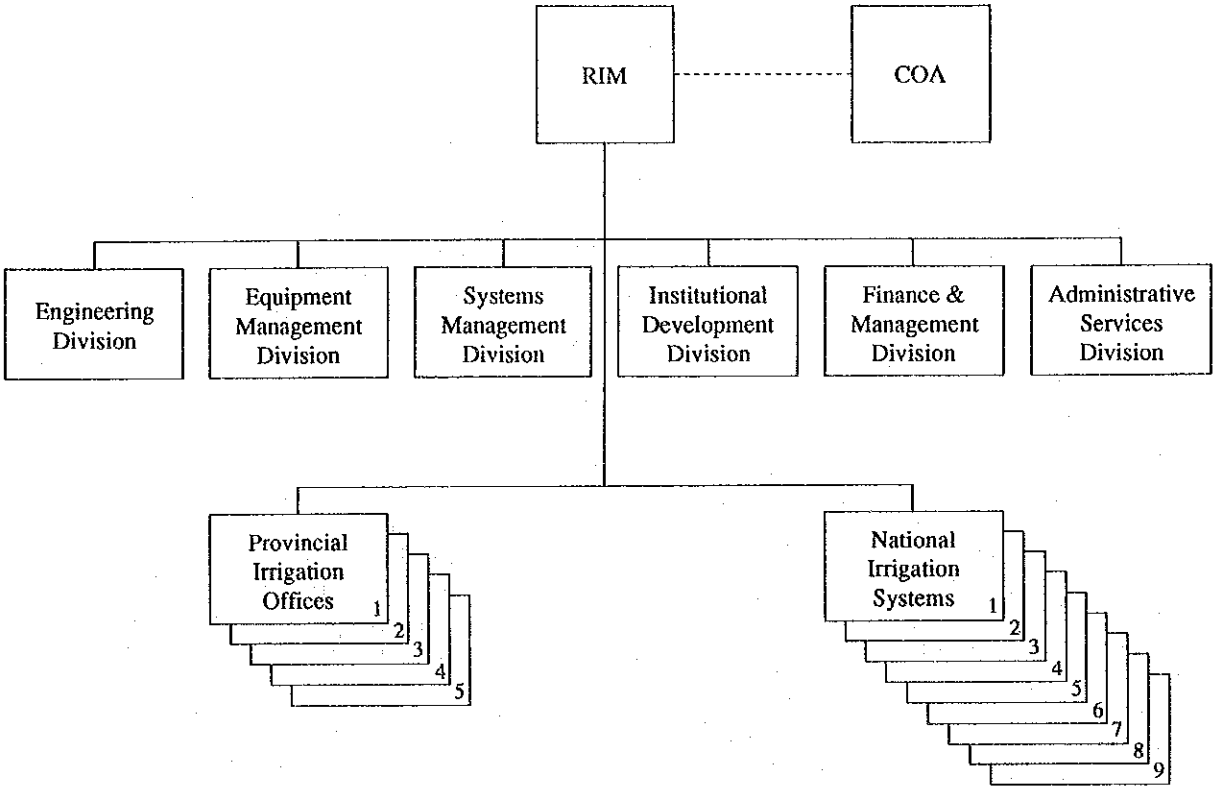


Fig. 2 Organization of National Irrigation Administration



There are 13 RIOs (Regions 7 & 8 combined) including UPRIIS and MRIIS which have the same status as the RIOs and 67 PIOs. In 1992, there were 101 ISOs.

Fig. 3 Organization of NIA Region 6 Office

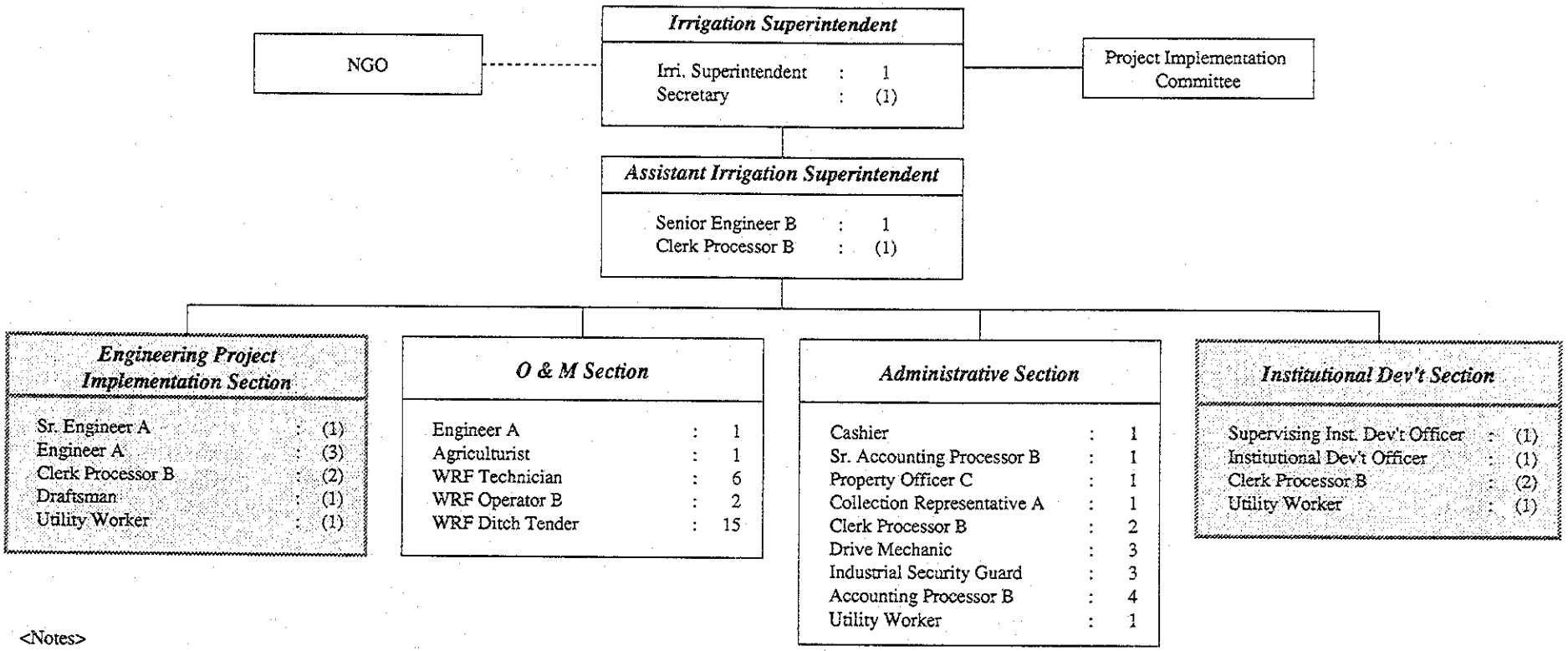


<Notes>

RIM : Regional Irrigation Manager

COA : Commission on Audit

Fig. 4 Organization of NIA Aganan River Irrigation System Office



<Notes>

ARIS : Aganan River Irrigation System

: Existing Organization

: Proposed Organization

WRF : Water Resource Facility

Figure in round brackets means the number of personnel for newly proposed organization.

Figure without round brackets means the number of personnel for existing organization.

Fig. 5 Organization of Post - Harvest Facilities Office

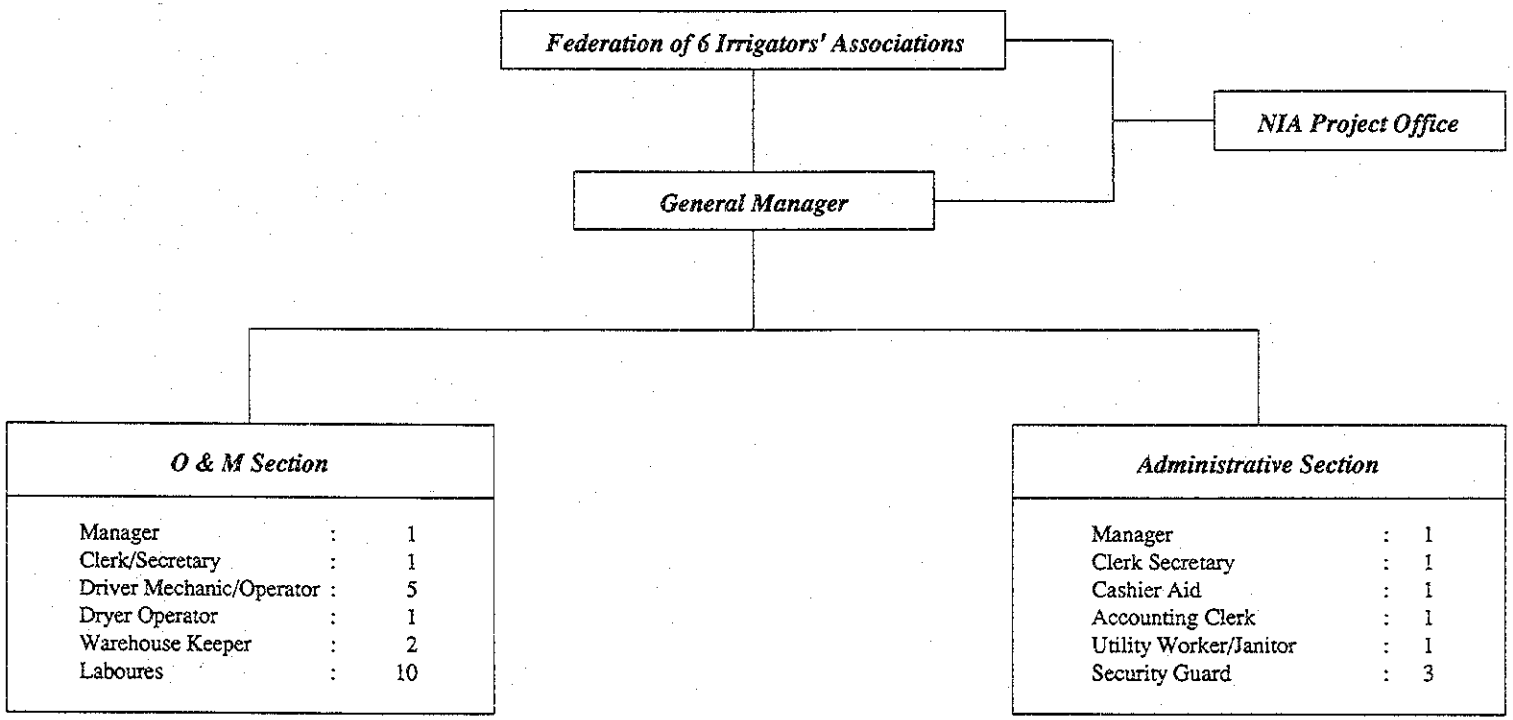
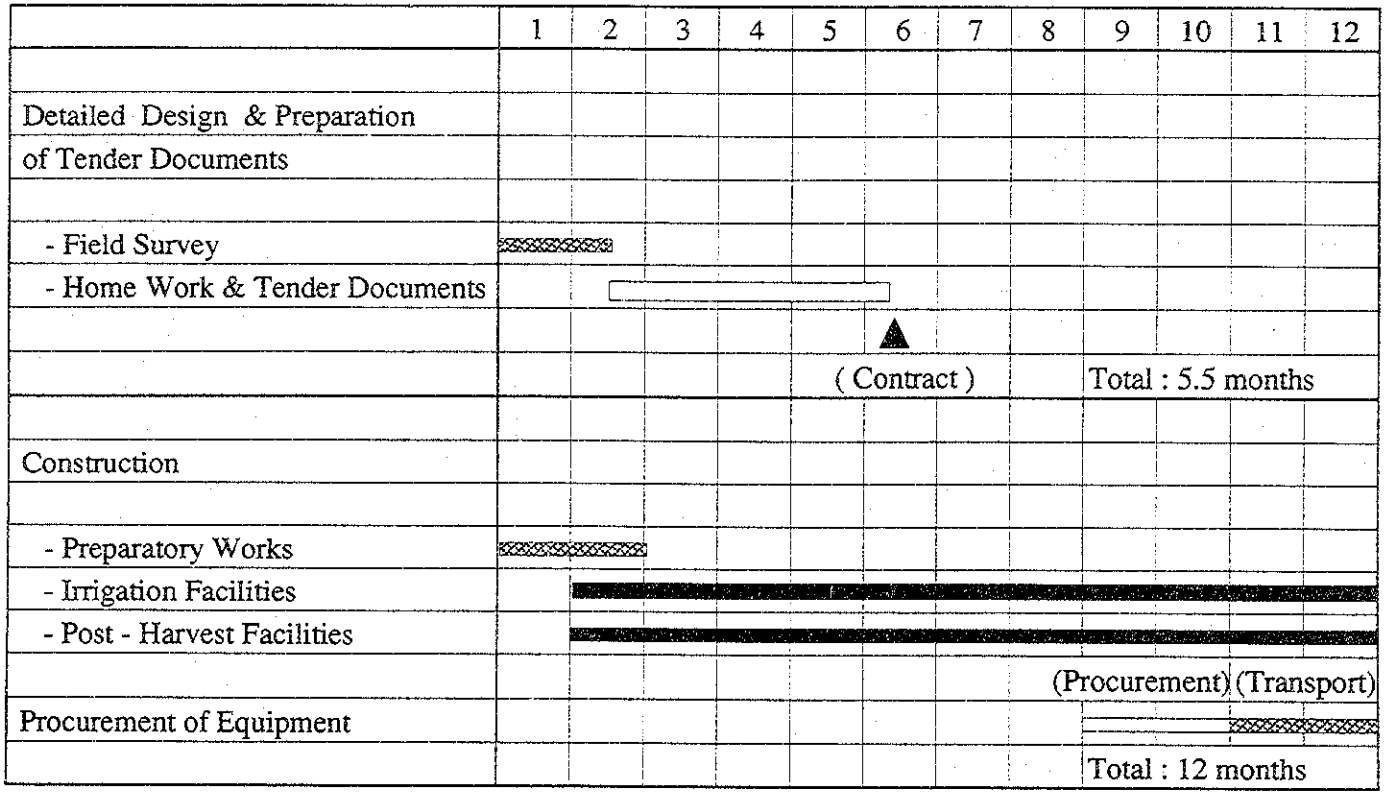


Fig. 6 Tentative Implementation Schedule of the Project



APPENDIXES

Member List of the Basic Design Study Team

Position	Name	Home Post
Leader / Agricultural Development Planner	Mr.Akira NAKAZAWA	Ministry of Agriculture, Forestry and Fisheries
Project Coordinator	Mr.Yuto HARA	Japan International Cooperation Agency
Chief of Consultant / Farm Management Planner	Mr.Toshikazu HIGASHIKAWA	Nippon Koei Co., Ltd.
Irrigation Facilities Engineer	Mr.Takashi MISAKI	Nippon Koei Co., Ltd.
Facilities Planner	Mr.Genshichi WADA	Nippon Koei Co., Ltd.
Equipment Planner	Mr.Shinichi HAMADA	Nippon Koei Co., Ltd.

Member List of the Draft Final Report Explanation Mission

Position	Name	Home Post
Leader / Agricultural Development Planner	Mr.Akira NAKAZAWA	Ministry of Agriculture, Forestry and Fisheries
Project Coordinator	Mr.Hisatoshi OKUBO	Japan International Cooperation Agency
Chief of Consultant / Farm Management Planner	Mr.Toshikazu HIGASHIKAWA	Nippon Koei Co., Ltd.
Irrigation Facilities Engineer	Mr.Takashi MISAKI	Nippon Koei Co., Ltd.
Equipment Planner	Mr.Shinichi HAMADA	Nippon Koei Co., Ltd.

Activities of the Basic Design Study Team in the Field

No.	Date	Itinerary	Description
1	Nov. 02 (Tue)	Manila	Courtesy call on Embassy of Japan & JICA Philippines office
2	03 (Wed)	Manila	Courtesy call on NEDA, & Explanation of Inception Report & tentative schedule to NIA
3	04 (Thu)	Manila - Iloilo	Discussion with NIA in Iloilo
4	05 (Fri)	Iloilo	Site survey in Iloilo
5	06 (Sta)	Iloilo	Site survey in Iloilo
6	07 (Sun)	Iloilo - Boracay Iloilo	Site survey (M/S Nakazawa & Hara) Internal meeting (M/S Higashikawa, Misaki, Wada & Hamada)
7	08 (Mon)	Boracay - Manila Iloilo - Manila Iloilo	Site survey (M/S Nakazawa & Hara) Data collection in Manila (Mr. Higashikawa) Field survey (M/S Misaki, Wada & Hamada)
8	09 (Tus)	Manila Iloilo	Meeting & Discussion with NIA (M/S Nakazawa, Hara & Higashikawa) Field survey (M/S Misaki, Wada & Hamada)
9	10 (Wed)	Manila Iloilo	Discussion with NIA & signing of the Minutes of Discussion, and reporting to JICA office & Embassy of Japan (M/S Nakazawa, Hara & Higashikawa) Field survey (M/S Misaki, Wada & Hamada)
10	11 (Thu)	Manila - Tokyo Manila - Iloilo Iloilo	Leaving for Japan (M/S Nakazawa & Hara) Leaving for Iloilo (Mr. Higashikawa) Field survey (M/S Misaki, Wada & Hamada)
11	12 (Fri)	Iloilo	Field survey
12	13 (Sta)	Iloilo	Field survey
13	14 (Sun)	Iloilo	Internal meeting & data compilation
14	15 (Mon)	Iloilo	Field survey
15	16 (Tus)	Iloilo	Field survey
16	17 (Wed)	Iloilo	Field survey
17	18 (Thu)	Iloilo	Field survey
18	19 (Fri)	Iloilo	Field survey
19	20 (Sta)	Iloilo	Field survey
20	21 (Sun)	Iloilo	Internal meeting & data compilation
21	22 (Mon)	Iloilo	Field survey

No.	Date	Itinerary	Description
22	23 (Tus)	Iloilo	Field survey
23	24 (Wed)	Iloilo	Field survey
24	25 (Thu)	Iloilo -Manila Iloilo	Data collection in Manila (Mr. Higashikawa) Field survey (M/S Misaki, Wada & Hamada)
25	26 (Fri)	Manila Iloilo	Data collection in Manila (Mr. Higashikawa) Field survey (M/S Misaki, Wada & Hamada)
26	27 (Sta)	Manila Iloilo	Data collection in Manila (Mr. Higashikawa) Field survey (M/S Misaki, Wada & Hamada)
27	28 (Sun)	Manila Iloilo - Manila	Data collection in Manila (Mr. Higashikawa) Data collection in Manila (M/S Misaki, Wada & Hamada)
28	29 (Mon)	Manila	Reporting to JICA office & Embassy of Japan
29	30 (Tus)	Manila	Internal meeting & data collection
30	Dec. 01 (Wed)	Manila	Leaving Manila for Japan

Activities of the Draft Final Report Explanation Mission in the Field

No.	Date	Itinerary	Description
1	Feb. 24 (Thu)	Manila	Courtesy call on Embassy of Japan & JICA Philippines office
2	25 (Fri)	Manila - Iloilo	Leaving for Iloilo
3	26 (Sat)	Iloilo	Explanation of draft final report to & discussion with NIA in Iloilo, & field survey
4	27 (Sun)	Iloilo	Internal meeting of the mission & data compilation
5	28 (Mon)	Iloilo - Manila	Explanation of draft final report to & discussion with NEDA in Iloilo, & leaving for Manila
6	Mar. 01 (Tue)	Manila	Explanation of draft final report to & discussion with NIA central office, & courtesy call on NEDA central office
7	02 (Wed)	Manila	Discusion with NIA & signing of Minutes of Discussion Reporting to Embassy of Japan and JICA Philippines office
8	03 (Thu)	Manila	Leaving Manila for Japan

List of Officials Concerned

NIA Central Office

1.	Mr.Apolonio V. Bautista	Administrator
2.	Dr.Jose A. Galvez	Assistant Administrator for SOEM
3.	Mr.Edilberto B. Payawal	Department Manager, SMD
4.	Mr.Mario M. Gulinao	Officer in Charge of O & M Division, SMD
5.	Mr.Leonardo E. Balite	Section Chief, O & M Division, SMD
6.	Mr.Mario M. Sagum*	Section Chief, Research & Development Division, SMD
7.	Mr.Florentino R. David*	Senior Engineer A, SMD
8.	Mr.Abelardo Y.Armentia	Officer in Charge of Plan Formation Division, PDD
9.	Mr.Rodolfo D. Gales	Officer in Charge of Design Division, DSD
10.	Mr.Eleuterio C. Luz	Dam Safety Group, DSD
11.	Ms.Proserfina A.Mariano	Civil Works Design Division, DSD

NIA Region 6 Office

1.	Mr.Eduardo P. Corsiga	Regional Irrigation Manager
2.	Mr.Samuel S. Japitana*	Division Manager, Systems Management Division
3.	Mr.Rudy R. Ibabao*	Supervising Engineer A, Engineering Division
4.	Mr.Phridi C. Melendez*	Division Manager, Equipment Management Division
5.	Mr.Cezar Y.Villodres*	Section Chief, SMD
6	Mr.Benjamin P. Sanchez*	Senior Engineer A, Engineering Division
7.	Mr.Norman P. Sinfuego*	Agronomist, System Management Division

NIA Aganan /Sta.Barbara River Irrigation System Office

1.	Mr.Edilberto F. Lomigo*	Irrigataion Superintendent II
2.	Mr.Melchor I. Bajande	Engineer A

NIA Jalaur /Suague River Irrigation System Office

1.	Mr.Rolando P. Beloniio	Agriculturist A
2.	Mr.Lauro M. Asperas	Engineer A

NIA Provincial Irrigation Office (Iloilo)

1.	Mr.Renan S. Alberca	Acting Provincial Irrigation Officer II
2.	Mr.Teddy Z. Buyco	Engineering Assistant A

NEDA Central Office

1.	Ms.Josefina Esguerra	Director, Public Investment Staff
2.	Mr.Florante G. Igtiben	Officer in Charge of Program Finance I (Asia-Pacific), Public Investment Staff
3.	Ms.Pam D.Quizon	Senior Economic Development Specialist in Charge of JICA Grant Aid, Public Investment Staff

Iloilo Provincial Government

1	Mr.Arthur D. Defensor	Governor of Iloilo Province

NEDA Region 6 Office

1.	Mr.Nicholas B. Rivas, Jr.	Chief, Economic Development Specialist
2.	Mr.Alexis C.Prieto	Economic Development Specialist II

Provincial Agricultural Office (Iloilo)

1.	Mr.Nielda B. Catilo	Chief, Planning and Programing Section

National Food Authority Region 6 Office

1.	Mr.Ludovico J. Jarina	Regional Director

National Food Authority Provincial Office (Iloilo)

1.	Mr.Benjamin B. Marto	Provincial Manager

Visayas Experiment Station

1.	Mr.Dominador P. Banayco	Assistant Manager

National Statistical Coordination Board,Iloilo

1.	Mr.Presentacion A. Penpilla	Manager

Embassy of Japan

1.	Mr.Yugo Matsuda	First Secretary

JICA Philippines Office

1.	Mr.Akihiko Hashimoto	Resident Representative
2.	Mr.Katsumi Yoshida	Staff

NIA Central Office

1.	Mr.Takeshi Ishida	JICA Expert
2.	Mr.Yasutaka Hosono	JICA Expert

DCIEP (Diversified Crops Irrigation Engineering Project)

1.	Mr.Norikazu Tsujii	Team Leader

* : NIA's counterpart personnel

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE OPTIMUM WATER UTILIZATION AND RURAL DEVELOPMENT PROJECT IN AGANAN RIVER IRRIGATION SYSTEM IN THE REPUBLIC OF THE PHILIPPINES

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a Basic Design Study on the Optimum Water Utilization and Rural Development Project in Aganan River Irrigation System (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team, which is headed by Mr. Akira Nakazawa, General Manager of Technical Information, Design Division, Agricultural Structure Improvement Bureau, Ministry of Agriculture, Forestry and Fisheries, and is scheduled to stay in the country from November 2 to December 1, 1993.

The team held discussions with the officials concerned of the Government of the Philippines and conducted a field survey at the study area.

In the course of discussions and the field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study Report.

Manila, November 9, 1993

Mr. Akira Nakazawa	Mr. Apolonio V. Bautista
Leader	Administrator
Basic Design study Team	National Irrigation Administration
Japan International Cooperation Agency	

ATTACHMENT

1. Objective

The objectives of the Project are to increase agricultural production and improve farm economy in Aganan River Irrigation System by rehabilitating and improving existing irrigation facilities, constructing post-harvest facilities and equipment procurement.

2. Executing Agency

The National Irrigation Administration is responsible for the administration and execution of the Project. The organization for the Project is shown in ANNEX-I.

3. Project Site

The project site is Aganan River Irrigation System located at Iloilo, Iloilo Province, Philippines which is shown in ANNEX-II

4. Items Requested by the Government of the Philippines

After discussions between the Basic Design Study Team and the Philippine side, the items listed in the ANNEX-III are finally requested by the Philippine side. However, the final components of the Project will be decided after further studies in Japan.

5. Japan's Grant Aid System

(1) The Philippine side has understood the system of Japan's Grant Aid as explained by the Team.

(2) The Philippine side will take necessary measures, described in ANNEX-IV for the smooth implementation of the Project, on the condition that the Grant Aid by the Government of Japan is extended to the Project.

6. An Important Issue Related to the Project

The Philippine side should secure approval from the Investment Coordination Committee (ICC) as soon as possible and send copies of this to JICA, Manila immediately.

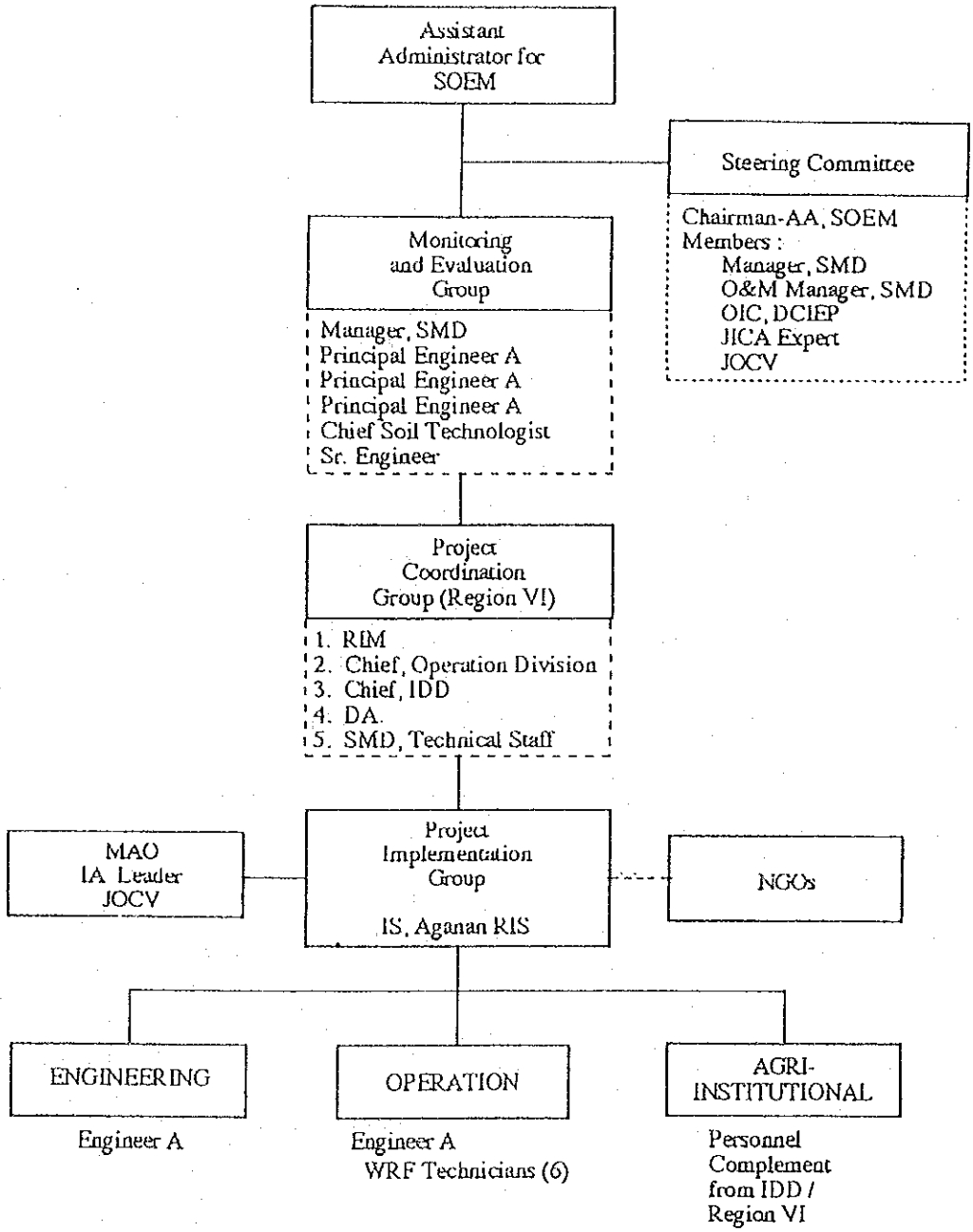
7. Tentative Schedule of the Study

(1) The consultants will proceed to further studies in the Philippines until December 1, 1993.

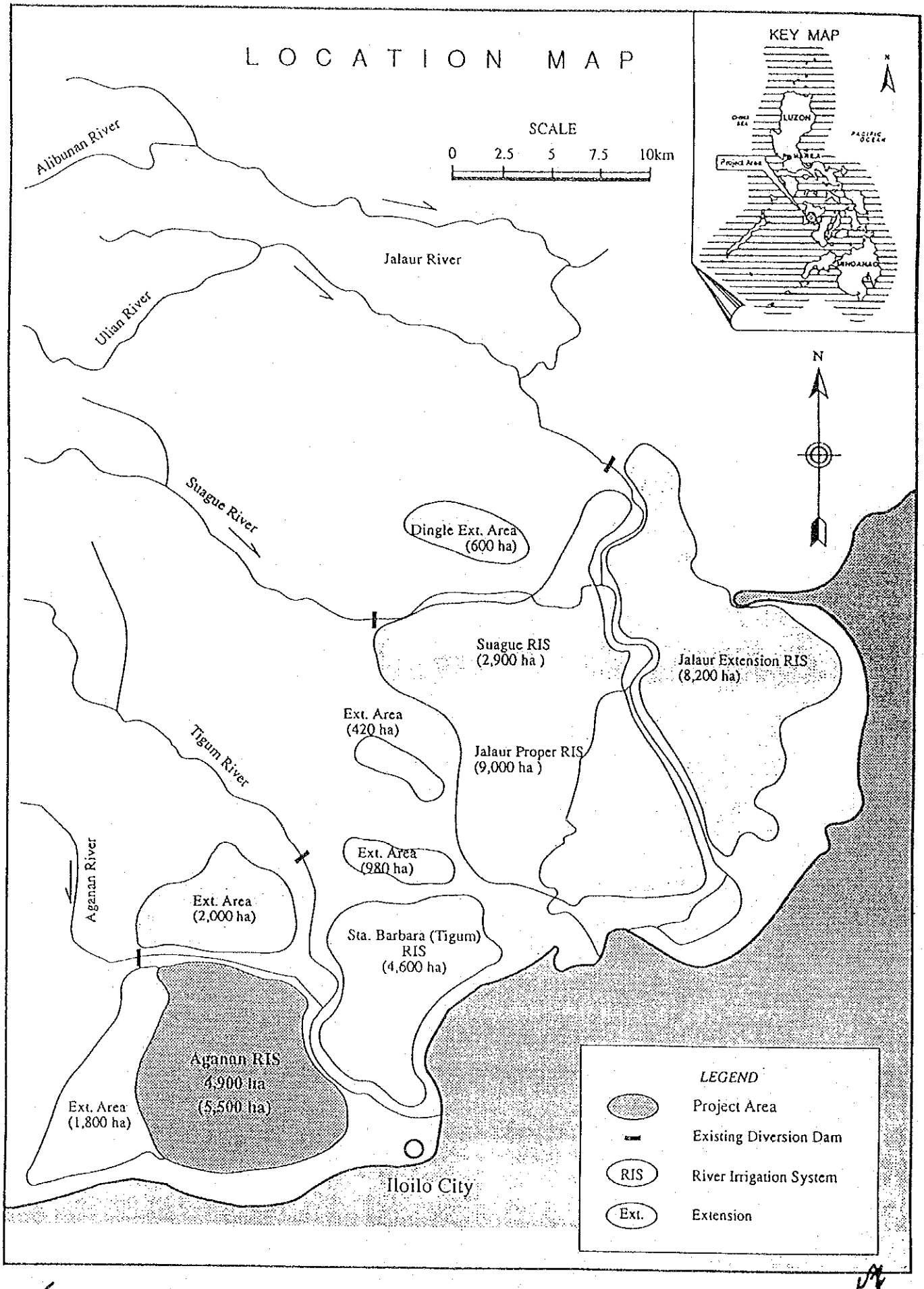
(2) JICA will prepare a draft final report of the study and dispatch a mission in order to explain its contents in February, 1994.

(3) Based on the Minutes of Discussions and technical examination of the study results, JICA will complete a final report and send it to the Government of the Philippines by March, 1994.

ANNEX-I PROPOSED ORGANIZATIONAL CHART OF THE OPTIMUM WATER UTILIZATION AND RURAL DEVELOPMENT PROJECT IN AGANAN RIVER IRRIGATION SYSTEM



Notes :
- SOEM : System Operation and Equipment Management
- AA : Assistant Administrator
- SMD : System Management Department
- OIC : Officer In Charge
- DCIEP : Diversified Crops Irrigation Engineering Project
- RIM : Regional Irrigation Manager
- IDD : Institutional Development Division
- DA : Department of Agriculture
- MAO : Municipal Agricultural Officer
- IA : Irrigators' Association
- IS : Irrigation Superintendent
- RIS : River Irrigation System
- NGO : Non Government Organization
- WRF : Water Resources Facilities


LOCATION MAP
KEY MAP
SCALE
0 2.5 5 7.5 10km
N
Alibunan River
Jalaur River
Ulian River
Suague River
Tigum River
Aganan River
Dingle Ext. Area (600 ha)
Suague RIS (2,900 ha)
Jalaur Extension RIS (8,200 ha)
Ext. Area (420 ha)
Jalaur Proper RIS (9,000 ha)
Ext. Area (980 ha)
Ext. Area (2,000 ha)
Sta. Barbara (Tigum) RIS (4,600 ha)
Aganan RIS 4,900 ha (5,500 ha)
Ext. Area (1,800 ha)
Iloilo City
LEGEND
Project Area
Existing Diversion Dam
RIS River Irrigation System
Ext. Extension

ANNEX-III ITEMS REQUESTED BY THE GOVERNMENT OF THE PHILIPPINES

I. Construction Works

(i) Improvement / Rehabilitation of the Existing Irrigation Facilities

- Improvement / rehabilitation of the existing diversion dam and its appurtenant structures
- Provision of concrete lining to the existing major irrigation canals and its related structures
- Rehabilitation of the existing O & M roads along the irrigation canals

(ii) New Construction of Post-Harvest Facilities

- Administration house
- Paddy warehouse
- Glasshouse
- Multipurpose pavement
- Equipment shed

II. Procurement of Equipment

(i) Procurement of Post-Harvest Equipment

- Portable dryer
- 4-wheel tractor
- Cargo truck
- Miscellaneous

(ii) Procurement of O & M Equipment

- Hydro-meteo station equipment
- Data processing and communication equipment
- Construction equipment
- Miscellaneous

ANNEX-IV NECESSARY MEASURES TAKEN BY THE GOVERNMENT OF THE PHILIPPINES

1. To secure the sites for the Project at Aganan River Irrigation System.

2. To clear, level and reclaim the site for post harvest facilities as needed prior to the commencement of the construction.

3. To undertake incidental external works such as fencing and making gates in and around post-harvest facilities' site.

4. To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside post-harvest facilities' site.

5. To bear commissions to the Japanese foreign exchange bank for the banking services based on the Banking Arrangement.

6. To ensure prompt unloading and custom clearance at the port of disembarkation in the Philippines and timely internal transportation of the products provided under the Grant Aid.

7. To exempt Japanese nationals involved in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in the Philippines with respect to the supply of the products and the services under the verified contracts.

8. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Philippines and stay therein for the execution of the Project.

9. To maintain and use properly and effectively the equipment provided under the Grant Aid.

10. To bear all the expenses other than those to be borne by the Grant, necessary for the transportation and installation of the equipment.

MINUTES OF DISCUSSIONS
ON
BASIC DESIGN STUDY ON THE OPTIMUM WATER UTILIZATION AND RURAL DEVELOPMENT PROJECT IN AGANAN RIVER IRRIGATION SYSTEM
IN
THE REPUBLIC OF THE PHILIPPINES
(CONSULTATION ON DRAFT FINAL REPORT)

From November through December 1993, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Optimum Water Utilization and Rural Development Project in Aganan River Irrigation System (hereinafter referred to as "the Project") in the Republic of the Philippines. Through discussions, field surveys, and technical examination of the results in Japan, the team has prepared the draft final report of the study.

In order to explain and to consult the Philippine side on the components of the draft final report, JICA sent to the Philippines a study team, (hereinafter referred to as "the team"), headed by Mr. Akira Nakazawa, General Manager of Technical Information, Design Division, Agricultural Structure Improvement Bureau, Ministry of Agriculture, Forestry and Fisheries, from February 24 to March 3, 1994.

As a result of discussions, both parties have confirmed the main items described on the attached sheets.

Manila, March 2, 1994

Mr. Akira Nakazawa
Leader
Draft Report Explanation Team
JICA

Mr. Apolonio V. Bautista
Administrator
National Irrigation Administration
Philippines

ATTACHMENT

1. Components of Draft Final Report

The Government of the Philippines has agreed and accepted in principle the components of the draft final report proposed by the Team.

2. Japan's Grant Aid System

2.1. The Philippine side has understood the system of Japan's Grant Aid explained by the Team.

2.2. The Philippine side will take necessary measures, described in ANNEX-I for smooth implementation of the Project, on the condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

3. Further Schedule

The Team will prepare the final report in accordance with the confirmed items, and send it to the Government of the Philippines by the end of March, 1994.

4. Necessary Internal Approvals

4.1. The Philippine side will take necessary measures to satisfy the internal criteria of the Environmental Management Bureau (EMB) not later than the end of March, 1994.

4.2. The Philippine side will promote and complete the ICC deliberation procedures according to the schedule shown in ANNEX-II.

4.3. The Philippine side should secure approval from the Investment Coordination Committee (ICC) not later than the middle of April, 1994 and send copies of the approval to JICA, Manila, immediately.

5. Other Important Issues

The Philippine side will take the following actions for the Project.

5.1. Acquisition of land for the construction, post harvest facilities site (110m x 110m = 1.21ha), construction office and batching & crushing plant yard (about 2ha), temporary stockyards along the main canal (about 1ha x 2 = about 2ha), borrow pits (embankment material: about 30,000m^3), and soil disposal areas (about 4ha) in advance of the commencement of the construction. Regarding the acquisition of land for post-harvest facilities, the Philippine side will make agreements with the land owners concerned about the sale of land and send the agreements to JICA, Manila, not later than March 15th, 1994.

5.2. Completion of a power supply system (100kVA) to the post-harvest facilities to be undertaken by the government of the Philippines.

5.3. Securing budgetary, administrative and institutional arrangements for the Project implementation and Operation & Maintenance. (Organization charts of the Project office and the post-harvest facilities office are shown in ANNEX-III and IV respectively.)

5.4. Conclusion of the arrangement on the following matters with the 6 Irrigators' Associations and sending of the agreement papers to JICA, Manila, not later than the end of April, 1994:

- Farmers' cooperation with the construction works
- No water use from the irrigation facilities during the construction period
- Impartial water use by the 6 Irrigators' Associations
- Operation & Maintenance of the post-harvest facilities by the 6 Irrigators' Associations

ANNEX-I: NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE PHILIPPINES

1. To secure the sites for the Project at Aganan River Irrigation System.

2. To clear, level and reclaim the post harvest-facilities site as prior to the commencement of the Project.

3. To undertake temporary fencing for the post-harvest facilities site, and marking for the other areas.

4. To provide facilities for distribution of electricity, drainage and other incidental facilities outside post-harvest facilities' site.

5. To bear commissions to the Japanese foreign exchange bank for the banking services based on the Banking Arrangement.

6. To ensure prompt unloading and custom clearance at the port of disembarkation in the Philippines and timely internal transportation of the products provided under the Grant Aid.

7. To exempt Japanese nationals involved in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in the Philippines with respect to the supply of the products and the services under the verified contracts.

8. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Philippines and stay therein for the execution of the Project.

9. To maintain and use properly and effectively the physical facilities and the equipment provided under the Grant.

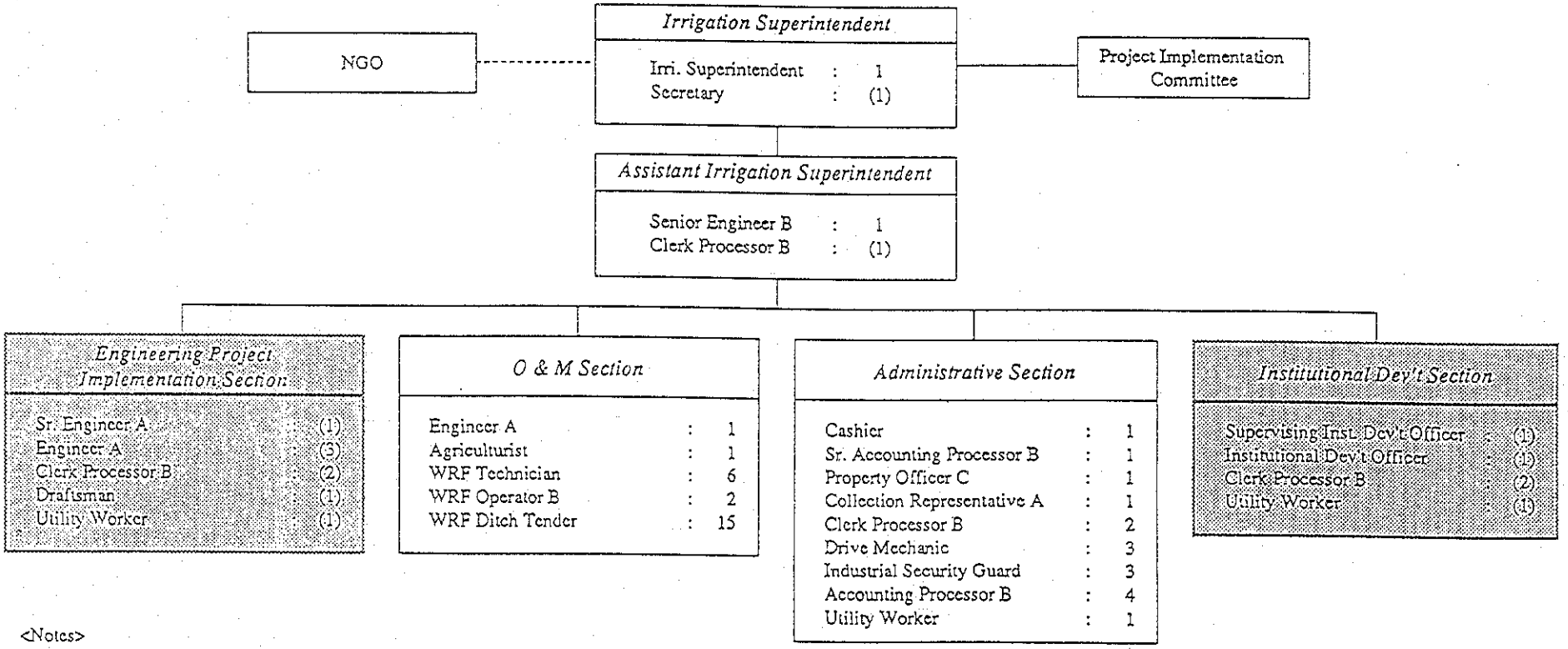
10. To bear all the expenses other than those to be borne by the Grant, necessary for the transportation and installation of the equipment.

ANNEX-II

SCHEDULE OF ICC DELIBERATION

Year	1994						
Month	MARCH				APRIL		
Date	1	10	20	31/1	10	20	30
1. Signing of D/F Minutes	*						
2. NIA submits documents							
to NEDA Region 6		*					
to NEDA Central Office		*					
to EMB		*					
3. NEDA Region 6 Review/Evaluation Endorsement of Project to Central Office		--*					
4. NEDA Central Office NEDA Technical Board reviews Project			----*				
5. EMB reviews, issues clearance				----*			
6. Presentation in ICC Deliberation				-----*			

Organization of NIA Aganan River Irrigation System Office



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ARIS : Aganan River Irrigation System

: Existing Organization

: Proposed Organization

WRF : Water Resource Facility

Figure in round brackets means the number of personnel for newly proposed organization.

Figure without round brackets means the number of personnel for existing organization.