

## 5.3 Agriculture Development

### Development Target and Strategy :

The purpose of agricultural development and arrangement is to realize stable and high productivity through the development of irrigation system and its operation and effective management. From the point of agriculture development, following aims are especially stressed:

- 1) To increase an agriculture production by extending farming area.
- 2) To develop a productivity by diffusing modern agriculture techniques.
- 3) To enhance the quality of products through the improvement of farming facilities.

These basic aims are set up considering following backgrounds:

- 1) The farmers are familiar with rice cropping and irrigated agriculture. They are preferred to continue rice double cropping if irrigation water is available.
- 2) Rice cropping is major income source for the farmers.
- 3) As the government assures the producer's price of rice, stable price seems to be promised in the future.

Strategies for development and arrangement :

- 1) To increase agricultural production, it is proposed double cropping of rice in the Study Area. One is where cropped in rain season and fallowed in dry. The other is fallowed in rain season and cropped in dry.
- 2) To enhance productivity through diffusion of modern agricultural techniques.
- 3) To raise the value of production and facilitate the product flow, by building and arranging postharvest and marketing facilities as well as flow facilities.

### 5.3.1 Farming Technology Development Plan

#### (1) Proposed Cropping Pattern

Following three points are taken into consideration for the selection of proposed cropping pattern:

- 1) The cropping pattern should utilize irrigation water effectively.
- 2) The cropping pattern should provide the maximum profit to the farmers.
- 3) The cropping pattern should easily be practiced by the farmers.

Proposed crops are selected based on the irrigation water supply conditions during the wet and dry season. Rice crop is selected due to sufficient irrigation water during the wet season. In the dry season, rice crop is selected on the area of sufficient irrigation water supply, while, diversified crops are selected on the area of insufficient for paddy cropping.

Rice, diversified crops, and sugarcane seem appropriate for this project in consideration of economy, profitability, and marketability.

Suitable diversified crops in the Study Area is considered from the viewpoint of climate, Soil and market that are mongo, corn, water melon, peanut, sorghum, chinese cabbage, eggplant, tomato and sweet potato.

Among the crops above mentioned, mongo and corn are selected as the proposed diversified crops in the Study Area based on the following reasons :

Mongo; progressed research activities for production increase and high farmers's willingness to grow,

Corn ; farmer's possibility of selective production farm output, such as grain (feed), green corn (food) and baby corn (vegetable),etc., without much change on farming practice.

These crops are promising for marketability, stable production, and are supposed to improve the farmers' diet concerning nutrition. Also, the government encourages to increase yield of staple food crops and crops for acquisition of foreign currency. Corn is available for both food and forage. Young corn can be exported because it becoming popular for cooking. Mongo contain 20-25% of protein, and are one of important protein sources. When it is stressed only upon the profitability per planted area, another possibility will be arised. That is to select highly intensive vegetables like eggplant.

Cropping pattern are proposed, so as not to change drastically the present pattern, considering duty of water, farm management, profit, and the farmers' intention (Refer to Table 5-3-1 and Figure 5-3-1). Profitable area is designed to be extended as large as possible taking account the relation between the amount of irrigation water for rice culture and that of natural water, such as available rainfall and river.

The period between harvesting and following seeding is going to be more than 30 days, in consideration of field husbandry method as well as maintenance and repair works of the irrigation facility after the dry-season crop. Moreover, present 3-month transplanting period is going to be half by insuring irrigation water. To fix cropping period is enable intensive controle of pests and weed. Also, this plan complys with the farmers' wishes to begin planting if sufficient water is available at the beginning of present planting season. Intensive labor will result in promotion of the employment of tenant farmers and the unemployed.

Comparative study on duration of trnsplanting for two to three months period for the irrigated puddy conditions, is conducted from the viewpoints of cultivation technics, irrigation water supply, maintenance period and labour requirement ;

- a) Two months of transplanting period is recommendable from the view point of cultivation technics and operation aspects because of possibility of preventive countermeasures for pest control due to the small differences on growing stages, lower prices of agricultural inputs, such as fertilizer and chemicals, resulted from cooperative

purchase and increase of production accrued from timing supply of agricultural inputs.

- b) Effective use of irrigation water is expected from transplanting period of two months.
- c) Variety of short maturity will be required for rice-rice cultivation. In case of the present transplanting period of three months by using variety of 110 day's maturity, insufficient maintenance works of irrigation system is practiced because the period for maintenance works can be provided only for 10 days. On the other hand, in case of transplanting period of two months, it will be possible to provide a period for maintenance works of more than one month.
- d) As for the labour requirement in November (Refer to Table H.1.11 and Figure H.1.2 in Appendix H), the labour requirement in the peak month, in case of transplanting period of two months, increase slightly comparing to three months case. However, this increase is accommodated by the landless farmers and/or unemployment.

Although some people are worried about rain in the heading period, transplanting period is planned that the harvest fall on the season when the yield of rain season crop is large. This plan corresponds with that of DA Provincial Agricultural Office (Refer to Table H.1.12 and H.1.13 in Appendix H).

Cropping intensity planned at 172 percent (Refer to Table 5-3-2) by adapting cropping pattern to natural conditions and through focussing on marketability in crop selection, as stated above, farming volitions of the farmers will be enhanced and distribution of family labor should be systematic. Moreover, as agricultural technique instruction achieves, individual techniques will be improved equally as well as that of whole family labor. This will result in stable progress of productivity.

## **(2) Proposed Farming Practices**

Based on data obtained from BAEx and other agricultural institute, the proposed farming practices in the future with project is designed as below.

In regard to rice varieties, the IR series such as IR 36, 60, 66, 72, etc. are recommended in order to ensure the anticipated high yield in the future with project. The land preparation is recommended to be one plowing, two times of harrowing and one puddling. The nursery area is set to be 1/20 to 1/25 of the planting area. The spacing of transplanting is set to be 30 cm x 10 cm with three seedlings per hill. The fertilizer application for sustaining the target yield is estimated at 70 to 100 kilograms per hectare of N and 28 kilograms of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O. The proposed weeding consists of one application of herbicide during the period between puddling time and rooting stage, and two manual weedings depending on the state of weed growth after herbicide application. With regard to plant protection, the recommended dosage is two litres per hectare for insecticides and one litre of fungicides.

The recommended varieties of sugarcane are PHIL 56226, 62120, etc. The amount of fertilizer is proposed to be 108 kilograms per hectare of N, 20 kilograms per hectare of P<sub>2</sub>O<sub>5</sub> and 120 kilograms per hectare of K<sub>2</sub>O. The proposed cultivation method would consist of ridge busting, two times of off-barring and two times of hilling up. Weeding would be carried out in parallel with cultivation. Harvested cane must be milled at the sugar mill factory as soon as possible because delayed cane causes sucrose deterioration.

With regard to the varieties of diversified crops, recommended varieties are Pag-asa series, etc. for mongo and UPCA and PHIL series, etc. for corn. The land preparation consisting of one plowing, two times of harrowing and one furrowing is proposed for both mongo and corn. The application amounts of fertilizers are estimated 66 kilograms per hectare of N, 21 kilograms per hectare of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O for mongo and 95 kilograms per hectare of N, 28 kilograms per hectare of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O for corn. The dosages of insecticides are estimated to be three litres for mongo and corn. Spot weeding is carried out four weeks after seeding of mongo and corn.

### 5.3.2 Crop Production Plan

#### (1) Target Yield and Production

The target yield is estimated at 4.5 metric tons and 5.0 metric tons of irrigated paddy in wet season and dry season, respectively, 1.0 metric ton of mongo and 3.38 tons of corn, based on statistic data of crops and experimental results at research institutions (Refer to Table 5-3-3).

Expected production is estimated as shown below, based on the target yield and proposed planted area (Refer to Table 5-3-4 and 5-3-5).

<u>Crops</u>	<u>Study Area</u>	<u>19 CIsSs area</u>
Paddy	123,000 metric ton	69,000 metric ton
Sugarcane	339,000	77,000
Mongo	1,500	700
Corn	1,500	700

The estimated total annual paddy production in 19 CIsSs is about 69 thousand metric tons ; 35 thousand metric tons in wet season and 34 metric tons in dry season, and 15 thousand metric tons will be increased in comparing to the present.

In order to achieve the target yield, the following step of services for agricultural diffusion as well as strengthening of facility arrangement, are required ;

- a) Improvement of techniques for cultivation and irrigation by training.

- b) Advanced progress of techniques for cultivation and irrigation.
- c) Seed production and its utilization by high-yield farms through training.
- d) Stability of techniques for cultivation and irrigation.
- e) Diffusion of high-yield seed appropriate for areas.

## (2) Selection of Preferred Area for Development

Classification of farming is made with three steps A, B and C, based on the present cropping intensity and the yield at every CISSs area (Refer to Table H.1.17 in Appendix H). The A is the highest of the three.

From the data above, the relation between the present condition and following four types of lands are considered (Refer to Figure H.1.3 in Appendix H). These four lands are; lands aim at increasing cropping area, lands aim at increasing yield, lands where it is needed to enhance the quality after harvest, and lands aim at promoting stable production to produce self-supplied seed. They are classified from the points of urgency and hopefulness.

- a) Lands where it is needed to increase cropping area characterized by high unit yield and low cropping intensity, and high yield with average intensity or average yield with low intensity, such as
  - i) Tinang CIS.
  - ii) Sta. Rita, Marita, San Martin, Baluto, San Bartolome and Sta. Monica CISSs.
- b) Lands where it is needed to increase yield are characterized by high cropping intensity and low unit yield, and high intensity with average yield or average intensity with low yield, such as
  - i) Telebanca CIS.
  - ii) Bamban, San Pedro, Malonzo and Caluluan CISSs.
- c) Lands where it is needed enhance the quality after harvest are characterized by high yield in rain season, such as Baluto, Lilibangan, Tinang and Sto. Rosario CISSs.
- d) Lands where it is needed to promote stable production are characterized by high yield in dry season, such as Sta. Rita, Marita, Baluto, Lilibangan, San Bartolome, Magao, Tinang, Sto. Rosario and Sta. Monica CISSs.

Among these, area which have many items of improvement should be given higher priority of development (Refer to Table H.1.18 in Appendix H). Examining these CISSs areas on a map indicated that the area of Sta. Rita, Marita, San Martin, Baluto, Lilibangan, San Bartolome, San Isidro and Magao CISSs, are the most prior area (Refer to Figure 5-3-2). Next is the area, of Lucong, Tinang, Sto. Rosario, Sta. Monica and Caluluan CISSs

and followed by the area of Bamban, San Pedro, Malonzo, Bangcou and Susuba CISSs.

The above-mentioned is the considerable order of priority of development, at present stage.

### **(3) Agricultural Development Plan**

Through improvement and provision of irrigation facilities and strengthening of farmers' organizations in the CISSs area, increase of agricultural productivity shall be envisaged. For the increase of productivity, introduction of modernized farming techniques and agricultural input materials and also practice of proper application of input materials shall be propagated to the farmers within the area.

Practical relationships between rice production farmer's operation are classified into following three patterns:

- i) Seeds production,
- ii) Farm management, and
- iii) Post harvesting.

These three relationship will be materialized more reasonably in cooperation with functional activities of CISSs.

As for the seeds production, quantity of qualified seeds is absolutely shortage. Many farmers apply seeds at 75 kilograms and 90 kilograms in wet and dry season, these figures indicate 30 percent and 50 percent increase from estimated proposed seed of 60 kilograms, because of not sureness of budding and growing after sowing, growth obstacle of rice caused by infectious seeds can be observed often.

These problems will be solved by strengthening certified seed production system at Concepcion Seed Growers Multipurpose Cooperative.

As for the farm management, development of farm technology, such as timely application of fertilizer and pest disease control, etc., is still required. Farmers in the area are generally receiving such ideas on new techniques and practice on their farms through the extension technicians assigned by DA. However, timely and effective technical support to the farmers seems to be not enough due to insufficiently assigned technicians and lack of technical and managerial tools in the area.

These problems will be solved by strengthening the extension technicians and proposed Farming Technology Demonstration Farm Program (FTDF) (refer to APPENDIX II). FTDF seeks to conduct demonstration of farming techniques and transfer it to farmers as a show-window of farming practically adopted techniques on water management, cultivation and crop management for palay production.

The farm with an acreage of about 20 hectares every 800 hectares are to be selected allowing for the location, accessibility and organizational activities of each CISSs.

As for the post harvest, one of the most important problems during the wet season is treatment of threshed paddy. Since the farmers in the area sun-dry their paddy on cemented roads and the like, the threshed paddy are lowered their market value. These problems will be solved by construction of post harvest station (refer to APPENDIX II).

### **5.3.3 Agro-Related Production Plan**

#### **(1) Duck Raizing Expansion Program**

More than 400 farmers in the Study area are connected with duck raising. Duck raising shall be expanded with an initiative of the cooperatives. The duck raising business in the Study Area became recently quite favorable in farmers economy, due to much marketability of "baluts" production to be hauled to Metro Manila. Although improvement of the farmers living standard depends on the increase of the agricultural productivity and also available agricultural land is limited to expand farming scale in the area, obtaining off-farm income shall be seriously considered. One of the side business possible in the area would be the duck raising among others.

As for an expansion on this, the cooperatives on behalf of individual farmers shall handle the purchase of their feed and market of products such as eggs and meat.

#### **(2) Inland Fishery Promotion Program**

Tinang, Magao and Lucong CISOs have rather high potential for inland water fishery in commercial scale. The program would promote the fish farming of terapia, mud fish and fresh water crab. Cooperatives shall be purchasing of inputs such as farming nets and fingerling. The program shall get a technical support from the DA.

### **5.3.4 Post Harvest Equipment and Facility Development**

#### **(1) Pre Harvest Mechanization**

Farm mechanization in project area especially in the field of pre harvest does not seem to be rushed because urban industrialization not yet take off for pulling farm labors in rural area.

However, it can be understood that equipment designed by IRRI will serve as a base of equipment to be extended to farmers. Appropriate modifications will be made to make the machines operate effectively under farming conditions in the Study Area.

The Study Area experiences several weather disturbances every year in the form of a tropical depression, storm or typhoon. Therefore, proper timing shall be selected for planting and harvesting to reduce such harmful effects.

At the same time, special attention for hardness and durability is required while designing machinery and facilities.

## **(2) Post Harvest Equipment and Facilities**

Responses against project study team indicate that most farmers are aware of shortage of post harvest and marketing facilities and technology.

Most farmers, the CIS or the IA and cooperatives suffer seriously how to dry paddy especially in wet season and to keep them until price coming high due to shortage of post harvest facilities.

More efficient and timely operations significantly reduce grain loss and consequently increases post harvest yields by as much as 12 percent. Moreover, the use of the dryer and thresher substantially improves the quality and quantity of milled rice. Improved mechanical technology has a quantitative and qualitative impact on total output through more timely operations and reduced units costs.

Six percent of 22.5 percent present post harvest losses can be expected to restrain in project area by way of improving post harvest facilities.

Furthermore, it is reported by the QGFB that they stand to earn a gross incremental price received of 90 centavos per kilogram or 45 pesos per cavan. The 90 centavos incremental per kilogram of paddy is borne out by the EVSA survey in November of 1988 when it could be said that farmers are selling under a weak bargaining position. When they shall have been organized and equipped with post harvest facilities, it is not far fetched to imagine that they would be able to command better returns on their harvest.

By estimation on the above mentioned conditions, more than 10 million pesos per 1,000 hectare are expected to get additionally as net profits due to decreasing post harvest losses and increasing quality of produce.

The following five equipment and facilities are especially recommended to improve to save post harvest losses and upgrade quality :

i) Thresher :

Increasing portable axial flow threshers together with versatile hauling units.

ii) Dryer :

Drying and conditioning equipment for paddy shall be enabling decreasing running cost as much as possible, of which basic condition concludes the installation of mechanical solar dryer together with pre-dryer and traditional concrete yard.

iii) Warehouse :

On-farm small scaled warehouses are required to establish newly.

iv) Rice Milling Unit :

To provide services to paddy producers and rice consumer within



marketing unit and in neighboring Barangays in terms of more accessible milling facilities and better quality/higher milling recovery rate of rice.

v) Transportation :

To reduce transportation cost incurred in rice marketing, it is required to improve transportation facilities together with market access road.

### **5.3.5 Marketing System Development**

#### **(1) Multi-Purpose Marketing Cooperatives**

It has been identified that two cooperatives in Bamban, three in Capas and 18 in Conception, Total 23 cooperatives were already registered.

However, no post harvest and marketing facilities belonging to cooperatives have been established except Corazon de Jesus Multi-Purpose Cooperative in Conception and group action for procurement of farm input or for sale of produce not yet realized by any cooperative.

As proposed in APPENDIX J.2.6 Proposed Development Plan for Farm Mechanization and Marketing, more attention is required to be focused on the following program in the post production system and their interactions with factors such as paddy quality, prices for paddy and milled rice and the complementary relationships between technical performance and operations such as timing of harvesting, handling, threshing and drying which precede milling.

#### **a) Primary Marketing Station Development Program**

Small rice farmers in the Study Area are still unable to realize better returns from their paddy harvest. This is to attribute to post harvest factors which significantly reduce farmers' income, one major factor is the poor quality of produce, paddy harvest of small farmers are usually not dried nor cleaned properly and could therefore not command a better price.

Another factor is the great distance of farm sites to the NFA warehouse or its inaccessibility to big trader-miller. Since most farms are located in remote areas, farmers' paddy produce are normally procured by ambulant middlemen or assembly traders at much lower prices compared to those of big trader-millers.

The third factor is on-farm losses due to improper practices and lack of post harvest facilities. Therefore, it is required to establish Primary Marketing Stations (PMSs) in the Study Area to help small rice farmers obtain higher returns for their produce.

This program must be designed to reduce post harvest losses, improve quality of produce to be marketed and provide farmers with better market access. These PMSs shall become convenient collection points or "satellites" where big trader-millers and/or the NFA could directly

procure farmers' paddy thereby facilitating efficient marketing. Extra layers in market channel, ambulant middlemen and assembly traders, who normally underprice farmers would be by-passed. The farmer groups would then obtain better returns for their paddy. This simple mechanical solar dryer together with pre-dryer for emergency use during rainy days together with concrete yard, on the other hand, would improve quality of marketed paddy, thereby enabling farmer to command higher prices.

Most private grain traders/millers in the Study Area as listed in APPENDIX J.1.48 express their willingness to buy good quality paddy in bulk straight from CIS's marketing station with fair price for mutual benefits between them.

#### **b) Expected Returns through Post Harvest Facilities and Marketing Improvement**

Potential post harvest losses or expected returns through the PMS development program proposed are estimated approximately total 102.9 million pesos in 19 CISs area, which equals about 33 thousand pesos increase of gross income per year per member farmer, and total 203.2 million pesos in project area as estimated in APPENDIX J.2.3 based on the magnitude of the potential in 1989/1990.

On the other hand, practical target through the PMS development program i.e. saving six percent post harvest losses, total approximately 72.5 million pesos in 19 CISs area may be increased as gross income, which means about 23.4 thousand pesos increase of income per year per member farmer, and also total 137.0 million pesos in the Study Area in 1989/1990 (refer to APPENDIX J.2.4).

#### **c) Expected Returns through Pilot Primary Marketing Station (PPMS) Development Program**

Expected returns through Pilot Primary Marketing Station (PPMS) development program are tried to estimate at Sta Rita and Marita, Baluto, Bamban, Tinang and Telabanca CIS, respectively, all in where the common land for establishing the PPMS is prepared. As shown in APPENDIX J.2.5, Potential returns are 2.3 to 7.7 million pesos and targetable returns 1.7 to 5.6 million pesos, which means about 20 thousand pesos to 46 thousand pesos increase of gross income per year per member farmer.

#### **(2) Seed Marketing Station (SMS) Development Program**

To secure the effective supply of pure certified seed to farmers in the Study Area, it is required to establish Seed Marketing Station (SMS) at field near to Barangay Cafe in Lucong CIS area already prepared by Conception Seed Producers Cooperative, Inc. consisting mainly of a 10,000 bags or 500 metric tons paddy warehouse with multi-purpose concrete yard, portable seed threshers, seed dryers, air-screen cleaner, scales, transportation vehicles, seed quality control and station support equipment.

### **(3) Post Harvest Technology Demonstration Farm (PTDF) Program**

For systematic post harvest training and technology proper transfer, the PTDF with about four hectares field will be recommended to prepare near to each PMS to train farmers practically.

### **(4) Training and Technology Transfer**

Training shall be conducted in order to equip farmers with more basic knowledge and skills on post production process together with cooperative, financial management and leadership. This general objective, however, can only be satisfactorily attained if re-organization will be conducted. Moreover, training not only focused on production but also on post production technology should be given more emphasis.

It is required to establish systematic technology transfer organization between the NIA and the Government Institutions concerned such as PHILRICE, NAPHIRE, NFA, ATI, and Feed/Grains Processing Center of CLSU. At least, extension officers for post harvest technology are proposed to assign additionally in each Municipal Agricultural Offices of the DA for effective technology transfer.

## **5.3.6 Financial and Other Services**

### **(1) Financial and Other Services**

The financial problems of the IAs will not satisfactorily be solved unless the IA itself has a financial power. As proposed in succeeding pages, the IA should establish the fund through various activities, and the capital for crop insurance and crop production loan should be gradually created by IA level. Then, it is recommended that such crop insurance and crop production is to be actually tried in proposed MFIA, FIA, and CIA.

As mentioned in Section 3.8 "Inquiry Survey of Inhabitant's Felt Needs", there are strong request to the Government for the improvement of crediting services. The proposal includes two components, viz. i) improvement of prevailing production loan and ii) introduction of two step loan. Medium and long term loan will be available for perennial crop and profitable livestock productions under the Project. And also, the cooperative spirit through the association of beneficial farmers under the introduction of financial-intermediary loan (two step loan) will be strengthened.

#### **a) Improvement of Prevailing Production Loan**

About 90 percent of the total farmers in the area are engaging in palay cultivation and the bulk of them are asking for production loan either from the banks of private lenders.

There are constrained crop production loans as mentioned in Appendix M, and these loans are provided only to limited annual and perennial crops with a strict limitation of amount. Therefore, immediately, the framework

of crop and amount to be granted by the loan should be expanded. The following items should be fully incorporated to the Supervised Credit Program by LBP:

- i) There is no effective production loan which deals with livestock so far. Livestock production, represented by duck raising is getting very popular as the most profitable sideline in the area, but due to a big initial investment and no availability of low-interest loan, only a few can enter into this business. In this sense, livestock production loan with lesser annual interest should be incorporated.
  - ii) Perennial crops, especially mango production will be aspired as another sideline, therefore the loan should open wider door for fruit production.
  - iii) After the fulfillment of basic farm infrastructure, the expansion of loan for the use of stabilization and upgrading for farmgate price of the production will essentially required. Therefore, the loan should gear toward for the convenience of farm mechanization and marketing.
- b) Introduction of Two Step Loan Program

After the establishment of multi-functional IA: viz. MFIA, FIA, and CIA, two step loan program to strengthen the financial stability should be introduced and the trial of actual loan application will be performed in such association(s).

Two step loan as described in Figure 5-3-3 aims to grant a low interest production loan to the farmers through such IAs. The fund of the loan is rent from some foreign assistance agency such as WB, ADB, OECF and the procurement and management of the loan should be undertaken by LBP. It is observed that LBP, Concepcion has a eligibility to manage a test-run of the loan allowing for the following reasons ;

- i) The emancipation of rice and corn land under PD.27 has been smoothly achieving in the area, and most of farmers are applying the production loan with high interest rate through the banks and private lenders.
- ii) Due to good achievement of operation of land transfer, the LBP, Concepcion has lesser burden as compared with other branches, and its organization now is well-functioning.
- iii) There is strong cooperative movement in the area, and some cooperatives have already perfectly organized.
- iv) Land and labor productivities in the Study Area are, to some extent, higher than other places, thus, the farmers are considered to enough affordability to pay back the loan.

Figure 5-3-2 shows the example flow of loan. Every economic entities involved in this loan program will be benefited, because.

- i) Farmers will be the grantee of the loan with more or less 6 percent of annual interest rate, and will no longer require the loan with high interest rates offered by private lenders.
- ii) Agricultural cooperatives will be able to save the balance arising from the difference of interest rate; viz. 4.5 percent granted from LBP and about 6 percent rendered to farmer beneficiaries. Through the expansion of internal stock, the cooperatives will be able to get a running cost for strengthening of organic function.
- iii) LBP will be able to save the balance brought about by the difference of interest rate in the same way as cooperatives.

As mentioned above, this program should be substantially started after the establishment of eligible IA(s), because the IA(s) have to play an important role as a conduit bank LBP. The trial of the program shall also be implemented after the selection of the model IA(s), suitable loan donor and the experienced consultant.

There are some projects on which this loan has already been implemented so far. As a result of this loan program, the following effects are being reported.

- i) The farmers who have applied the loan expanded from model area to the whole of the nation.
- ii) High development effect could arise within a short period; for example, average farm income of beneficial farmers multiplied to 190 percent two to five years after loan commencement.
- iii) Continual implementation brought up the establishment of long-term loan system and familiarized the beneficial farmers.
- iv) The program stabilized and strengthened not only agricultural credit lines but also others.
- v) Introduction of agricultural machinery was accelerated and as a result, upgraded the living standard of the beneficial farmers.

## (2) Marketing Credit

Together with improvement of post harvest facilities and enhancement of trading, effective credit facility is required so that farmers do not suffer how to get living or next production expenses without selling paddy immediately after harvest. Objectives are as follows :

- i) To promote the flow of credit funds from the banking system thereby providing support to agrarian reform and rural development.
- ii) To provide farmers directly with an opportunity to market their produce at better price.

iii) To assist farmer groups establish their own post harvest facilities to enhance their income.

iv) To sustain the positive impact of the program in terms of buying up farmgate prices, increasing trader-millers inventory and encouraging improvement in post harvest facilities.

The incremental is expected to be the result of enabling farmers to raise interim funds via Quedan loan and await for better prices on their harvests rather than outrightly selling after harvest when prices are normally low.

And back-up the extension of credit by private commercial banks to farmer groups for construction of post harvest facilities.

It is verified that by having their own mechanical dryer and on-farm storage, farmers would realize better prices by simply being able to upgrade quality of their marketable produce and by being able to sell directly to big trader-millers rather than to assembly-traders or ambulant middlemen.

For the success of the above mentioned objects, Quedan Fund by the QGFD through conduit banks shall be strengthened to grant credit with cheaper interest rate to small rice farmers' group for their living and next crop production expenses incurred during pledging their paddy at the PMSs. To maximize income of group from its paddy trading activities, it shall be encouraged to avail of Quedan loan against its stock inventories especially during the peak harvest months to enable group to wait for better prices and realize more profits.

Table 5-3-1 Proposed Cropping Pattern in CISs Area

No.	Name of CIS	AGRICULTURAL AREA (Ha)					Total	
		Wet Season	Rice	Rice	Rice	Fallow		Sugarcane
		Dry Season	--- Rice	Diversified Crops	Fallow	Rice		Sugarcane
1	BAMBAN		532	-	219	-	300	1,051
2	SAN PEDRO		120	-	-	-	-	120
3	MALONZO		240	-	-	-	-	240
4	BANGCOU		500	-	200	-	-	700
5	SUSUBA		8	-	32	-	-	40
6	TELEBANCA		364	25	-	-	-	389
7	STA. RITA		135	-	-	-	-	135
8	MARITA		100	-	-	-	-	100
9	SAN MARTIN		240	40	-	-	-	280
10	BALUTO		570	170	-	-	-	740
11	LILIBANGAN		240	-	-	-	-	240
12	SAN BARTOLOME		260	90	25	-	-	375
13	SAN ISIDRO		330	120	-	-	-	450
14	LUCONG		1,240	400	360	150	-	2,150
15	MAGAO		468	-	-	152	-	620
16	TINANG		100	-	150	-	600	850
17	STO. ROSARIO		150	-	50	-	-	200
18	STA. MONICA		300	-	-	440	-	740
19	CALULUAN		45	35	-	-	-	80
	Total		5,942	880	1,036	742	900	9,500
	Intensity		63	9	11	8	9	172

Table 5-3-2 Present Cropping Intensity in CISs Area

No.	Name of CIS	AGRICULTURAL AREA (Ha)					Total	
		Wet Season	Rice	Rice	Rice	Fallow		Sugarcane
		Dry Season	--- Rice	Diversified Crops	Fallow	Rice		Sugarcane
1	BAMBAN		51	-	-	-	29	130
2	SAN PEDRO		100	-	-	-	-	200
3	MALONZO		100	-	-	-	-	200
4	BANGCOU		71	-	-	-	-	143
5	SUSUBA		20	-	-	-	-	40
6	TELEBANCA		94	-	-	-	-	187
7	STA. RITA		100	-	-	-	-	200
8	MARITA		100	-	-	-	-	200
9	SAN MARTIN		86	-	-	-	-	171
10	BALUTO		77	-	-	-	-	154
11	LILIBANGAN		100	-	-	-	-	200
12	SAN BARTOLOME		69	24	7	-	-	193
13	SAN ISIDRO		73	27	-	-	-	200
14	LUCONG		58	-	-	7	-	122
15	MAGAO		75	-	-	25	-	175
16	TINANG		12	-	18	-	71	112
17	STO. ROSARIO		75	-	25	-	-	175
18	STA. MONICA		41	-	-	59	-	141
19	CALULUAN		56	44	-	-	-	200
	Total		63	9	11	8	9	172

Table 5-3-3 Average Crop Yields per Hectare

Crops	Actual Unit	With Project Unit	Without Project Unit
Irrigated Paddy			
Wet Season	3.70 MT.	4.50 MT.	3.70 MT.
Dry Season	4.10 MT.	5.00 MT.	4.10 MT.
Rainfed Paddy	2.00 MT.	2.00 MT.	2.00 MT.
Sugarcane	85 MT.	85 MT.	85 MT.
Diversified Crops			
Hongo	0.85 MT.	1.00 MT.	0.85 MT.
Corn(shelled)	2.70 MT.	3.38 MT.	2.70 MT.

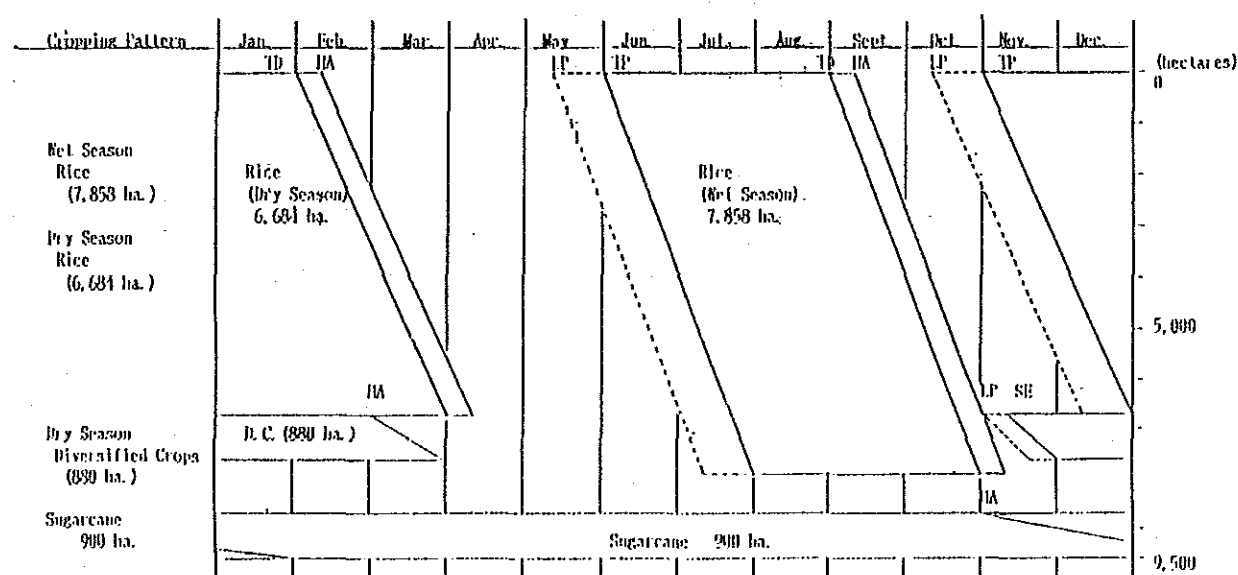
Table 5-3-4 Proposed Agricultural Area & Estimated Production in Study Area

Crops	Area (Hectares)			Production (Metric ton)			
	CIS	Others	Total	CIS	Others	Total	Yield
Rice							
Irrigated							
Wet Season	7,858	5,248	13,106	35,361	23,616	58,977	4.50
Dry Season	6,684	3,818	10,502	33,428	19,090	52,510	5.00
Rainfed	-	5,521	5,521	-	11,042	11,042	2.00
(Sub Total)	14,542	14,587	29,129	68,781	53,748	122,529	
Subercane	900	3,090	3,990	76,500	262,580	339,158	85.00
Dry Crops **							
Mango	678	839	1,517	678	839	1,517	1.00
Corn	202	249	451	682	840	1,522	3.38
(Sub Total)	880	1,088	1,968				
Idles	435	2,256	2,691	-	-	-	-
(Sub Total)	435	2,256	2,691				
Total	16,757	21,021	37,778				

Table 5-3-5 Estimated Agricultural Production in CISs Area

No.	Name of CIS	Paddy Area (has.)		Yield(MT.)		Production(MT.)		Mango Area Production		Corn Area Production	
		Wet Season	Dry season	WS	DS	WS	DS	(has.)	(MT.)	(has.)	(MT.)
1	BAMBAN	751	532	4.5	5.0	3,380	2,660	-	-	-	-
2	SAN PEDRO	120	120	4.5	5.0	548	600	-	-	-	-
3	MALONZO	240	240	4.5	5.0	1,080	1,200	-	-	-	-
4	BANGCOU	700	500	4.5	5.0	3,150	2,500	-	-	-	-
5	SUSUBA	40	8	4.5	5.0	180	40	-	-	-	-
6	TELEBANCA	389	364	4.5	5.0	1,751	1,820	19	19	6	20
7	STA. RITA	135	135	4.5	5.0	608	675	-	-	-	-
8	HARITA	100	100	4.5	5.0	450	500	-	-	-	-
9	SAN MARTIN	280	240	4.5	5.0	1,260	1,200	31	31	9	38
10	BALUTO	740	570	4.5	5.0	3,330	2,850	131	131	39	132
11	LILIBANGAN	240	240	4.5	5.0	1,080	1,200	-	-	-	-
12	SAN BARTOLOME	375	260	4.5	5.0	1,688	1,300	69	69	21	71
13	SAN ISIDRO	450	330	4.5	5.0	2,025	1,650	93	93	27	91
14	LUCONG	2,000	1,390	4.5	5.0	9,000	6,950	308	308	92	311
15	MAGAO	468	620	4.5	5.0	2,106	3,100	-	-	-	-
16	TINANG	250	100	4.5	5.0	1,125	500	-	-	-	-
17	STO. ROSARIO	200	150	4.5	5.0	900	750	-	-	-	-
18	STA. MONICA	300	748	4.5	5.0	1,350	3,700	-	-	-	-
19	CALULUAN	80	45	4.5	5.0	360	225	27	27	8	27
	Total	7,858	6,684	4.5	5.0	35,361	33,420	678	678	202	682

Figure 5-3-1 Proposed Cropping Pattern in CISs Area

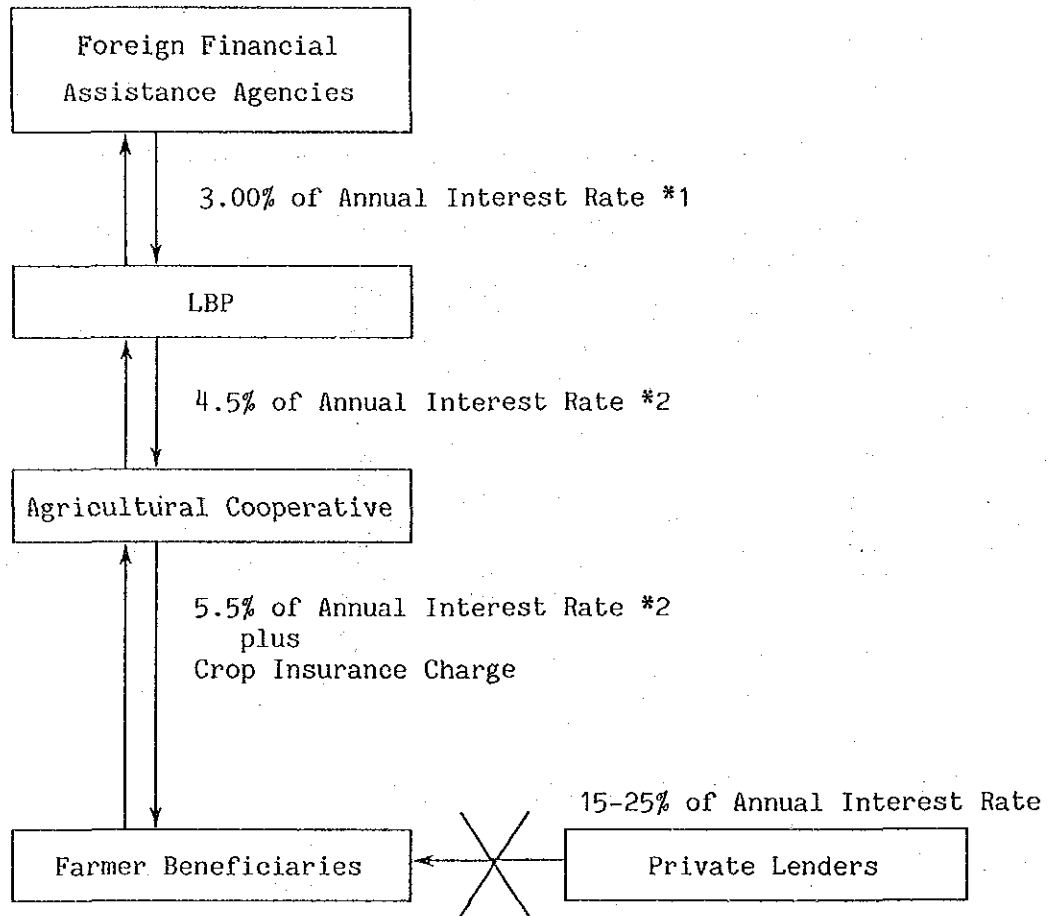


Remarks : LP - Land Preparation. TD - Terminal Drainage  
 TP - Transplanting. HA - Harvesting  
 SE - Seeding. D.C. - Diversified Crops.

\* The crops before the hyphen are wet season crops; those after the hyphen are dry season crops.



Figure 5-3-2 Flow Chart of Two Step Loan



Note : \*1 Average annual Interest Rate by OECF, Japan was assumed. Actually more or less 2.7% of rate is being adopted for the loan to the Philippines, recently.

\*2 Estimated.

## 5.4 Agricultural Infrastructure Development

### 5.4.1 Irrigation Plan

The purpose of the irrigation plan is to possibly increase the agricultural production, with high irrigation rate by upgrading and improving of the irrigation facilities. And the double cropping system is recommended as the well-suited farm management pattern for the Study Area in taking into account physical conditions of the area such as topography, meteorology, hydrology, etc and irrigation plan for rice.

#### (1) Water Resources for Irrigation

##### a) Existing Water Resources Available for Irrigation

The existing water resources in the area are the river discharges. The extremely doughty months generally last from March to May of the latter period in dry season although changeable year by year.

For dry season irrigation, the specific drought discharge are estimated at 1.17 m<sup>3</sup>/s in the mountainous district and 0.18 m<sup>3</sup>/s in the flat land for 100 km<sup>2</sup> in March by 5-year probability. The drought discharge by river basin is as follows :

Bamban river basin	;	1.82 m <sup>3</sup> /s
Lucong river basin	;	1.26 m <sup>3</sup> /s
Tinang river basin	;	0.13 m <sup>3</sup> /s
Spang Balen creek	;	0.06 m <sup>3</sup> /s

##### b) New Water Resources Facilities for Irrigation to be Developed by Groundwater Collecting Conduit

The groundwater level observed at between San Francisco bridge and Barangay Lilibangan is comparatively high and less than 0.5 meters below ground surface. The geological formation consists of sandy soils, and the coefficient of permeability is high ( $K=1 \times 10^{-2}$  cm/s). The gravity irrigation method is possible with the steep slope of land. These conditions are good for the plan of the groundwater collecting conduit.

The groundwater collecting conduit is proposed in considering topographical constraints as follows.

Name of CIS	Collecting Length (m)	Conduit Discharge (cu.m/s)	Irrigation Area (ha)	Water Requirement (cu.m/s)
Sta. Rita & Marita	1,000	0.49	235	0.43
San Martin	1,000	0.49	240	0.44
Lilibangan	950	0.47	240	0.44
Baluto	2,000	1.03	570	1.03
<b>Total</b>	<b>4,950</b>	<b>2.48</b>	<b>1,285</b>	<b>2.34</b>

Note : Discharge and water requirement are shown for dry season.

## (2) Proposed Cropping Pattern

The following points are taken up for consideration on the selection of the proposed cropping pattern :

- The cropping pattern is one to be utilized irrigation water effectively.
- The cropping pattern is one to be utilized the existing irrigation facilities effectively.

### a) Effective Utilization of Irrigation Water

The beneficial area is planned to be expanded as large as possible in taking into account the irrigation water requirement for rice culture and available water resources, such as available effective rainfall and river discharge. The present three-month transplanting period seems too long. To find reasonable transplanting period in an irrigation area case study is conducted on the following three (3) cases:

- Case 1 : Transplanting period is for three months.
- Case 2 : Transplanting period is for two months.
- Case 3 : Transplanting period is for one months.

For the case study, the following, basic assumption are considered:

- i) The design year with 5-year probability is the year 1982.
- ii) The rainfall at Hacienda Luisita is adopted as the representative rainfall in the Study Area.
- iii) The climate data of San Miguel, Tarlac station is adopted as the basic climate conditions.
- iv) The calculated river discharge of Parua (Bamban) river is adopted as the available water source.

According to the result of the above-mentioned case study, especially study on the daily water requirement and irrigable area, a case of short transplanting period, like Case 3, is required rather much daily water requirement resulting comparatively less irrigable acreage. On the other hand, a case of long transplanting period, like Case 1, is needed to extend the growing period up to the dry season with rather less available water resources in the river resulting also less irrigable acreage. As a result, the transplanting period in the master plan is proposed reasonably to apply the Case 2 with two-month period (refer to Figure F-1-1 in Appendix F).

### b) Effective Utilization of the Existing Irrigation Facilities

The flow capacity of the existing canals in CISs has sufficient design capacity except for the main canal No.1 and No.2 in Molonzo CIS (refer to Table F-1-13 in F-1-13 in Appendix F). The existing canal facilities is required no improvement of the capacity for Case 2, transplanting with two-month period instead of the present three-month period. Taking into account the magnitude of the improvement of the existing facilities, the Case 2, transplanting with two-month period is proposed for the master plan.

### **(3) Water Requirements**

According to the meteorological data and information available at the station of Hacienda Luista, the monthly evapo-transpiration is analysed by applying Modified Penman Method as 6.5 mm/day at maximum in April and 3.9 mm/day at minimum in August. Crop coefficient on paddy varies in ratio between 0.95 and 1.1 for both the dry and wet season cropping.

ET<sub>crop</sub> value varies from 3.9 mm/day at minimum in September to 5.7 mm/day at maximum in June for the wet season paddy, while 4.5 mm/day at minimum in January and 5.3 mm/day at maximum in March for the dry season cropping. Percolation is considered at 3.0 mm/day in the area with sandy features of the soils. The puddling water in the area is required 240 mm for wet season and 230 mm for dry season.

The irrigation efficiency to be employed for various design of the facilities is estimated at 46.8 percent in wet season and 54 percent in dry season, which are planned based on losses that 20 percent of conveyance losses at main and lateral canals, 10 percent of operation losses, and field application losses of 35 percent in wet season and 25 percent in dry season. The maximum water requirement per hectare is estimated at 2.11 l/sec (refer to Table F-1-5 in Appendix F).

### **(4) Irrigation Area**

Irrigable area in the Study Area under the existing 19 CISs is planned 7,759 hectares or 79 percent of irrigation rate in wet season and 5,012 hectares or 51 percent of irrigation rate in dry season.

Irrigation water resources for the master plan is the existing river discharge and the new water resources of groundwater collecting conduit (GCC) along Bambang river to be developed by the Project. The irrigation rate of Sta. Rite, Marita, San Martin, Lilibangan and Baluto CISs is proposed at 100 percent due to the service areas of the GCC. The irrigated area of the other CISs are just the same as the present areas because of availability of the existing water resources. The proposed irrigated area of 19 CISs are 8,199 hectares or irrigation rate 84 percent in wet season and 6,087 hectares or irrigation rate 62 percent in dry season (refer to table Fig.F-1-2~3 in Appendix F).

### **(5) Water Balance of CISs**

As the result of water balance study on the water resources and water requirement in the development plan, water resources for the following CISs denote insufficient for the water requirement and necessary for supplement of pump irrigation. Telabanca CIS is supplemented by the present private owned pumps, however, irrigation water is still insufficient, and additional pumps are required (refer to Table F-1-10 in Appendix F).

Name of CIS	Shortage Discharge	Existing Pump	
	m <sup>3</sup> /s	unit	m <sup>3</sup> /s
Susuba Cutcut	0.02	2	0.02
Telabanca	0.08	1	0.01
San Bartolome	0.24	52	0.52
Sam Isidro	0.33	188	1.88
Lucong	0.01	50	0.50
Magao	0.03	12	0.12
Tinang	0.03	4	0.04
Sto Rosario	0.03	30	0.30
Sta Monica	0.12	100	1.00
Caluluan	0.07	50	0.50

#### 5.4.2 Irrigation Facilities Improvement and Development

The development plan for the irrigation facilities will be made under the following basic consideration.

- a) To check and improve the hydraulic cross-section and structural design of the existing canals in order to convey the irrigation water to every farm lot and to conduct the proper water management.
- b) To study the suitable and safe intake method in relation with the existing brush dams which are deteriorated by sediment and flushed away by floods frequently.
- c) To improve the deteriorated O'gee-type weir, gates, river bed and bank protection works of the existing diversion dams to regain their proper functions.
- d) To provide the groundwater collecting conduit as new water resources development in the area where groundwater is abundant with high groundwater table and the geological formation with sandy materials.
- e) To provide new diversion dams in unifying the existing 14 intakes which are located sporadically along the Bambang River.

#### (1) Irrigation Canals

The average canal density for 19 CISs is 18.7 m/ha and nearly 20 m/ha of the standard of NIA. Therefore, the canal density of the existing canal systems seems to be adequate from the viewpoint of proper water management. The capacity of the existing canals is mostly enough, except the main canal of Malonzo CIS. The lined rate of the main canal is 10 percent only. Canals with sandy soil, more than 0.6 meters in depth and more than 0.3 m<sup>3</sup>/s in discharge is proposed to rehabilitate by concrete lining for prevention of erosion and seepage. The Malonzo CIS main canal with 4.8 kilometers in total is to be rehabilitated to keep its proper hydraulic cross-section (refer to Table F-1-13 in Appendix F).

## (2) In take Facilities

The area in 19 CISs is irrigated through 27 diversion works and 31 intake works. All of 14 dams located along Bambang river are brush dams, while 13 weirs on Lucong and Tinang rivers and creeks are o'gee-type weirs with gates. Improvement works of these weirs are required by types as follows (refer to Table F-1-11~12 in Appendix F).

### a) Brush Dam

The brush dams in the area have been destroyed or washed away by floods, or deteriorated in their function by sediment transported from the watershed area. Under the conditions, the brush dams are planned to improve taking into consideration the river training of the upstream reaches and the river conditions around the intake points as follows :

- i) For the low weir method with stop-log placed diagonally crossing of the river, stone rip-rap works are provided partly as river-bank protection. The collection pipes are provided inside these rip-rap works during wet season and during dry season the open canals are used.
- ii) For the low weir method with triangular gate in crossing the river, the intake is just the same as low weir method with stop-log.
- iii) For the low weir method with gabions in diagonally crossing the rivers, the transported sand sediment will be flushed away through the spillway cum sluiceway provided at the upstream of the feeder canal.

Among the above three methods, low weir method with gabions will be buried by transported sand sediment and the intake will not function. The triangular gate method is hard for the operation, and the construction cost is rather high. Therefore, the improvement of the brush dam is recommended by introducing the low weir method with stop-log (refer to Fig. F-1-4~5 in Appendix F).

### b) Rehabilitation of Dam Body

On No.1 weir of San Bartolome CIS, the broken crest is required to rehabilitate with reinforced concrete.

### c) Repair of Gates

These CISs of Lucong, Tinang, Sto. Rosario, and Sta. Monica have the O'gee-type weir with wooden flap gates of about 2.0m span (upstream support), which are malfunctioned with water leakage and caused the back water in flood giving damages at the upstream embankment by over-flowing. These dams are rehabilitated with rubber dams in view of water tightness, easy operation and economy.

### d) Rehabilitation of Downstream River Bed and Bank Protection Works

Scouring and wash-away are found at the downstream river bed and embankment to the dams of those CISOs of NO.1 and No.2 of San Bartolome, Tinang, Sto.Rosario and Sta.Monica. The dam body and downstream embankment are exposed to destruction. Consequently, the riprap of these dams is used for rehabilitation.

e) Total Improvement of Dams

Dams in Susuba Cutout and Caluluan CISOs, are proposed to totally improve with widening the related creek for the expansion of the capacity.

**(3) Development of New Intake Facilities**

a) Groundwater Collecting Conduit

The groundwater collecting conduit GCC for development of groundwater as the new resources are proposed in Sta Rita, Morita, San Martin, Lilibangan and Baluto CISOs along Bamban river in the Study Area. The GCC is planned by 1,000 mm in diameter, 1.0 kilometer in length, and 0.53 m<sup>3</sup>/s in discharge capacity. Irrigable area by GCC is planned about 250 hectares.

The dimensions of proposed GCC are as follows ;

<u>Name of CIS</u>	<u>Diameter (mm)</u>	<u>Length (m)</u>	<u>Irrigable area (ha)</u>
Sta Rita & Marita	600~1,000	1,000	235
San Martin	600~1,000	1,000	240
Lilibangan	600~1,000	950	240
Baluto	600~1,000	2,000	570

b) Unified Diversion Dam

There are many brush dams and other intakes along the Bamban river and the farmers are obliged to face difficulty by the unstable intake. As an alternative study on the master plan, the construction of large unified diversion dams is considered together with the development of its canal systems in order to conduct adequate water distribution under the proper water management. For the study, various examination are required to select the suitable location for the diversion dam.

Furthermore, the following considerations are particularly taken up for the design of diversion dam ;

- i) Erosion and flood control works at upper reach of the catchment area.
- ii) Suitable location for stable intake.
- iii) Upstream and downstream effect after the construction of the dam.

Construction cost of the dam together with the related benefit is economically studied. Through the study, the unified diversion dam is proposed to locate at immediate upstream of the railway bridge. The service area of the dam is 1,750 hectares in Bamban, San Pedro, Malonzo, Bangcu and Telabanca CISOs. The dam is planned with 55.5 meters (fixed weir: 30 m and movable weir: 11.0 m x 2 set) and 2.0 meters in length.

The unified diversion dam is recommendable to implement in the future in high. Considering the watershed management and flood control development, land productivity and growth of social economic conditions (refer to Figure F-1-6 in Appendix F).

c) Shallow Well

Irrigation water in CISOs is insufficient amount during dry season except the upper portion of Bamban river serving by Bamban, San Pedro, Malongo, Bangcu and Telabamca CISOs and obliged to reduce the irrigation area.

Paddy fields with high groundwater table level are irrigated by privately owned pump except Susuba CutCut and Tinang CISOs where groundwater table level is very low.

In the master plan, installation of supplemental shallow wells is proposed to increase the irrigation rate in dry season due to abundant and high level of groundwater in the area (refer to Table F-1-4 in Appendix F).

d) Linkage of the National Irrigation System

SMORIS is a national irrigation system by O'Donnell river as its water resources and irrigates the parts of the Study Area. However, water resources of the system is not sufficient to irrigate over the area of 19 CISOs.

The BBMP canal is planned to run south from Tinang to San Bartolome via Santa Nicoles. The plan includes supplemental water supply through feeder canals to 12 CISOs located at the eastern part of the Study Area in Sta.Rita, Marita, San Martin, Baluto, Lilibangan, San Bartolome, San Isidro, Lucong, Magao, Tinang, Sto.Rasario and Sta. Monica CISOs.

### 5.4.3 Drainage and Flood Protection plan

#### (1) Drainage Canals

Drainage on the farm land in the Study Area is made mainly through creeks, and density of the drainage canal in 19 CISOs is 23.0 m/ha on an average. The density seems to be enough for the drainage of on-farm, therefore, new drainage canal is not proposed at the present. Since the creeks of Susuba Cutcut and Caluluan are suffered by shortage of drainage capacity and caused frequently inundation in their peripheral farm lands, these two creeks are planned to improve by widening for increase of capacity.

#### (2) Flood Control

a) Embankment Protection Works

In the Study Area, the embankment protection works are on going along the rivers of Bamban and Chico by the flood control project of DPWH.



i) Bamban river

The upstream left bank of Bamban river was left intact after being washed away by flood in the distance between Barangay of Bamban and San Pedro. In other respect, the embankment toes to the river side are scoured and exposed to danger of destruction even by small floods due to the fact that Bamban river bank are constructed with sandy soils. The protection works shall be carried out at the banks where the water current collides, and furthermore, many springs are found along the inside of the left banks from Barangay San Martin to Barangay Lilibangan. Improvement of the existing intake are to be carried out in cooperation with the flood control works of DPWH.

ii) Chico river

A strip land with about 2.0 kilometers along Chico river is a chronically inundation area in wet season, covering about 792 hectares in CISOs of Lucong, Magao, and Sta. Monica. Under the situation, this river improvement works as well as inundation protection works shall be carried out for the area to eliminate the standing water in the area in the future.

However, complete elimination of such inundation will be very hard until the river training works of the Pampanga river is implemented, because Chico river is a tributary of Pampanga river and considerable cost and time are required for its works.

b) Reforestation of Catchment Area

Although the development of the catchment area is not included in the study according to the terms of reference, the development plan is recommended for further consideration taking into account that it is indispensable to solve the problems of erosion and flood control.

The following plan is recommended.

- i) Reforestation
- ii) Sabo dam

The catchment areas of Bamban and Lucong rivers are almost denuded land by disorderly timber cutting. Heavy sediment to the downstream from these naked catchment area is caused serious river bed rise in elevation resulting obstacles for river training and water utilization works. Adequate soil conservation shall be implemented for the areas of the sediment supply, and reforestation or greening works shall be promoted for the naked catchment areas.

In the mountain area of the catchment of Bamban and Lucong rivers basins, Sabo dams are required on each river and their tributaries so as to trap and store the sand transported from the mountainous areas for preventing sand from flowing down.

#### **5.4.4 Farm Road Development**

At present, there are few main and branch farm roads running within the Study Area, but these farm roads will be inevitably required for the rationalization of farming and the improvement of productivity.

The service roads are planned to be constructed along the canals for the use as farm roads and for operation and maintenance of the facilities. The road is proposed to design gravel pavement with a width of 4.0m and 2.0m for main road and branch road, respectively in taking into consideration a kind and type of vehicle to pass as well as the transportation volume.

#### **5.4.5 On-farm Facilities Development**

##### **(1) Irrigation and Drainage Ditches**

Currently, the plot-to-plot irrigation and drainage are practiced in the area. In future, however, the on-farm irrigation and drainage ditches shall be constructed for keeping the paddy fields well-drained and for proper water management. The irrigation ditches shall be provided between the existing lateral canals and paddy plot, while the drainage ditches between paddy plot and lateral drainage canal or creek. The said works shall be implemented by farmers themselves in the future.

##### **(2) On-farm Roads**

The on-farm roads shall be provided between the main and branch farm roads and paddy plots so as to secure easy access of farming machines for effective farm mechanization and rationalized farming in the future. These roads shall have 2.0m in width and of gravel pavement type.

## **5.5 Rural Road Development**

### **5.5.1 General**

Rural road consists of provincial and Barangay road by its function. Provincial road connects a municipality with other municipality playing an important role in social activities. Since provincial government makes a great effort to improve the road condition, road concreting is often seen elsewhere on provincial road.

The development objectives are not only to improve transportability of the products and commodity but also to enhance socio-economic activities. The provincial roads in the Study Area, however, are rapidly on going or planning for improvement by the government. The provincial road improvement should be excluded from the development plan.

On the other hand, Barangay road defined as roads connecting a Barangay with other Barangay, farm, provincial or municipal road in the surrounding area is still poor in physical condition. For the development plan, Barangay road can be categorized into three parts according to their function; Barangay road proper, Barangay road and farm-to-market road.

Barangay road proper is defined as any road within the Barangay proper area. Main road in a Barangay proper with a length of 100 to 200 meters is under concreting or planned to be concreted as the multi-purpose pavement. This pavement project aims at utilizing a road for living activities, palay drying, recreational event and so forth. So Barangay road proper improvement should be excluded from the development plan. Therefore, the development plan should cover only Barangay road and farm-to-market road.

### **5.5.2 Barangay Road**

#### **(1) Development Objectives**

The development objectives are not only to improve the accessibility from the municipal proper to the rural area in order to promote the agricultural/production, but also to support agricultural and other infrastructure development in order to enrich the living condition of inhabitants.

The farm road is rather higher than the national average in the road density per land area, but rather low in the pavement ratio. Therefore, the emphasis of development target should be placed on the improvement of the existing road condition.

#### **(2) Development Plan**

Barangay road is defined as any road connecting a Barangay with another Barangay which plays a vital role on living activities, communication and agricultural productive activities. At present, any Barangay road in the Study Area is more or less constructed by earth or

gravel road, but the physical road condition is so poor that they become muddy or bumpy in rainy season and dusty in dry season. Therefore, Barangay road should be concreted for improvement in accordance with the priority relating to 19 CISs listed (refer to Tables G-2-5, G-2-6 and G-2-7 in Appendix G).

Barangay road to be improved are selected in due consideration of distance between Barangay and municipality, occurrence of water impound or interference in rainy season and bad conditioned road according to Barangay road status.

Improvement of farm road contributes to the save of transporting time, reduction of labor force in transportation, increase of transport capacity, acceleration of agricultural productivity and promotion of living activities.

### **5.5.3 Farm-to-market Road**

#### **(1) Development Objectives**

The development objectives are to improve the accessibility and transportability from Barangay or Barangay road to farms in order not only to increase the carrying capacity of agricultural input and output but also to ease the carrying convenience.

#### **(2) Development Plan**

Farm-to-market road is defined as any road connecting farm to Barangay or Barangay road which is utilized for transporting agricultural input but also to ease the carrying convenience. These roads are still rough that farmers could hardly carry their agricultural products at the proper time. Therefore, farm-to-market road should be gravelled for improvement.

For those farms which do not have farm to market roads within 500 to 1,000 meters transporting distance, new farm roads should have to be constructed/by improving existing catwalks or footpaths.

## 5.6 Institutional Development

### 5.6.1 Participatory Approach

#### (1) Basic Concept

The basic concept of NIA's participatory approach is placed on the acceleration of the maximum beneficiaries' participation from planning and designing stages to operation and maintenance stage on completed irrigation facilities. To realize this, NIA takes the responsibility to assist them of financial and technical aspects.

The former NIA's concept on farmer's organization has been primarily placed on the amortization collection, however the collection rate has never shown favorable increase. The reason for it could be explained in the sense that the farmer's intention for payment has never become strong enough, because all the developments undertaken were proceeded under the Government's initiative and did not reflect the beneficiaries' intention. Consequently, the policy of participatory approach has gradually shifted to the maximum farmer's participation with the consciousness that the irrigation project should be undertaken by the farmers and for the farmers themselves. Further, the participatory approach places its concept on aggressive promotion to simulate the system formulation and evaluation, which require farmer's initiatives in the process of irrigation development and NIA's effort as the supporting agency for such farmer's activities.

Thus, the participatory approach program aims to formulate strong IA based on the basic concept mentioned above. A strong, functional, cohesive and viable IA is indicated by the followings :

- i) Equitable distribution of water among members ;
- ii) Management of internal conflicts without outside intervention ;
- iii) Operation and maintenance of irrigation system ; and
- iv) Financial solvency such that amortization could be paid on time.

According to the survey on 19 CISs, the participatory approach was actually applied to 12 CISs and in the most places, the approach was well applied. However, to adopt the participatory approach to the proposed plan, the following items related to : i) ICO/LOW, ii) by-low of IA, and iii) adjustment of irrigation plan are to be supplemented and emphasized.

#### (2) ICO/IOW

The ICO or IOW is fielded in 12 CISs out of 19CISs in the Study Area. However, the number of ICOs/IOWs who are belonging to PIO and in charge of the area is at four, and to supplement lack of manpower, an Irrigation Technician is concurrently acting as an ICO. Among four organizers, the permanent staff of NIA is counted at one, and the other three are temporary staff. When allowed for the future situation in the area, that is, one IA would be set up in each CIS and multi-functional IA (MFIA) would be established in the process of development, it is considered that at least two more organizers (one each by sex) should be needed. One ICO for three CISs is recommended to be taken charge of, and the chargeable

CISs are to be placed respectively on different development stages, namely, pre-construction stage, construction stage, and O/M stage.

There exist some examples of IA where the misunderstandings of amortization and IA association dues payment can be observed and/or the farmers' felt needs for irrigation facilities are not fully reflected due to imperfection of the approach on pre-construction stage. This is attributed to the shortage of the organizer as well as the assignment period of ICOs/IOWs. Usually, the organizer is fielded to the CIS eight to nine months before construction, but the longer time (about one year) will be required for pre-construction stage and more frequent communication should be made with the farmers. In O/M stage of the participatory approach, the organizer should devote himself primary to collection of dues and the frequent contact with the farmers are no longer necessary. Likewise, the organizer should gradually entrust O/M works of the facilities to the IA. Accordingly, it is recommended that the contact with IA should be retained up to the completion of two times' dues collection, and if high collection rate could be attained at that time, he should only continue to assist the campaign for dues collection.

When observed the situation of institutional development in nationwide, it is recognized that the acceleration of transferring of a part of O/M activities of National Irrigation System (NIS) to the CIS(s), and strengthening of O/M activities by the CIS will be brought about with the rapid increase in communal investments proposed under NIA's revised Corporate Plan. Thus, the institutional development will require a corresponding increase in institutional development staff. In anticipation, the number of ICOs/IOWs has already risen from about 670 in late 1987 to 810 in late 1988 and 870 at present. A further increase to about 1,000 by 1991/2 is envisaged. NIA calculations suggest these numbers are sufficient, in particular since the targets under the locally-funded and CARP programs may prove difficult to achieve. NIA has, however, encountered serious difficulties in retaining ICOs/IOWs so that a substantial recruitment and training program will be required not only to increase numbers but also to replace those that leave.

It is considered that increased remuneration following salary standardization and improved promotional prospects will encourage greater staff stability. Nevertheless, the fundamental problem is the fact that Institutional Development Staff hold temporary contracted positions and are not considered employees of NIA. A review of this situation is needed to enable these staff to be appointed as regular project staff.

### **(3) By-Law of IA**

Among 19 CISs, the 15 CISs have the IA with individual by-law which, however, is prepared taking NIA's standard draft by-law as a model, without any modifications. The investigation of the existing by-laws in 15 CISs suggests that the following items are to be revised and incorporated.

- 1) Penalty for Non-payer of Amortization and IA association Dues (ISF)

At present, only Sto Rosario CIS has a penalty for the non-payer of amortization, but this penalty is not written in the by-law. And also, the definition of non-payer from the viewpoint of yield, income and land holding area is not made. As the tentative plan, the following should be recommended : if his yield of paddy per hectare was less than 30 cavans by the reason of force majeure, he is exempted from the payment on the condition that he prepares for promissory letter for next payment. In the next harvesting season, he must pay it including former debt. In case he had to face with low harvest again, the obligation of first payment will completely exempted, but if he could not fulfill the obligation, the IA will not allow him to obtain irrigation water from the CIS.

ii) Remuneration of Dues Collectors and Penalty in Case of Embezzlement Scandal

There is no remuneration for amortization fee collector in spite that the IA association dues (ISF) collection is promised, by the unwritten understandings, to get 10 percent of his collected amount. This situation magnifies the collector's undoing in the area. The following tentative plan should be investigated : viz, both the amortization and IA association due collectors can obtain 10 percent of his collected amount as the remuneration by the authorization of IA treasurer. If some embezzlement scandals of the collector come about, the IA treasurer will immediately dismiss and accuse him.

iii) Number, Way of Election and Assignment Period for Dues Collector

The following tentative plan should be considered : the dues collectors are to be placed at the rate of 1 person to 50 farms for the amortization collector, and 1 person to 80 farms for the IA association dues collector, respectively. The selection of the collectors should be made pursuing two steps. First step is to divide the resident area into several blocks by the rate mentioned above, and the second step is to advertise the candidates. The collectors are then appointed and authorized from among the candidates by the meeting of BODs. The period of assignment for the collectors is two years.

iv) Number, Way of Election, Assignment Period, and Remuneration of Water Tender

Although the water tender(s) are employed at 15 CISs now, only a few CISs such as San Pedro and Bangou regard them as the permanent employee. Accordingly, their treatment is always unsteady, so that, the intention for water management will inevitably become negative. The following plan should be examined : viz, the water tender will be placed at the rate of one person to 200 hectares. The election should be undertaken in a same manner as due collectors. The period of assignment for the water tender is also recommended at two years. As for the remuneration of the water tenders, the exemption from dues payment as well as salaries amounted to 30 pesos per day will be recommended for those who come from the locality of the CIS, while for those who come from outside the locality, some 35 pesos per day will be given. To retain the water tender's intention, about one third of salary should be continuously paid even in the dry season.

#### v) Assignment Period of BOD

The assignment period of the BOD of IA is usually defined as one year. However, it is impossible for them to improve the organization of IA and act to the best of ability. The assignment period of BOD is thus recommended at least two years.

#### (4) Adjustment of Irrigation Plan

The situation on locational superiority given to the CISs in the upper stream is very hard to improve and the coordination meeting between the CISs in lower and upper basins are scarcely held. It is expected that PIO should call the representatives from such CISs together just in the beginning of cropping season, and hold the coordination meeting to discuss about water delivery schedule on subject cropping season. In the Study area, therefore, the representatives from 10 CISs whose main water source is Bamnan river should join the meeting under the chairmanship of NIA. It is also recommended that 3 CISs relying irrigation water on Lucong river should gather together. Agendas to be discussed in the coordination meeting are: i) the problems and constraints at the present and the request to other CIS(s), ii) periodical water delivery schedule and the responsibilities of upper sided CIS(s), iii) mode of communication between the BODs in charge, and iv) mutual aid in terms of operation and maintenance activities.

The impartial distribution of irrigation water will be undertaken through the adjustment of irrigation plan and adequate water management by each CIS. Out of these, the adjustment of irrigation plan should be made perusing the following two steps.

The first step is to prepare the irrigation plan by each CIS. The second step is to adjust them on river basin level in order to utilize the limited water resources in the most effective manner. These two steps should be carried out by the proposed FIA or CIA under the strong support and administrative instruction by PIO : viz. PIO should provide technical assistance in the first step, while in the second step, the administrative instruction will be strongly required because the quantity of water resources is tightly constrained.

#### 5.6.2. Strengthening of Irrigators' Associations (IAs)

As mentioned in the former section, the viable IA can be expressed using the four indicators. The followings are strengthening plan concerning to each indicator.

##### (1) Equitable Distribution of Water Among Members

Impartial distribution of irrigation water from physical point of view is basically regarded as very difficult activity even though modernized facilities are properly introduced. This concept is also applicable to the Study Area in the sense that it will be impossible to accomplish solely by the institutional improvement. However, the



difference on location, that is, the areas located in the upper stream of the irrigation canal is always flooded, while the areas located in the lower stream of the canal is usually dried up, can be frequently observed on a CIS level especially in the dry season and this situation can be moderated to a extent through the institutional development as follows:

- i) In addition to assign water tenders by irrigation block basis, the assistant water tenders should be placed on sub-block basis; viz, one irrigation block should be sub-divided into several sectors like the upper stream sector, the mid-stream sector and the lower stream sector, and each sector will be managed by an assistant water tender. Assistant water tenders are to be temporary employee or volunteers. The problem will be gradually solved through the close discussion by them. The acreage of which one assistant water tender should take charge is recommended more or less at 35 hectares.
- ii) Water tenders should prepare the inventory ledger in which cropping schedule, situation of crop management and stage of palay growth are to be recorded by parcel. They should utilize this ledger for adequate water management of the irrigation block in charge. Also, this provides the yield criteria which can be applied to determine payer and non-payer on amortization and IA association dues (ISF) collection.

## **(2) Management of Internal Conflict**

At present, the management of internal conflict which is mostly related to water distribution is favorably undertaken without outside intervention at every CIS in the Study Area. This fact can probably be explained as the following reasons : viz, i) in the first place, IA itself has been formulated inside the Barangay community, and ii) the Barangay community itself stands on strong kinship of the inhabitants.

Although there exist a few CISs which are made up of several Barangay communities such as Lucong and Bamban, the management of internal conflict is likewise undertaken smoothly. This situation is explained by the reason that the competent personnel are elected as the BODs, and they are solving internal conflict adopting better superintendence capability than other CISs. Accordingly, this favorable situation should be retained forever even though the expansion or multi-functioning of the IA would be realized in the future.

## **(3) Operation and Maintenance of Irrigation System**

Although the major duties of CISs are operation and maintenance (O/M) of the irrigation system by the hand of IA, there are some CISs in which O/M works are undertaken by Barangay council, that is, for example Lilibangan and Tinang CISs. The BODs in such CISs, therefore, have to take two major responsibilities as the director in charge of day-to-day Barangay operation and as the manager who is responsible for O/M activities for irrigation facilities. Accordingly, they must shoulder undue obligations and actually it is impossible for them to accomplish both obligations simultaneously. At present, there are no ICO/IOW being fielded to these CISs, and the organization of these CISs is not so

active. Therefore, it is recommended that PIO should give them proper advice to set up independent BODs in charge.

O/M activities for brush dams and intake facilities are usually the obligation of water tenders. Generally, the water tender can get some remuneration as the compensation of his services except for a few CISOs such as Lilibangan, San Bartolome and Magao. In these CISOs, the water tenders are the volunteers who provide their services without remuneration. Accordingly, rewarding to the water tenders out of their collected amount is highly recommended in order to encourage working spirit of water tenders and to involve farmer's consciousness in participation of O/M activities.

Mass work for cleaning and weeding of irrigation canals and/or ditches is ordinary undertaken twice a year under the principle of participation of all farmer members. However, the mass work for dry season cropping presents the lower participation rate than that for wet season cropping, because due to scarcity of surface water in the dry season, most of farmers in the lower basin are utilizing groundwater obtained by private owned pumps and irrigating their paddy field without any assistance from others. Further, the participation rate with penalty for non-participant is higher than that without it. Thus the introduction of adequate penalty for non-participant should be immediately examined especially in Malonzo, Sta Rita and Caluluan CISOs.

In spite of existence of strict penalty in Sta Monica CIS, that is, water distribution to non-participant will be the last order, the participation rate of the CIS is quite low at 35 percent. This is primarily attributable to non application of penalty to non-participant. In this sense, the BODs of IA should keep strict observance of by-laws in their mind.

#### **(4) Financial Solvency**

To establish financial stability of IA, the following improvement is needed:

##### **i) From "Case-to-Case" to "In-Advance"**

Out of the 19 CISOs, 7 CISOs are asking the members to pay association charges. Usually, the association dues are used for the operation and maintenance of the CIS. The implementors regard it as "irrigation fee" to distinguish it from "amortization payment" to NIA. The remaining 12 CISOs collect irrigation fees, when necessary, hence on a "case to case" basis. On the contrary, 7 CISOs which are collecting association dues, collect irrigation fees "in advance".

When comparing the CISOs, the 7 CISOs collecting "advance fees" have better production value per hectare than the 12 CIS paying dues on a "case-to-case" basis. This is maybe due to the fact that once a farmer invest some amount before crops are damaged, they would make the best effort to recover their investment. Farmers, on the other hand, who have not paid any amount in advance would not pay further amount when their crops are already damaged.

Some farmers still have the wrong notion that by paying the amortization to NIA, the management of irrigation water should be undertaken by the Government. Thus, the PIO should start the training of such farmers, and then, through the ICOs and IOWs, improve the method of collecting irrigation fees of IA from "case-to-case" basis to "in-advance" basis. The effectiveness of the advance payment is measured not only by upgrading the productivity through motivation of farmer's incentives, but also by the flowing intangible benefits:

- a) The burden of the irrigation fee collectors is lightened. The irrigation fee collectors who have been asked to collect irrigation fee after damage will be released from the burden. Also, the duties of the treasurer are minimized.
- b) If the advance payment would be deposited to the financial institutions it will earn some amount of interest. If these amount would be regularly saved, this would create the internal funds for the IA. Having financial power, the organization of IA would be strengthened.

The same example can be applied to NIA's amortization collection. Of course, it is impossible to apply this advance payment to the newly established CISs. This is applicable only to existing CIS which intends to make some improvements, because, usually the farmers are considered to have at least 1.5 cavans of affordability before improvement of the facilities.

#### ii) Minimizing Illegal Cultivation

Illegal rice cultivation is widely undertaken during both the wet and dry seasons, especially at the river bed of Bambang. These riverbed are basically government property and are not allowed for cultivation without government permission. Usually, it is not considered as irrigation service area, so NIA cannot ask the illegal cultivators for the amortization. Also, the IA officials do not collect irrigation fees from these cultivators.

In the project area, 6 CISs with a total area of about 40 hectares have illegal lands as estimated below;

<u>Name of CIS</u>	<u>Area of illegal land</u>
San Pedro CIS	4 hectares
Malonzo CIS	15 hectares
Bangcu CIS	2 hectares
Telebance CIS	12 hectares
San Martin CIS	4 hectares
Baluto CIS	2 hectares
Total	39 hectares

As the safeguard against illegal cultivation, it is recommended that the IA in collaboration with NIA, should request periodical cultivation right from DENR to manage the land in a just manner. That is, the IA president will have the responsibility for cultivation of the land, as

well as for payment to NIA of the handling and guarantee charge of land acquisition. NIA will charge 1.5 cavans per hectare, the equivalent amortization paid by the CIS. In this case, the IA should justly distribute the profit of the land to the farmers who have rendered labor contribution, farm management and so on. NIA should advise them that some portions of the profit is to be saved in financial institutions, as internal funds of IA.

### iii) From Non-profit to With Profit

Generally, the IA is registered with the SEC as a "non-stock, non-profit organization". According to the interviews of amortization collectors and of non-payors mentioned in the succeeding section, the break even yield for irrigation fee payment is estimated at 45 to 60 cavans per hectare, and for amortization payment, at 80 to 130 cavans per hectare.

However, since the farmers who borrow money from private lenders are first obliged to pay back their loans, it is sometimes impossible to pay amortization even though the farmers have harvested beyond the break-even yield. To secure the amortization collection, accordingly, the IA should gradually expand its activities from water management (non-profit activities) to farm input/output dealings (with-profit activities) which would provide farmers with financial affordability for payment.

Thus it is recommended that the IA increase its revolving fund through the collection of the association dues (irrigation fee) in advance. The treasurer of the IA should manage the fund in the safe manner with interest rate the same as when deposited in the bank. If some fund is retained at the end of the harvesting period, it should be deposited in the bank through the time deposit system. Other special financing systems should be considered in appropriate banking institutions which could give the most advantageous high interest rate.

In time, these deposits would be used for the purchase of post-harvest facilities such as threshers, rice mills and warehouses. These facilities would enable the farmers to increase farm income by upgrading the quality of the production and decrease post harvest losses. Since some of the reasons why farmers do not pay irrigation fees and amortization are greatly attributed to their debt from private lenders (who also act as post-harvest dealers at the same time), this move will economize the internal margin and minimize the debt from the lenders.

### iv) Functions and Power of the Treasurer

At present, amortization collection is the full responsibility of the IA. There exists inconsistencies regarding the amount the farmers pay and the amount reported by the collectors, treasurers, and even NIA. Some collectors and even treasurers use the money collected for other purposes like lending it to their relatives or use it for paying their debts and obligations (refer to Appendix K).

For the collection of amortization payments, NIA depends entirely on the IAs while the IA treasurer depends on the collectors. The IA

treasurer does not have direct contact with the non-payers in the CIS. The credibility of the IA associations will be weakened if NIA directly contacts the collectors and the non-payers. It is therefore necessary for the treasurer to check and verify the total collections remitted by the collector.

It is therefore necessary that functions of the treasurer should be identified and strengthened as follows :

- a) The treasurer must be given the authority to determine non-payers. It is recommended that the treasurer must be authorized to determine the final say as to whether the farmer should pay or not.
- b) The treasurer must be given the authority to assign collectors with an acknowledge of the President. In case the collector commits a mistake, the treasurer should penalize him and when necessary replace him.

If the treasurer as well as the concerned IAs attain a high collection rate, they should be given incentives. For example, assuming that the collection rate is more than 90 percent, the excess of the 90 percent, should be deposited in the bank by NIA as IA funds. And from the deposited amount, percent should be given to the treasurers as incentives.

v) Research and Decrease of the Damage of Tungro

Based on interviews made on non-payers, it is estimated that about 70 percent are not really capable to pay because of lack of farm income. The rest of the 30 percent of the non-payers are reluctant to pay even if they can afford to pay.

The considered main reason for the low harvest is the presence of tungro which damages crops. Unless research is made on the control of tungro, damage to crop will continuously increase. As a consequence, high collection rate will never be materialized.

vi) Computerization

At present, NIA PIO has only four ICOs who are in-charge of 12 CIS. They are therefore overburdened. The introduction of computer system will lessen their work load and help the PIO in the following aspects:

- a) The PIO can easily identify the problems of non-payers from the data about amortization collection prepared by the IA BODs of the CIS. Through these data policies regarding CIS development can be assessed and determined.
- b) The endemic problems will also be visualized. For example, the characteristics of non-payers in a specific year such as farm location, number of families and tungro-affected areas will be easily defined.

- c) Injustices of collectors or non-payers will be minimized and consequently, the amortization collection rate will increase.
- d) Routine official works such as bookkeeping, documentation and calculation works will be simplified.

### **5.6.3. Multi-Functioning of IA**

The proposed plan concerning to the financial stability of IA mentioned in the former section is regarded as the most important one among various strengthening plans of IA and vis-a-vis, as far as financial problems of IA would not be solved, strengthening of IA can not be realized. Since DA has been taking the responsibility for rural commercial activities through the management of agricultural cooperatives, the IA, primarily registered as non-profit corporation, was prohibited any commercial activities. NIA's recent policy accelerates new organizational setup which intend to have not only the original functions of IA but also the functions of agricultural cooperative. Thus, new organization entitled "integrated multi-purpose cooperative" has been gradually establishing at several places in the Philippines.

As shown in the succeeding pages, it is necessary for the area to realize the establishment of the organization of same nature. Further, it is immediately needed to set its business in the right direction by providing optimum support from concerned agencies. Since this development is the first trial for the communal irrigation system in Region III, the proposed plan should be urgently realized to constitute suitable model for exhibition of ideal CIS development in the future.

With the exception of a few agricultural cooperatives like PLF founded by Kumander Dante, the 23 cooperatives in the Study Area do not work well or work only for the purpose of obtaining the loan with low interest rate from financial institutions. Since the cooperative movement in the area has been started recently since 1988 and almost all cooperatives have the origin in specific Barangay or CIS, the integration of cooperative functions and/or harmonic coexistence with the existing cooperatives are considered to be smoothly performed by the proposed model IA.

### **5.6.4. Federation and Confederation of Irrigators' Association**

#### **(1) Federation of Irrigators' Association (FIA)**

The integrated multi-purpose cooperative set up as the model of development would gradually expand the size in the future up to 1,000 to 2,000 hectares, and should be shifted to Federation of Irrigators' Association (FIA) whose main purpose is to undertake multifunctional activities. It is expected to optimize the scale merit of the FIA and act as the functional body for O/M of FTDP, SMS, PPMS, PTFD and other related facilities.

The following sections are expected to set up in the FIA: i) Education and Training Section, ii) Administrative Section, iii) Irrigation Management Section, iv) Agricultural Supervisory Section, and V) Agro-Processing and Marketing Section.

i) Education and Training Section

Education and Training Section is responsible for planning and coordination of education and training for members. The section should take account for member's experience, capability, and the IA committee he belongs and provide members with appropriate programs. The donor of training will be NIA, DA, Technology Resource Center (TRC) and so on.

ii) Administrative Section

Administrative Section should take responsibility for collection of amortization fee and FIA association dues as well as payment of such fee and dues to proper agencies/organizations. The section is also in charge of management of internal funds. It should investigate the most profitable utility of the funds such as deposit to banking institutions, loan to the members and investment to the facilities, etc.

Second, the section is responsible for auditing of account and allocation of budget as well as registering of members. As mentioned above, a great deal of members are deemed to be registered in FIA, the inventory control adopting computer system should be essential. Accordingly, through the adequate inventory control by computer system, the situation whether he has paid for obligation or not will be strictly checked. Through this activity, the collection rate of the amortization to NIA and/or FIA association dues can be expected to increase.

Third, the section should deal with internal conflict and the matter related to member's welfare. The section takes the liability for the personnel management and total coordination.

iii) Irrigation Management Section

Irrigation Management Section takes charge of planning and implementation of: i) water distribution schedule as a whole (water management on CIS level should be taken charge by the existing irrigation management committee of each IA as usual), ii) technical assistance for O/M of CIS, iii) advice to each irrigation management committee to carry out proper water management on inter-CISs level, and iv) mutual cooperation in case of construction and rehabilitation of facilities. The section, in cooperation with NIA, is also responsible for determining of object area where payment obligation on amortization fee and FIA dues will accrue.

iv) Agriculture Supervisory Section

Agriculture Supervisory Section is liable for assisting of members in terms of planting, managing and harvesting of crops on on-farm level: for example, propagation of technical information obtained from Farm Technician of DA, negotiation and control of bid in case of procurement of

agro-inputs, and promotion of group management of farm. In respect to the group management of farm, it is recommended to start with two to three farms, and then increase the participants and area up to the marginal range where the merit accruable from expansion of operable land will be maximized. O/M of proposed FTDF and SMS should also be handled by the section.

v) Agro-Processing and Marketing Section

The section takes the responsibility for expansion of cooperative activities through negotiating of selling price of the products with traders, adjusting of forwarding quantity, and exploiting of new market. Thus, the section plays an important role as the pipeline between FIA and DA. The activities of the section also involves : i) introduction of profitable crops resulting from marketing research, ii) planning of marketing and transportation mode, iii) advertisement and propagation of cooperative activities to other organizations, and iv) negotiation with governmental and private financial institutions.

Second, the section takes the liability for O/M of proposed PTDF and existing facilities, and should act as planning board for new project, right of way acquisition, and financial set up. Operating of facilities along with the forwarding schedule should be undertaken by the section.

The membership of each section should be composed of the chiefs of the related committee of member IAs, thus, the number of membership of each committee will be at more or less 10. The BODs of FIA should be also composed of the Presidents of member IAs. Thus, the other officers of FIA are to be elected by the conference of BODs.

Since FIA is regarded as mass of individual IA, it is expected for the existing IA committees to be left as it is and to be incorporated to the organization of FIA. However, as the proposed Agro-Processing and Marketing Section will deal with new fields which have not yet taken part in by the IA, setting up subcommittee on those fields is to be done on IA basis, especially by the members of Agriculture Supervisory Committee. Consequently, the representatives from each IA subcommittee should hopefully form the members of the section. In case there would be still lack of personality, picking up of capable personnels from other IA committee is needed (refer to Figure 5-6-1).

**(2) Confederation of Irrigators' Association (CIA)**

As the size of FIA to be expanded, integration of the CISOs located in inside of same river basin and/or federation with another FIA in nearby area would be accelerated. Through the establishment of Confederation of Irrigators' Association (CIA), the federation with 1,000 to 2,000 members can be anticipated. In this case, the area will expand to river basin and to municipal level, and finally to provincial level. For example, if CIA to cover Bamnan and Lucong river basins are established, the former will include about 3,500 hectares of land area with 1,200 members, while the later will involve 2,700 hectares with 1,000 members, respectively. In this stage, the policy of the association will naturally shift from FIA's:



establishment of strong IA federation with multifunctions, to CIA's: the pursuit of commercialism and social welfare.

It is estimated that the establishment of CIA takes long time: may be more or less 10 years as the precedents of advanced countries suggest. The workers of CIA will be no longer farmers, but experts of permanent employee. Generally, the organization chart of CIA suggests bigger pyramidal shape than that of FIA's. Further, each section gets to have chance for the independent profit system. Figure 5-6-2 illustrates expected organization chart of CIA. Crop insurance and rural financing systems presented in the figure should be firstly improved in nationwide, unless otherwise the realization of the committees in charge of these two subjects will be impossible.

### **(3) Payment of Amortization and Association Dues (ISF)**

As the proposed organization develops, the farm area managed by group will increase, and business operation achieved through cooperative forwarding and purchasing will bear considerable profit. If this situation will come true, the mode of due payment (amortization to NIA and association dues) will be completely changed: viz. from individual payment to organizational payment.

For example, even though the harvest from one's farm are too small to pay for due, the payment will surely be made through the association in due time, since his farm is managed by the group under the association. Further, some amount of subscription will be provided to him from the association and it is no longer necessary for him to borrow money from loan sharks. His income will be likewise secured by the association.

Accordingly, the cash obtained through cooperative forwarding will be delivered to the members after subtracting of payable dues. It is highly expected to get the optimum profit at the minimum cost through maximizing the merit accruable from expansion of operable area.

### **5.6.5 Suggestion on Institutional Development Program**

The following suggestions are summarized as the conclusion of this section.

First of all, NIA should improve the items related to participatory approach mentioned in Section 5.6.1 and should continuously promote the strengthening plan of IA mentioned in Section 5.6.2. Selecting and establishing of prioritized CISS which will exhibit a model for the future development of IA as shown in Section 5.6.3. is effective procedure to draw forth the maximum farmer's participation of the area and in the long run, of the nation. The following development policy should be stressed in setting up the development model.

- i) To establish and exhibit of the method of low cost water management and incidental organization through optimizing utilization of water resources in the area.

- ii) To equip with the functions of agricultural cooperative and the easily manageable facilities for improvement of financial situation of IA as mentioned in Section 5.6.2.
- iii) To consolidate the base which the model can expand the size up to river basin or provincial level in the future mentioned in Section 5.6.4.

Second, NIA should continuously carry out adequate training for the members of model organization, as is implemented in cooperation with DA both in central and field levels intending to provide them of knowledge and know-how required for multi-functioning of the IA.

As mentioned in Section 3.7.1, the present training program of NIA for the participatory approach is composed of 3 systems with 21 models. To optimize these training program, it is recommended to introduce audio-visual facilities in NIA training center in Dutang-A-Matas. The training for multi-functioning should be added to the existing training curriculum with harmonic assistance from DA and LBP : items to be trained are shown in Section 5.3.7 and Appendix II.

Third, on the process of organizational expansion from MFIA to FIA and to CIA, the improvement of rural finance and crop insurance system should be examined in the national level. The suggestions on prevailing production loan as well as financial-intermediary loan are considered as one of examples for the improvement. NIA should, in order to bring up the organization, immediately implement the study and research activities for these in harmonic cooperation with other related agencies.

Finally, it is needed, not only NIA but also other governmental organization, to extend their assistance to the Project. It should be comprehended that the success of Tangaran CIS mentioned in Appendix I is achieved by the strong assistance from NFA, DA, and Quedan Board. Accordingly, fine coordination should be made by NIA with related agencies both in central and field level.

Figure 5-6-1 Organization Chart for Federation of Irrigators' Association (FIA)

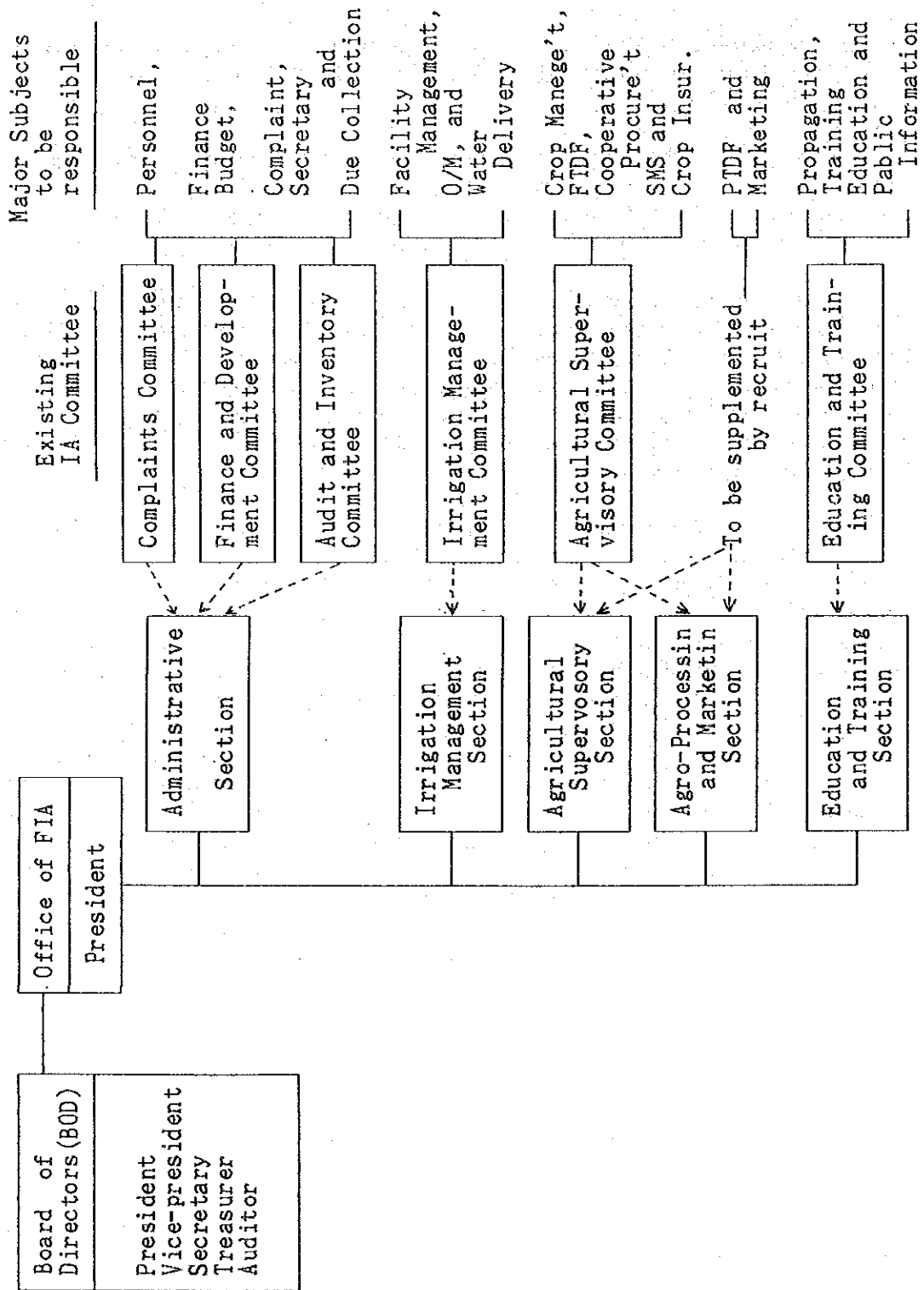
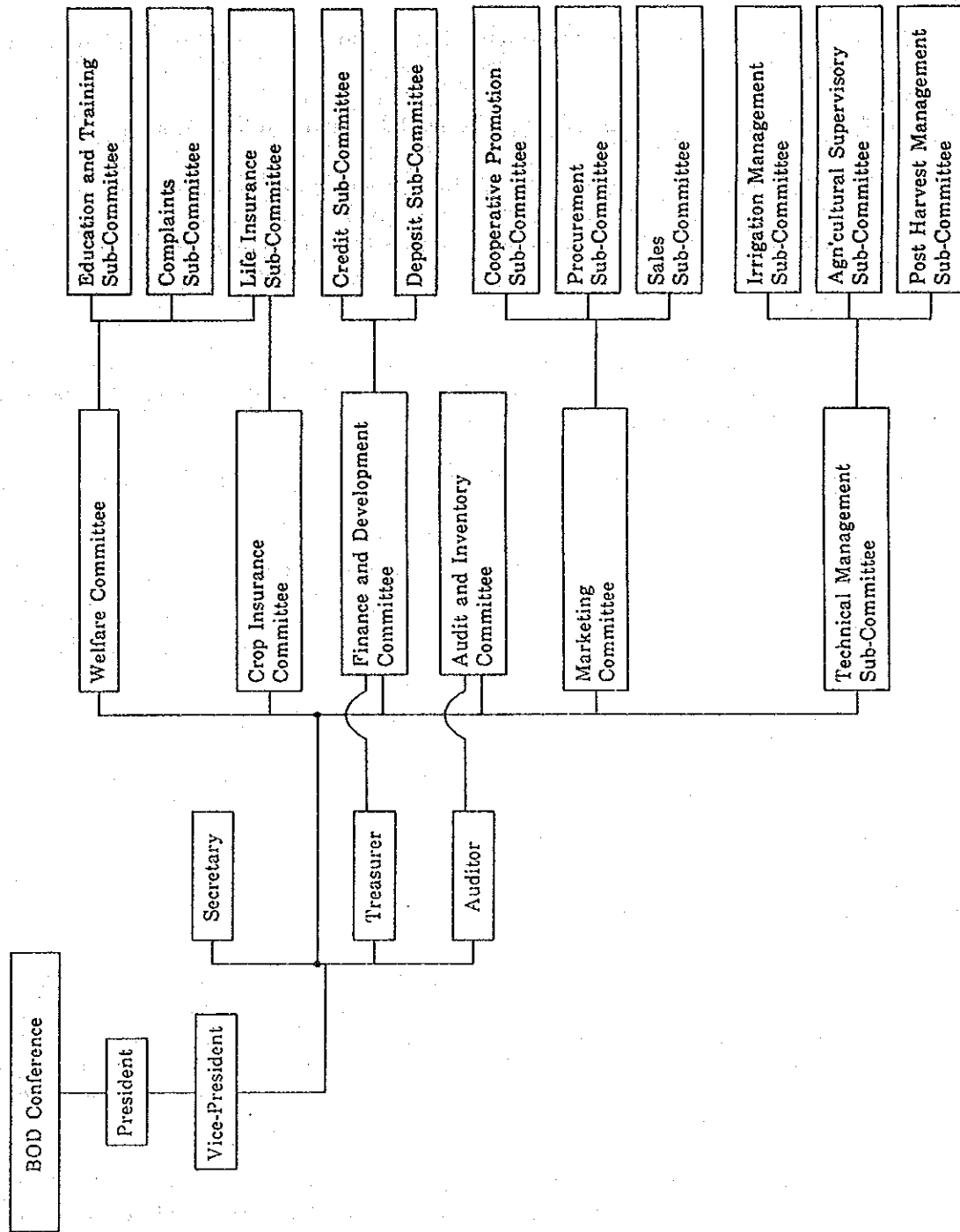


Figure 5-6-2 Organization Chart of Con-Federation of Irrigator's Association



## 5.7 Project Cost Estimate

### 5.7.1 Condition of Cost Estimate

The project cost is estimated under the following conditions:

- 1) The project cost is estimated based on the current market prices on February 1990.
- 2) The construction mode is considered by contract basis.
- 3) The unit price of materials, labor and civil works are mainly based on Analysis of Unit Construction Cost updated to February, 1990 by NIA. Those which are not available in the analysis are calculated by adding up all the necessary materials, labor and machine at the current market price (refer to Tables Appendix L-9, L-10 and L-11).
- 4) Engineering and administration cost is considered as 20 percent of the construction cost and physical contingency with 15 percent is also included in the project cost.
- 5) The exchange rate between Philippine Peso and U.S. Dollar is adopted at US\$ 1.00 = P 22.50.
- 6) The percentage for foreign and local currency portion is adopted according to Funding Institutions Standard prepared by NIA (refer to Appendix L-7).

### 5.7.2 Project Cost

The total project cost at current price is estimated at 740 million pesos, of which 240 million pesos is for the phase-I development and 500 million pesos for the phase-II development (refer to Table 5-7-1).

### 5.7.3 Operation and Maintenance Cost

The annual operation and maintenance cost is composed of salary and wages for O & M organization staff, administration and general expenditures, equipment depreciation and repair cost, fuel and oil cost, maintenance cost of the facilities and office facilities, special expenditure for training/seminar/ demonstration programs, and about ten percent of the total O & M cost as physical contingency.

The annual operation and maintenance cost is amounted at million pesos for the phase-I and million pesos for the phase-II (refer to Table 5-7-2 ).

Table 5-7-1 Summary of Project Cost at Current Price

(Unit: 1,000 Pesos)

Description	Total		Phase-I (Pilot CUSD)		Phase-II	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. Agricultural Infrastructure Development	182,300	187,700	58,000	43,000	124,300	124,700
1.1 Irrigation Facilities Development	81,000	104,900	12,500	16,400	68,500	88,500
1.2 Diversion Dams	9,500	7,900	2,900	500	6,800	7,400
1.3 Groundwater Collecting Conduit	83,900	46,200	40,900	25,200	43,000	21,000
1.4 Shallow Wells Development	4,700	3,900	1,700	900	3,000	3,000
1.5 Drainage Development	3,200	4,800	-	-	3,200	4,800
2. Farm Road Development	51,400	75,600	8,400	12,600	43,000	63,000
2.1 Barabgay Road	39,600	57,900	8,200	12,300	31,400	45,600
2.2 Farm-to-Market Road	11,800	17,700	200	300	11,800	17,400
3. Agricultural Development	196,300	29,700	80,000	11,000	116,300	18,700
3.1 Farming Technology Demonstration Farm	840	360	140	80	700	300
3.2 Seed Multiplication Station	2,800	600	2,800	600	-	-
3.3 Pilot Primary Marketing Station	76,700	10,200	76,700	10,200	-	-
3.4 Primary Marketing Station	114,000	15,000	-	-	114,000	15,000
3.5 Post-harvest Technology Demonstration Farm	1,060	440	360	140	700	300
3.6 Duch Raising	1,700	2,300	-	-	700	2,300
3.7 Fishery Pond	200	800	-	-	200	800
4. Institutional Development	7,000	10,000	6,000	2,000	1,000	8,000
4.1 Support Assistance for Strengthening of IAs	1,700	3,200	1,300	600	400	2,600
4.2 Support Assistance for MFIA	3,800	3,100	3,700	1,200	100	1,900
4.3 Support Assistance for Strengthening FIAs	100	400	-	-	100	400
4.4 Support Assistance for Strengthening CIAs	100	400	-	-	100	400
4.5 Support Assistance for Strengthening ASS	200	2,300	-	-	200	2,300
4.6 Support Assistance for Seminar & Training	1,100	600	1,000	200	100	400
Total of Project Cost	487,000	283,000	152,400	68,600	284,600	214,400

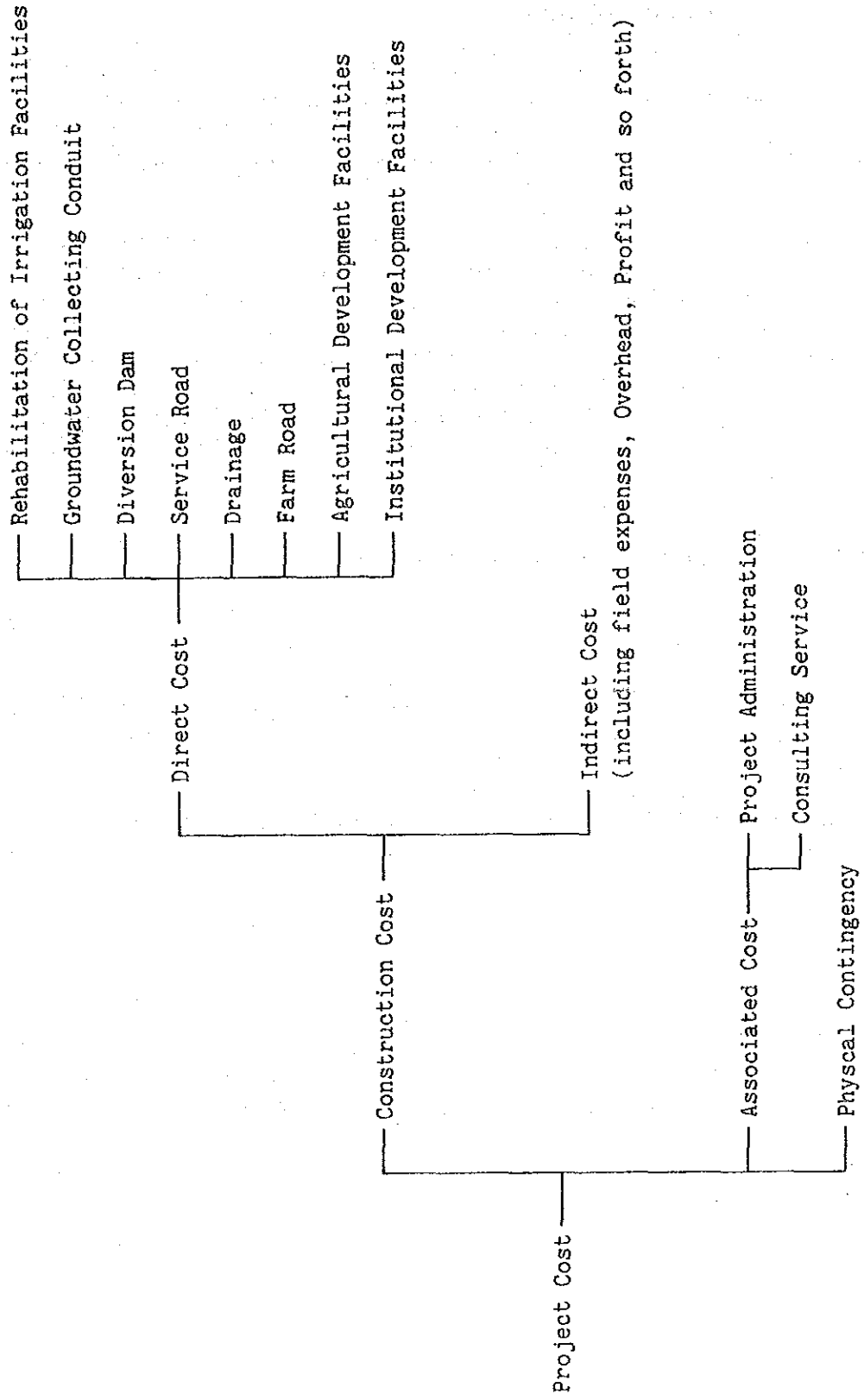
Note : 1. F.C. : Foreign Currency Portion  
L.C. : Local Currency Portion  
2. Exchange Rate : US\$ 1.00 = P 22.50 = ₱ 150.00

Table 5-7-2 Summary of Annual Operation and Maintenance Cost

(Unit : 1,000 Pesos)

Description	Total	Phase-I	
		Pilot	CISD
		Phase-I	Phase-II
1. Agricultural Infrastructure Development	9,040	2,710	6,330
1.1 Irrigation Facilities Development	4,054	484	3,590
1.2 Diversion Dams	559	129	430
1.3 Groundwater Collecting Conduit	4,050	2,040	2,010
1.4 Shallow Wells Development	197	77	120
1.5 Drainage Development	180	-	180
2. Farm Road Development	2,640	340	2,300
2.1 Barangay Road	2,000	330	1,670
2.2 Farm-to-Market Road	640	10	630
3. Agricultural Development	5,410	2,150	3,260
3.1 Farming Technology Demonstration Farm	200	60	140
3.2 Seed Multiplication Station	130	130	-
3.3 Pilot Primary Marketing Station	1,890	1,890	-
3.4 Primary Marketing Station	2,870	-	2,870
3.5 Post-harvest Technology Demonstration Farm	140	70	70
3.6 Duck Raising	110	-	110
3.7 Fishery Pond	70	-	70
4. Institutional Development	460	220	240
4.1 Support Assistance for Strengthening of IAs	120	50	70
4.2 Support Assistance for MFIA	170	120	50
4.3 Support Assistance for Strengthening FIAs	20	-	20
4.4 Support Assistance for Strengthening CIAs	20	-	20
4.5 Support Assistance for Strengthening ASS	60	-	60
4.6 Support Assistance for Seminar & Training	70	50	20
Total of Annual Operation and Maintenance Cost	17,550	5,420	12,130

Figure 5-7-1 Development Cost Component





## **5.8 Project Implementation Plan**

### **5.8.1 Implementing Agency**

Considering the jurisdiction of irrigation and the past outstanding performance of NIA in this field, implementing agency shall be NIA with strong partnership of IAs and FIAs to be organized under the project in the near future and also other government agencies concerned particularly with DA.

Under the administration of NIA Head Office and Regional Irrigation Office, Project Office headed by Implementation Manager (IM) shall be established directory under the Provincial Irrigation Engineer (PIE) of NIA (refer to Figures 5-8-1 and 5-8-2). The IM shall supervise the implementation of the project in consultation with the PIE and in cooperation with provincial/field engineers and officers of the other government agencies. Particularly the IM shall be paid special attention to the institutional aspects participated closely with the project by members of IAs or MFIA or FIAs.

### **5.8.2 Schedule of Project Implementation**

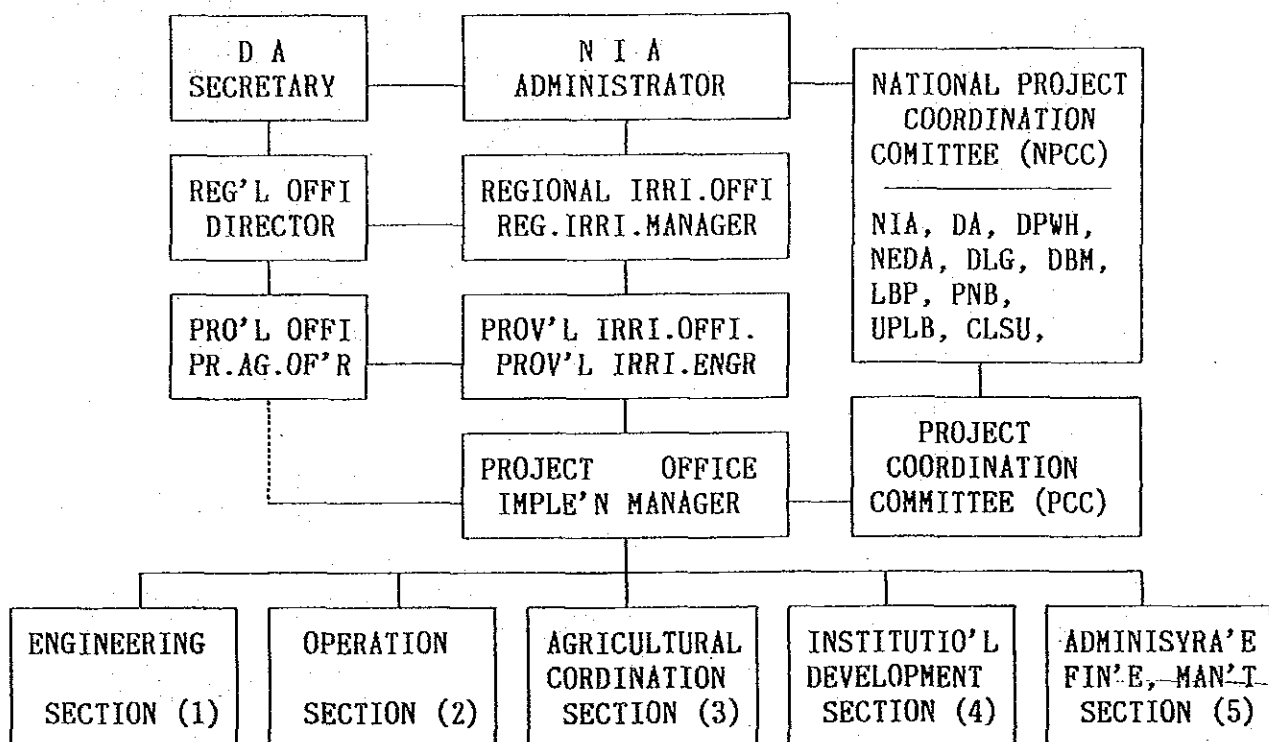
Implementation of the project is programmed in taking two phases. The Phase-I development is expected to carry out for the initial two years period by special funding sources, while the Phase-II development is to be carried out for another four years period (refer to Figure 5-8-3). The physical development and basic institutional development will be sufficiently completed within the scheduled period, however, some activities particularly in institutional aspects shall be necessary to follow up continuously by NIA successfully to reach the target of the project.

### **5.8.3 Operation and Maintenance of the Project**

After completion of the project construction, all facilities constructed/provided and equipment by the project shall be turned over to the farmer's association of MFIA or FIAs. The farmer's association shall be responsible for the operation and maintenance of the said facilities and equipment under sufficient assistance and guidance of NIA through the PIE.

Figure 5-8-1

Organizational Setup of The Project



Note: Services of the section

- Section (1) : Planning and investigation, Design and specifications, Construction management,
- Section (2) : Systems management, Research and development, Equipment control and evaluation, Equipment maintenance and repair,
- Section (3) : Water management, Farming demonstration program, Seed multiplication, Post-harvest and marketing, Post-harvest technology demonstration,
- Section (4) : IAs organization, Seminar and training, Public affairs and information,
- Section (5) : Personnel and general services, Procurement and property, Legal, Management and budget, Accounting, Cash,

Figure 5-8-2 Organization Chart for NIA Project Office and FIA Office

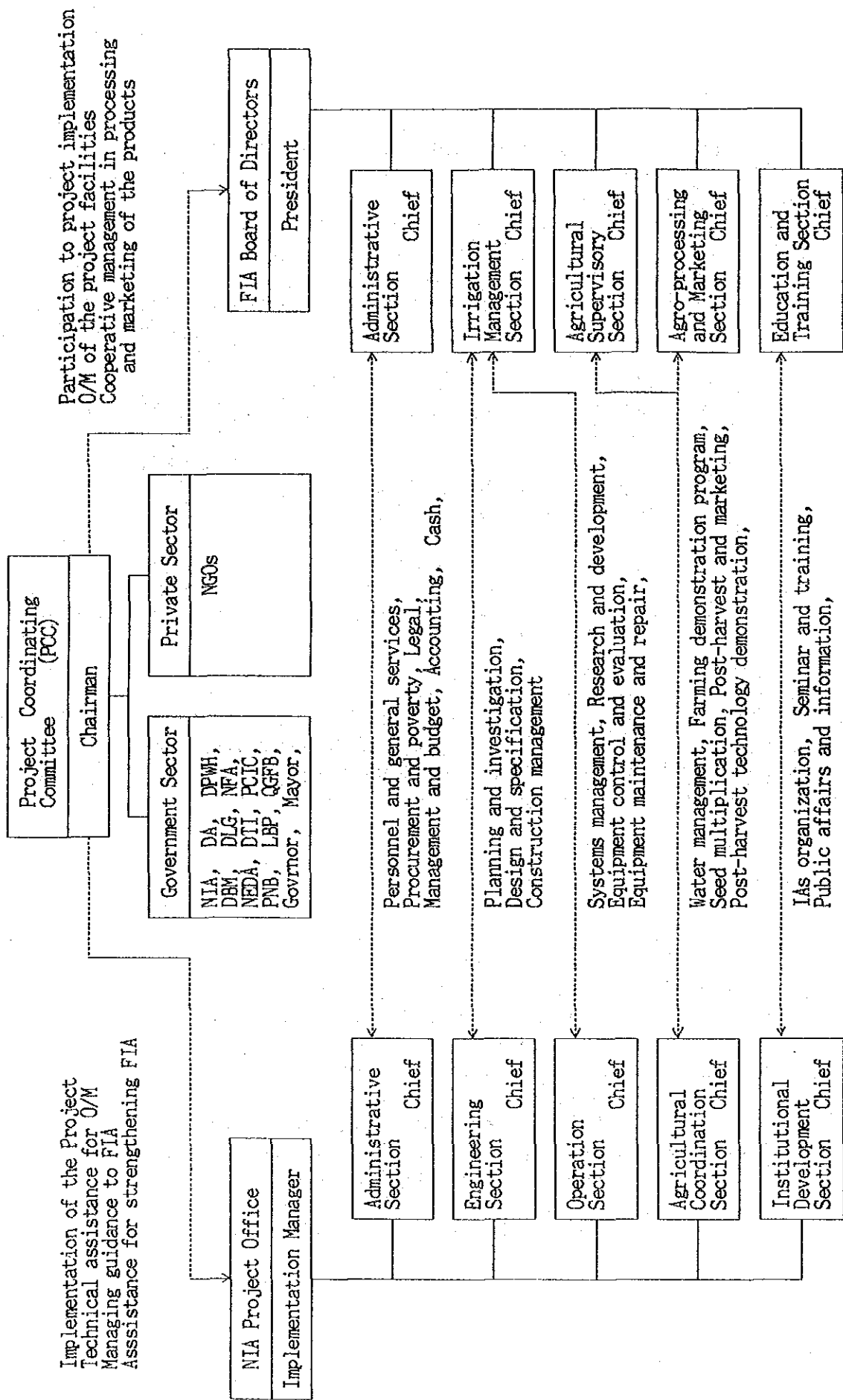


Figure 5-8-3 Implementation Schedule of The Project

DESCRIPTION	COMPONENTS	Project Year	PHASE-I DEVELOPMENT		PHASE-II DEVELOPMENT			FURTHER DEVELOPMENT				
			1	2	3	4	5	6	7	8	9	
1. Pilot Communal Irrigation Systems Development ( Pilot CISD )	1.1 Irrigation Facilities Development Canals & Canal Structures Intake Structure Diversion Dams Groundwater Collecting Conduit(GCC) Shallow Wells		-----	-----								
			-----	-----								
			-----	-----								
			-----	-----								
			-----	-----								
	1.2 Agricultural Development Farming Technology Demonstration Farm Program ( FTDFP ) Seed Multiplication Station ( SMS ) Post-harvest Station ( PPHS ) Post-harvest Technology Demonstration Farm Program ( PTDFP )			-----	-----							
				-----	-----							
				-----	-----							
				-----	-----							
				-----	-----							
	1.3 Farm Road Development Barangay Road Farm-to-market Road			-----	-----							
				-----	-----							
	1.4 Institutional Development Support Assistance for Strengthening of IAs Support Assistance for MFIA Assistance for Seminar & Training Program			-----	-----							
				-----	-----							
				-----	-----							
1.5 Administrative Management of Pilot CISD			-----	-----								
			-----	-----								
2. Agricultural Infrastructure Development	2.1 Rehabilitation of Irrigation Facility Intake Structures Canals & Canal Structures				-----	-----						
					-----	-----						
	2.2 Groundwater Collecting Conduit (GCC) San Martin GCC Lilibangan GCC					-----	-----					
						-----	-----					
	2.3 Diversion Dam Improvement					-----	-----					
	2.4 Shallow Wells Development					-----	-----					
	2.5 Drainage Development					-----	-----					
2.6 On-farm Facilities Development					-----	-----						
3. Agricultural Development	3.1 Farming System Development FTDFP SMP					-----	-----					
						-----	-----					
	3.2 Post-harvest & Marketing Development Post-harvest Station PTDFP Marketing Assistance					-----	-----					
						-----	-----					
3.3 Agri-related Industries Development Duck Raising Fishery Pond					-----	-----						
					-----	-----						
4. Farm Road Development	4.1 Barangay Road					-----	-----					
	4.2 Farm-to-market Road					-----	-----					
5. Institutional Development	5.1 Support Assistance for Strengthening of IAs					-----	-----					
						-----	-----					
	5.2 Following Assistanse for MFIA					-----	-----					
						-----	-----					
	5.3 Support Assistance for Strengthening of FIAs					-----	-----					
						-----	-----					
5.4 Support Assistance for Strengthening of CFAs					-----	-----						
					-----	-----						
5.5 Support Assistance for Strengthening Agricultural Supporting Services					-----	-----						
					-----	-----						
5.6 Assistance for Seminar & Training Program					-----	-----						
					-----	-----						
6. Administration & Engineering	6.1 Project Facilities					-----	-----					
	6.2 Administration					-----	-----					
	6.3 Engineering Services					-----	-----					
7. Physical Contingency												

LEGEND: ----- Purely GOP activity  
----- Project activity

## **5.9 Project Evaluation**

### **5.9.1 Introduction**

The Study Area includes 19 CISs and each CIS is a system for agricultural production, which consists of agricultural facilities, organization of farmers and farming techniques. Aiming at improvement of such CISs, content of the Project is from irrigation facilities development to marketing development. Therefore, increase of agricultural production and farm income will be achieved effectively and multiplicatively through accomplishment of every components of the Project.

In this section, economic analysis is carried out from the standpoints of national economy by studying future project costs and benefits. Financial analysis is also carried out from the standpoints of farmers to be benefited. Project costs and benefits are estimated by constant price as of February 1990.

### **5.9.2 Project Cost**

#### **(1) Financial Project Cost**

The project capital cost is estimated at 720 million Pesos in Financial value, which consists of 283 million Pesos of local currency portion and 437 million Pesos of foreign currency portion. The implementation period is assumed to be six years and the annual disbursement schedule is formulated in accordance with the implementation schedule of the Project (refer to Table N-1-1 in Appendix N). Financial value of annual operation and maintenance cost is estimated at 17.55 million Pesos, which is wholly local currency portion (refer to Table N-1-3 in Appendix N).

#### **(2) Economic Project Cost**

Economic project cost is estimated by applying opportunity cost of 0.39 for wages of unskilled construction labor in local currency portion and standard conversion factor of 0.78 for the rest of local currency portion. The economic project cost is evaluated at 624 million Pesos indicating conversion factor of 0.87 (refer to Table N-1-2 in Appendix N). Economic operation and maintenance cost is evaluated at 10.36 million Pesos showing conversion factor of 0.59 (refer to Table N-1-3 in Appendix N). The opportunity cost of unskilled construction labor is derived from multiplying the standard conversion factor (0.78) and the ratio of hired farm labor cost (65 Pesos per man-day) to financial wage rate of unskilled construction labor (130 Pesos per man-day).

### **5.9.3 Project Benefits**

#### **(1) Tangible Benefit**

Tangible benefits of the Project are quantified based on the following concept (refer to Table 5-9-2) :

a) Agricultural Production Benefit

Agricultural production benefit accrues from increase of production, upgrading of quality of palay and reduction of post harvest losses of palay. Increase of production is realized by increase of yields of palay and cash crops as well as enlargement of cropping acreage through development of groundwater collecting conduits and shallow wells. Upgrading of quality of palay is expected from post harvest and institutional development. Upgrading of quality is evaluated at 0.9 Pesos financially and 0.36 Pesos economically in incremental value of palay of one kilogram. Reduction of post harvest losses of palay is ensured through post harvest development, etc. Post harvest losses are expected to reduce from 16.5 percent to 10.5 percent by the Project (refer to Tables N-3-1 & N-3-2 in Appendix N).

b) Barangay Road Benefit

Benefits accrue from concrete pavement of Barangay roads with the total length of 52.9 km. Barangay road benefits are counted as saving of vehicle operating cost (VOC). VOC saving is computed on agricultural use and non-agricultural use transportation separately (refer to Tables N-4-1 & N-4-2 in Appendix N). Future traffic volume of non-agricultural transportation is projected based on the results of traffic volume survey executed by the Study Team by applying annual growth rate of four percent (refer to Table N-4-3 in Appendix N).

c) Farm-to-Market Road Benefit

This benefit arises from gravel pavement of existing foot paths with the total length of 57.9 km. Without project situation, agricultural inputs and outputs will be transported by manpower through foot paths. On the other hand, manpower will be substituted by vehicle transport with future project condition. Farm-to-market road benefit materializes as transportation cost saving through this substitution of transportation method (refer to Table N-4-4 in Appendix N).

d) O & M Cost Saving Benefit

Existing 14 brush dams have been destroyed by flood several times a year and reconstructed by bulldozer after each destruction. After implementation of the Project, above reconstruction cost is to be saved through construction of the groundwater collecting conduits and semi-permanent structures in stead of brush dams (refer to Table N-4-5 in Appendix N).

**(2) Other Benefits**

In addition to above mentioned tangible benefits, the following socio-economic benefits are expected to be realized with the Project :

- Increase of farm income will improve farmers' living standard such as nutrition, education and health, etc.
- Employment opportunity will be generated during the construction as well as O & M of the Project. Farming practices will also require much farm labor.
- Development of road network among villages and between villages and urban areas will improve social and living environment such as communication, traffic for work and school, public services and commerce. It will benefit not only farmers but also the whole residents of the Project area on upgrading living standard.
- Institutional development will improve communication among CIS farmers influencing technical upgrading of crop cultivation and farm management. Favorable impacts on technical aspects will be expected on farmers around the CIS areas.
- The Project will be a precedent on improvement of CISOs in the Philippines. Therefore, the Project will contribute toward nationwide progress on CISOs improvement as well as socio-economic rural development in southern Tarlac Province. This will alleviate disparity in living standard between rural and urban areas.

#### **5.9.4 Economic and Financial Efficiency of the Project**

##### **(1) Comparison of Cost and Benefit**

The internal rate of return (IRR) is employed to evaluate the Project from the viewpoints of national economy. The IRR of the Project is computed at 18 percent indicating higher value than the opportunity cost of capital of 15 percent in the Philippines. In the study, the project life is considered as 50 years (refer to Table N-5-1 in Appendix N).

##### **(2) Farm Budget Analysis**

Farm budget analysis on typical farm household models is carried out on small farm (farm size 1.45 ha) and middle farm (farm size 2.30 ha) of part-owner (refer to Table 5-9-3). In without project situation, monthly average net farm income is estimated at about 1,300 Pesos for small farm and about 1,800 Pesos for middle farm. These figures are below the rural poverty threshold of about 2,000 Pesos in Region III. In with project situation, monthly average net farm income is expected to increase to about 2,000 Pesos for small farm and about 2,800 Pesos for middle farm. As for annual disposable income, it is expected to increase by about 7,500 Pesos for small farm and about 11,600 Pesos for middle farm. These incremental disposable income will contribute toward upgrading the living standard of farmers (refer to Tables N-6-3 & N-6-4 in Appendix N).

Table 5-9-1 Financial and Economic Project Cost

Description	Financial	Economic
1. Capital Cost (million Pesos)		
Agricultural Infrastructure Development	350.0	293.0
Farm Road Development	127.0	101.3
Agricultural Development	226.0	215.9
Institutional Development	17.0	13.6
Total	720.0	623.8
2. O & M Cost ('000 Pesos/Year)		
Agricultural Infrastructure Development	9,040.0	5,334.0
Farm Road Development	2,640.0	1,558.0
Agricultural Development	5,410.0	3,192.0
Institutional Development	460.0	271.0
Total	17,550.0	10,355.0

Table 5-9-2 Tangible Benefits at Full Development (Unit : million Pesos)

Description	Benefit	Relating Project Component
a) Agricultural Production	50.50	
Increase of Production	13.10	Agricultural Infrastructure, Agricultural and Institutional Development
Upgrading of Quality	23.30 <sup>1)</sup>	Agricultural & Institutional Development
Reduction of Post Harvest Losses	14.10 <sup>2)</sup>	Agricultural & Institutional Development
b) Barangay Road	80.75	
Agricultural Transport	2.76	Farm Road Development
Non-agricultural Transport	77.99	Rural Development
c) Farm-to-Market Road	35.05	Farm Road Development
d) O & M Cost Saving	0.05	Agricultural Infra. Development
Total	166.35	

Note : 1) Palay Production(W/) $\times$ 0.36 Peso/kg(Incremental Value) $\times$ (1-0.105)

2) Palay Production(W/) $\times$ (0.165-0.105) $\times$ 3.24 Peso/kg(Economic Value)

Table 5-9-3 Improvement of Farm Budget

Item	Small	Farm	Middle	Farm
	W/O	W/	W/O	W/
1. Farm Size (ha)	1.45	1.45	2.30	2.30
2. Family Size (person)	6.7	6.7	6.7	6.7
3. Net Fam Income ('000 Pesos/year)	15.6	23.9 <sup>1)</sup>	21.2	33.6 <sup>2)</sup>
4. Disposable Income ('000 Pesos/year)	0	7.5 <sup>1)</sup>	0.2	11.8 <sup>2)</sup>

Note : W/O ; without project condition, W/; with project condition

1) Reduced service charge for drying of about 6,000 Pesos per year,

2) Reduced service charge for drying of about 11,000 Pesos per year.



## **5.10 Environmental Impact Assessment**

### **(1) General**

The construction of civil works, no matter how small, is always accompanied by a change in the surrounding environment. In improvement of communal irrigation systems, such changes, whether beneficial or adverse, will be very slight.

### **(2) Beneficial and Adverse Project Effects**

Generally, the environmental impacts resulting from the construction of the civil works, particularly irrigation facilities would be very minimal. The major impact expected would be economic in nature arising from the provision of more irrigation canals and more irrigated paddy fields.

With available and dependable irrigation water and improved facilities, the farmers in the Project area would be able to increase of crop production resulting in the increase of their farm income. The long term impact in land use would be the shift partially from rainfed farming to irrigated agriculture. Agricultural development in the area would lead to the establishment of an economic base which can provide an improved standard of living to the people.

Environmental impact assessment checklist is prepared by item-wise (refer to Table 5-10-1).

### **(3) Mitigating Measures**

Certain environmental considerations should be followed in addition to the safety and sound engineering practices normally adopted in the construction of irrigation project in order to minimize the adverse impact of the project on the environment.

Any disturbance to the lands during construction should be returned to the natural condition whenever possible after project construction.

Water pollution along the streams shall be minimized by imposing strict regulations against dumping of garbage, human waste, and other organic materials into the streams concerned. The use of toxic pesticides, farm chemicals, and fertilizer shall also be studied and, if necessary, regulated.

For the watershed development, a program of monitoring is recommended to be developed.

Table 5-10-1 Impact Identification and Evaluation Checklist on Improvement of Communal Irrigation Systems

ENVIRONMENT PARAMETERS	MAGNITUDE OF IMPACT							IMPACT
	0	1	2	3	4	5	6	
<b>A. EXISTING PHYSICAL AND CHEMICAL CHARACTERISTICS</b>								
1. Earth								
a. Mineral Resources	X							X
b. Soils	X							X
c. Land Forms	X							X
d. Unique Physical Features	X							X
2. Water								
a. Stream, Drainage, Effluent	X							X
b. Groundwater	X							X
c. Quality, Temperature	X							X
d. Recharge	X							X
3. Processes								
a. Floods	X							X
b. Erosion	X							X
c. Stress-Strain (Earthquake)	X							X
d. Downstream Sedimentation	X							X
<b>B. EXISTING CULTURAL FACTORS</b>								
1. Land Use								
a. Agriculture	X							X
b. Residential	X							X
c. Industrial	X							X
d. Commercial	X							X
e. Forestry	X							X
f. Grazing	X							X
g. Wetlands	X							X
2. Infrastructures								
a. Major Structures	X							X
b. Utility Networks	X							X
c. Transportation Networks	X							X
<b>3. Aesthetics and Human Interests</b>								
a. Scenic Views and Vistas	X							X
b. Parks and Reserves	X							X
c. Rare and Unique Species								X
d. Historical and Archeological Sites and Objects								X
4. Cultural Status								
a. Employment	X							X
b. Life Styles	X							X
c. Health and Safety	X							X
d. Population Density	X							X
e. Food Production	X							X
5. Recreation								
a. Resorts							X	X
b. Swimming, Fishing							X	X
<b>C. ECOLOGICAL RELATIONSHIP</b>								
1. Food Chain								X
2. Water-Related Disease Vectors							X	X
3. Insect Vectors							X	X
<b>D. OTHERS</b>								
1. Rise of Groundwater Table							X	X

LEGEND

- + Positive Environment Impact
- Negative Environment Impact
- 0 No Environmental Impact
- 1 Minor Environmental Impact
- 2 Moderate Environmental Impact
- 3 High Environmental Impact
- 4 Unknown Environmental Impact
- 5 Not Applicable

## CHAPTER 6. DEVELOPMENT OF PRIORITY PROJECT

### 6.1 Identification of the Priority Component

The project on the improvement of communal irrigation systems in southern Tarlac province would serve as a model project for improvement and development of thousands of communal irrigation systems/projects in the Philippines through the participation of farmers and irrigators' association. Thus, this project is expected to be implemented immediately when funding arrangement for implementation of the project is made. However, taking into account the magnitude of the project component and availability of funding source in addition to the required term for the institutional arrangement on the farmers' association, a pilot project should be formulated among the development component of the master plan and implemented at the early stage of the project effectively.

Priority component shall be assessed and selected for planning of the implementation according to the criteria provided for the project. Taking into consideration the criteria for selection of priority component, three basic assumptions are taken in line with the objectives of the master plan. Firstly, the project is a model project on the improvement of CISOs through physical and institutional development for thousands of CISOs in the Philippines. Hence, priority shall be given to certain component which is considered a pilot structure. Secondly, the project is concerned with viable IAs as a leading body for the implementation of the prioritized component through active participation of farmers' association. Although the said component are expected to be implemented as a pilot project in a short period of time, institutional development and approach to the project must be quickly arranged. Thus, some IAs with institutional support, will be selected among CISOs with active and certain records of collection fee and financial background. Thirdly, the priority component is located at the accessible place by the project members as well as visitors from outside and is concerned with adequate socio-economic conditions as a pilot project.

### 6.2 Priority Component

In line with the above-mentioned assumption, priority component in physical development and institutional development for the proposed pilot project would be selected as follows:

#### 6.2.1 Physical Development Component

##### (1) Structures for Engineering Pilot

- Improvement and development of intake structures with brushdam by replacement of semi-permanent structure.
- Improvement and rehabilitation of a part of structure of diversion dams by providing easily operational device.
- Improvement and rehabilitation of canals with lining.

- Improvement and development of canal structures for handling proper water management.
- Development of new method of utilization on groundwater resources by providing Groundwater Collecting Conduit (GCC).
- Additional development of groundwater resources aside from the GCC by providing drilling equipment and shallow wells.
- Improvement and development of Barangay roads and farm-to-market roads.
- Others

## **(2) Agricultural Facilities for Pilot**

- Development of Farming Technology Demonstration Farm (FTDF).
- Development of Seed Multiplication Station (SMS).
- Development of Pilot Primary Marketing Station (PPMS).
- Development of Post-harvest Technology Demonstration Farm (PTDF).
- Others

### **6.2.2 Institutional Development Component**

Institutional development in the proposed pilot project is programmed on the selected CISSs, which is selected based on the following considerations ;

- Maturity of IA organization.
- Fee collection records of amortization, IA fund and equity.
- Financial status in availment and utilization of production loan.
- Others

Assessment of the CISSs is made based on the above-mentioned criteria and some of other conditions as a pilot project (refer to Table 6-2-1). Taking into consideration the location of CISSs as a pilot project, the present function and activities of IAs and other conditions in Sta. Rita and Marita CISSs are selected as pilot CISSs and is expected to be organized as a Model Federation of Irrigators' Association (MFIA). Baluto CIS is also selected as a pilot CIS and is expected to be organized an IA. The two groups of CISSs with IAs are proposed for Pilot project giving highest priority for immediate implementation.

Table 6-2-1 Assessment of the Existing Facilities and Agricultural Aspects on 19 CISS

Name of CIS	1.1 STRUCTURE & O/M		1.2 DENSITY CANAL		1.3 CROP INTENSITY		1.4 PUMP IRRIGATION		1.5 LAND HOLD		1.6 WATER MANAGEMENT		1.7 YIELD		TOTAL
	No. of Struc.	O/M	Main C	Lateral C	Wet-S	Dry-S	Utilization	Average	Grade of O/M	No. of WT	Wet-S	Dry-S	Point	Point	
1. Bamban	2	1	2	1	3	2	1	1	1	2	1	1	1	21	C
2. San Pedro	2	1	3	0	3	3	1	1	2	3	2	1	3	27	B
3. Malonzo	3	1	2	0	2	3	1	1	1	3	1	2	2	23	C
4. Bangu	2	1	1	0	3	2	1	1	2	2	2	2	3	23	C
5. Susuba-cutcut	2	1	3	0	3	1	1	1	3	1	1	1	1	19	C
6. Telebanca	3	1	2	0	3	3	1	1	2	3	1	1	2	25	B
7. Sta. Rita	2	3	2	1	2	2	1	1	2	3	2	2	3	28	A
8. Marita	2	1	3	1	3	3	1	1	2	3	3	1	1	25	B
9. San Martin	3	1	3	0	2	2	1	1	2	3	2	2	3	26	B
10. Baluto	3	3	2	1	2	3	2	2	3	1	3	3	3	30	A
11. Lilibangan	2	1	2	0	3	3	2	2	3	1	1	3	3	27	B
12. San Bartolome	3	3	1	0	3	3	2	2	3	1	2	2	3	28	A
13. San Isidro	1	1	1	0	2	2	2	2	1	2	2	2	3	21	C
14. Lucong	2	1	1	1	2	3	1	1	3	3	2	2	3	24	B
15. Magao	3	3	1	0	2	3	2	2	3	1	2	2	3	27	B
16. Tinang	1	1	1	0	3	3	1	1	2	3	3	3	3	25	B
17. Sta. Rosario	1	1	2	1	2	2	1	1	1	3	3	3	3	26	B
18. Sta. Monica	1	1	1	1	1	3	2	2	3	2	2	2	3	24	B
19. Caluluan	1	1	1	0	3	3	2	2	2	1	2	2	1	20	C
Criteria on Point Assessment	No. of Structures	O/M	Density	Density	Intensity	Intensity	Shallow Well	Acreage	Grade of O/M	Acreage	Yield Covered	Average Cavan/ Ha			
	0	Easy	Below 10	Below 5	Below 70%	Below 50%	Pump	Below 1.5 Ha	Poor	By a Water Tender	Below 60 Cav.	24.7			
	1	3	1	1	1	1	Unused	1	1	None	1	24.7			
	2	Over 3	Hard	5~10	71~80%	51~80%	1	1.6~2.5 Ha	Moderate	200 Ha	61~80 Cav.	Below 23			
			1	2	2	2	Used	2	Excellent	Over	81 Cav. Over	24~27			
			3	3	3	3	2	3	3	2	2	2			
			20	10	90	80	2	2.6 Ha Over	3	Below 200 Ha	28 Over				
			3	3	3	3	3	3	3	3	3				
			Lined	1	Unlin.	0									

## 6.3 Pilot Communal Irrigation Systems Development (Pilot CISD)

### 6.3.1 Objectives of Pilot CISD

The Pilot CISD aims at providing a sample on improvement of communal irrigation systems in physical and institutional development and implementing the proposed component as a pilot project through active participation of farmers' association.

### 6.3.2 Component of Pilot CISD

The Pilot CISD to be implemented as a pilot of the improvement of communal irrigation systems consists of agricultural infrastructure development, farm road development, agricultural development and institutional development. The components are categorized as follows (refer to Appendix II) :

#### (1) Agricultural Infrastructure Development

- |   |                |          |
|---|----------------|----------|
| a) Canal Rehabilitation   |                |          |
| Canal Type-II (Exc. 1.7 m <sup>3</sup> , Conc. 0.5 m <sup>3</sup> )       | Length 700 m   |          |
| Canal Type-III (Exc. 2.0 m <sup>3</sup> , Conc. 0.6 m <sup>3</sup> )      | Length 1,700 m |          |
| Canal Type-IV (Exc. 2.4 m <sup>3</sup> , Conc. 0.7 m <sup>3</sup> )       | Length 1,000 m |          |
| Turnout   | 38 units       |          |
| Service Road, Main C. (W.3.0 m, Gr.0.6 m <sup>3</sup> )                   | Length 4,200 m |          |
| Service Road, Lateral C. (W.2.5 m, Gr.0.3 m <sup>3</sup> )                | Length 2,400 m |          |
| b) Intake Facility Rehabilitation   |                |          |
| Type-V (Ex.1,600 m <sup>3</sup> , Riprap 3,800 m <sup>3</sup> , RCP.250m) |                | 1 unit   |
| c) Diversion Dam Rehabilitation   |                |          |
| Type-II (Rubber Dam W.20m, H.3m, Tinang CIS)                              |                | 1 unit   |
| Type-III (Rubber Dam W.36m, H.1m, Lucong CIS)                             |                | 1 unit   |
| d) Groundwater Collecting Conduit   |                |          |
| Type-I (RCP.1.0Km, CorrP.0.5Km, Sta Rita&Marita CISs)                     |                | 1 system |
| Type-III (RCP.2.0Km, CorrP.0.7Km, Baluto CIS)                             |                | 1 system |
| e) Shallow Wells Development  |                |          |
| Drilling Equipment & Accessories  |                | 1 L.S.   |
| Shallow Wells   |                | 10 unit  |

#### (2) Farm Road Development

- |                                   |                |  |
|-----------------------------------|----------------|--|
| a) Barangay Road                  |                |  |
| Aggregate subbase and base course | Length 8,200 m |  |
| b) Farm-to-market Road            |                |  |
| Aggregate subbase and base course | Length 500 m   |  |

#### (3) Agricultural Development

- |   |  |  |
|---|--|--|
| a) Farming Technology Demonstration Farm (FTDF) |  |  |
|---|--|--|

- |  |           |
|--|-----------|
| Input materials for 20 ha                            | 2 places  |
| b) Seed Multiplication Station (SMS)                 |           |
| Seed production and inspection/control equipment     | 1 station |
| c) Pilot Primary Marketing Station (PPMS)            |           |
| Post-harvest facilities and equipment                | 2 station |
| d) Post-harvest Technology Demonstration Farm (PTDF) |           |
| Production equipment                                 | 2 places  |

**(4) Institutional Development**

- |  |        |
|--|--------|
| a) Support Assistance for Strengthening of Irrigator's Association (IA)      |        |
| Equipment and materials  | 1 L.S. |
| b) Support Assistance for Model Federation of Irrigator's Association (MFIA) |        |
| Equipment and materials  | 1 L.S. |
| c) Assistance for Seminar and Training                                       |        |
| Vehicle, training equipment and materials                                    | 1 L.S. |

**6.3.3 Implementation of Pilot CIRD**

The Pilot CIRD is expected to be implemented by NIA at the early stage of the project for a period of two-year for Phase-I as a pilot of the improvement of communal irrigation systems with participatory approach of beneficial farmers by receiving financial support from certain foreign country/ international agency for the implementation of the Pilot CIRD. The Pilot CIRD would give an impact and serve as good sample.





