The plan of land distribution conceived in the agrarian reform program is as summarized below:

Plan of Land Distribution in Jala-Jala Area

Size of Land Distribution Unit	Number of Farmer Beneficiaries	Proportional Extent (%)
Housing Yard (ha):		
>0.10	1,306	68.0
0.10 - 0.25	616	32.0
Farm Land (ha):		
0.25 - 0.49	557	29.0
0.50 - 0.99	826	43.0
1.00 - 1.49	391	20.3
1.50 - 1.99	96	5.0
2.00 - 2.45	20	1.0
2.50 - 2.99	10	0.5
3.00 - 3.49	5	0.3
3.50 - 5.00	17	0.9

3.3.3 Farm Production and Farming Practice

As shown in Table 3.3.2, agriculture is the mainstay of the rural economy in the study area. The main crops are paddy, corn, root crops, vegetables, coffee, cacao, and fruit trees. Root crops include taro, sweet potato, yam and cassava, while vegetables include string beans, tomatoes, squashes, eggplants, gourds, bitter gourds, bottle gourds, watermelons, etc. Fruit trees include mango, citrus, guanabana, jackfruit, banana, etc. Among the above, citrus plantation is now development as the new diversified crop in the lower terrace area. Besides, coffee plantation in narrow valley is the essential cash source for the local farmers in the mountainous area.

In 1988, the total paddy production stood at about 1,540 tons (including upland paddy). Paddy planted in the wet season has increased rapidly at an annual rate of 8% from 461 ha (1983) to 703 ha (1988), and as at 1989, reclamation of paddy field has been accomplished over 770 ha .Total production of paddy increased only about 5% annually, from 968 tons to 1,265 tons during the said period. However, the unit yield of paddy remained as low at 2.1 ton/ha on an average. The yield of the rainy season paddy widely varies from 1.8 ton/ha to 4.3 ton/ha. Dry season paddy planted during the past six years averaged 50 hectares. The yield of dry season paddy ranged from 2.0 ton/ha to 3.8 ton/ha

and 2.8 ton/ha on an average. A low productivity of paddy are attributed to crop damages caused by typhoon (79%), drought (68%), and pests and diseases (67%). Less use of farm inputs due to lack of basic infrastructure and inadequate farm guidance or technical extension services is another constraint in paddy production.

Vegetables are planted for about 70 hectares in 1988. Total production of vegetables is estimated about 470 tons. More than 60% of vegetable production consist of bitter gourd, string beans and tomatoes. Root crops are about 90 hectares and their total production is about 680 tons .

Orchard plantation has been developed about 350 ha in the entire study area. Out of the total planting area, most 85% or 290 ha is extended in the lower terrace and/or valley portion in mountain area. Approximately 1,130 farm households grow orchard trees, however, the regular orchard farmers are so far only 45 households. Greater remains grow limited trees as sub-income source. At present, main production of orchard are mango and banana. these production are as low as 3.5 to 5 ton/ha. Major constraints in these production are use of traditional varieties in case of mango, while serious typhoon damage on matured stem in case of banana. A part of citrus is just reached over the harvesting stage. The initial yield is estimated approximately 6 ton/ha. In the future, it will be expected to harvest more than 15 ton/ha when those citrus trees are maturated.

For paddy cultivation, the soils are prepared by use of draft animals. Use of power tillers or tractors is still rare in the study area. All the paddy cultivators use the high yielding varieties (HYV). In reality, however, the use of certified seeds or quality seeds is limited to less than 5% of total farmers. The majority of farmers consequently use owned seeds which were obtained from the preceding production and which have been seriously contaminated by other varieties .In most cases, seedlings are prepared from June to August for the wet season cropping and November to January for dry season cropping. HYV prevailing in the area is IR-42, IR-36, IR-66 and IR70. The seedlings are transplanted to the main fields with the plant spacing at 20 cm x 20 cm. Regular transplantation with a spacing at 20 cm x 20 cm is predominant in this practice. Use of chemical fertilizers is limited where the road network is fairly adequate. Urea is dominantly used at the application rate of about 100 kg per hectare. Recently, such compound fertilizers as 14-14-14, 16-20-0 and 21-0-0 have also been introduced for paddy production. Weeding is usually done once by use of rotary-weeders during the initial growing stage, and thereafter weeds are controlled by hand, from time to time. Recently, some 46% of the farmers have introduced herbicides (mostly in liquid form) into the weeding practices. Harvesting including reaping, threshing and winnowing are

commonly done on a contract basis by use of hired labor. The payment is, in most cases, made in harvested paddy by sharing rate at 1:6 with land owner.

3.3.4 Post Harvest and Marketing

Harvest activities such as reaping, threshing and winnowing, are usually done manually. These harvesting works are usually scheduled on both contract based work and/or mutual assistance of the farmers each others. Incase of the contract based work, the labour wages are paid in harvested product at the rate of 1/6 to 1/7 according to the field conditions.

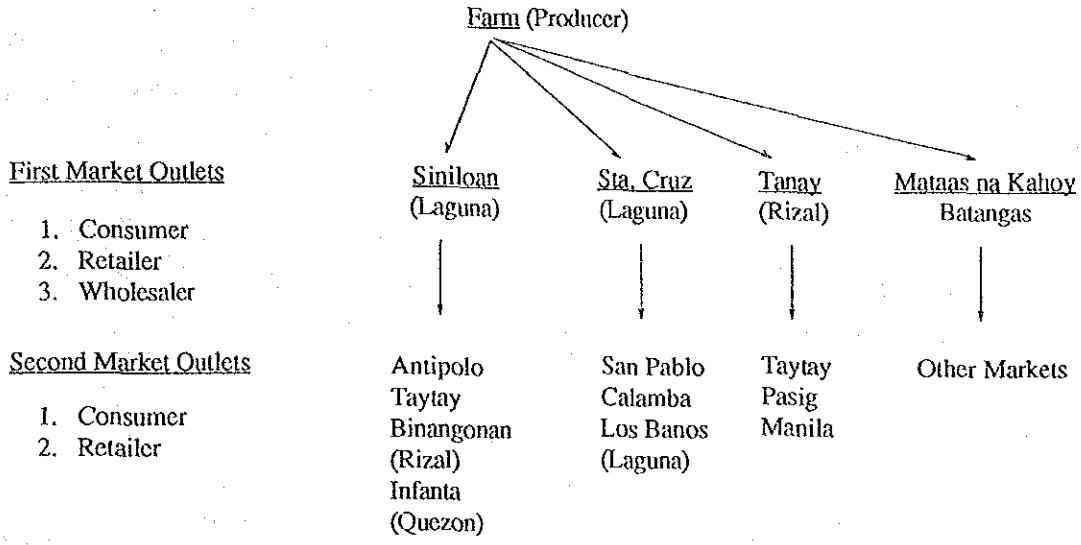
Threshing is usually done by a beating method using the traditional implement, purchase to threshing table or bamboo frame threshing stand. Usage of a power thresher (IRRI model) or pedal thresher is only used by rich farmers. The majority of farmers rely on conventional sun drying using public road pavement, concrete floors such as basketball courts, barangay halls, etc.

About 30 small capacity rice mills equipment "called Kiskisan" having a working capacity of 0.25 ton/hr are available in the study area. These mills are mainly used for milling paddy for local consumption. Recently, one rice mill complex " called Cono" which has a working capacity of about 0.5 to 0.75 ton/ha has been installed by a private dealer in Jala-Jala area.

Marketing of farm products from the study area to outside market is made by individual farmers or small private dealers. Farmers' cooperatives in the area have not yet organized joint marketing of farm products. Thus, the performance of the marketing system is inefficient in terms of movement of product and marketing costs.

The farm products that are marketable are paddy, corn, root crops, vegetables, fruits, and livestock and its products. At the first market outlet, the farm products are sold by the farmers either to consumers, retailers and wholesalers. Market outlets may be illustrated as follows:

Market Outlets of Farm Products from Jala-Jala



3.3.5 Agro-Related Production

(1) Fishery

Fishculture such as tilapia, bighead-carp and milk fish in lake Laguna contributes to a significant extent to the economy of the study area. The fishing area of Jala-Jala occupies about 9,400 ha in lake Laguna of which 1,450 ha is used for 12 blocks of fishpens. Greater remain is considered to be not suitable for setting of fishpens or cages due to shallow shoal, and thus, hard to maintain effective water depth in the dry season.

At present, about 700 households are engaged in fishing. Among them, the licence households for using the said fishpens under contract with Laguna Lake Development Authority (LLDA) are 178 . Remaining 612 household are the part time engagement and/or the casual laborers for aquaculture. The total production of aquaculture in 1988 is about 530 tons of fish and 480 tons of snails.

According to the statistical data provided by LLDA, the total fish production in the lake has been recently reduced significantly, and overcome with apprehension on fishery life. Major constraints on such reduction of fish production is considered to be a water contamination due to oversetting of fishpens as well as increase flow of drainage water from urban area surrounding the lake.

(2) Livestock

Most of farmers in the study area are also characterized as small scale backyard raisers of livestocks and poultry. The livestock include water-buffaloes, cattle, hogs and goats. Poultry includes chickens and ducks.

Recently, number of beef cattle has been increased to 1 - 2 heads/household, however, cattle grazing is always faced a shortage of forage. Chickens and ducks are the typical backyard grazing and contribute to the local consumption.

Livestock in the Study Area (heads)

Beef Cattle	Water Buffaloes	Swine	Goat	Horse	Chicken	Duck
582	771	445	455	168	3,630	6,580

Among the livestock presented above, water buffaloes, swine and chicken are almost evenly grazed in each barangay. As for beef cattle grazing, barangay Bayugo and Punta have a grazing head more than two times of other barangays. Duck grazing is mostly concentrated in barangay Sipsipin and Bagumbong .

3.3.6 Farm Economy

Under the current implementation of agrarian reform program, about 70% of the total farmers have received the farm land and registered as owner cultivationship. With broad classification, five types of farms are recognized as the production units of farm economy according to the results obtained from the farm economic survey.

Farm Household by Farm Types

Farm Types	Households	Proportion (%)
- Paddy Cultivator	710	43
- Upland Crop Cultivator	260	16
- Paddy cum Upland Crop	80	5
- Orchard Plantation	160	9
- Others	460	27

Farm size varies from 3 ha as the maximum holding as specified in the agrarian reform law to 0.3 ha as the smallest holding. The average holding size is a little smaller than 1 ha. About 70% of the farms are amortizing owners and remaining 30% is still land less farmers. These landless farmers are, at present, seasonally employed by the new owner farmers, while in off-farm season, they shall get other job outside of the study area.

Annual income level of each typical farm is estimated based on the farm economic survey conducted in Phase I stage. Mean average income and living expenditures are as summarized as follows:

Farm Economy by Farming Types (₱)

Descriptions	Paddy Cultivator	Upland Crop Cultivator	Paddy/Upland Crop Cultivator	Orchard Plantation
Farm income	8,550	4,300	6,400	4,800
Sub-farm income	2,500	4,900	3,000	4,900
Off-farm income	13,600	13,600	13,600	13,600
Total Income	24,650	22,800	23,000	23,800
Farming cost	2,100	1,100	1,600	1,200
Living Expenditure	18,800	18,800	18,800	18,800
Total Out go	20,900	19,900	20,400	20,000
Balance	3,750	2,900	2,600	3,300

As seen in the above Table, the annual income from both crop production and side business is not sufficient to meet the living expenditure of some ₱ 18,770 which has been estimated as the mean average for standard size of family consisting of 6 persons. In fact, almost all of the farmers are being engaged in the off-farm works especially in such advanced are as Antipolo, Tay-Tay, Metro Manila , etc., and supplement the income to a significant extent. The major sources of sub-income are livestock grazing and free fishing in the lake. A part of farmers also got some additional income from such side business as operation of small rural shop called sari-sari store, garment, production of ceramic articles, transportation services by use of jeepney, etc. Other than the labour work outside of the study area, remittance from kindreds who have been engaged in jobs in the advanced area.

3.3.7 Farmers' Organization

In the study area, four types of farmers cooperative societies had been organized at the barangay bases under promotion of the previous government. There are 34 farmers cooperatives societies, i.e. 7 farmers associations, 6 multi-purpose cooperatives, 14 irrigators' associations and 7 pre-cooperatives (Samahang Nayon). In general, most of these cooperatives societies are not so active due to the lack of funds, and insufficient guidance and facilities. The membership of the above cooperative societies overlapped with each others. Thus, a farmer has two to three memberships in most case. The cooperative societies in each barangay are as summarized below:

Inventory of Farmers Cooperative Societies

Barangay	Samahan Nayon	Farmers' Association	Multi-Purpose Cooperative	Irrigation Association	Total
Sipsipin	1	-	1	4	6
Jala-Jala I	-	1	1	2	4
Jala-Jala II	1	-	-	1	2
Jala-Jala III	-	1	-	1	2
Bayugo	2	1	1	-	4
Punta	1	-	-	-	1
Palay-Palay	1	1	-	-	2
Pagkarinawan	1	1	1	-	3
Lubo	-	1	1	1	3
Bagumbong	-	1	1	5	7
Paalaman	-	-	-	-	-
Total	7	7	6	14	34

The membership of each cooperative society is as follows:

Samahan Nayon	Farmers' Association	Multi-Purpose Cooperative	Irrigation Association	Total
1,040	544	257	578	2,419

Under the guidance of Bureau of Cooperative in DA, the farmers association and multi-purpose cooperative had been organized aiming to maintain joint liability on farmers credit as well as mutual assistance on agricultural production. Irrigation association has a function to maintain the irrigation facilities under the technical supervision of NIA. Generally speaking, these farmers' cooperative societies are inactive due to low incentives in each cooperative services as a result delinquent of membership fee, non-participation to the communal work, etc were appeared to a significant extent.

3.3.8 Agricultural Institutions and Support Activities

Agricultural support services are undertaken by the concerned provincial government. The supporting facilities for promotion of the agricultural production as well as rural development program have been established sufficiently at the provincial level. In reality, however, the institutional supporting facilities and staff assignment at municipal level are not yet sufficient to meet the rural requirement.

At the municipal level, the DA has three regular agricultural production technologists and four casuals. Their main function is to assist farmers in improving institutional and farm management practices through disseminating agricultural information and transfer of farm technologies. They also organize credit and multipurpose cooperatives, farmers associations and other related organizations. Besides these activities relating to farming, they also assist the farm households in home management and youth development.

The municipal agrarian reform office, on the other hand, assists the farmers in tenure development through a process of registration and documentation follow-ups of prospective farmer beneficiaries included in the land transfer operations. At present, the municipal manpower of DAR consists of three agrarian reform technologists, one statistician, a clerk and the municipal agrarian reform officer as head.

Other institutions in the municipality directly or indirectly working on the development of the farmers' welfare include the representatives from the Department of Local Governments (DLG), Department of Trade and Industry (DTI), Social Welfare and Health Development

(SWHD). These institutions cater their respective services to the farming population in terms of local barangay government supervisions, livelihood programs, calamity assistance and health services.

Other than the above, Meralco Foundation Inc. (MFI) has established in Bayugo area, the Agricultural and Aquacultural Extension Center (AAEC) including the function of agricultural extension, home economy extension, demonstration farm and operation and management of fish nursery pond. However, both facilities and technical staff still remain short to meet the requirement.

Related institutions outside the municipality but could also influence agricultural development in the study area include the following:

1. Bureau of Plant Industry (BPI)
2. Bureau of Soils (BS)
3. Philippines Rice Research Institute (PRRI)
4. Philippines Coconut Authority (PCA)
5. University of the Philippines at Los Bannõs (UPLB)
6. Philippines Council for Agricultural Research and Resources Development (PCARRD)

3.4 Non-Agricultural Sector

3.4.1 Small Scale and Cottage Industries

The cottage industries in the study area include ceramic articles production, concrete products, embroidery and garments, mat weaving and charcoal production. Among the cottage works, garment sewing is the most active off-farm work in the area. A few subcontractors in garment sewing were observed in the study area. They are paid on piece work basis averaging at ₱37.50/day.

Agro-processing industries were not established yet in the study area. Some minor work is existed but only for home consumption. The Department of Agriculture personnel, who are extending services on home management taught some housewives how to preserve fruits and vegetables for family consumption. This helps minimize the family budget in buying expensive canned preserves from the groceries.

3.4.2 Financial and Insurance Services

As for the financial service structures, there was a rural bank at Jala-Jala, previously but has closed the shop due to less profitable business. Other private sources of credit have to be tapped by farmers and non-farmers alike to finance their farming and other economic activities at present.

The present source of credit for farmers in the area includes the cooperatives and private individuals (relatives and friends). Of four cooperatives established, three cooperatives are active in granting loans to a limited extent. The multipurpose cooperative averaged about ₱18,750.00 per month. The operation of the cooperative appears well managed with the able guidance of the Municipal Agricultural Office. Besides credit extended to members, the cooperative with a modest capital of about ₱5,000.00 also started a consumer goods store for the patronage of both members and non-members.

Multi-purpose cooperative collects a membership fee of ₱20.00 and an initial capital share of ₱400.00. The total capital share per member is ₱1,250.00. A member can borrow for a business loan of ₱1,000.00 for a period of one week with interest of 2% per day. A member could also borrow for farmer's loan amounting to 2 times his fixed deposit for a four-month period at current interest rates of rural banks (12% annum).

Many farmers and non-farmers who have a demand for a large amount of loan used/or could use sources outside the study area most especially those located at Tanay, Rizal. These include the Tanay Rural Bank, United Eastern Savings Bank, First Savings and Loan Bank, Capitol City Development Bank, Minor Lending Investment and the Tanay Market Vendors Credit and Commercial Development Corporation, Inc. Recently, Philippines Land Bank has been established in Tanay city and readily accessible to the study area. However, this service system is still so extensive at provincial level. Provision credit is also limited to the registered cooperatives.

National crop insurance corporation operating nationwide was already established by the Government as a semi-government entity. Paddy and corn farmers could avail of their service thru the nearest branch office in the province. No farmers in the study area is not utilized such crop insurance yet, the said service can also be accessible to the study area through the branch office in Morong city.

3.5 Irrigation and Drainage Works

3.5.1 Irrigation

In the study area, fifteen communal irrigation systems (CIS) have been constructed by use of river or creek flows. The respective locations of the CIS are as shown in Fig. 3.5.1. The general features of the CIS are as shown below.

Existing Communal Irrigation Systems in the Study Area

Name of CIS	Location (Barangay)	Construction Year/Agency	Service Area (ha)	Irrigation Area (ha) Wet Season	Dry Season
1. Sipsipin	Sipsipin	1957/NIA	86	73	10
2. Puang Linis	Sipsipin	1939/DPWH	34	24	15
3. Butsinge	Sipsipin	1977/NIA	60	54	8
4. Manggahan	Sipsipin	1978/ADCA	26	23	4
5. L.Mapakla	District I	1986/NIA	38	29	3
6. U.Mapakla	District I	1968/DPWH	48	48	15
7. Ilog Tangge	District II	1977/NIA/FSDC	16	(not functioning)	
8. Bayugo	Bayugo	1980/NIA/FSDC	18	(not functioning)	
9. Bagumbong	Bagumbong	1985/PRV'l GT	44	39	10
10. Pulong Matsing	Bagumbong	1981/NIA	8	8	0
11. Ilog Munti	Bagumbong	1988/NIA	10	8	0
12. Ilog Na Malaki	Bagumbong	-	28	8	0
13. Lumang Nayon	Bagumbong	1985/NIA	27	22	5
14. Lubo	Lubo	1985/NIA	22	14	0
15. Ik-Ik	Lubo	1977/NIA	18	(not functioning)	
Total			483	350	70

Rainfalls and river discharges in the study area fluctuate in magnitude and time of occurrence. Irrigation area in the wet season has 350 ha or 72% of the service area. Further, the river discharges in the dry season are scarce or dried up, then the irrigation service in the dry season is limited to 70 ha in total or 14% of the service area.

All existing CIS are provided with diversion dams which are mostly constructed on the middle reaches of steep rivers or creeks. There exist fifteen diversion dams, i.e., diversion weir, barrage with wooden stoplogs, simple check structure, depending on sizes of rivers and topography. No provision or less functioning of scouring sluices occurs heavy

sedimentation in the upstream river sections and serious scouring in the downstream river sections. Further, absence of the intake gates accelerates siltation in their canal systems.

A total of 25.5 km of main and lateral irrigation canals serves for operational CIS. About 74% of the canals are lined with concrete blocks or wet stone masonry of U-shape flume type, to save losses of the limited water sources. In general, canal slopes are steep, running on the surfaces of steep slope land. Most of canal linings are superannuated.

No diversion structure such as turnout, division box is provided in the CIS. Some conveyance structures to cross roads and streams are constructed. Diversion of water to lateral canals or to fields is controlled only by means of stones or turfs through breakage of canal embankments or canal linings.

There is no inspection road of both main and lateral canals. Water supply to fields is carried out by plot to plot supply. The downstream fields confront excess water in flood seasons and water shortage in the dry seasons. Equitable water supply is not assured.

The inventory of irrigation facilities of the existing CIS are as shown below.

Intake structure		
	Diversion weir	5 nos.
	Barrage type	4 nos.
	Check structure type	6 nos.
Irrigation canal		
	Number	43 nos.
	Length, total	25,460 m
	Concrete lining	18,730 m
	Earth canal	6,730 m
Canal structure		
	Siphon	1 no.
	Culvert	11 nos.
	Aqueduct	2 nos.

In addition to the above-mentioned CIS, pump irrigation is practiced in total 15 ha of individual farms by use of pumping equipment loaned by NIA. During the survey period, it

was confirmed that 8 pumping units were operated,and those were sparsely located in rainfed farming areas in Bagumbong. Water sources of pumping irrigation are groundwater for 5 units and lake water for 3 units.

3.5.2 Drainage

There are no distinct drainage canals to evacuate excess rainfall or to convey excess irrigation water to the natural streams or creeks. In the lowlying area, some irrigation canals are functioning for dual purpose of irrigation and drainage. However, since those canals are small in capacity, it is brought inundation problems in the downstream areas when heavy rainfalls occur.

The major streams or creeks have sufficient capacities to flow down surface runoffs in the upper and middle reaches. However, in the lower reaches toward lake Laguna, they get smaller in those capacities. At crossing points with the lake coastal roads, the flow capacities are reduced to small remarkably due to heavy sedimentation in river courses. Maintenance and/or control of the river course and excavation of sedimentation are essential and urgently needed for protection against flood problems.

In the CIS area, runoff of the small creeks is effectively collected for irrigation, and consequently, the stream courses disappear into paddy fields. Thus, at the heavy precipitation, a serious inundation sometime appears in the low-lying paddy field.

3.5.3 Operation and Maintenance

Operation and maintenance of CIS are carried out by Irrigators Associations (IA) under the technical and administrative guidance of the NIA provincial office. The IA conducts a regular meeting to discuss the cropping and water supply schedules and some important matters to be discussed related to their association. Generally, canal cleaning is done by communal Irrigators Association members. The water tender of the association monitors farm operation and water distribution according to the said schedules.

The water charges are paid to the irrigation association. Generally, the water charges are paid in paddy at the rate of 125 Kg to 175 Kg/ha/crop season. The charges are collected by fee collector employed or designated by the association with a monetary incentive of 5% of the collected fees. The rate of water charges fluctuate, year by year, depending upon the progress of irrigation services. Progress of the water charges payment is being recorded as high as 70 to 80% of the total memberships.

3.6 Power Supply Services

3.6.1 Rural Electrification

Under the current rural electrification program, 10 barangays out of 11 barangays are energized in the study area, and 2,680 households or 85% of the total households are connected with the distribution lines. The households in the isolated hilly areas including barangay Paalaman area still remain unconnected with the distribution line.

According to the rural electrification programmed in the medium term development plan of Region IV, continuous extension of power supply systems has been scheduled so as to support rural industries in rural areas and then to increase rural employment opportunities. The rural electrification in Region IV and Jala-Jala municipality is as follows:

Rural Electrification

(Unit: %)

	Region IV		Jala-Jala Municipality
	As of 1986	Target up to 1992	As of 1989
Barangay	61	92	91
Household	51	91	85

3.6.2 Power Supply System

Electric power in the study area is supplied by Manila Electric Company (MERALCO) which receives electric power in bulk from the National Power Corporation (NPC) and distributes the power to consumers.

There are two power distribution networks in the study area as shown in Fig. 3.6.1. Electric power for Jala-Jala up to Lubo through Punta is supplied from Malaya Thermal Plant with a generating capacity of 300 MW which is located 5 km north of Jala-Jala poblacion. Bagumbong area is served from Kaliraya Hydro-Power Station with a generating capacity of 330 MW through Matikiw municipality in Laguna province. The layout of the power line in the study area is as shown in Fig. 3.6.1.

Construction of distribution lines and connection to households as well as maintenance of this facility are undertaken by MERALCO.

The general features of the power supply systems in study area are as follows:

- Sub-station adjacent to Malaya Thermal Plant	(stepdown)	20 kV/3.6 kV
- Distribution line		
Jala-Jala network	(single phase, high voltage)	3.60 kV
Bagumbong network	(single phase, high voltage)	7.62 kV
- Tertiary line	(single phase, low voltage)	220 V

3.7 Domestic Water Supply

3.7.1 Present Water Use

In the study area, groundwater is the main source for drinking cum domestic use. At present, total 713 Nos. of shallow wells and 63 Nos. of deep wells which are graded into level-I have been installed under the current rural water supply program. Shallow wells have a depth around 6 to 10 m, while deep wells are in and around 30 m. Almost all of these wells were equipped with "jetmatic pump" manual operation type. One well is possibly to supply the domestic water for 22 to 69 persons. As far as the number of installed wells is concerned, the rural water supply program in the study area has already achieved the goal conceived in the rural development plan, successfully.

Other than the above, in Jala-Jala Poblacion, the water supply system at level-III has been established in 1981 by the Jala-Jala Waterwork Association. This system includes 150 m deep well with 5 lit/sec capacity of turbine pump, pump house, 38 cu.m of distribution steel tank and more than 2 km of distribution pipelines. This system is, however, still not worked yet due to both technical and financial problems on operation.

Water Supply Services

Descriptions	Level III	Level II	Level I	
			Deep Well	Shallow Well
No. of Wells Installed	1	-	63	713
- Wells not Functioned	1	-	-	185
- Wells Functioning	-	-	63	528
Beneficiaries(households)	(1,753)	-	870	2,286

There are several springs in the mountain and hilly areas as well as in lowlying areas along the shoreline of lake Laguna with yields of 2-3 lit /sec. Some of these springs in the hilly area are used for domestic water by local inhabitants.

Recently, Rizal province has undertaken the feasibility study on installing deep wells for improvement of the rural water supply system, and in the study area, total 9 wells have been accepted in 1988. Among the proposed 9 wells, installation of one well has been planned at the location 300 m northeast from Jala-Jala elementary school. The drilling depth scheduled is 250 m. After installation, water from this well will be supplied to Jala-Jala poblacion through connection with the existing pipeline.

3.7.2 Water Quality of Groundwater

To assess the quality of groundwater, some 37 wells and 5 springs were selected at random, and water sampling test was conducted in the field.

As far as the EC values are concerned, all the well water is recognized to be permissible and meets the requirements specified by the Philippines standard for the potable water. As for the pH value of water, it is also accepted to be ranged within the permissible limits of 6.5 to 8.5 except for some wells in the Sipsipin area. The well water in Sipsipin area shows an acidity at less than 6.5 which are not acceptable for potable water according to the standard ranges specified in Philippines.

Detailed chemical analysis and biological test were conducted in the Laboratory of Rural Water Utilization Administration. To this work, some 10 water samples were taken at random selection. The quality of most well water is considered to be permissible as the

potable water. However, someone shows an abnormal value of turbidity and color, indicating that these water have been contaminated to a certain extent.

According to the results of biological tests, only two among 10 sampled wells were found to have water free from the colon bacillus . The other wells were all contaminated with the bacillus. This is due to the absence of or weak protection measures against seepage of drained water because of proximity to septic and sewage tanks.

Upon the basis of the above observation, it is recommended that the foundations of existing wells should be reinforced and protected from contamination by seepage water. Improvement of septic and sewage tanks is also essential and urgently needed. Installation of deep wells and grading up of the water supply system into level-II or -III is also necessary for supplying the increasing population since the yield of the present shallow wells is limited to small capacity especially in the dry season.

3.8 Road and Transportation

3.8.1 Road Network

Access to Jala-Jala, capital town of Jala-Jala municipality, is facilitated by a national road route 301, which leads to Metro Manila with about 75 km in length. This route 301 is presently under concrete pavement by provincial DPWH. Essential sections of the road have been paved. To barangay Bagumbong, the branch from national road route 349 is available up to the adjacent Matikiw barangay of Laguna province. This road is also under pavement by the provincial DPWH.

The road network in the study area is as shown in Fig. 3.8.1. In the study area, there exist about 40 km of barangay roads and about 3 km of municipal roads. The municipal roads in Jala-Jala town or barangays are mostly paved with concrete. Barangay roads are still unpaved, and more or less affected by erosion hazard, at present. In fact, most barangay roads are hard to pass during rainy season.

The link road of Jala-Jala peninsula from Jala-Jala to Bagumbong through Punta for about 18.0 km was preliminarily implemented by the municipal office by use of construction equipment leased from DPWH in 1975, and clearing and excavation were executed up to Bagumbong without any structure works. At present, however, only the route between Jala-

Jala and Palay-Palay for about 8.5 km can be passed.on during dry season and the remaining 9.5 km is not passable.

Farm road networks are insufficient so as to support an efficient operation of crop cultivation. Barangay roads presently serve the function of farm roads. In the rainy season, those roads are so difficult to pass in major parts due to muddy condition or serious erosion because of lack of proper drainage facilities and maintenance works.

3.8.2 Transportation System

The transportation system in the study area consists of land and water systems. The road system includes simple pathways, feeder roads, barangay, municipality, provincial and national roads. To travel across lake Laguna from Jala-Jala area to other towns of Laguna and Rizal provinces, water transportation system is available.

Private light buses and bus service are available to transport goods or passengers from Jala-Jala area to Tanay city, while bus service is available thereafter Tanay to Metro Manila. To transport large quantities of goods to or from a market place, vehicles to be used are usually contracted between shippers and vehicle owners.

3.9 Social Infrastructure Setting

3.9.1 Health and Medical Services

In the study area, there are one municipal health center (MHC) in Jala-Jala Poblacion and barangay health centers (BHC) in three barangays. The MHC is presently staffed with one doctor (periodical service) a nurse, three midwives and a sanitary inspector.

Of about 1,616 children, 6 years old and below examined for health condition, nearly 70% showed varying degrees of malnourishment, indicating poor sanitary and health conditions as well as poor nutrition in meal arrangement. In fact, about 12% of the babies born died after birth or during infancy. The leading infant mortality causes are broncho pneumonia, respiratory distress syndrome, congenital abnormality, fetal death, diarrhea and infantile beri-beri. For adults, the leading mortality causes include cardio vascular arrest, broncho pneumonia, myocardial infection and pulmunary tuberculosis.

Patients from the municipality who need immediate or emergency hospitalization are usually brought to either the private hospitals at Tanay or to a public hospital at Morong. A service ambulance of the mayor's office and private jeepneys are available for transportation of the patients to distant medical centers and hospitals. Some families could also use motorized boats especially those from barangays along the lakeside of the municipality. Under normal conditions, the bed capacities and health personnel capabilities of available hospitals at Tanay are adequate to accommodate out-of-town patients.

The present health problems in Jala-Jala relate to poor road access to some barangays, irregular transportation, lack of additional health service staff, lack of interest among local residents and poverty. Although the residents need more and better health and medical services from the center, yet these problems inhibit the delivery of such services coupled with the occasional shortage of medical supplies.

3.9.2 Education

The educational level of inhabitant in the study area is low if compared with other area within Rizal province. In fact, about 80% of the adult have been attending or have completed the schooling at elementary level while 40% are attending or have completed high school, and only 10% members have attained college or vocational level.

The school facilities in the study area are distributed among the barangays including the Poblacion. At present, every barangay has an elementary school and two barangays have each high school (barangay. First District and barangay. Bagumbong). In addition, barangay. Malaya High School of Pililla, Rizal, extends classes of first year level at barangay. Bayugo in Jala-Jala. For the school year 1989-1990, there are about 3,285 elementary pupils enrolled more or less proportionately distributed from Grades 1 to 6 in the municipality with 92 classroom teachers and 8 school heads . For the high school level, the enrollment totalled 436 students for public (Barangay high school) and 473 students for the private high school and manned by 22 teachers.

In addition, two colleges in Rizal are also available to high school graduates who would like to take up college and vocational courses: (1) Rizal Technological and Polytechnic Institute at Morong and (2) Rizal College of Arts and Trade at Tanay.

The current status of elementary and high school level education in the study area is still below standard according to school heads. School facilities such as buildings, books, science equipment and staff are inadequate. Some teachers have overloading classes especially at the elementary level. Drop out rate of school children average about 17% annually due to problems such as poverty, transfer of residence, illness and other disturbances.

The program on adult and women education has been on-scheduled according to the provincial arrangement, such as Anak Bukid Club and Rural Improvement Club. program. The program includes such specific courses as agricultural technology, home economy and management , including family planning, nutritional control in cooking, cottage work technology, etc. In reality, however, activities of this program is still at minimal level so far.

3.9.3 Communications

At present, there is one radio communication facility at the Poblacion, Jala-Jala. This is often used to receive and deliver messages to and from other municipalities of Rizal. No telephone system is available for use of residents especially for long distance call. Callers have to go to Tanay Poblacion or other nearby places in Rizal where communication facilities are available.

Communication media to inform residents at the study area about current events include transistor radios, television sets and newspapers (dailies and non-dailies). An information center established at the Poblacion is also a source of information for the

residents. This is an information outlet of the Philippines Information Agency (PIA) to disseminate various published materials including subjects on livelihood and related topics. Other informative materials specially dealing with farming are distributed to farmers through the Municipal Agricultural Office.

CHAPTER IV DEVELOPMENT CONSTRAINTS AND PROBLEMS

4.1 Development Constraints and Limitations

In the study area, the population has been inhabiting densely. Recently, promotion of socio-economic modernization has been taken place in the study area. Besides, structural improvement on agricultural production is progressed in, i.e., crop production by the tenant farmers under traditional tenure system to production of diversified crops by new owner-cultivationship under the current implementation of the agrarian reform programme. In reality, however, the socio-economic situation in the study area is still inactive.

The major constraints lying in the current rural development are as summarized belows:

(1) Physical constraints and unfavorable circumstances

1) Rainfall distribution during the rainy season is always irregular, month by month as well as year by year, and accordingly, the productive conditions of crops still remains unstable.

2) A shortage of soil moisture in the dry season is one of the serious constraints on the present agricultural production.

3) Typhoon attacks very frequently, and gives damages on agricultural production as well as properties of local inhabitants.

4) Arable land for profitable crop production is limited to 2,830 ha, of which only 1,210 ha is recognized to be suitable for intensive development investment for crop production increase.

5) Major portion of total rainfall runs off immediately after precipitation, and eventually, rivers have only a small regular flow discharges.

(2) Socio-economic constraints and unfavorable circumstances

1) Dense population cum high annual population growth, in contrast, limited arable land in the study area.

2) Major part of beneficiaries of agrarian reform still remains poor and therefore has no enough working capital for efficiently operating crop production.

3) Production diversification has been tried by the local farmers. However, economic effect of those activities is still low at minimal level. Low bargain power due to small quantity of each production is the main cause.

4) Insufficient development of agricultural infrastructure is one of the most critical constraints in agricultural production. Inadequate operation and maintenance of the existing service facilities obstruct those function and shorten those useful life.

5) Poor road network is another critical constraint in the socio-economic activities in the study area.

6) Agricultural institution and supporting services are still not effectively functioning yet so as to maintain an agricultural production and to promote modernization of farming.

   In the exceptional case, Meralco Foundation Inc. (MFI) has recently established the Agro-Aquatic Development Center including the nursery ponds for fish cultivation. Technical extension services as well as guidance in community development to the local farmers are carried out, however, the facilities and technical staff are still short to the requirement.

7) Social infrastructure and public services are still short to the need of local inhabitants.

4.2 Farmers' Wishes and Anticipation in Rural Development

Farmers' wishes and anticipations in the rural development are confirmed through the field interview with 395 farmers selected at random in the entire study area. These are broadly grouped into two conditions, namely:

(1) Stabilization of agricultural production, and

(2) Infrastructural development and reinforcement of rural institutions for up-liftment of livelihood standard.

The former wishes are mainly concentrated on the following seven conditions as summarized below:

Farmers Wishes in Agricultural Development

Description	Wishes by Priority			
	First Priority	Second Priority	Third Priority	Fourth Priority
Irrigation Water	354	12	2	2
Farm Road Improve.	14	98	43	133
Plant Protection	7	84	51	46
Mechanization of Harvest.	4	57	62	39
Fertilizer Supply	4	27	89	59
Drainage Improve.	2	21	7	4
Seeds Supply	0	79	105	39

Note: Figures show number of respondent to interview (farmers).
Source: Farm Economic Survey in Phase I.

About 90% of farmers recognize necessity of stable supply of irrigation water even in the rainy season so as to stabilize agricultural production as well as sustain growth of farm economy, and then, give the top priority for early realization of the stable and year-round communal irrigation service system. Improvement of farm road network and farm input supply, such as agro-chemicals for plant protection, fertilizers and quality seeds are pointed out as the second important matters to be required to implement in line with the rural development. Farmers also pay attention to the farm mechanization especially on the rice post-harvest activities of threshing and milling.

As for development of the rural infrastructure as well as reinforcement of institutional structures, the farmers emphasize the following:

Farmers Wishes on Development of Infrastructure and Institutional Structures
(Summary List of Development Schemes)

1.	Construction of Fishery Harbor	(7)
2.	Construction of Bridges	(1)
3.	Construction of Barangay Road	(1)
4.	Provincial Road/Trunk Road	(11)
5.	Water Supply System,	
	- Deep Well	(6)
	- Spring Development	(2)
6.	Improvement of Irrigation Dam/Intakeware	(4)
7.	Improvement of Communal Irrigation System	(7)
8.	Market and Slaughter-House	(2)
9.	Construction of Public Buildings,	
	- Public Building Complex	(3)
	- Barangay Hall	(4)
10.	Rural Electrification	(1)
11.	Procurement of Equipment	(3)
12.	Rural Institution (Emergency Fund)	(11)
13.	Establishment of Health Center	(1)
14.	Establishment of Day Care Center	(5)
15.	Periodic Health Control Programme	(4)
16.	Sport Programme and Facilities	(4)
17.	School Project	(5)

Source: Farm Economic Survey carried out in Phase I Study Period.
Figures in parentheses are the number of Barangays requested.

Among the major anticipations listed above, improvement of the road network is given the highest priority. Up-grading of the water supply system by installation of deep wells is another essential scheme in their anticipation.

CHAPTER V BASIC CONCEPT FOR INTEGRATED RURAL DEVELOPMENT PLAN

5.1 Prospective Goal of Current Rural Development in the Philippines

To cope with the above problems and to improve/enhance the socio-economic situation, the Government of Philippines has launched a medium term development plan covering the implementing period of 1987-1992. The development goals conceived for this plan are as follows:

(1) *Alleviation of poverty*

Poverty alleviation is a strong argument for the socio-economic development particularly in the rural areas. Possible approaches suggested for poverty alleviation is to increase food production for family, to extend cash crop production (annual and perennial crops), and further to diversify into other on and off-farm activities especially through the rural industrialization.

(2) Generation of more productive employment

Medium term development programme emphasizes to create the labour opportunity through modification and/or development of employment structures, such as agro-based and labour-intensive as well as capability of cooperative enterprises preferably within the rural area.

(3) *Promotion of equity and justice*

Realization of the self-reliance and then social justice is another essential argument for socio-economic development of the Philippines. To this end, therefore, it is emphasized to develop the domestic resources at the potential maximum through the full mobilization of the local people, and to spread those development benefits widely over the society for avoiding disparities in income and wealth.

(4) Attainment of sustainable economic growth

In order to realize the above development principles and achieve sustainable growth of national as well as regional economy, the Government has placed the highest priority

on agricultural development in the development strategy. The target of this development has been conceived to be continuously increased of staple food crop, i.e. rice and corn although these production have already been achieved over the self-sufficiency. The crop diversification and then increase of industrial and/or exportable crop production are also essential target for the subjected attainment.

The principle strategies for achieving the above development goal and/or targets emphasize the following activities:

1) to improve the production basement by means of irrigation development, drainage improvement, flood control, land and soil conservation against serious erosion, etc.

2) to increase industrial crop production for activation of the rural industrialization

3) to reinforce the agricultural support services, such as farmers credit, farm input supply, extension services, etc.

4) to improve rural infrastructures for sustaining the production activities as well as supporting the distribution cum marketing of those agricultural production.

5.2 Necessity of Rural Development and Development Potential in Jala-Jala Area

In the study area, socio-economic modernization has been taken place through implementation of the current regional development programme. CARP has also been implemented under the current development policy of the Government. However, the socio-economic aspect as well as the infrastructural setting still remain at a minimal level.

As already explained in the Chapter 3, the regional gross domestic product (RGDP) is about P66 million as at 1988 of which most half of product is brought by off-farm works. The potential resources for rural economic development is limited to the labour forces and arable land of 1,210 ha (class I,II and III). Other resources are quite marginal in this area. Therefore, it is foreseeable that agricultural activities will have to be the mainstay in the rural economy of this area even in the future. In general speaking, agricultural development broadly have two ways, i.e. "production increase" and " structural improvement of agricultural production". In this area, the structural improvement, e.g. introduction of agro-based industrialization is hardly expected since the rural industrialization has been already

pursued intensively around the study area. Thus, herein the planning, the rural economic development for goal to 2000 year will have to be implemented in agriculture with particular emphasis on a production increase and stabilization of farm economy.

Other than the agricultural development, there are small opportunity for tourism development. In reality, however, the natural environment has been destroyed to a serious extent especially in both mountainous area and lake Laguna. Thus, in comparison with the advanced areas surrounding lake Laguna, it is hardly expected to pursue new development, at this moment.

The following are fundamental approaches to development of the study area.

(1) Land resources

Out of 4,930 ha of the total study area, the land to be capable for agricultural development is demarcated about 2,830 ha in gross (or 57%) of which only 1,210 ha (or 25% of total area) is recognized as arable land to be suitable for intensive development investment for crop production increase (Table 5.1.1).

In this planning, it is proposed that an arable land of 1,210 ha shall be intensively developed with provision of the basic infrastructure and reinforcement of the supporting services. This intensification of agricultural production would be effective to create the basement of the rural economy as well as stabilize livelihood of the beneficiary farmers.

The greater remain of 2,800 ha is classified into non-arable land due mainly to steep or rolling topography, shallow effective soil depth underlying the base-rocks. The land is subjected to protect against serious erosion problem. Therefore, it is recommended that the forestation should be on-scheduled with particular attention to land cum soil conservation of this area.

(2) Water resources

At present, utilization of the river water is limited to 430 ha irrigation in the rainy season, while only 70 ha in the dry season. With structural improvement of the existing intake facilities, supplementary irrigation to the rainy season cropping could be maintained to a certain extent.

For promotion of the dry season cropping, additional water resource development should be made by utilizing the lake water. Lake Laguna has a enough potential for the said development, nevertheless the installation cost and technical training programme on pump irrigation should be carefully taken into consideration.

It has been confirmed that the groundwater resources is considerably small and the unit yield of well is marginal for irrigation use. Thus, herein the planing, the groundwater will utilize only for the domestic use.

(3) Labour force

Population growth in the study area is foreseen in 2000 year with an assumption of annual growth rate at 2.5%. The forecast population and labour force are as summarized below:

Forecast Population

Description	1987	1990	1995	2000
Population	18,750	19,220	21,560	23,910
Labour Force	8,430	8,830	9,920	11,240

According to the above forecast, the labour employment opportunity under the conditions with the project as well as an anticipated setting of labour employment in 2000 year is estimated as follows:

1) Employment opportunity in project implementation
   - Annual requirement of labour force for the construction works
     1,000 person/day x 150 days/year = 150,000 persons/day/year

   - Labour force to be available:
     Total labour force 9,920 person /day - Employed labour 9,010 persons/day = Free from 910 persons/day

As seen in the above , it is expected to employ the farmers in off-farm season for the construction work until 1993 where the irrigation facilities will be completed. However, after 1994 when the dry season farming is commenced under irrigated conditions, labour shortage totaled more than 13,500 persons/day will appear during the construction work.

2) Labour work in agriculture

The labour requirement under implementation of the intensified crop production is estimated as shown in Fig. 5.2.1. The peak requirement of labour will appear on transplanting and harvesting works for paddy cultivation of both wet and dry seasons. Practically, however, the labour requirement still remain within the total family labour force, and never exceed over the total force even at the peak times. The labour requirement for the daily care and/or casual work on crop production is around 30% of the total family force. Greater remain shall use for off-farm work and/or side business for earning the additional income.

3) Labour Employment in 2000 Year

Total Labour Fource	11,240	persons
- Agriculture	7,310	
- Aquaculture	1,350	
- Commerce/Services	450	
Total	9,010	
Balance	2,130	

As at 2000 year, it is foreseen that about 2,130 persons will remains from the employment in the study area. After completion of all the project facilities, some employment opportunity will be brought in rice mill, workshop, etc., however, greater part of labour force shall get job outside of the study area.

(4) Marketing prospect

It is foreseeable that the study area would, in near future, be included into the commercial zone of Metro-Manila. Therefore, diversification of agricultural production as well as its production increase could be pursued based on the demand of market in Metro-Manila.

Agricultural production to Metro-Manila is mostly supplied from the surrounding area, of which Pampanga Delta has the greatest share in the said marketing. No serious marketing concurrence has been observed so far in the center market of Metro-

Manila. Since the consumer demand in Metro-Manila is always larger than the total supply of production, it is also expected that a prospective marketing on agric production in the study area will be of sunjune although harvesting/shipping pattern of the production is similar to those of Pampanga Delta.

Many agro-based industries have been developed in and around Rizal province. However, in most cases, these factories are not always operated satisfactorily and successfully. A shortage and/or unstable supply of processing materials are one of the most serious constraints. Since most of the said industries are located near to the study area, it is expected that the agricultural production in the study area could be traded smoothly with those agro-based industries without any serious hindrance.

(5) Rural industrialization program

As already explained in the preceding chapters, the study area has been exceedingly rich in labour force. Besides, certain quantity of materials for industrial use could also be expected from agricultural production. However, as far as the agro-based industrialization is concerned, it is hardly expected to realize an agro-processing factory in the study area due to the following critical constraints:

- Lack of water resources to be capable for industrial use
- Lack of fuel and/or power supply with reasonable cost
- Large investment cost to be required for additional installation of water treatment plant especially for drainage work as the environment protection measure against water contamination of lake Laguna.

In attempt to create labour opportunity as well as up-grade the labour productivity, the following program will be pursued in line with the production cum marketing activities as well as technical extension services.

- Agricultural production to be excessive from the marketing demand will be sold as the agro-processing materials to the advanced factories which have been established and operated in the areas surrounding lake Laguna.
- Promotion of family-based cottage industry will be made especially for activation of the labour force in the off-farm season. Among the existing cottage works,

embroidery and garments sewing, mat weaving and ceramic articles could be extended as the side-business of the farmers.

(6) Pilot area development program

According to "implementing arrangement(I/A)", Lubo (300 ha) and Llano (62 ha) areas were selected as the candidate for the pilot scheme development area among 11 barangays.

The primary objectives envisaged on the pilot scheme development plan is:

a) To implement the integrated rural development programme to be applicable to this study area,

b) To demonstrate the development impact to other areas where the land is being under distribution and/or still remains subject to the agrarian reform.

However, according to the overcomes of the study so far made on both integrated rural development plan for the entire Jala-Jala area and pilot plan on the candidate areas, it is identified that:

(1) The CARP-oriented development components shall be implemented in package so as to respond to the primary objectives of this development plan and maximize the development effects.

(2) Practically, two candidate areas have no representative features or merits for applying and implementing the pilot schemes.

(3) The model development schemes conceived for the pilot areas are too small in scale. Accordingly, those development cum demonstration impacts are hardly recognized in this regard.

5.3 Development Target and Strategies

In due consideration of the Government policy applied to the rural development and CARP as well as the present socio-economic situation of the study area, it is presumably

taken the following three points as the primary goals of this integrated rural development of the study area.

(1) Early bringing up self-reliance farmers

In the agrarian reform law, it has been set forth that the beneficiaries of agrarian reform (BAR) shall efficiently amortize the allocated land and pay up the land charges within 15 years. In case of the study area, the due land charges is estimated at around ₱30,000/ha (or equivalent to annual due ₱4,405/ha).

The unit farm size set under the present agrarian reform is a little smaller than 1.0 ha/household. Therefore, to achieve land amortization and financial self-reliance of BAR, increase of farm production and up-grading of productivity of family labour shall be realized through promotion of intensification of farming and diversification of crop production. To this end, it is urgently needed to develop the irrigation service system, and to enable steady supply of water to both paddy and upland fields.

In the intensification particularly of the upland cropping, it shall be scheduled on to introduce cash crops, such as legume, vegetables, cut-flower, etc. in stead of such traditional food crops as corn, taro, cassava, etc. being planted at present. Since the study area is favorably located near to Metro-Manila, these cash crops would be lucratively traded to Manila market.

(2) Increase Regional Gross Domestic Product (RGDP) by improving the socio-economic structures and foundations

As for up-liftment of the actual regional gross domestic product (RGDP) in the study area, the primary target is set up at ₱22,500/capita or ₱35,000/family making reference to the per capita income level in the advanced areas, such as Antipolo, Tay-Tay, etc. where socio-economic modernization has been pursued with industrialization under favorable geo-economic position to be proximity to Metro-Manila.

(3) Self-sufficiency of food production within the municipal area

As estimated in the preceding Section 5.1.2, population in 2000 year would be 23,910 persons. If applied the Government controlled "per capita consumption of staple food" in terms of milled rice at 125 kg/person, the total demand of staple food production is corresponding to 2,990 ton of rice, approximately.

To meet the above demand of rice, it is necessary to generalize double cropping of paddy a year as well as to secure a unit yield of paddy. Improvement of the existing communal irrigation systems is essential and urgently needed to this end, accordingly. Besides, irrigation service to the dry season cropping should be secured through development of new irrigation systems, such as pumping system by use of lake Laguna, small water impounding system on rivers, etc.

It is expected that rice produced in the study area could be sufficient to meet the gross demand of staple food. Great surplus of rice production would also contribute to the rural economy to significant extent.

To efficiently pursue the principle strategies stated above and achieve the development goal, successfully, the following schemes shall be implemented as the essential functions of the integrated rural development envisaged hereby.

a. Establishment of Rural Development Center, including the following essential functions:
   - Supply of farm inputs
   - Supply of qualified seeds and nursery for crop production
   - Farm mechanization service center
   - Training and guidance in operation and maintenance of project facilities
   - Supporting services in post harvest activities, including rice mill facilities

b. Improvement/reinforcement of irrigation and drainage facilities

c. Improvement of road network, including construction of trunk road to be going around the peninsula

d. Reinforcement of agricultural supporting institution such as farmers' credit, technical extension services, covering the production technology on crops, livestock, poultry, aquaculture, etc.

   In addition to the above institutional reinforcement, the following programs shall also be emphasized:
   - Training cum guidance to farmers in home management technology, including youth and women education through activation of the existing programs.
   - Community development, including activation of cottage industries.

Activation of farmers cooperative societies and organization of integrated Jala-Jala Agricultural Cooperative through unification of the existing barangay farmers associations.

f. Reinforcement of the rural infrastructure, such as

- Rural water supply system
- Rural electrification system
- Transportation service system
- Communication service system
- Health center, clinic, etc.

The framework of Integrated Rural Development Program prepared in due consideration of the development targets as well as the principle development strategies is as illustrated in Fig. 5.2.2 attached hereto.

CHAPTER VI INTEGRATED RURAL DEVELOPMENT PLAN

6.1 Land Resource and Land Use Plan

As of the middle of May, 1990, the land distribution has been achieved about 1,650 ha. The distributed land is mostly the paddy and upland field which had been developed in the lowlying area (see Table 6.1.1) and being scheduled on the Program A of agrarian reform. The distributed land includes some 120 ha of upland field, 720 ha of paddy field,480 ha of non-cultivated land and 250 ha of homestead. Out of the non-cultivated land of 480 ha, 60 ha land is considered to be possible to reclaim for the crop farming . The remaining 420 ha land is of shrub and/or grass land. Among these land, some 130 ha of shrub extending over the mountainous area is not suitable for economical land use and/or agricultural investment due to steep topography and shallow soil depth. The other 290 ha lying on lower terrace area is classified into arable land in class IV, however, it is hardly expected to develop for intensive agricultural production due mainly to unfavorable soil and topographic conditions.

The land of 3,280 ha being remained in the current agrarian reform (see Table 6.1.1) includes some 520 ha of farm, of which 100 ha of upland field and 20 ha of paddy field in Bagumbong and 30 ha of paddy field in Punta area is still under negotiation with the land owners. These lands (150 ha) are recognized as suitable for intensive agricultural development investment. Remaining 370 ha land consisting of 360 ha of plantation and 10 ha of common field are patchy scattered widely in the mountainous area,and are recognized as unsuitable for intensive agricultural development.

The land of 3,280 ha excluded from the current agrarian reform program A is mostly lying over the steeply dissected mountainous area and a part in the lower terraces. Almost all of the land is classified into class VI :non-arable land. This means that an economic development is hardly expected on these land. Since the vegetation as well as ecology is seriously degenerated in this area, the soil and land conservation measures are essential and urgently needed. Thus, in this development planning, it is recommended to pursue reforestation for the entire mountainous area so as to maintain total ecology and water shade environment.

The proposed land use has been planned based on the above basic consideration as well as wishes of the farmer beneficiaries (see Fig. 6.1.1). The basic plan is as follows:

	Mountainous/ Hilly Land		Lower Terraces		Alluvial Fans		Total	
	Present	Proposed	Present	Proposed	Present	Proposed	Present	Proposed
Agricultural Land:	310	960	450	1,000	680	730	1,440	2,690
Paddy Field	0	0	270	480	500	500	770	980
- Irrigated	0	0	0	450	450	500	450	950
- Rainfed	0	0	270	30	50	0	320	30
Upland Field	10	10	50	110	100	140	160	260
- Irrigated	0	0	0	10	0	120	0	130
- Rainfed	10	10	50	100	100	20	160	130
Plantation	300	320	130	190	80	90	510	600
- Orchard	170	260	130	190	50	90	350	540
- Coconut	70	0	0	0	30	0	100	0
- Others	60	60	0	0	0	0	60	60
Agro-Forest	0	630	0	220	0	0	0	850
Non-Agric. Land	2,360	1,710	740	190	60	10	3,160	1,910
- Forest	200	1,710	80	190	0	10	280	1,910
- Shrub/Bush	1,150	0	340	0	30	0	1,520	0
- Grasses	1,010	0	320	0	30	0	1,360	0
Homestead/Others	10	10	150	150	170	170	330	330
Total	2,680	2,680	1,340	1,340	910	910	4,930	4,930

At present, the village yard and/or homestead is estimated at about 330 ha in total which is corresponding to about 0.1 ha/household. This unit holding size is rather small compared with other rural area. In this land use planning , however, no special arrangement is made for further expansion of the households since limited farm land in this area.

As for promotion of the reforestation in the mountainous area, it is proposed that the local farmers shall organize themselves into the specific cooperative for forestation, and introduce the Integrated Social Forestation program of the Department of Environment and Natural Resources(DENR). For implementation of the reforestation work, following trees are selected as recommendable species:

- Higher portion in dissected mountain where soil moisture is shortened in a certain months period especially in the dry season.
  - Acacia, Eucalyptus, and Cashew

- Lower part and/or valley portion of mountains where high soil moisture conditions are expected almost throughout the year.
  - Narra and Mahogany, etc.

The nursery of those tree species is prepared by the provincial nursery DENR in Antipolo, however, steady supply of nursery is hardly expected from the said nursery

because of small production. Thus, it is proposed to establish nursery farm with farmer growers especially in the mountainous area under promotion of crop diversification program.

6.2 Agricultural Development Plan

6.2.1 Crop Production Programme

The study area has been inhabited densely as against limited arable land of only 2,830 ha in gross or 57% of the total area. Therefore, in order to achieve self-sufficiency of staple food and financial self-reliance of the beneficiary farmers of agrarian reform as early as possible, cropping intensification and diversification of farm productions are the essential bases. With this understanding, it is planned to pursue the following promotion of agricultural intensification including crop diversification.

(1) Irrigated paddy field

- To diffuse and generalize double cropping of paddy a year
- To increase unit yield to around 5 ton/ha/crop season
- To stabilize paddy production

The proposed paddy cropping pattern in CIS areas is prepared as illustrated in Fig.6.2.1.

(2) Rainfed paddy field

- To increase unit yield of paddy to 2.5 ton/ha on an average

Prospective Rice Production

Land Category	Farm Area	Cropping Area	Unit Yield	Production	Milled Rice
Irrigated Field	950 ha	1,830 ha	5 ton/ha<1	9,150 ton/y	5,950 ton/y
Rainfed Field	30	30	2.5	75	50
Total	980	1,860	-	9,225	6,000

Note: Anticipated unit yield of irrigated paddy is estimated based on actual unit yield recorded at progressive CIS field in Rizal province and maximum yield recorded at Jala-Jala Municiparity of 4.3 ton/ha(see Table 6.2.1).

The total production of rice will meet the domestic demand of 3,000 ton in 2000 and accordingly, 3,000 ton of excessive rice will be surplus for marketing. Other than the rice production, some 1,450 ton of rice bran, 1,775 ton of husk will also be produced as the by-product. The rice bran is useful for feeding of livestock and/or poultry. Husk is useful as one of the fuel source for small scale industrial operation.

To the above promotion of rice production increase, the institutional supporting services, i.e., technical extension service, qualified seed supply, steady supply of farm inputs, post-harvest activities, etc. will have to be reinforced and activated.

(3) Intensification of upland cropping

The upland crop cultivation will be subject to enhance a land productivity and profitability, therefore, intensification cum diversification of crop production are scheduled on the following basis:

- To diffuse and generalize the rotational crop operation with more than 2.5 cropping intensity,
- To diversify the traditional food crops to profitable cash crops.
- To increase crop yield as well as to improve quality of production for successful marketing.

The proposed cash crops are selected taking into account the following conditions:

a. Seasonal adoptability shall be high enough for controlling the harvesting to a certain long period according to the demand in market.
b. The production never conflicts with that from the other producing areas at the market.
c. Price of production do not fluctuate so seriously.
d. The production be solid enough against damages which are generally given during the long transportation.

The proposed cash crops herein preliminarily selected are:

- For dry season cropping : bitter gourd, corn, soybean
- For rainy season cropping : corn, eggplant, tomatoes, string bean, soybean

The production of major crops and prospective marketing values are estimated as shown in Table 6.2.2 and the cropping pattern is illustrated in Fig. 6.2.1.

In the near future, it is also expected that a part of the upland farming is diversified to an industrialized horticulture, such as plantation of cut-flower, production of pot plants and gardening plant, etc.

(4) Rainfed upland field

The farming conditions in the rainfed upland field do not change drastically from the present setting. To uplift the land productivity as well as profitability of crop production, production diversification will be made with enhancement of livestock production through introduction cum increase of forage crop. As for the upland field lying on steeply sloped land it is proposed to change those farm into agro-forestation and /or reforestation.

To achieve the intensification and diversification of upland crop production and raise the farm economy in upland farmers, the institutional supporting services, such as extension services, qualified seed supply, steady supply of farm inputs, shall be reinforced. Besides, establishment of information services system in respect to the marketing activities is an essential schedule for promotion of this crop production increase programme.

(5) Promotion of fruit production increase

As for the fruit plantation developed in the alluvial fans and lower terraces, production stabilization is emphasized by introduction of modern technology. To this end, reinforcement of technical extension services, including improved farming practices on fertilization of trees, artificial pollination practices, control of sprig, twig/bough, etc. as well as supply of sound seedlings will be made through supporting activities of the proposed rural development center.

The fruit production under intensification program is presumably estimated as follows:

Citrus (Orange):

80 ha x 15 ton/ha	=	1,200 ton
1,200 ton x 0.7	=	840 ton to be marketable as fresh fruit
		360 ton to be out-grade for marketing but useful for agro-processing

(6) Agro-forestation

In higher terrace and sloped area, agro-forestation is proposed as an advantageous economic setting. Promotion of fruit plantation will be scheduled in terraces where soil is deep enough in soil depth. Mango and lime (Karamancy) will be taken up as one of the most recommendable crop. Maturation of these fruits is practically free from typhoon season. Vigorous growth even under dry conditions is also an advantageous feature of these trees.

Annual production of the above plantation will fluctuate to significant extent, year and year, due to rainfed operation and plantphysiological constraint on fertilization of fruit. Annual production of these fruits is estimated conservatively as follows:

Mango (medium size of fruit):

300 ha x 10 ton/ha	=	3,000 ton
3,000 ton x 0.7	=	2,100 ton to be marketable
		900 ton to be out-grade for marketing but useful for agro-processing

Citrus (Karamancy):

550 ha x 7 ton/ha	=	3,850 ton to be all marketable

6.2.2 Supporting System on Post Harvest Activities

The present conditions of post harvest activities still remain at minimal level. The facilities related to the post harvest works are only for rice production, such as small rice mills and simple warehouse. No other effective facilities and/or service systems are available in this area. Thus, in order to successfully achieve the intensification and diversification of crop production, establishment of supporting services for post harvest activities on each crop

is essential and vital necessity in this agricultural development plan. The post-harvest facilities are preliminarily designed for two productions, i.e., rice and vegetable/fruits.

(1) Post-harvest facilities for rice

At present, the post-harvest facilities for rice production is limited only 30 nos. of small rice mills and simple warehouse for temporary storing of paddy. Thus, provision and reinforcement of the post harvest facilities is one of the essential needs in promotion of rice production increase program. Reinforcement of the post harvest facilities will also be effective for saving the field operation losses of the production.

General speaking, the post harvest facilities on rice could be specified into 4 types of equipment according to the type and capacity of rice mills to be installed. Namely:

1) Kis-Kisang type of small mill (0.25 ton/hr, right duty type):
2) Cono type of medium mill (0.5 - 0.75 ton/hr, light duty type):
3) Medium capacity complex type (1.0 ton/hr, heavy duty type):
4) Large capacity complex type (3.5 ton/hr, heavy duty type):

The installation cost, operational conditions and technical specifications of each rice mill equipment are as follows:

Descriptions	Kiskisan Type	Cono Type	Complex Type (Medium)	Industrial Type (Large)
Technical Specification	Right Duty For Individual Use	Right Duty For individual Use	Heavy Duty For Industrial Use	Heavy Duty For Industrial Use
Milling Quality - Broken (%) - Milling Effic.(%)	Fair >20 <60	Fair >15 <60	Excellent <5-7 >62	Excellent <5-7 >62
Operation/Mainte.	Easy/Free Operation	Easy /Free Operation	Need Operation System	Need Operation System
Beneficiary Farmers	5	10 - 15	200 - 250	850 - 950
Investment Cost(₱)	58,300	108,500	6,239,400	17,884,700
Amortization/Farmer/ Annum(₱)	3,230	3,010	3,660	2,760

1) Kiskisan and 2) Cono type of rice mills are, at present, assembled in Philippines and prevailed in rice producing area extensively. These equipment are cheap in price and have a simple mechanism for easy operation. However, an annual debt repayment, if apply the farmers credit for this installation, is considered to be rather heavy for farmers. Besides, milling quality and operation losses (broken hazard) are not acceptable as profitable operation.

Rice mill equipment of 3) and 4) are the heavy duty type being capable for industrial use. Rice mill of 3) type is considered to be most suitable compact unit for doing rice milling enterprise at the farmers cooperative bases. However, to meet the total rice milling requirement, 3) type rice mill equipment required 4 units for entire study area. Consequently, this installation cause rather heavy capital investment due to requirement of related facilities and structures for each unit. Amortization of the facilities is also large and heavy for the farmer beneficiaries. Rice mill equipment of 4) type has been designed as the capable unit for rice production program conceived in this planning. Requirement of large capital investment at one time is a demerit of this unit, although an annual due amortization would be payable by beneficiary farmers.

In due consideration of both of the technical and financial merit and demerit, 4) type of rice mill has been selected for this plan. Operation and management of this rice mill shall be the task work of the farmers cooperative. In reality, however, it is hardly expected to play such works by farmers themselves at the initial stage of development due to no skillfulness for the technical work and knowledge for management of rice milling enterprise. Thus, herein the planning, this rice mill facility will have to install as the basic facility in the Rural Development Center and provide the milling services to rice producing farmers. Through this practical operation and management of rice milling services, farmers shall study necessary technique and know-how for future handling over of this rice mill facilities into farmers cooperative.

The basic facilities and related structures to be provided to this rice mill are as follows:

- Dryer: Concrete flower of 25 m x 50 m (1,250 m2)
-Rice milling equipment: R.H.R.P Complex type having 3.5 ton/hr capacity

- Warehouse: 500 ton capacity for temporary storing of paddy and/or milled rice

(2) Post harvest facilities for diversified crops

For successful marketing of such vegetable, fruits production, etc., a speedy shipping immediately after harvesting and highly unified quality are essential requirement. To this end, establishment of the following production depots is proposed as the subjected function. To operate and manage these proposed production depots, it is also suggested the farmer beneficiaries shall organize them into the vegetable and/or fruit production/shipping cooperatives and practice joint production and shipping work.

a. Production Depot for Vegetables
   3 locations for production gathering , primary treatment, grading, and packing : Steel frame with precast form, concrete floor 50 m^2 including 10 m^2 store space.

b. Production Depot for Fruit
   3 locations for production gathering , primary treatment, grading, and packing : Steel frame with precast form, concrete floor 50 m^2 including 10 m^2 store space.

(3) Establishment of production/shipping cooperatives

Under establishment of the Agricultural Cooperatives in the study area, the farmers shall organize the joint production cum shipping system on rice as well as vegetable and fruit so as to easily control the production and those marketing.

6.2.3 Farm Mechanization

In line with the agricultural development plan stated in the preceding section 6.2.1, farm mechanization will be promoted in a part so as to secure an intensification of farming, and also to properly deal with crop production increase. Farm mechanization will be conceived only for three points as described below.

(1) Soil preparation, including ploughing, harrowing and puddling or levelling works,
(2) Plant protection works, and
(3) Threshing work

The soil preparation is, at present, practised by use of draft animal, mostly water buffaloes. The present animal power is, however, not sufficient for maintaining the objective intensification of crop production. On the contrary, no more enough feeds can be expected for further increase of such draft animal due to limitation of farm land. Besides the cost required for substantial feeding is far bigger than that cost to be required for fuel consumption for the machinery operation.

Comparison of Work Efficiencies on Soil - Preparation by Draft Animal and Power Tiller

Description	Draft Animal	Power Tiller
Ploughing Depth	Shallow at less than 10 cm	Around 15 cm
Daily Work	About 0.1 ha	About 0.4 ha
Requirement of Net Working Days for Soil Preparation of 950 ha Paddy Field	Almost 1 month	15 days
Consumption for Operation	Substantial Feeding 5 Kg/day in case of hard corn or 62 ton of corn/ crop season	Fuel and Oils 2.5 lit/hr in case of diesel oil or 29,690 lit/ crop season
Cost of the above	₱ 329,130/ crop season (₱ 346/ha)	₱ 135,400/ crop season (₱ 142/ha)

According to the above comparison, it is recommended to introduce the farm tractors and/or power tillers for soil preparation in both paddy and upland field instead of the present use of draft animal.

Plant protection is not regularized yet in this area due mainly to inadequate supply of agro-chemicals. To ensure high crop production in this area, plant protection against damages by diseases, pests and insects is one of the most essential farming practices. Generally, plant protection work should cover certain wide area once some damages happened. Therefore, in

stead of small knapsack type sprayers being prevailed on at present, motorized sprayers will have to be introduced.

To suit increased paddy production in the future, mechanization of threshing work is indispensable. Power threshing will also be required on some upland crops, i.e. beans, and power threshers for paddy will be utilized for beans.

Selection of machinery and equipment and those ownership and/or operation system are studied taking into account the field conditions (form of reclamation) as well as prospective financial force of farmers. The proposed system is as follows:

Agricultural Machinery and Owner/Operation System

Machinery	No. Required	Owner/Operation System	
For Paddy Cultivation:			
- Hand Tractors	160	Joint Investment	(1 unit/5 households)
- Power Sprayers	80	Joint Investment	(1 unit/10 households)
- Power Threshers	65	Joint Investment	(1 unit/15 households)
For Upland Crop Cultivation:			
- 4-W Tractors	8	Cooperative Own	(1 unit/30 households)
- Power Sprayers	25	Joint Investment	(1 unit/10 households)
For Fruit Plantation:			
- Power Sprayers (Stational Type)	10	Cooperative Own	(1 unit/50 households)

Note: The joint investment for procurement/joint ownership shall be organized and operated under management of the agricultural cooperatives.

Other than the above machinery, the Rural Development Center will also hold some 10 numbers of 4-w tractors (45 HP in class) and provide periodical services for deep ploughing of the paddy field. This deep ploughing practices is essential for maintaining high yielding conditions in paddy production. Besides, workshop for repair and maintenance services on farm machinery will also be established in the rural development center. These functions will be transferred to the agricultural cooperative in the future when the farmers will be skilled enough in necessary technology for machinery operation and repairing services.

6.3 Promotion of Animal-Husbandry

In the dry season, majority of wild pasture are dried up, and accordingly, such livestock as cattle, horses, water buffalo, etc.are affected by serious shortages of forages, at present. On the contrary, no enough spaces for producing the forages is available in this study area due to limited arable land. With this background, it is hardly expected to develop livestock more than the present setting. Thus, in this rural development plan, the development goal of animal-husbandry is set forth with particular emphasis on the following schedule:

- Livestock production will be made as the off-farm work of farmers.

- Beef cattle will be the main production in this plan.

- In principle, cattle will graze in the wild pasture land during the wet season, while feeding by use of forage products during dry season.

- The existing water buffaloes shall be gradually replaced in line with the farm mechanization so as to secure forage and pasture for beef cattle farming. As the meat of water buffaloes is less economic value in the market, replacement to beef cattle would be one of the essential diversification to up-grading the farm economy.

- Development potential of daily farming in this area is quite low due to no possibility to reserve forages for maintaining milk production for more than eight months. Then the existing small number of milch cows is also scheduled to be replaced into beef cattle.

- Small livestock, such as sheep, goats, rabbits, etc. will be fed same as the present conditions mainly for the home and/or rural consumption.

- Rather than the above, piggery and poultry will have possibility to some extent to develop the commercial based farming owing to increase in forage products (by-product of the main farm production), such as rice bran, waste of fruit and vegetable productions, etc.

Based upon the preliminary estimation of the basic nutrition of forages and pastures, the prospective livestock farming is foreseen as follows:

Variety of Livestock	Gross Heads to be Fed	Number of Heads to be Marketable
Beef Cattle	1,300	700
Swine	620	520
Poultry	25,900	10,400 (broiler)
		378,000 (eggs)

6.4 Promotion of Aquaculture

Since the present siting of fish-pens has filled almost all available space, there is no possibility for expansion of aquaculture. Therefore, for the time being, the production of fish might remain the same as at present, unless special feeding is practised, artificially.

To ensure an economic improvement of aquaculture, amendment of the present production pattern and marketing system should be pursued with particular emphasis on the following:

- Introduction of rotational cultivation and systematic harvesting according to the seasonal demand of market,
- Organization of joint marketing system as one of the essential functions of the farmers cooperative society,and
- Provision of additional values to an excessive production by introducing small scale processing plant .

To the above promotion, it is planned to provide fishery ports for the following locations:

- Punta
- Bayugo
- Pagkalinawan
- Ik-Ik
- Bagumbong

6.5 Irrigation and Drainage Development Plan

6.5.1 General

The irrigation and drainage development plan is formulated on the basis of the following :

(1) Paddy field:

- To establish year-round irrigation systems by means of improvement of the existing communal irrigation systems (CIS) and of irrigation development of the rainfed paddy fields.

(2) Upland field:

- To establish upland irrigation system in the existing upland fields and orchards located in the gently sloped area.

(3) Organization of operation and maintenance:

- To continue the existing operation and maintenance system of CIS for the implemented facilities, which are presently well functioning under the guidance of NIA.

6.5.2 Irrigation Plan

(1) Irrigation methods

(a) Paddy field

Water supply to paddy fields is practiced with continuous 24 hours supply in a day and rotational supply will be conducted within an irrigation block. The size of an irrigation block is 10 ha and that of a rotation block is 1 ha.

(b) Upland field

Crops to be irrigated are corns, beans, vegetables and citrus. Irrigation methods to be applicable are a surface method, sprinkler method, and drip

method. With comparative study on those methods, the surface irrigation method is selected in consideration of the farmers present economic condition and technical level.

Upland field irrigation requires precise water management, then 16-hour water supply at the field level is selected. The intake works including pumping systems are planned on the basis of continuous 24-hour operation. Therefore, a night storage pond is provided.

(2) Irrigation water requirement

The crops proposed for the Project are paddy rice, upland crops such as soybeans, corn, beans, eggplant,etc. and citrus. The irrigation water requirements are separately estimated for each crop according to the proposed cropping patterns on the monthly basis.

Paddy rice : (ET + PE + PU - ER +NR)/IE
Upland field : (IN + ET - ER) / IR
Citrus : (ET -ER) / IE
where,

ET Evapotranspiration
PE Percolation
PU Puddling water requirement
ER Effective rainfall
NR Nursery water requirement
IN Pre-irrigation
IE Irrigation efficiency

In the above calculation, the following basis is applied:

(a) ET is estimated by product of potential evapotranspiration by crop coefficient relating to the crop growth stages. Data of potential evaporation estimated in IRRI at Los Banos by a modified Penman method on monthly basis are used.

(b) PE is determined to be 2 mm/day based on the field investigation result in the study area.

(c) PU is estimated to be 180 mm for filling a root zone, losses due to evaporation and percolation, and standing water on a field surface.

(d) NR is calculated for land preparation, evaporation, percolation loss for nursing period of 25 days and 5 % of the paddy fields.

(e) ER for paddy fields is estimated on the basis of the result of water balance in paddy fields, and ER for upland fields is based on the relationship of consumptive use of water by crops and effective rainfall proposed by USDA.

(f) IE of paddy field and upland field are determined, taking into account the irrigation method to be applied, small extent of irrigation system area, lining canals in major parts. The overall irrigation efficiencies for respective paddy and upland fields used in the estimate are as follows:

Irrigation efficiency	Paddy field	Upland field
Application efficiency	75 %	65 %
Conveyance efficiency	85 %	85 %
Overall efficiency	64 %	55 %

Based on the result of the estimate of water requirement, the design unit water requirements for paddy field and upland field are determined as follows:

Field	Main system	Main farm ditch	farm ditch
	(l/sec/ha)	(/sec)	(l/sec)
- Paddy field	2.30	32	16
- Paddy field and upland field	1.85	32	16
	-	30	15
- Upland field	1.00	30	15

(3) Headwork plan

The existing CISs have been dependent only on the river flows, then irrigation services are largely affected by the fluctuation of rainfall in the rainy season cropping and fall

in only 14% of the service area in the dry season cropping due to scarce or dried up river flows. The following three intake measures are taken according to the runoff characteristics

(a) Irrigation system by use of river flow supplemented with pumping-up of lake water

Through the water balance study between irrigation water requirements and river discharges, available river flows of the major rivers were assessed. Based on the result, 50% to 60% of irrigation water will be supplied from the riverflow. To divert the river flow effectively, the existing intakes are improved. However,the dry season river flows do not meet irrigation water demands for dry season cropping. Thus, pumping systems are supplemental required.

The following 8 irrigation systems are formulated with this plan :

River name	Proposed irrigation system	Irrigation area (ha)
Puang	Sipsipin	170
Mapakla	Mapakla	130
Manggahan	Manggahan	55
Ik-Ik	Ik-Ik	45
Lubo	Lubo	45
Lumang Nayon	Lumang Nayon	95
Bagumbong	Pulong Ligaya	45
Bagumbong	Bagumbong (paddy field area)	65
	Total	650

(b) Irrigation system by pumping-up of lake water

Where no rivers or available river flows are existed, irrigation water are to be taken by means of pumping-up of Laguna lake water. Only the pumping station will be provided as diverting facilities of irrigation water.

The following 5 irrigation systems covering 370 ha are formulated with this plan:

Proposed irrigation system	Irrigation area (ha)
Bayugo	50
Llano	65
Punta	35
Pagkalinawan	55
Bagumbong (upland area)	165
Total	370

(c) Irrigation system with impound

All the rivers in the Study area are generally steep. The suitable impounding site is limited on the Palay-Palay river. The impounding plan was selected to command an irrigation area of 140 ha in Palay-Palay area through economic comparison with a pumping plan.

(4) Preliminary design of irrigation facilities

(a) Pump station

Fourteen (14) pump stations are required for the Project. The irrigation area is gradually sloping to Lake Laguna from the skirt of the hills and mountains. Then pumping areas and pumping heads are different from respective areas. In determining the pumping system, the area is classified as a low head area and high head area according to topographic conditions. The single pumping-up system is applied to the low head areas in consideration of the simple operation and maintenance. On the other hand, to high head areas, pumping equipment are divided into two ; high elevated area and low elevated area with respect of the economic advantage.

The power transmission line located in the area (3.6 kV, single phase) are not sufficient in capacity to supply the power required by the pumping stations. In determining a driven type of pump, the comparison of a motor driven type with a diesel engine driven type is conducted. As a result, the motor driven type is selected. Then power transmission line is required to be extended from the existing transmission line .

A pump station consists of an inlet channel, suction pond, pump house, discharge pipeline and outlet structure. The locations of pump stations are proposed near the shore of lake Laguna, taking into account the safety to the high water of lake Laguna, reducing a distance from the lake water front in the dry season and topographic conditions.

The design water levels in the suction ponds are determined to be low water level - 0.34 and high water level + 2.84 on the basis of the records of lake water. Two sets of pump without a spare set are proposed, in due consideration that the off-peak water requirement is less than 50% of the peak requirement, and sizes of pump equipment are generally small. Pumping heads are 10 to 60 m and the discharges are 1 to 6.5 m^3/min, then a type of pump is determined to be of horizontal volute due mainly to low initial cost and simple maintenance.

(b) Intake

Improvement of 10 existing intakes and replacement of 1 intake are proposed. The existing 8 intakes located in the steep slope area are presently suffered from sediment with boulders in the upstream sections and erosion in the downstream sections, then confront with insufficient diversion. In due consideration of the above conditions, the improvement plan of intake is determined;

i) To ensure stable diversion even under the quickly varied river discharges,

ii) To secure sufficient diversion against drift cobbles boulders and others, and to be strong enough to them,

iii) To be simple in structure and convenient in operation and maintenance

To suit the above conditions, a bar-screen backstream intake of a torrent intake type (mountain stream diversion works) is selected.

On the other hand, the existing 3 intakes located in the lower area are comparatively well functioning. Improvement for them is determined to be

executed by means of installation of intake gate and provision of upstream and downstream river side protection.

The improvement plan of the existing intakes are summarized as follows:

1. Improvement by means of mountain type intake (8 intakes)
   Sipsipin, Upper Mapakla, Manggahan, Ik-Ik (relocation),
   Lubo, Lumang Nayon, Ilog Munti, Bagumbong

2. Improvement by means of installation of intake gate (3 intakes)
   Lower Mapakla, Ilog Na Malaki, Pulong Matsin

(c) Palay-palay dam

To store the water of the Palay-Palay river and to supply irrigation water to Palay-Palay irrigation system of 140 ha, Palay-Palay impounding is proposed. The proposed dam site is located at a narrow neck of the Palay-Palay river about 1.5 km upstream of the river mouth.

The total storage volume is 1,060 x 10^3 cu.m , consisting of effective storage of 722 x 10^3 cu.m and dead storage of 338 x 10^3 cu.m. The dam is of center cored earthfill type. The crest elevation is 29.5 m and dam height is 24 m. An overflow type spillway is constructed on the left bank with the discharge capacity of 64 m^3/sec (100 year flood). An intake is installed on the right bank with steel pipe 500 mm in diameter and is provided with discharge control and energy dissipating valves. A temporary diversion work is provided with a concrete pipe conduit of 2.4 m in diameter on the river bed to discharge of 38 m^3/sec(5 year flood). After completion of the dam the pipe is filled with concrete.

The general features of Palay-Palay dam are as follows:

I. General	
1. Catchment area	381 ha
2. Water surface area at full water	13 ha
3. Storage volume	
Total storage	1,060 m^3
Effective storage	722 m^3
Dead storage	338 m^3
4. Water level	
Flood water level	27.5 m
Normal high water level	26.5 m
Low water level	20.0 m
II. Dam	
1. Dam type	Central core earthfill dam
2. Crest elevation	EL.29.5 m
3. Dam height	24 m
4. Crest length	130 m
III. Spillway	
1. Type	Non-gated overflow type
2. Design discharge	64 m^3/sec
3. Crest elevation	El.26.5 m
4. Crest length	30 m
IV.Intake	
1. Design discharge	0.253 m^3/sec
2. Discharge control device	Discharge control valve

(d) Irrigation canal and related structure

The canalization system consists of main canals, main farm ditches and on-farm canals. To connect intakes with outlets of pumps, the connection canals are required. The main canal and main farm ditch are lined with U-shaped concrete flume. On-farm canals are of earth canal. All the main canals and main farm ditches are provided with inspection road to assure the access to the fields. Inspection roads of main canals are connected to farm roads and embankments of main farm ditches provide a function of inspection roads. Related structures to be provided are turnouts,farm ponds road crossings, siphons, aqueducts and drops.

The general features of irrigation canals and structures are as follows:

Irrigation canal	Main canal	
	Length	22.5 km
	Nos.	39 nos
	Type	Concrete flume
	Main farm ditch	
	Length	56.9 km
	Nos.	129 nos
	Type	Concrete flume
Related structures	Turnout	101 nos
	Aqueduct	31 nos
	Siphon	6 nos
	Drop	4 nos
	Road crossing	79 nos
	Farm pond	2 nos

The general features of the proposed irrigation systems are as summarized below. The layouts of each irrigation system are as shown in Fig.6.5.1.

Irrigation System	Irrigation			
	Paddy	Upland	Headworks	
1. SIPSIPIN	170	-	1-intake	1-pump station
2. MAPAKLA	100	30	2-intake	1-pump station
3. MANGGAHAN	45	10	1-intake	1-pump station
4. BAYUGO	50	-	-	1-pump station
5. LLANO	65	-		1-pump station
6. PUNTA	35	-	-	1-pump station
7. PALAY-PALAY	140	-	1-impound	1-pump station
8. PAGKALINAWAN	45	10	-	1-pump station
9. IK-IK	45	-	1-intake	1-pump station
10. LUBO	30	15	1-intake	1-pump station
11. LUMANG NAYON	95	-	3-intake	1-pump station
12. PULONG LIGAYA	45	-	1-intake	1-pump station
13. BAGUMBONG	85	145	1-intake	2-pump station
TOTAL	950	210	12-intakes 1-impound	14-pump stations

6.5.3 Drainage Plan

The drainage systems consist of main, and farm drains. Natural drains running across irrigation areas are improved as main or field drains with enlargement of stream sections, where flow capacities are not sufficient or the stream courses disappear. The main drains function to convey the excess water in paddy fields as well as to convey run-off from hilly areas to lake Laguna. Farm drains are connected with main drains to evacuate excess water in the irrigation area.

The drainage characteristics differ in respective paddy fields or upland fields. Then, drainage water requirements of the paddy fields, upland fields and hilly areas are separately estimated.

Drainage systems for paddy fields are provided with the capacity that 5-year, 24-hour rainfall storm 182 mm is drained within 24 hours. The design drainage capacity is fixed to be 8.4 lit./sec/ha in paddy area. Drainage water requirements for upland and hilly areas are estimated to respective areas by use of Macmath formula.

The general features of the drainage system are as summarized below.

Main drain	Length	11.2 km
	Nos.	9 nos
	Type	Trapezoidal earth canal
Farm drain	Length	39.3 km
	Nos	92 nos
	Type	Trapezoidal earth canal
Related structures	Road crossing	70 nos

6.5.4 Farm Road

To make smooth the transportation between fields and feeder roads, the existing village roads are improved with gravel metalling. The total width of farm roads is 4 m with gravel metalling of 3 m wide. The general features of farm road improvement are as shown below.

Width	4 m
Width of gravel metalling	3 m
Length	9.6 km
Nos.	16 nos

6.6 Social Infrastructure Development Plan

6.6.1 Road Networks

The main purpose of road network development is to establish sufficient transportation routes to improve daily transportation conditions, and to promote regional and agricultural development in the Study area.

The road network to be provided will consist of the trunk road and feeder roads. The general features of the road improvement works are as shown below.

(1) Trunk road

The link road starting from Jala-Jala to Bagumbong through Punta running along the lake coast is required to link all barangays and to lead transportation to the national road. The link road will provide the function of the trunk road which will much improve inhabitants' economic life and to save the time of transportation for them. The general features of the trunk road improvement are as shown below. The layout of the trunk road is shown in Fig.6.6.1.

Length	18.1 km
Required width	20 m
Total road width	9.1 m
Pavement	
Width	6.1 m
Type	Concrete
Thickness	20 cm
Related structures	
Drainage crossing	50 nos

(2) Feeder roads

The existing barangay roads of 46.7 km are improved with gravel metalling to ensure smooth connection of villages with the trunk road and village with farmland. The width of gravel metalling is 4 to 6 m. The general features of the feeder road improvement work are as shown below.

Description	Road width 8 m	Road width 6 m	Total
Total length	1,420	45,310	46,730
Nos	4	61	65
Width of gravel metalling	6	4	-
Thickness of gravel metalling	20	20	-

6.6.2 Power Supply System

The Project will provide irrigation pumps, deep well pumps for rural water supply, farm product processing facilities and other electric equipment to be furnished to public facilities. With implementation of the Project, the power demand will be increased largely. The existing power distribution lines of 3.6 kV and 7.62 kV with a single phase are not sufficient to satisfy those power demand.

The power transmission line of 34.5 kV with three phase current will be constructed by extension of the existing power line started from Malaya thermal plant, to supply the power. The power distribution lines 460/230 V, 3 phase to irrigation pumps and rural water supply pumps are provided by branching from the transmission line to be constructed. Power supply to the unenergized areas is ensured by connecting the tertiary line from the existing power line network.

The route of the power transmission line is as shown in Fig.6.6.2. The general features of power supply system to be constructed are summarized below.

Power transmission line, 34.5 kV, 3 phase	23 km
Power distribution line, 460/230 V,3 phase	5.1 km
Tertiary distribution line, 220 V, single phase	3.5 km

6.6.3 Rural Water Supply System

Inhabitants in the Study area are presently using the ground water taken from shallow aquifers by manual pumps. They are confronted with water contamination due mainly to insufficient sewerage conditions,and water shortage in the dry season. In order to establish and improve the water supply system, the rural water supply systems are provided to those areas.

Rural water supply systems to be constructed are Level-I and Level-II and those are constructed with the following conditions (see Fig. 6.6.3) :

(1) Standard facilities

- Level-I :
  This system is same as the present water supply facilities and it consists of a simple well with a cylinder type manual pump. Beneficiary households are about 50 numbers located within 250 m from a well. The daily water consumption is estimated 40 liter per person.

- Level-II:
  This system consists of a deep well, pumping equipment, water tank, main pipe line, distribution line and communal faucets. Numbers of beneficiaries are more than 100 households located within 250 m. One faucet should serve about 4-6 households within a distance of approximately 25 m. The daily water consumption is estimated 80 liter per person.

(2) General features

The general features of rural water supply facilities to be constructed are as summarized below.

Level-I

Deep wells with manual pumps	16 sites
Spring water development with concrete box	2 sites

Level-II ..... 4 sites

Level-I

Facility number	
- Deep well	16 nos
- Spring development	2 nos
Barangay	8 Barangay
Beneficiary household	900 households
Well	
- Depth	30 to 60 m
- Diameter of well	100 mm
- Design discharge	0.3 l/sec

Level-II

Facility number	4 nos
Barangay	3 Barangay
Beneficiary household	850 households
Well	
- Depth	50 to 100 m
- Diameter of well	100 to 150 mm
Pump and motor	
- Discharge	0.12 to 0.30 m^3/min
- Motor	1.5 to 3.7 kW
Distribution pipe	7,406 m
Faucet	176 nos

6.7 Establishment of the Rural Development Center

(1) Necessity of the Rural Development Center

Establishment of the Rural Development Center is one of the essential reinforcement measures in agricultural supporting and rural institution services.

- The basic facilities and fundamental functions regarding the supporting services have been established and regularized by the Government. Necessary staffing and budgetary arrangement for extending the services have also been reedy at the provincial level.

- As reported in Chapter 3, the present conditions of agricultural and rural institutional activities , including extension services, guidance and training services, supply service on farm inputs, etc. are still inadequate. Those facilities and staffing are short to meet the requirement in the rural area, accordingly.

- Recently, Meralco Foundation Inc. has established the Agric. Aquacultural Development Center in the study area, and started to extend his services in technical extension and home management technology (see Organization Flow Chart in Fig.3.3.2). However, this facility is also short to meet the rural requirement.

To effectively promote and successfully achieve the integrated rural development project, it is essential to motivate farmers' insentive. An intensive guidance and supporting services in improvement of production structure will also be required in the study area. In reality, however, reinforcement schedule of the institutional function is still far behind the goal which has been conceived in the current medium term rural development plan. Thus, in due consideration of the present progress of said rural development plan, it is proposed to establish the Rural Development Center so far as to be functioning the intensive supporting services to the local farmers.

(2) Establishment plan of the Rural Development Center

The Rural Development Center hereby conceived is the institutional structure at the municipal level and has the public service function, such as agricultural extension, home management technology extension, training and guidance services, etc. As for the farmers credit services, the Philippines Land Bank is now under preparation of the nationwide service network. Thus, the function in such financial assistance is excluded from the function. The principle functions of the Center and facilities to be prepared in the Center are as follows:

Principle Function of Rural Development Center

Existing Function and Facilities	Function Necessary to Reinforce	Function Newly Established
Extension Services:		
-	- Crop Cultivation Technology Services	- Demonstration Farm - Seed Farm and Seeds Distribution System
-	- Livestock Production Technology Services (Veterinary Clinic)	-
- Aquacultural Technology Services (Fish Pond)	-	-
-	- Home Management Technology Services	-
-	-	- Farmers Cooperation Management Service
Technical Guidance and Training Services:		
-	-	- Farm Mechanization Technology (O/M Services) (Workshop) - Post Harvest Activities Technology (O/M Services) (Rice Mill)
-	-	- O/M Services in Irrigation Pump and Related Facilities
Education and Guidance Services:		
-	- Adult Education Program	-
-	- Women Education Program	-
-	- Cottage Industry Technology Transfer Program	-

Other than the above, such facilities as workshop for farm machinery, rice mill complex and warehouse for farm input supply, etc. will be installed as the basic facilities for promotion and assistance in structural amendment and reinforcement of the agricultural production in the study area. It is no doubt, these facilities shall belong to the farmers cooperative. However, since farmer beneficiaries have no ability in both technical and financial services for operating these facilities at the initial development stage, O/M services of these facilities are expected to be undertaken by the Center. Through this O/M service of the Center, farmers shall get intensive training for skill. Whenever the training of the farmers will achieve successfully, these facilities will transfer to the agricultural cooperative.

(3) Operation and management of the Rural Development Center

The Rural Development Center will be, at the construction stage, established as one of the essential function of the Jala-Jala Integrated Rural Development Project Office, and commence the supporting services to the farmers. While, after completion of the construction works, the Center will continue the technical services though his services will also be reduced according to the achievement of transfer of facilities to the farmers' cooperatives. The operational organization and proposed staffing are as summarized in Fig. 7.3.1. The principle concept for operation and management of the Center is as follows:

- Participation of the CARP Coordinating Agencies:
  - = Technical training and transfer of technology in respect to O/M of basic facilities, such as warehouse and procurement of farm inputs, rice mill, workshop, etc.
  - = Technical extension services covering crop production, livestock, aquaculture, etc.

- Joint Operation among the Government and Non-Government Organization
  - = Technology transfer especially in home management , cottage and/or family work for the off-farm season, etc.
  - = adult and women education, etc.

The financial requirement for the Center operation is as follow:

- Financial Assistance from the Government (for only initial stage of development)

Staff Salary	₱ 1,908,000
Maintenance Cost, incl. Power, light,etc.	₱ 240,000
Vehicle, etc.	₱ 100,000
Office Expenditure	₱ 180,000
Miscellaneous	₱ 65,000
Total	₱ 2,493,000

- Operation and maintenance cost and/or the running cost of the basic facilities of warehouse, rice mill , workshop, etc. will be fully contributed by farmer beneficiaries. The annual requirement of the running cost is as estimated below:

Cost Items	Warehouse	Rice Mill	Workshop
Labour Charges	₱ 44,800	₱ 480,000	₱ 112,200
Power, Light, etc	1,000	350,000	5,000
O/M cost	250	180,000	10,000
Depreciation Cost	300	100,000	15,000
Miscellaneous	200	55,000	5,000
Total	₱ 46,550	₱ 1,165,000	₱ 147,200

Due amount to be paid by farmers for each utilization is estimated based on the annual cost requirement stated above.

- Store fee: ₱ 47,050 / 250 ton fertilizer/season = ₱ 0.18/Kg fertilizer (₱9.0/50 kg)
- Rice milling fee: ₱ 1,165,000 / 9,500 ton/year = ₱ 0.12/Kg paddy
- Repairing fee: ₱ 174,200 / 2,110 hrs = ₱ 80/hr work

(4) Facility of the Rural Development Center

The Rural development Center will be established within the facility yard of Agric. Aquaculture Development Center of Meralco Foundation Inc. in Llano area. The major facilities to be constructed are as listed below:

Facility of Rural Development Center

Proposed Facilities	Technical Features	Space (m^2)
Rural Development Center Office	Reinforced concrete, two story, including - Office - Lecture Room - Practice Room - Library, etc.	3,600
Dormitory: for Senior Staff for Junior Staff	 Reinforced concrete, bungalow type (3LDK) Reinforced concrete, two story (1LK/unit)	4,300
Deep Well and Water Supply System		
Garage and Workshop	Steel frame with precast , concrete floor, over-head crane, spare parts store	2,600
Rice Mill and Related Facilities (Store, Dryer, etc.)	Steel frame with precast , concrete floor,	6,000
Warehouse	Steel frame with precast, concrete floor including office space	2,500
Total		19,000 (1.9 ha)

6.8 Reinforcement and Activation of Farmers Cooperative Society

6.8.1 General

Under the previous agricultural development programme and/or promotion programme on farmers' organizations, farmers in the study area have already organized them into four types and 32 units of cooperative societies. These cooperatives have been established at each barangay level for taking the function of crop production, farm input supply, farmers credit, etc. Since each cooperative society has a different function, majority of farmers have more than two memberships among the said cooperatives. Consequently, each cooperative society become a small unit in membership and then financial aspect. Farmers' motivation for cooperative activities is so far minimal, accordingly.

As stated in the preceding chapters, the arable land in this area is limited to small, and then, the land holding size after agrarian reform is as small as 1.0 ha/household on the

average. Thus, to uplift the farm economy and to stabilize farmers' livelihood, intensification cum diversification of agricultural production are essential and crucial. Accordingly, improvement of the marketing structures is urgently needed so as to operate marketing of such increased production, efficiently and successfully.

The agricultural cooperative hereby conceived is established as the basal structure for efficient operation and management of the agricultural production and then post-harvesting activities.

6.8.2 Proposed Organization and Function of the Agricultural Cooperatives

The proposed agricultural cooperation will have the function to play all the agricultural activities, including plant protection, farm mechanization, post-harvest work as well as supply of farm inputs and farmers credit services for the entire Jala-Jala area. The conceptional organization chart prepared based on the new code prepared by the Cooperative Development Authority is as shown in Fig. 6.8.1.

As it has been pointed out in the preceding section 3.3.7, majority of farmers have low incentives and/or motivation for taking the cooperative work or activities. Therefore, an education and training of farmers are indispensable so as to establish the agricultural cooperation under implementation of this integrated rural development project. To efficiently organize the objective cooperation, it is planned to pursue stepwise development through performance progress of such training and guidance as rice mill operation, workshop services, joint financing for procurement of farm machinery, etc.

First Step Development:

Out of the existing 32 cooperatives, 7 Samahan nayong, 7 farmers cooperatives and 4 multi-purpose cooperatives will be unified at the barangay level and re-arrange the operational system according to the purposes, such as paddy cultivation, diversified crop production , etc.

The existing Irrigators' Association will be re-organized according to the proposed CIS units.

Second Stage Development:

Establishment of the farmers cooperatives based on the single function, such as crop production/shipping, plant protection, farm mechanization, irrigation cum drainage, fishery , etc.

Getting technical training and guidance in various technology in respect to operation management of each cooperative.

Third Stage Development:

Unifying the above single purpose cooperatives, and commencement of self management operation for all the principle facilities, i.e. rice mill, workshop, warehouse, etc.

6.9 Social Service Development

6.9.1 Health and Medical Services

By the year 2000, the population of Jala-Jala would increase to about 23,900 persons from the current population of 18,750 persons. One of the public services that needs to be provided to the study area in the future would be health and medical services.

In attempt to deal with the future population increase and to secure those health conditions, it is proposed to establish a General Hospital in Jala-Jala poblacion and Day-Care Centers or Health center in several Barangay. One health service car will also be required for emergency services cum periodical medical services to barangays. This vehicle will have to be stationed at the general hospital. Stock of medical supplies at hospital should be available in sufficient quantities to give proper treatment of patients under regular schedules and even on emergency cases. While the most common illness include upper respiratory infection, influenza, bronchitis, diarrhea, gastritis and hyperacidity, broncho pneumonia, pulmonary tuberculosis and parasitism, appropriate drugs or medicines should be prescribed for treating the sick. Nutritional and family planning services could be provided through seminars and workshops especially for housewives and other interested parties. On the overall, health, nutrition and family planning services should be integrated in one office of the local health department for proper coordination and support.

6.9.2 Communications

The present communication system is not adequate to accommodate the need for increased communication activities in the future especially with the implementation of the project. A two-way radio communication or telephone system connecting different parts (barangays) of the municipality is needed to facilitate communication activities relative to marketing, production and other aspects of rural development. The system will be connected to other parts of Rizal province especially to Philippines Long Distance Telephone. The proposal should be studied more in-depth by the Bureau of Telecommunication to estimate a more inexpensive investment.

CHAPTER VII PROJECT IMPLEMENTATION SCHEDULE

7.1 Principle Approach to Project Implementation

The integrated rural development plan here formulated includes various schemes for development and/or consolidation of infrastructure facilities as well as for reinforcement and/or activation of supporting functions. These development components can be divided into the following two groups according to the principal concepts of CARP implementation and the basic concepts applied to this development planning.

(1) CARP-oriented development components

This group will include the following components :

- Leading program and its principal components for achieving the three essential development goals,
- Fundamental function or basement for promoting the subject rural development program,
- Development to be urgently needed, and
- Large investment cost and technical assistance and supervision required for implementation.

The main components to be included into this group will be:

- Rural Development Center,
- Consolidation works of agricultural infrastructure, such as irrigation cum drainage facilities, farm road network, agricultural machinery center, post harvest support facilities, fishing ports, etc.
- Consolidation of social infrastructures, such as road network, including trunk road and barangay roads, electrification especially amendment of transmission line, rural water supply system, etc.
- Reinforcement of institutional supporting system and activation of farmers organization.

(2) Components to be implemented in the ordinary regional/rural development program.

The development components included into this group is identified as:

- Development scale is small enough to arrange the financial budget within the local government,

- Stepwise development shall be made according to long focus on future socio-economic requirement.

Major components and/or schemes are as listed below:

- Enhancement of education facilities,
- Construction of public buildings, such as barangay hall, etc.
- Promotion of rural electrification program on terminal utilities,
- Improvement of health and sanitation services
- Environmental conservation measure, i.e. forestation in mountain area, treatment of drainage water from living yard, etc..
- Establishment of emergency fund
- Reinforcement of transportation and communication facilities
- Improvement of the public market facilities
- Provision of the Sport Club and related facilities

As for the CARP-oriented schemes and components, the development package for the CARP-based implementation schedule is arranged so as to realize the development goals and to demonstrate the development impacts to other areas. It is proposed to implement these development components and related schemes by three steps according to the current progress and schedule of the agrarian reform program (see Fig. 7.1.1). The project features of each component are shown in Table 7.1.1.

(1) First stage development :

In the first stage, implementation will be concentrated on the 1,650 ha where the land has been already distributed to the farmers. The implementation program will include the following:

- Improvement and development of 13 CIS schemes, covering 895 ha of paddy field and 120 ha of upland field.
- Construction of the trunk road (18 km) from Jala-Jala to Bagumbong and improvement of feeder roads (41 km)
- Construction of the transmission line (3 phase and 34.5 KV) and distribution line (3 phase 460/230 V)
- Construction of the Rural Development Center, including workshop, rice mill etc.
- Installation of deep well for rural water supply, including 2-level II and 15-level I
- Construction of four fishing ports

(2) Second stage development:

The second stage development will cover the area where the agrarian reform is now under implementation. Commencement of construction work will be subjected to completion of the agrarian registration.

- Construction of 2-locations of CIS, including 30 ha of Punta CIS and 120 ha of Bagumbong CIS
- Installation of rural water supply system for 3 villages, such as Punta, Paalaman and Bagumbong.
- Improvement of barangay road for the same villages to the above
- Installation of rural electrification for the same villages .
- Construction of one fishing port

(3) Third stage development

The area to be subjected to this stage is mainly the steep mountainous area. As already suggested in the preceding chapters, 5 and 6, the land in this area is not suitable for intensive development. Moreover, the land urgently needs protection against soil erosion. Thus, in implementing land distribution, careful attention shall be paid to these circumstances and requirements.

7.2 Implementation Schedule of First Stage Development

7.2.1 Construction Works

The main construction works of the first stage development will consist of irrigation and drainage development works, social infrastructure development works and the rural development center. Main works for each category are as follows:

(1) Irrigation and drainage development works (12 irrigation systems)

- Intake structures
- Pump stations
- Small impoundments
- Irrigation canals and related structures
- Drainage canals and related structures

- Farm roads
- On-farm works

(2) Social infrastructure development works

1) Road component
- Trunk road with related structures (18.1 km)
- Feeder roads with related structures (41.4 km)

2) Rural water supply component
- Level-I rural water supply system (15 wells)
- Level-II rural water supply system (2 systems)

3) Power supply component
- Power transmission line (23 km)
- Power distribution line (4.2 km)

4) Fishing port (4 locations)

(3) Rural development center, rice mill center and work shop

7.2.2 Construction Schedule

The implementation schedule of the first stage development works is shown in Fig.7.2.1. It includes the preparatory works and the construction works. The preparatory works will last 12 months including the time necessary for detailed design, tendering, and project mobilization for implementation. The construction works will last 36 months for the main works and on-farm works. All the works will be completed in 4 years.

The rural development center will be implemented first at the beginning of the second year to be used as the construction office. The rice mill center and machinery center will be implemented in the fourth year, including procurement and installation of equipment.

Irrigation and drainage works will be implemented with stage wise construction. Stage-1 will be commenced at the beginning of the second year. It will include improvement of the intake, construction of the impounding dams and irrigation and drainage canals of 9 irrigation systems, which will be irrigated by river discharges during the rainy season.

Stage-2 will be commenced at the beginning of the third year. It includes construction of all pumping stations and the remaining irrigation and drainage canals of 3 irrigation systems.

Road works will also be executed with stage wise construction. The first stage will be commenced at the beginning of the second year. It will include the pavement works of trunk road for the route from Jala Jala to Bayugo to provide access to the Rural Development Center, and preparation of the trunk road embankment for the route from Bagumbong to Pagkalinawan to ensure construction access to relating works. Gravel metalling of feeder roads will be commenced in the third year by villages and be completed by the end of the dry season of the fourth year.

The rural water supply component will be implemented first from Level-I facilities in consideration of the urgency water supply and Level-II will follow, after completion of Level-I facilities.

All the construction works will be executed by contractor(s) selected through competitive tendering, except for extension of the power supply system and on-farm irrigation and drainage works. On-farm works will be executed by water users under the guidance of NIA, the power supply system will be constructed by MERALCO under the supervision of the Project office.

7.3 Organization for Project Implementation

Implementation of the project will be managed basically in accordance with the present practice rule being applied to the current operation of CARP. Department of Agrarian Reform (DAR) shall primarily be responsible for implementation of this project. In line with the policy and the principle rule prepared by the Presidential Reform Council (PARC), DAR shall prepare the implementation program and its budget for execution of the development works.

To efficiently implement the project, close coordination among CARP coordinating agencies, namely DA, DPWH, DENR, etc. as well as Meralco Foundation Inc., will be essential and crucial.

From the viewpoint mentioned above, in order to effectively manage and operate the Jala-Jala Integrated Rural Development Project, the organization structure of the project will consist of the following:

(1) Board of Directors (BOD)

An Undersecretary of DAR will act as the chairman of BOD. It will be composed of representatives of DAR and related agencies and will control implementation of the project, as follows:

a. Members
- Two undersecretaries of DAR
- Assistant secretaries of DA, DENR, DPWH and NIA
- Assistant Director-General of NEDA
- Operation Manager of Meralco Foundation Inc.
- Governor of Rizal province

b. Functions
- Decisions on matters/polices relating to overall project implementation
- Action on recommendations relating to project management (i.e. audit and monitoring of evaluation reports, etc.)
- Approval of the project's annual operating budget

(2) Project Management Committee (PMC)

This committee will have responsibility for implementing the policies and guideline formulated by BOD. The assistant Secretary of DAR will act as the head of this committee. Members and functions of the committee will be as follows:

a. Members
- Assistant secretary of DAR
- Regional directors of DAR, DA, DENR, DPWH and NEDA
- Project manager of NIA-CARP
- Head of ADS-Meralco Foundation Inc.
- Jala-Jala Project Office Manager
- Mayor of Jala-Jala

b. Functions
- Overall project planning and scheduling
- Review of project performance
- Recommendations to BOD on policies and strategies related to overall project implementation

- Facilitation of the timely provision of their respective agency inputs to the project
- Implementation of the policies and directions set by BOD for project implementation

(3) Secretariat

The project secretariat will be constituted from a designated DAR Central Office Unit, utilizing already available staff resources. The secretariat will be responsible for execution of the general matters.

(4) Jala-Jala Project Office

This office will be headed by a full-time Project Manager, it will be principally based at the project site, while maintaining a project coordination desk at the DAR Central Office. The Project Office will administer the Rural Development Cluster and be assisted by an infrastructure Division and an Administrative/Finance Division.

a. Infrastructure Division

This is essentially an interagency group, composed of designated technical counterparts from the DPWH, NIA, DA, DENR and the Municipal Government. it will generally assist in providing necessary counterpart assistance in the implementation of the various project components outside of the Rural Development Center.

b. Administrative and Finance Unit

This will undertake all administrative, financial and legal services, i.e., accounting, treasury, personnel, records, construction works supervision, other general services, and review of contracts for the Project.

(5) Rural Development Center

This will have three distinct functional sections, as further described below;

a. Agricultural Extension Services Section

This will assume all functions related with agricultural technology extension, inclusive of the development of demonstration farms and seed farms, and covering both livestock and plant agriculture.

b. Engineering and Maintenance Section

This group will assume all responsibilities related to the physical operations, repairing and maintenance of the tasked to provide engineering support services to the irrigation facilities in particular.

c. Special Projects Section

This section is so named because it will tackle a variety of center programs which will involve the participation of other sectors, particularly the non-government organization, cooperatives, other government agencies, and the private sector.

Among the basic concerns of this Section are Institutional Development Works, Community and Cooperatives Development, administration of the center's economic and training facilities, and market development.

In the operation of the various activities of the project, MERALCO's participation will focus on the provision of consulting services and technical assistance specifically on community organizing. It will also make available the use of MERALCO facilities in the area for the development activities of the project.

The conceptional skeleton for project implementation is shown in Fig. 7.3.1. and the coordination system among the inter coordinating agencies is illustrated in Fig. 7.3.2.

7.4 Cost Estimate

7.4.1 General

The costs of implementation of the Project are estimated on the basis of the following conditions:

1) The exchange rate used is :
   1 US$ = ₱ 23.00 = ¥ 150.0

2) The main construction works will be carried out by contractor(s) selected through competitive bidding.

3) The unit prices of the works will be divided into foreign currency portion and local currency portion. Local currency portion will be

estimated with reference to current market prices in the early 1990s, and the cost data obtained from similar on-going works around the Project area. Foreign currency portion of materials and equipment to be imported is estimated on the basis of CIF Manila.

The classification of local currency portion and foreign currency portion will be carried out on the following basis:

Local currency portion

- Land acquisition cost
- Labor force
- Wooden materials
- Concrete aggregates
- Cement
- Inland transportation
- Administration expenses

Foreign currency

- Reinforcement bars
- Fuel
- Depreciation of construction equipment and machinery
- Pumping equipment
- Post harvest processing machinery
- Metal works of irrigation system
- Structural steel
- Contractors' general expenses and profit of the contractors
- Expenses and fees of engineering services by foreign consultants

4) Physical contingencies allowed for in the cost estimate are 10 % of the construction cost. Price contingencies applied are 7% per annum for the local currency portion and 3% per annum for the foreign currency portion.

7.4.2 Cost Estimate

The project cost will consist of construction cost, procurement cost of agricultural machinery, land acquisition cost,engineering services and administration cost, and contingencies. The total cost is estimated to be ₱ 631 million, consisting of the foreign currency portion of ₱ 379 million and the local currency portion of ₱ 252 million as summarized below. The breakdown is shown in Table 7.4.1.

(Unit : ₱ 1,000)

Description	Foreign Currency	Local Currency	Total
I. Construction cost			
1. Rural development center	17,777	13,736	31,513
2. Rice mill center	15,887	1,998	17,885
3. Irrigation and drainage	139,881	70,916	210,797
4. Road network	58,785	52,405	111,190
5. Rural water supply system	10,096	4,998	15,094
6. Power supply system	10,306	19,138	29,444
7. Fish port	1,072	1,295	2,367
8. On-farm development	0	3,057	3,057
Sub-total	253,804	167,543	421,347
II. Procurement	5,088	1,366	6,454
III. Engineering services and administration	55,600	16,824	72,424
IV. Land acquisition	0	1,664	1,644
V. Contingencies			
1. Physical	31,449	18,741	50,190
2. Price	33,145	45,982	79,127
Total	379,086	252,120	631,206

The annual disbursement is worked out according to the implementation schedule as shown below. The breakdown is as shown in Table 7.4.2.

(Unit: ₱1,000)

Year	Foreign Currency	Local Currency	Total
1991	19,034	4,550	23,584
1992	95,349	89,373	184,722
1993	119,902	76,351	196,253
1994	114,041	62,994	177,035
1995	30,760	18,852	49,612
Total	379,086	252,120	631,206

7.4.3 Operation and Maintenance Cost

Operation and maintenance costs at the full operation stage of the Project are estimated to be ₱ 8.5 million , comprising operation and maintenance of the rural development center, operation and maintenance of the Project facilities. The breakdowns of operation and maintenance cost are as shown in ANNEX-X.

7.4.4 Cost of Replacement of Project Facilities

Pumping equipment of irrigation and rural water supply systems, post harvest processing equipment and metal works of irrigation canal related structures are periodically to be replaced. The economic life and the replacement cost used in the estimate are shown in ANNEX-X.

CHAPTER VIII PROJECT EVALUATION

8.1 *Economic Evaluation*

8.1.1 Basic Conditions

The economic evaluation is made to verify the viability of the Integrated Rural Development Plan formulated in 4,930 ha. To this end, the following conditions was taken into account.

(1) Five years for construction period including one year for detailed design and preparation of tender document.
(2) Useful project life of 35 years.
(4) Shadow exchange rate at 1.2 and shadow wage rate at 0.6, according to NEDA guideline.
(5) Price and cost at 1990 constant prices.
(6) Exchange rate among Pesos, US dollar and Japanese Yen as of May 1990, US$ 1 = ₱ 23 = ¥ 150.

8.1.2 Economic Price

(1) Economic price of the agricultural production and farm inputs

Since the domestic consumption of rice and corn are still supplemented by importation, the economic farm gate prices of these paddy and corn production are estimated as import substitution on the basis of the international market price forecasted for the year of 2000 by the world bank. For other crops, the economic prices are estimated from the current market price after deduction of transfer payments. The economic price for fertilizer is also estimated at import substitution, based on the international market price projected by the World Bank. The economic prices of agro-chemicals are estimated by applying the conversion rate and current market prices of fertilizers.

(2) Economic cost for construction, O&M and replacement

Project cost comprises 4 items of imported material including the engineering cost to be applied as technical assistance, domestic material, unskilled labour wages and the amount

of the transfer payment. The economic cost will be estimated by applying the following conversion factor :

Foreign portion	:	1.2 (shadow exchange rate)
Local portion	:	1.0
Unskilled labour wage	:	0.6
Transfer	:	0.0

8.1.3 Project Benefit

Project benefits consists of the tangible and intangible benefits as defined in Table 8.1.1. Tangible benefits (direct benefit) are taken up as project benefits, while intangible ones (indirect benefit) is assessed as a socio-economic impact.

The project benefit is primarily generated from the agricultural development, road network, rural electrification and water supply system as breakdown in Table 8.1.2 and summarized as below :

(1) Agricultural benefit

The agricultural benefit will be the increment of crop production to be attributed to a stable irrigation water supply, improvement of the quality and quantity of the farm input, crop intensification, crop diversification , farm mechanization, etc (see Table 8.1.3):

(Unit : ₱ 1,000)

Crop	Without Project	With Project	Benefit
Milled Rice	2,876	21,286	18,410
Upland crop	1,409	15,339	13,930
Plantation	1,525	5,688	4,163
Livestock	457	4,860	4,403
Total	6,267	47,173	40,906

(2) Benefits of road construction

The benefits of road construction will be primarily derived from the saving effect of transportation cost on the agricultural products due to new construction and/or improvement of the road network.

The total annual benefit from the road construction is about ₱ 31.8 million as shown in Table 8.1.4 and summarized as follows :

Crop	Without Project	With Project	Cost saving
Milled Rice/Upland crop	34,445	3,290	31,155
Plantation	976	343	633
Total	35,421	3,633	31,788

Note) In this case, without project condition means the road will not be improves as it is, while with project condition means the road will be improved.

(3) Benefits of rural electrification

At present, there is no electricity supply system in Paalaman, and he inhabitants have to consume kerosene for the lighting. Under with project condition, these inhabitants could use the electricity as a surrogate of kerosene at a cheaper tariff.

Applying the above concept of the willingness to pay, the benefits of rural electrification are expected on both of tariff revenue and the consumers surplus which is the saving cost to be attributed to the change of energy source from the kerosene to electricity.

The annual benefits borne from the above are estimated at about ₱ 37,000.

(4) Benefit of the water supply

Applying the same concept of the willingness to pay to the above rural electrification, the economic benefit of the water supply is estimated from the water fee for the operation and maintenance of the proposed well and supplemental facilities.

The annual economic benefit is estimated at about ₱ 97,000.

8.1.4 Economic Cost

(1) Capital cost

Economic cost is converted from the financial cost by applying the conversion factor provided in Section 8.1.2(2), as shown in Table 8.1.5 :

(Unit : ₱1,000)

Item	Economic cost
Rural Development Center	28,983
Rice Mill Center	17,782
Irrigation and Drainage	196,088
Road Network	103,039
Rural Water Supply	13,928
Power Supply System	25,709
Fish Port	2,059
Procurement	6,351
Sub-total	393,939
E/S and Administration	71,012
Land Acquisition	1,414
Physical contingency	46,639
Price escalation	-
Total	513,004

(2) Annual operation and maintenance cost

Annual operation and maintenance cost in terms of economic value is estimated as follows :

(Unit : ₱1,000)

Item	Economic Cost
Administration, Store/Workshop	2,265
Irrigation/Drainage	3,790
Rice Mill Center	887
Rural Water Supply System	97
Road Network	1,510
Total	8,549

(3) Replacement cost

Annual replacement cost in terms of economic value is estimated as follows :

(Unit : ₱1,000)

Item	Useful life	Economic Cost
Irrigation/Drainage	20	44,464
Rural Water Supply	20	2,415
Rice Mill Equipment	20	10,242
Power Supply System	20	31,023
Farm Machinery	10	6,587

8.1.5 The Results of Economic Evaluation

Applying all the economic benefits and cost mentioned above, the economic evaluation on Integrated Rural Development Plan ha is made, according to the conventional evaluation method of IRR, B-C and B/C. The result of the evaluation is as shown in Table 8.1.6 and summarized as follows :

EIRR	:	14.4 %
B-C(15 %)	:	-10,372
B/C(15 %)	:	0.97

The Economic Internal Rate of Return (EIRR) is estimated at 14.4%, which shows a slightly low rate compared to the standard rate of 15% for viable projects as specified by NEDA. As discussed in the following paragraphs, the project includes several components such as agriculture, transportation , water supply , electrification, etc., moreover the proposed agricultural development plan contains 13 CISs, of which EIRRs vary from 8% to 24%, and being 13% on an average.

Though EIRR of the project is slightly low, indirect benefits such an increase of job opportunities, contribution to regional socio-economic development, improving of farmers' living standard, etc., could be expected as discussed in Section 8.2.3. Considering the principal features and objectives of the project and such indirect benefits and impacts, it is apparent that this project is economically feasible.

Economic evaluation of the four components which bear the economic benefit is conducted with the following results.

Component	Project Financial Cost (₱ . 1,000)	Present Value/1 Economic Cost (₱ 1,000)	Present Value/1 Economic Benefit (₱ 1,000)	Economic IRR (%)
Irrigation/Drainage	334,886	234,602	214,694	13
Road Construction	141,882	98,885	177,707	32
Rural Water Supply System	2,267	1,657	160	-
Rural Electrification	20,871	12,586	420	-
Others	52,173	45,200		
Total	552,079/2	392,930	392,981	14

Remarks: /1 : Present value applying the discount rate of 14 %
/2 : excluding price escalation

Comparative study for 13 CISs is made so as to sound economic viability of each CIS, individually. The result of EIRR is summarized as follows :

CIS	EIRR(%)	CIS	EIRR(%)
Sipsipin	9	Pagkalinawan	24
Mapakla	12	Ik Ik	10
Manggahan	15	Lubo	17
Bayugo	14	Lumang Nayon	8
Llano	17	Pulong Ligaya	10
Punta	13	Bagumbong	18
Palay Palay	13		
Total	13		

EIRR of CIS will vary widely ranging between 8 % and 24 % and 13 % for whole CIS. The low EIRR in some CIS is attributable to the lower increment of project benefit and the high costs of irrigation development.

8.1.6 Sensitivity Analysis

Sensitivity analysis is done for the following condition:

Case 1 10 % up of the cost
Case 2 20 % up of the cost
Case 3 10 % down of the benefit
Case 4 20 % down of the benefit
Case 5 Combination in 4 cases mentioned above

The result of the calculation in the cases mentioned above is shown as follows.:

	Benefit down				
Cost up	-20%	-10%	0%	10%	20%
-20%	26	23	20	17	14
-10%	22	19	17	14	12
0%	19	16	14	12	10
10%	16	14	12	11	9
20%	14	13	11	9	7

8.2 Financial Evaluation

8.2.1 Basic Condition

In financial analysis, farm budget analysis is done in order to judge the viability of the project and the capacity to pay in the typical farm. Financial evaluation is conducted on the basis of the following condition.

(1) Exchange rate among Pesos, US dollar and Japanese Yen as of May, 1990 US$ 1 = ₱ 23 = ¥ 150.
(2) Physical contingency : 10 % of total capital cost.
(3) Price escalation rates : Foreign currency portion 3 % and local currency portion 7 %
(4) Price of local material for the construction : the current market price
(5) Price of imported materials : CIF price at Manila.
(6) Prices of the agricultural products and farm inputs : the current market price

8.2.2 Farm Budget and Capacity to Pay

(1) Farm budget (capacity to pay) analysis

From the standpoint of the farm economy, farm budget analysis under without project and with project conditions is made to confirm the financial viability of the project as well as the development effect to be expressed in "payability to all the duties and redemption" in the farm economy. Net profit will increase about 3 to 10 times without project condition. The result is elaborated in Table 8.2.1 and summarized as follows :

(Unit : ₱ 1,000)

	Standard Farmer in the typical Farming Category			
	Rice (1.0 ha)	Rice/upland crop (0.7 ha)	Upland crop (0.4 ha)	plantation (0.5 ha)
I. Farmer's net income	33,863	24,889	12,377	6,028
II. Annual fee				
- Irrigation fee (O&M cost)	3,585	2,510	1,434	0
- Water charge of well (O&M cost)	66	66	66	66
- Milling charge	1,200	480	0	0
III Amortization				
- Land	4,405	3,084	1,762	2,203
- Rice mill	2,760	2,760	0	0
- Agricultural machinery	2,484	2,484	1,551	375
Total(II+III)	14,500	11,384	4,813	2,644
IV. Net revenue (I-II-III)	19,363	13,505	7,564	3,384

Farmer's net revenue by farm types widely varies ranging between ₱ 6,028 and 33,863. Any way, each farmer can pay back the annual due amount of ₱ 2,644~14,500 including land amortization cost and other duties such as the irrigation fee, water charge, milling charge,etc.

The dues for amortization of the all irrigation facilities are estimated at ₱ 3,300 per ha on an average. Each farmer beneficiary will be able to pay the said amortization cost. However, if paying both the irrigation fee (O&M cost) and amortization cost, those due payment become large at almost 20 % of capacity to pay. To maintain the farmers incentives for agricultural intensification, it might be desirable to apply the Government subsidization to capital investment for CIS development especially for pump installation.

8.2.3 Social Impact of the Project

The project will not only generate direct benefits, but also social impacts. The social impacts to be brought in are approximated as follows :

(1) Upgrading of the living standard according to large increase of farm revenue
(2) Expansion of the willingness to work

(3) Production of processing materials to the agro-based industries
(4) Advancement of farming technology
(5) Enhancement of social support services
(6) Contribution to regional socio-economic development in the province
(7) Improvement of sanitary condition
(8) Promotion of sense of regional solidarity

8.3 Justification of the Project

In the study area, the development resources other than human resource are quite scarce and marginal for exploitation. Thus, in order to realize activation of the regional economy, consolidation of the basal infrastructure due to uplifting agricultural productivity is the essential matter for immediate attention.

It is verified and confirmed that an increase in agricultural production will be achieved through promotion of agricultural intensification with the support of irrigation services.

The income in agricultural production achieve self-sufficiency of the staple food crop, as well as upgrading the farm economy. Accordingly, the balance of the farm budget will have enough capacity to meet the annual due amount of the duties and redemption, such as the land amortization cost, water charges for both irrigation and domestic water supply, debt repayment for covering rice mill, farm machinery, etc.

RGDP of about ₱ 77 million or corresponding to about ₱ 7,000 per capital will be generated through project implementation. This RGDP is wholly generated by agricultural production. The gross product from the off-farm work is not counted in this evaluation though a considerably large product could is expected under the intensive technical guidance and skilled training of the rural development center. In any case, the large increment in agricultural production will accelerate further production activities as well as rapid growth of the regional economy.

The economic internal rate of return (EIRR) at 14% is a little low if compared with that of 15% for viable project as specified by NEDA. However, in due consideration of the project features and principal objectives, it could be justified as "viable".

CHAPTER IX. RECOMMENDATIONS

9.1 Early Project Implementation

The development plan herein formulated has been justified as technically feasible and economically viable as mentioned above. Therefore, it is recommended, that DAR shall make the necessary arrangements for early implementation of the project so as to effectively demonstrate an impact of agrarian reform as well as the supporting effect of the integrated rural development.

9.2 Organization for Project Implementation

The integrated rural development plan herein conceived includes various components ranging widely in both soft and hard-ware technologies. It is suggested therefore, that DAR shall organize the coordination system between the inter CARP coordinating agencies for efficiently executing project implementation. To this end, organization of a Board of Director, a Project Management Committee, a Jala-Jala Project Office, etc. is recommended as the structure for such coordination. To operate efficiently, DAR will also require both administrative and technical assistance from the inter CARP coordinating agencies as well as non-government organizations, namely Meralco Foundation Inc., etc.

9.3 Land Space for Construction of Rural Development Center

About 1.9 ha (19,000 m^2) of land will be required for the construction of the Rural Development Center . As a result of these studies, it is recommended that the Rural Development Center be established within the yard area of the existing Agric.-Aquacultural Development Center of MFI (see Fig.9.1.1). Thus, it is suggested that DAR shall negotiate with MFI and acquire the land for establishing the Rural Development Center. The demonstration farm as well as the seed farm and/or nursery will be prepared on private farm land owned by the farmer beneficiaries.

9.4 Financial Assistance to Farmer Beneficiaries

In planning the development scheme, emphasis has been put on reinforcement and improvement of the socio economic structure in the study area through provision of the basic infrastructure. To efficiently operate and/or utilize these facilities, further development investment is required at the on-farm level as a responsibility of the farmer

beneficiaries themselves. For this purpose, the Land Bank of the Philippines has been appointed as the main responsible institute and it already has a farmers credit service system.

At the initial development stage, majority of farmer beneficiaries will not have enough financial force. Furthermore, the economic activities of the farmers cooperatives also remain at a minimal level so far. These unfavorable circumstances and poor economic prospects do not meet the necessary requirements for utilizing the farmers credit service. To effectively apply farmers credit to on-farm investment, such as for procurement of farm machinery, establishment of production depots etc., it is, therefore, suggested that special facilities be offered for CARP implementation.

- To provide the opportunity for individual farmers to use farmers credit when registered under agrarian reform (if no farmers' cooperative is registered).

- To be effective the loan application stated above could be facilitated by support from the rural development center or the municipal agrarian reform office.

- To provide at least 3 years grace period for medium and long term credit, with an extended, loan period of 10 to 15 years from the original schedule of 5 to 10 years.

9.5 Operation and Maintenance Charges for CIS

In this plan, 13 CIS will be constructed in the study area. Each CIS area will have different physical conditions especially in water resources. The irrigation water supply systems will consist of either of pumping, water impounding dam, or a combination. The farmer beneficiaries have as yet no such technical skills and knowledge. Thus, it is recommended that NIA shall provide intensive guidance and assistance in operation and maintenance of these facilities.

As verified in chapter 8, all the irrigation beneficiary farmers will, in future when the development goal is achieved, have a capacity to pay the O/M cost of ₱ 3,585/ha as well as the cost of amortizing the capital investment at ₱ 3,300/annum. In practice, however, the fees and cost sharing will represent more than 20% of the capacity to pay in the case of the average farmer, while this rate will become too heavy for small holder farmers (more than 50% of the total paddy cultivators). To maintain the farmers intensives for increasing production as well as motivation to intensify and diversify

agricultural production, it is recommended that the Government should subsidize the greatest part of the capital investment so as to reduce the annual due amortization cost.

9.6 Environmental Conservation

The mountainous area of 2,680 ha has been steeply dissected, and accordingly, recognized as of low capability for economic development. Since the vegetation of this area degenerated to a serious extent due to heavy deforestation and/or operation of traditional shifting cultivation, it is essential and urgent needs to undertake preventive measures against soil erosion as well as for ecological conservation of this area. Thus promotion of reforestation is proposed. Implementation of the reforestation program should be scheduled in accordance with the Integrated Social Forestation Program which is being condeucted by the Department of Environment and Natural Resources.

In promotion of increased crop production as well as intensification and diversification of agricultural production, utilization of the agro-chemical will be indispensable so as to control the quality and quantity of the production. For use of agro-chemicals, it is suggested that DA shall control and guide the importers and dealers in selecting agro-chemicals with attention to low toxicity which has been specified in the decree for national environmental conservation.

Recently, water pollution in lake Laguna has increased to a serious extent. This water contamination may be attributed to intensification of aquaculture, sedimentation from flooding and increasing drainage from the urban areas surrounding the lake. In the case of this study area, prevention of soil erosion and drainage control will be essential to prevent environmental contamination in the lake.

At present, propagation of sanitary toilet is still low at 35% according to a report of the municipal health center. To conserve the environment of lake as well as to improve public promoted health, it is suggested that improved septic tanks for control and treatment of drainage water.

TABLES

Table 2.1.1 Gross National Product and Expenditure Account

Description	1972	1984	1985	1986	1987
1. Agriculture, Fishery and Forestry Sectors	16,135	139,505	162,519	163,801	177,017
2. Industrial Sector:	18,088	188,154	200,544	202,280	230,182
a. Mining & quarring	1,348	9,714	11,529	10,198	10,757
b. Manufacturing	14,014	137,251	150,523	145,719	174,000
c. Construction	2,240	31,209	27,506	22,685	28,092
d. Electricity, gas and water	468	7,980	10,986	14,678	17,333
3. Service Sector:	22,261	214,807	249,621	266,160	304,337
a. Transportation	2,732	33,820	38,263	39,256	42,027
b. Trade	7,527	99,711	118,370	121,243	137,355
c. Finance & housing	4,515	31,203	32,287	38,168	47,811
d. Private services	4,130	28,819	33,688	358,765	38,534
e. Government services	3,357	21,254	27,033	31,728	38,610
GROSS DOMESTIC PRODUCT at market prices	56,464	540,466	612,684	632,241	711,536
Net Factor Income from Abroad	(525)	(13,111)	(14,941)	(12,426)	(5,285)
GROSS NATIONAL PRODUCT at market prices	55,939	527,355	597,743	619,815	706,251
Indirect taxes, including subsidies	4,326	43,920	49,346	52,309	70,231
Depreciation	5,303	53,749	67,222	71,682	77,615
NET NATIONAL PRODUCT or NATIONAL INCOME	46,310	429,686	481,175	495,824	558,405

Data Source: Economic and Social Statistics Office,
National Statistical Coordination Board.

Table 3.1.1 Monthly Rainfall in Jala-Jala Area

(Unit : mm/month)

A.D.	JAN	FEB	MAR	APR	MAY	JEN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1969	29.8	12.7	25.0	22.5	87.1	133.5	405.6	166.1	165.2	146.7	153.7	263.9	1611.8
1970	45.1	31.4	35.4	53.5	132.5	235.2	289.6	158.2	401.5	568.3	637.9	205.9	2794.5
1971	25.8	39.9	102.0	32.1	261.1	438.1	356.7	192.0	238.1	465.7	381.9	553.8	3087.2
1972	82.9	15.5	83.3	53.5	169.8	370.4	828.5	310.3	149.6	258.6	221.8	131.5	2675.7
1973	49.9	19.0	20.3	22.7	105.4	238.6	213.0	159.0	291.5	360.2	398.8	323.8	2202.2
1974	16.3	36.4	24.7	21.9	146.0	223.1	170.2	478.1	176.4	365.7	430.9	305.0	2394.7
1975	133.1	21.4	110.3	231.2	80.0	174.4	105.4	279.0	268.5	304.3	212.2	397.3	2317.1
1976	39.9	21.6	26.6	54.7	596.8	258.8	231.8	289.7	259.8	150.1	226.6	243.4	2399.8
1977	168.0	35.7	42.1	24.4	105.0	307.2	207.3	262.2	290.2	157.2	218.7	34.9	1852.9
1978	35.6	20.2	12.8	43.1	126.6	117.6	149.8	558.1	336.7	824.0	173.5	128.6	2526.6
1979	22.9	23.8	15.8	216.6	259.8	314.9	159.3	322.5	263.5	263.4	235.6	39.0	2137.1
1980	17.6	0.0	111.5	28.4	116.6	264.6	277.6	245.8	159.3	(358.0)	405.2	218.5	2203.1
1981	31.9	16.2	17.7	38.2	129.8	246.6	395.2	201.1	295.3	343.2	355.8	96.9	2167.9
1982	13.7	28.3	41.3	36.9	83.1	154.8	515.1	175.9	350.9	133.8	185.8	77.2	1796.8
1983	66.2	15.7	28.2	12.8	32.3	122.1	253.8	218.2	149.1	337.6	128.4	0.0	1364.4
1984	21.9	14.0	23.8	74.1	205.7	236.0	88.6	362.7	188.8	682.3	145.0	41.9	2084.8
1985	22.1	25.6	35.9	71.8	136.5	516.7	241.4	113.5	184.4	403.8	137.9	100.2	1989.8
1986	23.7	21.8	13.4	16.8	131.1	44.8	257.9	382.4	166.9	381.1	337.2	99.4	1876.5
1987	28.3	13.8	13.3	13.3	48.5	141.8	(106.8)	196.3	277.1	105.6	249.3	128.0	1322.1
1988	119.2	63.2	13.9	147.5	102.8	334.0	171.6	213.8	171.2	643.5	416.4	20.4	2417.5
MEAN	49.7	23.8	39.9	60.8	152.8	243.7	271.3	264.2	239.2	362.7	282.6	170.5	2161.1

Note:1) Estimated by correlation from the rainfall data observed at Santa Cruz,
Rainfall(Jala-Jala) = 12.220 + 1.084 * Rainfall(Santa Cruz)
Correlation coefficient = 0.916

2) Figures of parenthesis; estimated by correlation from the rainfall data observed at IRRI Wet Land, Los Banos,
Rainfall(Jala-Jala) = 13.820 + 0.794 * Rainfall(IRRI, Los Banos)
Correlation coefficient = 0.856

Table 3.2.1 Population by Barangay

Barangay	Population			No. of Household	Family Size
	Male	Female	Total		
Sipsipin	1,118	1,031	2,149	358	6.00
District I	1,058	977	2,035	370	5.50
District II	758	701	1,459	243	6.00
District III	726	729	1,455	242	6.01
Bayugo	1,303	1,157	2,460	410	6.00
Punta	1,073	1,117	2,190	365	6.00
Palay-Palay	722	666	1,388	231	6.01
Pagkalinawan	679	578	1,257	210	5.99
Lubo	670	595	1,265	211	6.00
Bagumbong	1,218	1,268	2,486	414	6.00
Paalaman	316	292	608	102	5.96
Total	9,641	9,111	18,752	3,156	5.94

Note : Data Source;Annual Statistics, Jala-Jala Rural Health Center, 1990

Table 3.2.2 Income Classification By Land Holding Size

Annual Farm Income (peso/H.H)	Total Sample Farm		Land Holding of Paddy Field (ha)																				Non Paddy Farm	
			<0.25		0.25-0.49		0.50-0.74		0.75-0.99		1.00-1.24		1.25-1.49		1.50-2.00		2.00-2.49		2.50-3.00		>3.00			
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Less than 9,999	72	18.5	6	40.0	8	26.7	28	25.2	1	6.3	11	12.6	2	20.0	2	7.1	1	3.3	1	9.1	2	12.5	10	28.6
10,000-14,999	71	18.3	5	33.3	7	23.3	16	14.4	7	43.8	21	24.1	2	20.0	3	10.7	2	6.7	0	0.0	0	0.0	8	22.9
15,000-19,999	53	13.6	0	0.0	4	13.3	17	15.3	2	12.5	11	12.6	0	0.0	6	21.4	5	16.7	2	18.2	1	6.3	5	14.3
20,000-24,999	37	9.5	1	6.7	1	3.3	13	11.7	0	0.0	8	9.2	2	20.0	4	14.3	4	13.3	0	0.0	0	0.0	4	11.4
25,000-29,999	37	9.5	1	6.7	2	6.7	11	9.9	3	18.8	8	9.2	0	0.0	3	10.7	5	16.7	1	9.1	3	18.8	0	0.0
30,000-34,999	17	4.4	0	0.0	1	3.3	7	6.3	0	0.0	3	3.4	1	10.0	1	3.6	1	3.3	1	9.1	0	0.0	2	5.7
35,000-39,999	22	5.7	1	6.7	2	6.7	4	3.6	0	0.0	8	9.2	0	0.0	1	3.6	3	10.0	2	18.2	0	0.0	1	2.9
40,000-44,999	15	3.9	0	0.0	1	3.3	3	2.7	0	0.0	5	5.7	0	0.0	1	3.6	2	6.7	0	0.0	2	12.5	1	2.9
45,000-49,999	13	3.3	0	0.0	1	3.3	4	3.6	2	12.5	2	2.3	1	10.0	1	3.6	1	3.3	0	0.0	1	6.3	0	0.0
50,000-54,999	12	3.1	0	0.0	2	6.7	3	2.7	0	0.0	1	1.1	2	20.0	1	3.6	1	3.3	0	0.0	0	0.0	2	5.7
55,000-59,999	4	1.0	0	0.0	0	0.0	1	0.9	0	0.0	2	2.3	0	0.0	0	0.0	0	0.0	0	0.0	1	6.3	0	0.0
60,000-64,999	6	1.5	0	0.0	0	0.0	2	1.8	1	6.3	0	0.0	0	0.0	0	0.0	2	6.7	1	9.1	0	0.0	0	0.0
65,000-69,999	6	1.5	0	0.0	0	0.0	2	1.8	0	0.0	1	1.1	0	0.0	2	7.1	1	3.3	0	0.0	0	0.0	0	0.0
70,000-74,999	3	0.8	0	0.0	0	0.0	0	0.0	0	0.0	1	1.1	0	0.0	0	0.0	1	3.3	0	0.0	1	6.3	0	0.0
75,000-79,999	4	1.0	0	0.0	0	0.0	0	0.0	0	0.0	2	2.3	0	0.0	1	3.6	0	0.0	0	0.0	1	6.3	0	0.0
80,000-84,999	3	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	9.1	2	12.5	0	0.0
85,000-89,999	3	0.8	0	0.0	0	0.0	0	0.0	0	0.0	1	1.1	0	0.0	1	3.6	0	0.0	0	0.0	1	6.3	0	0.0
90,000-100,000	2	0.5	0	0.0	0	0.0	0	0.0	0	0.0	1	1.1	0	0.0	0	0.0	0	0.0	0	0.0	1	6.3	0	0.0
More than 100,000	9	2.3	1	6.7	1	3.3	0	0.0	0	0.0	1	1.1	0	0.0	1	3.6	1	3.3	2	18.2	0	0.0	2	5.7
Total	389		15		30		111		16		87		10		28		30		11		16		35	
Average Income (peso)	28,131		16,194		23,999		21,844		22,803		26,983		27,508		33,844		36,532		58,708		49,981		31,003	

Source:Farm Economic Survey, JICA, 1989

Table 3.2.3 Average Annual Cost of Living , Jala-Jala, 1989

Item	Farms Reporting		Living Expenses	
	Number	%	Pesos	%
	(m = 395)			
Food	-	-	8,361.07	44.54
Rice	391	99	(5,682.15)	(30.27)
Other cereals	96	24	(397.94)	(2.12)
Fish, meat, etc.	99	25	(463.42)	(2.47)
Beverages	97	25	(420.38)	(2.24)
Food ingredients	224	57	(1,396.78)	(7.44)
Tobacco, Cigarettes	265	67	1,314.77	7.00
Clothing	274	70	1,474.10	7.85
Light, Water, Fuel, etc.	286	72	591.97	3.15
Household Furnishings	35	9	295.71	1.58
Household Operation & Maintenance	63	16	433.38	2.31
Periodical Medical Care	217	55	1,383.71	7.37
Transporation and Communications	199	50	991.32	5.28
Recreation	33	8	61.24	0.33
Education	256	65	2,260.69	12.04
Ceremonial Occasions	197	50	1,055.21	5.62
Remittance to Relations	58	15	728.30	3.88
O&M Cost of Vehicles	11	3	788.73	4.20
Others	5	1	31.06	0.17
Total	-	-	18,770.76	100.00

Table 3.3.1 Present Land Use

Unit:ha

Land Category	Mountainous Slope Land	Lower Terrace	Alluvial Fans	Total
1. Agricultural Land				
1.1 Paddy Field				
-Irrigated	0	0	450	450
-Rainfed	0	270	50	320
sub-total	0	270	500	770
1.2 Upland Field				
-Irrigated	0	0	0	0
-Rainfed	10	50	100	160
sub-total	10	50	100	160
1.3 Plantation				
-Orchard	170	130	50	350
-Coconuts	70	0	30	100
-Others	60	0	0	60
sub-total	300	130	80	510
Total Agricultural Land	310	450	680	1,440
2. Non-Agricultural Land				
2.1 Forest	200	80	0	280
2.2 Bush	1,150	340	30	1,520
2.3 Grass Land	1,010	320	30	1,360
Total Non-Agricultural Land	2,360	740	60	3,160
3. Homestead/Village Yard	10	150	170	330
Ground Total	2,680	1,340	910	4,930