1.3 Agricultural Development Program

1.3.1 Proposed Land Use

For upgrading of irrigation efficiency and crop production in the Project Area, systematic usage of the water resources, improved operation and maintenance of the irrigation facilities, and future trend of the farm produce marketing have been intensively studied by the feasibility study team throughout the dual survey stages from 1982 to 1983.

As a result, the future land use are proposed to be improved and concentrated on the three items below;

(1) Expansion of new irrigable areas as extensively as the irrigation capacity can make it possible to support crop growth.

(2) Increase in cropping intensity of both the wet and dry season crops through drainage improvement.

(3) Introduction of upland crops diversification scheme to the well-drained areas, aiming at a higher income to farmers.

As has already been described, the expansion areas are focussed mostly on the low-lying submerged lands which can be served by means of gravity irrigation. These are distributed in ten places, totalling to 3,480 ha, including one well-drained area of 150 ha, WS6EX-1, where diversified crops rotation has been partly practiced by farmers.

Land use of the Project Area in terms of cropping system is proposed in Table C.1.3-1. Extent of each system in the service area is summed up as follows;

Item	Crop Season	Future Without Project		Future With Project	Difference
Service Area (ha)		33,886	(2,401)	34,965	+ 1,079
Planted Area (ha)					
1. Two season rice area	Wet	23,746	(380)	24,323	+ 577
	Dry	21,485	(150)	24,323	+ 2,838
2. Diversified area (Three crops)	Wet	0		2,250	+ 2,250
	Dry	0		4,500	+ 4,500
3. Dry season rice area	Wet	0		0	0
	Dry	9,313	(2,021)	8,392	- 921
4. Total	Wet	23,746	(380)	26,573	+ 2,827
	Dry	30,798	(2,171)	37,215	+ 6,417
	Total	54,544	(2,551)	63,788	+ 9,244
Cropping Intensity (%)	Wet	70.1	(15.8)	76.0	+ 5.9
	Dry	90.9	(90.4)	106.4	+ 15.5
	Total	161.0	(106.2)	182.4	+ 21.4

Figures in parenthesis express those of expansion areas, which are not yet served by AMRIS in the stage without Project.

With Project, planted area shall be increased totally by 9,244 ha. Cropping intensity would figure up to 76 and 106 percent in the wet and dry season, respectively, totalling 182 percent per crop year. A large increase in the dry season would result from the setting up of diversified Cropped areas.

1.3.2 Proposed Cropping Pattern

(1) Pattern Formulation

Pattern formulation in the AMRIS Project Area largely depends on topographical features as well as soil characteristics of the land, which may affect irrigability, drainability and submergence during the wet season. Each cropping calendar must be decided following the irrigation problem of water resources which are also controlled by the allotment program of the Angat Reservoir. A fallow season of about two months is needed, that is, from April to May for the repair and maintenance of the canals and other irrigation facilities.

Another aspect is from the economic point of view in relation to the balance between supply and demand in the cash crop marketing. Moreover for the diversified cropping, further intensification of extension activities would have to be implemented by NIA and BAEx. Many identifiable constraints in the Upland Crop Project conducted from 1981 to 1982 gave useful lessons about the introduction of upland crops into paddy field.

(2) Proposed Patterns

Considering the above-mentioned circumstances, five cropping patterns have been planned as shown in Figure C.1.3-1 together with the climatic conditions. The land conditions adaptable to each pattern are summarized in Table C.1.3-2.

Pattern A - Double cropped rice with late maturing varieties; the most major pattern covering far more than half of the total planted area; well-drained with stable higher yield.

Pattern B - Ditto, but with early maturing varieties; drought-suffered area due to the shortage in water supply; the dry season rice must be planted in October to advance harvest (October Rice)

Pattern C - Triple cropped, once with late maturing rice in the wet season and twice with diversified upland crops in the dry season; formerly pattern A area.

Pattern D - Double cropped for rice with early maturing varieties; the wet season rice crop must be planted in March to finish harvest before July in order to avoid typhoon season; poorly drained area.

Pattern E - Single cropped with late maturing rice in the dry season; common to submerged lands including expansion areas.

Area to be planted in both seasons and cropping intensity are already presented in Table C.1.3-1. Figure C.1.3-2 shows the cropping calendars of each pattern, indicating full use of the service area under the adequately programmed irrigation water allotment, excepting the lowlying submerged areas.

1.3.3 Planting Method and Variety

Ordinary transplanting of rice still remains at 40 and 30 percents of total in the wet and dry seasons, respectively. Because of its lower yield, this method should be replaced by straight transplanting or direct seeding. The latter method seems the most profitable for its rather high yielding capacity as compared to the other planting methods.

Such being the case, the area of direct seeding should be expanded for wider coverage as much as drainage conditions would allow. The following program would be optimum in the future.

Extension Ratio of Planting Methods (%)

Planting Method	Peature Without Project		Peature With Project	
	Wet	Dry	Wet	Dry
Ordinary transplanting	40	30	0	0
Straight transplanting	30	20	50	20
Direct seeding	30	50	50	80
Total	100	100	100	100

As for rice variety the most recommended ones are IR36 for short period maturity (110 days) and IR42 for long period maturity (130 days). IR52 and IR54 are also promising for the dry season because of their high tolerance to drought.

1.3.4 Diversified Areas and Upland Crops

Areas for pattern C shall be selected near the upland areas where some upland crops have been commercially grown. These are limited to the well-drained lands mostly within the existing service area. Their location and area shall be allocated as follows:

Working Station	Division	Area (ha)	Municipality
2	A	400	Bustos
	B	400	Bustos, Plaridel
4	B	200	Guiguinto
	C	200	Plaridel, Malolos
	D	200	Malolos
5	A	200	Malolos
	E	100	Pladical
6	Ex-1	150	San Rafael
7	A	200	Baliuag
10	A	200	San Simon
Total		2,250	

What kind of upland crops to select is another problem. One of the indices is the relationship between production cost and income. Table C.1.3-3 gives the recent data of the crops commonly grown in the Area. Among vegetables, pale sitao has the greatest net income, followed by egg-plant and ampalaya. In net income ratio, eggplant and tomato are superior to other vegetables although these two are not so marketable because of the family garden production or rather low demand. In conclusion, adequate crops would be watermelon and pale sitao in combination with green and yellow corn, respectively, for first and second crops, in view of their big demand in market. Corn cultivation shall take precedence to meet the national target of Maisagana

Program. Because of the higher production cost of vegetable crops both in inputs and labor requirements, 70 percent of the field will be subjected to grown corns. The vegetables can be alternated with muskmelon and mungo (mung bean). Recommendable varieties of these crops are listed in Table C.1.3-3.

Location of each cropping pattern is outlined in Figure C.1.3-3. Pattern D areas are distributed in the submerged area but at an altitude of more than 3.5 m so that wet season rice can hardly be grown. Accurate areas of each pattern shall be decided according to the command extent at lateral canal level.

1.3.5 Target Yield

Yields of rice and other diversified crops can be expected to increase considerably in the future by applying the proper fertilizers and plant pesticides with upgraded field management, provided the improved operation and maintenance schemes could be realized.

(1) Rice

To assess adequate future yield of paddy, the three items should be discussed;

a. Recent trend of paddy yield
b. Fertilizer response of rice
c. Economical use of fertilizer

1) Recent Trend of Padddy Yield

As described in the previous chapter, AMRIS Area and its related municipalities has attained a steady increase in paddy yield in these ten years despite a lean crop every five years due to flood and/or pests.

According to the frequency of paddy yield range in recent three years by Division in AMRIS, distribution of five to six tons of paddy per ha has become greater with increasing average yield. Especially in the dry season of 1982, frequency of this yield range occupied 27 percent of the total. This suggests that farming technique has much improved and it would be not imprudent to target the average paddy yield of more than five tons per ha in the future in AMRIS Area.

2) Fertilizer Responce of Rice

A crop yield increase with increasing rate of fertilizer application when the other conditions of farming are fixed. When any of them varies, effect of fertilization also deviates giving different increasing curves of yield.

Some field trials were conducted in AMRIS Area by the Bureau of Soils, MA from 1974 to 1977, using varing doses of fertilizers on the fields of representative textural soils. Since nitrogen is the most effective nutrient, its efficiency was calculated by the following equation using the above data.

Efficiency of fertilizer nitrogen (En) = Kilograms of paddy produced per kilogram of nitrogen applied = Yield produced with fertilizer nitrogen (Yna) - yield without nitrogen (Yno) ÷ Applied fertilizer nitrogen (Na, kg). Curves in Figure C.1.3-4 were obtained by plotting calculated values for both rice seasons. The curve for the wet season rice was somewhat revised with the results of IRRI trials (1979).

Since paddy yield with no nitrogen application is estimated to be 2.8 and 2.9 tons per ha for wet and dry season rice, respectively, any yield with any rate of nitrogen dosage can be calculated as;

$$Yna = Yno + Ena \times Na$$

The yield curves were thus ontained as drawn in the same Figure, ascending with increasing dosage. The most efficient dosage of nitrogen, however, must be found at the peak of each efficiency curve. Around 80 kg N per ha for wet season crop and 100 kg N for dry season crop. For convenience of farmers applying fertilizers, their quantities would be fixed by number of bags. Dosage of fertilizer nitrogen is thus to be 83 kg and 98 kg for wet and dry season crop, respectively. With these dosages, 4.5 tons and 5.2 tons of paddy per ha would be obtainable as calculated as follows;

Wet season : 2,820 + 20.3 x 83 = 4,505 kg
Dry season : 2,930 + 23.2 x 98 = 5,204 kg

Needless to say, these yield can be realized with sufficient use of phosphorous and potassium fertilizer and agrochemicals under adequate farm management.

3) Economical Use of Fertilizer

In view of the most essential input to attain a higher yield and its highest share among input materials, nitrogen fertilizers expressed as elemental nitrogen has been valued by prices reflection method.

The marginal value product assumes its maximum at the nitrogen dosages between 40 and 50 kg for wet season crop, and 70 and 80 kg for dry season crop. As a matter of fact, fertilizers have been applied more at present, and the qunatities above mentioned are involved in an acceptable range as compared with the farm-gate prices of fertilizer nitrogen. In conclusion, 4.5 and 5.2 tons of paddy per ha would be the target yield in wet and dry seasons respectively.

(2) Upland Crops

Only survey data compiled by BAEx, Bulacan Office are available to project future yields of the upland crops undertaken to be grown with Project.

Referring to the data listed in Table C.1.3-3, optimum or minimum yield would be realized with aid of the technical guidances which are being intensified through agricultural extension activities. The target yield per ha in the dry season of pattern C with the Project is expected as follows;

First crops	:	Watermelon	8.0 (tons/ha)
		Green corn	2.7
Second crops	:	Pole sitao	7.5
		Yellow corn	4.0

Five ton package technique being recommended by Mai-sagana Program is expected for yellow corn production, but the target yield is anticipated at four tons for safe achivement. The other yields are similarly less targeted for those listed in Table C.1.3-3.

1.3.6 Expected Crop Production

(1) Paddy Yield Deviation

To know comprehensive crop production in future with Project, some factors pertaining to paddy yield deviations have been investigated using AMRIS production reports in recent five years.

The first is yield difference by cropping system. For instance, the double cropped area supports slightly better growth than the whole area average in the wet and dry seasons. The submerged area produces poor yield in wet season though rarely practiced, while it can obtain almost average yield in the dry season being favored with the fertile soil

properties rich in nutrient elements. On the contrary, drought areas such as pattern B fields can not have luxuriant produce, especially in the dry season as harvests' yield are very poor due to the irrigation water shortage. The second is that it differs with rice variety.

It seems a nation-wide tendency among farmers that they intend growing early maturing varieties of rice to a large extent from the economic point of view. Paddies producted with these varieties, however, are inferior to those with late maturing varieties not only in quantity by five percent but also in quality after processing according to the survey data in the Project Area.

The third is due to the planting method as already pointed out in the preceding chapter.

The following coefficients were used to estimate more accurate yield of the different growing areas;

Cropped Area	Average	Drained	Submerged	Droughty
Wet season	100	101	87	97
Dry season	100	101	99	71

	Average	Early Maturing	Late Maturing
Rice variety	100	97.5	102.5

Planting Method	Average	Straight Transplanting	Straight Transplanting	Direct Seeding
Wet season	100	103	92	105
Dry season	100	101	92	107

(2) Crop Production

Before calculating the crop production in AMRIS Area, crop yield of each cropping pattern should be predicted. This can be done by combining the above coefficients depending on the pattern area, rice maturity and planting method. Table C.1.3-4 presents results of the production for each cropping pattern by development stage. Table C.1.3-5 gives the paddy production using those yields with the Project.

The total paddy production per crop year by development stage is outlined as follows;

(Paddy, 1,000 tons)

Cropping Pattern	Future Without Project (a)	Future With Project (b)	Difference (b - a)
A	186	205	19
B	10	20	10
C	-	11	11
D	-	19	19
E	42	45	3
Total	238	300	62

The production at full development stage would increase, amounting to 62 thousand tons or 26 percent over that without Project. In addition, upland crop production of around 21 thousand tons would be expected from pattern C areas by diversified cropping.

1.3.7 Improved Farming Practices

To realize target yield, farming should be practiced making every effort with various improved techniques. These techniques which shall be extended in the Project are;

a. Adequate variety and planting method
b. Increased fertilizer application
c. Increased plant protection
d. Integrated water management
e. Appropriate post-harvest operation

1) Rice

Use of recommended varieties which have been approved by the Seed Board is the first priority for rice culture. Amontg HYV commonly grown in the Philippines, IR36 and IR42 have gained reputation almost all over the country, being the most extensive varieties. Especially IR36, the early maturing variety, has given outstanding yield under direct seeding. Certified seed paddy shall be provided always through its production and supply system. Area with straight transplanting and direct seeding shall be extended by stopping ordinary transplanting. This may need more effort than before in land preparation and planting.

Land soaking has been traditional in the Area, making the following plowing easy. If the field is plowed soon-after the harvest, farmer can initiate harrowing operation by omitting plowing. This procedure would more or less control luxurious growth of the weeds. Moreover, soil effect which produces available nitrogen in the soil upon submergence could be expected for rice culture. Deep plowing is also recommended to decrease soil compactness and to improve drainability of the land.

Although fertilizers have been applied at a comparatively higher rate in the Area, more increased dosage will lead to enhanced paddy production. Urea is the cheapest nitrogen fertilizer as to unit price of nitrogen element. Its application must be split due to its immediate effect but possible loss through denitrofication in the soil.

Phosphate shall be increased expecting better yield under the unfavorable conditions such as flood and shortage of sunshine especially in the wet season.

Ball-cake type of complex fertilizer may decrease the labor requirement. This fertilizer has done very well in the field trials conducted by IRRI and other experiment stations.

The number of brands of agro-chemicals in use shall be increased though these are limited to insecticides. Granular herbicides such as Machete 5G will successfully control weeds in pre-emergence application.

To keep a suitable water depth of ten cm or so until the terminal drainage needs frequent patrol to the field. This is especially necessary in the Candaba area where comparatively high salinity value in the soil was observed in the present soil survey. To drain excess water at the flood period is the secondarily important management. Intermittent draining off has been proved to be not always effective.

Post-harvest operation has brought a problem how to dry the paddy as fast as possible. This problem will be discussed in the paragraph on agri-institution.

Table C.1.3-6, (1)-(2) describes the farming practice standard by crop season and planting method. The Philippines Recommendations for Rice can be referred to for detaild information.

2) Upland Crops

Farming practices of four upland crops which are selected for cropping pattern C shall be planned as arranged in Table C.1.3-7, 8, 9 and 10. Detailed cultivation methods for each of them are described in the publications issued by BAEx.

Watermelon can be successfully grown in the paddy field by means of planting hole culture. The hole is 40 cm deep and applied with compost and complete fertilizers as basal dressing before sowing the seed on the top soil. Corn shall be grown, formally following the Five Ton Package of Technology made by BAEx. Insecticide and herbicide are increased with the Project.

1.3.8 Production Cost

According to the input requirements of each farming criterion of the crops, the production costs have been calculated including costs of labor and utilization of animal and machineries. The results are summarized in Table C.1.3-11 and Table C.1.3-12.

As a matter of course, the highest net income and its ratio are found with the crops of direct seeding in the dry season except for pattern B. Although no apparent difference in the net income ratio is recognized between the development stages, the income itself become higher at full stage than at stage without Project. Comparing major cropping patterns, crops with pattern A and E at full stage are more profitable by around 400 pesos per ha. Anyway, the extremely low farm-gate price of paddy derives the least profitability from the wet season crops.

The upland crops grown in the dry season of pattern C would bring less benefit than paddies except for pole sitao which can leave a large return. There is no doubt, however, that more favorable balance will be obtained in total if these crops as compared with mono-rice crop.

For procurement of the necessary inputs, farmers shall be financed through the loan system of Masagana 99 and Maisagana programs. In particular timely acquisition of

fertilizers and agro-chemicals should be arranged by the extension agencies concerned. Supply of superior seeds for use in diversified upland cropping is extremely important to encourage the farmers with the highest yield of crops as well as high quality.

Besides, rate of labor cost to total production cost is still very high with rice crop, amounting to more than 60 percent although it has been slightly improved as a result of advanced farm mechanization.

1.3.9 Farm Labor Requirement and Balance

(1) Farm Labor Requirement

As described in the preceding Chapter, labor requirement per ha in rice and upland crop cultivation has been planned based on the farming practice criteria by development stage, planting method and season. The results are listed in Table C.1.3-13, 14 and 15. The total requirements at full stage increase by seven to eight man-days as compared with those without Project. Out of them, increase in hired labor is three to four man-days.

Labor requirements of upland crops per ha are rather smaller than those of rice excluding pole sitao which needs 101 man-days in total and out of them 66 hired man-days.

(2) Labor Balance

The following figures of labor source have been estimated for the total service area, using the statistical data collected at provincial and municipal level.

Year	Farm households		Landless farm workers		Total	
	1982	1992	1982	1992	1982	1992
Number of laborer	31,920	38,990	20,320	25,850	52,240	64,840
Monthly labor force (x 1,000 man-days)	798	975	508	646	1,306	1,621

Table C.1.3-16 gives the requirement by cropping pattern to show the monthly labor balance. A favorable balance can be obtained in all months because of the sufficient labor source. Even the greatest requirement in November with Project is less than half of the total force.

1.3.10 Farm Mechanization

After the implementation of the project, a comparative change in the use of farm machineries is not to be anticipated except perhaps in land preparation and post-harvesting.

(1) Land Preparation

Land preparation being practiced in the Area is divided into three types. Based on the present available level of machinery as well as working carabaos, the optimum proportion and coverage among these types would be assumed as follows;

No.	Operation Process		Proportion (%)		Coverage (ha)	
	Plowing	Harrowing to Leveling	Future Without Project	Future With Project	Future Without Project	Future With Project
1.	Carabao	- Carabao	15	5	4,620	1,860
2.	4-wheel Tractor	- Carabao	20	15	6,160	5,580
3.	2-wheel Hand Tractor	2-wheel - Hand Tractor	65	80	20,020	29,760
	Total		100	100	30,800	37,200

Although the proportions for type 1 and 2 would decrease by five percent, carabaos should be utilized to cover 20 percent of the whole area. The remaining 80 percent will be managed by the continuous operation 2-wheel tractor which has been appreciated by farmers using for its reasonable price as well as better field workability. This kind of farm machineries should be increased in number in the future

to realize the target. The trial balance for this purpose gives the following estimates of unit numbers needed;

Item	Carabaos	4-wheel tractor	2-wheel hand tractor
Coverage per unit (ha)*	3.2	40	7
Unit number available in future without project	4,380	175	1,850
Unit number needed in future with project	4,650	175	5,314
Difference	270	0	3,464

* Values used are more reasonable than those practised actually.

The result indicates an extreme shortage of two-wheel hand tranctors.

(2) Harvest and Post-Harvest

A large number of threshers commonly used in the Area will be needed. Taking the coverage per unit as 10 ha for one season, 4,514 units need to be used. This number is a long way from that available at present which estimated to be only 136 units.

As for the post-harvest facilities, the information has revealed that mechanical driers owned by the farmers are quite few in number to deal with the whole area. Participation by farmers in procurement shall be recommended to provide these machineries.

It would be of much importance, too, to select the most adequate system of drying paddy because it must function well to dispose of the wet season crop as soon as possible under the rainy weather, enabling the farmers to get high

quality of paddy rice which can be sold for a better farm-gate price. Adequate programs to implement the drying machinery and facility will be described in the next Chapter.

1.3.11 Pilot Demonstration Farm Set-Up

From the former experiences on the Upland Crop Project conducted in the service area, a pilot demonstration farm should be operated under the cooperative administration of NIA and BAEx. The major strategy concerning scale and budget would be as follows:

(1) Farm Scale and Operation

Location of farm: Ten farms for six Working Stations where the diversified upland crops will be introduced. Each farm has a size of one hectare and is hired from the farmers who grow the wet season rice by themselves.

Farming traials : Cropping twice only in the dry season from November to May. Crops are concentrated on watermelon, pole sitao and corns with some alternative vegetables such as mungo and tomatoes.

Demonstration trials are composed of cultural methods, water management, fertilizer use, agro-chemical application and so on.

Administration : Sixteen (16) field staffs from NIA and eighteen (18) from BAEx, totalling to 34 are deployed in concurrent service for technical guidances necessary to conduct farming practices and execution of extension activities such as group training course and farm trial visit of the farmers in the service area.

(2) Implementation Cost

	(₱ per season)
Man power (Gasoline allowance)	33,120
Supply and materials	14,670
Sub-total	47,790
Total for 8 seasons	382,320

The farmers concerned with Demonstration Farms will be given farming inputs with free disposal of the output except for the seeds which must be kept for the next cropping.

Table C.1.3-17, (1)-(2) provide some details of the implements.

TABLE C.1.3-1 PROPOSED LAND USE AND PLANTING PROGRAM IN AMRIS

(Unit : ha)

Land Use Criteria	Service Area		Planted Area					
			Wet Season		Dry Season		Total	
	Without Project	With Project	Without	With	Without	With	Without	With
1. Present Service Area								
Pattern A	22,082	19,982	21,255	19,982	20,732	19,982	41,987	39,964
B	2,111	2,111	2,111	2,111	603	2,111	2,714	4,222
C	0	2,100	0	2,100	0	4,200	0	6,300
D	0	2,000	0	2,000	0	2,000	0	4,000
E	7,292	5,292	0	0	7,292	5,292	7,292	5,292
Sub-total	31,485	31,485	23,366	26,193	28,627	33,585	51,993	59,778
(Cropping Intensity)	(100)	(100)	(74.2)	(83.2)	(90.9)	(106.7)	(165.1)	(189.9)
2. Expansion Area*								
Pattern A	380	230	380	230	150	230	530	460
C	0	150	0	150	0	300	0	450
E	2,021	3,100	0	0	2,021	3,100	2,021	3,100
Sub-total	2,401	3,480	380	380	2,171	3,630	2,551	4,010
(Cropping Intensity)	(100)	(100)	(15.8)	(10.9)	(90.4)	(104.3)	(106.2)	(115.2)
Total	33,886	34,965	23,746	26,573	30,798	37,215	54,544	63,788
(Cropping Intensity)	(100)	(100)	(70.1)	(76.0)	(90.9)	(106.4)	(161.0)	(182.4)

Note: * Not yet served by AMRIS at the stage without Project.

TABLE C.1.3-2 LAND CONDITIONS AND PROPOSED CROPPING PATTERNS FOR AMRIS AREA

Submergence during Wet Season	Cropping Pattern	Topography	Drainage	Major Soil Series	Soil Types	Land Class
Non-Submerged	A	Almost flat	Imperfectly drained	Bigaa	Clay loam (3)	1R
		Flat to slightly undullating	Moderately well to imperfectly drained	Quingua	Silt loam (5)	1R
				"	Silty clay loam (285)	1R
				"	Silty clay (899)	1R
				Calumpit	Silty clay loam (18)	1R
				Prensa	Silty clay loam (66)	1R
	B	Undullating to rolling	Moderatly well drained	Prensa	Silty clay loam (66)	1R
				Buenavista	Silt loam (9)	1R
	C	Almost flat	Imperfectly drained	Bigaa	Clay loam (3)	2d
		Flat to slightly undullating	Well to moderately well drained	Quingua	Fine sandy loam (4)	1
				"	Silt loam (5)	1
Submerged	D	Flat to slightly sloping, partly swampy	Imperfectly to poorly drained	Obando	Fine sandy loam (2)	2Rdf
				Bigaa	Clay loam (3)	2Rdf
				Calumpit	Sandy loam (17)	2Rs
				Candaba	Silt loam (69)	2Rdf
				"	Clay loam (70)	2Rdf
	E	Flat to slightly depressed	Imperfectly to poorly drained	Quingua	Fine sandy loam (4)	2Rst
				Calumpit	Silty clay loam (18)	2Rf
				Candaba	Clay loam (70)	3Rdf

Note : Refer to APPENDIX - A for soil and land classification.

TABLE C.1.3-3 PRODUCTION COST OF UPLAND CROPS IN AMRIS AREA

(P/ha)

Crop	Green Corn	Yellow Corn	Water melon	Musk melon	Pole-Sitao	Mungo	Tomato	Eggplant	Okra	Ampalaya	Peanut	Sweet Potato	Yam-bean
Variety	Sweet Corn, Glucinous Corn	Hybrid, IPB Var 1	Sugar Baby Charleston Gray	Gulf Stream	Bulacan Strain, Yaralog Purple	CES-80, MC-50, UPL mg-2	Pearl Harbor, UPL Tm-2, Harbor	College Long Purple, Dumaguete Long Purple	Green, Yellow Green	Tagalog, Ilocano	CES-101, EG Bunch, BPI-P2 UPL PN2	Cancanial, BNAS Julian	Native
Growing period (day)	85	110	85	80	100	65	90	90	70-90	70	100	70-120	90
Land Preparation*	755	755	635	755	755	755	755	755	755	755	755	755	810
Labor **	633	1,136	1,392	1,040	2,348	640	1,138	1,186	722	1,300	820	804	658
Materials:	1,112	1,926	1,901	1,453	5,045	681	1,453	1,793	741	3,833	1,382	1,173	600
Seed	255	340	180	160	240	150	220	200	90	300	800	300	420
Fertilizer	587	1,053	1,253	933	1,053	351	1,053	1,173	471	1,173	462	693	0
Agro-Chemical	270	533	468	360	1,232	180	180	420	180	360	120	180	180
Bamboo poles	-	-	-	-	2,520	-	-	-	-	2,000	-	-	-
Production Cost	2,500	3,817	3,928	3,248	8,148	2,076	3,346	3,734	2,218	5,888	2,957	2,732	2,068
Yield (ton)	2.7 (20,000 ears)	5	10	10	10	1.5	5	8	5	10	1.5	12	10
Farm gate price/ kg.	2.25	1.7	1	0.75	2	4	2	1.75	1	1.5	5	0.5	0.4
Gross income (a)	6,07	8,500	10,000	7,500	20,000	6,000	10,000	14,000	5,000	15,000	7,500	6,000	4,000
Net income (b)	3,575	4,683	6,072	4,242	11,852	3,924	6,654	10,266	2,782	9,112	4,543	3,268	1,932
Ratio (b/a, %)	58.8	55.1	60.7	56.7	59.3	65.4	66.5	73.3	55.6	60.7	60.6	54.5	48.3

SOURCE: Data prepared by BAEx, MA, Guiguinto, Bulacan (1983). Fixed cost is excluded.
* Plowed by 4 wheel tractor and harrowed/followed by carabao (6 days)
** From sowing to post harvesting, including cultivation (2-6 days) and farm-own labors.

TABLE C.1.3-4 PADDY YIELDS WITH DEVELOPMENT STAGES AND CROPPING PATTERNS

(Unit : ton/ha)

Development stage	Cropping Pattern	Wet season						Dry season					
		Variety*	Pattern average	Transplanting ** St	Transplanting ** Or	Transplanting ** Av	Direct seeding	Variety*	Pattern average	Transplanting ** St	Transplanting ** Or	Transplanting ** Av	Direct seeding
Present	A	EL	3.74	3.85	3.44	3.65	3.93	E - L	4.34	4.38	3.99	4.19	4.64
	B	-	-	-	-	-	-	E - L	4.26	4.30	3.92	4.11	4.56
	C	E	3.59	3.70	3.30	3.50	3.77	E	3.05	3.08	2.81	2.94	3.26
Future Without Project	A	EL	4.04	4.16	3.72	3.94	4.24	E - L	4.65	4.79	4.28	4.49	4.98
	E	-	-	-	-	-	-	E - L	4.55	4.60	4.19	4.40	4.87
	B	E	3.88	4.00	3.57	3.79	4.07	E	3.27	3.30	3.01	3.16	3.50
Future With Project	A	L	4.66	4.61	-	-	4.71	L	5.38	5.22	-	-	5.54
	B	E	4.39	4.35	-	-	4.43	E	5.07	4.92	-	-	5.22
	C	L	4.66	4.61	-	-	4.71	-	(11.4)	(average yield of upland crops)			
	D	E	4.39	4.35	-	-	4.43	E	5.07	4.92	-	-	5.22
	E	-	-	-	-	-	-	L	5.28	5.12	-	-	5.44

Note : Each yield is calculated as follows; (Refer to page C.1-37)

Pattern average yield*** = Season average x Coefficient with cropping pattern x Coefficient with variety (a)

Yield with planting method = (a) x Coefficient with planting method

* E - Early maturing; L - Late maturing ** St - Straight transplanting; Or - Ordinary transplanting

*** For yields at present and in future without Project, yield coefficient with variety is not used because this is already involved in yield deviation with cropping pattern at these stages.

TABLE C.1.3-5 PLANTED AREA AND PADDY PRODUCTION IN FUTURE WITH PROJECT

(Unit : area-ha, production-ton)

Cropping pattern		Wet season				Dry season				Total
		Total	St	Or	Ds	Total	St	Or	Ds	
A	Area	20,212	10,106	-	10,106	20,212	4,042	-	16,170	40,424
	Production	94,188	46,589	-	47,599	110,681	21,099	-	89,582	204,869
B	Area	2,111	1,055	-	1,056	2,111	422	-	1,689	4,222
	Production	9,267	4,589	-	4,678	10,893	2,076	-	8,817	20,160
C	Area	2,250	1,125	-	1,125	0 (2,250)	-	-	-	3,375 (2,250)
	Production	10,485	5,186	-	5,299	0 (21,015)	-	-	-	10,485 (21,015)
D	Area	2,000	1,000	-	1,000	2,000	400	-	1,600	4,000
	Production	8,780	4,350	-	4,430	10,320	1,968	-	8,352	19,100
E	Area	-	-	-	-	8,392	1,678	-	6,714	8,392
	Production	-	-	-	-	45,115	8,591	-	36,524	45,115
Total	Area	26,193	13,096	-	13,097	32,715 (2,250)	6,543	-	26,172	58,908 (2,250)
	Production	122,720	60,714	-	62,006	177,009 (21,015)	33,734	-	143,275	299,729 (21,015)

Note : For each yield, refer to Table C.1.3-4.
Figures for upland crops are given in parenthesis.

TABLE C.1.3-6 FARMING PRACTICE CRITERIA OF RICE, FUTURE WITH PROJECT (1)

(Unit : per ha)

Item	Wet season Transplanting			Dry season Transplanting		
1. Varieties	IR series (IR36, 42, 54)			IR series (IR36, 42, 54)		
2. Maturity days	110 - 130			110 - 130		
3. Amount of seeds	60 kg (certified)			60 kg (certified)		
4. Nursery period	20 days			20 days		
5. Nursery bed	400 m^2			400 m^2		
6. Land preparation	One plowing and three harrowing-levelings			One plowing and three harrowing-levelings		
7. Planting density	15 cm x 30 cm, 3 seedlings/hill			15 cm x 30 cm, 3 seedlings/hill		
8. Fertilizers application	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Nursery:	2	2	2	2	2	2
Field:						
Base	27	29	19	38	29	19
First top	19	10	-	23	-	-
Second top	35	-	-	35	-	-
Total	83	41	21	98	31	21
9. Chemicals application						
Nursery	Furadan 3G 2.0 kg			Furadan 3G 2.0 kg		
Field	Furadan 3G 14.7 kg(1bag) Azodrin 202R 1ℓ Brodan EC21 1ℓ Machete 5G 20 kg (1bag)			Furadan 3G 14.7 kg Azodrin 202R 1ℓ Brodan EC21 1ℓ Machete 5G 20 kg		
10. Weeding	Two times about 10 and 25 days after transplanting			Two times about 10 and 25 days after transplanting		

Remarks : Bag of fertilizers used.

	14-14-14	Amm. phosphate	Urea	14-14-14	Amm. phosphate	Urea
Nursery	0.3	-	-	0.3	-	-
Base	2.7	1	-	2.7	1	0.5
First top	-	1	0.5	-	-	1
Second top	-	-	1.5	-	-	1.5
Total	3.0	2	2.0	3.0	1	3.0

TABLE C.1.3-6 FARMING PRACTICE CRITERIA OF RICE, FUTURE WITH PROJECT (2)

(Unit : per ha)

Item	Wet season Direct seeding			Dry season Direct seeding		
1. Varieties	IR series (IR36, 42, 54)			IR series (IR36, 42, 54)		
2. Maturity days	110 - 130			110 - 130		
3. Amount of seeds	80 kg (certified)			80 kg (certified)		
4. Land preparation	One plowing and three harrowing-levelings			One plowing and three harrowing-levelings		
5. Fertilizers application	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Field:						
Base	29	31	21	40	31	21
First top	19	10	-	23	-	-
Second top	35	-	-	35	-	-
Total	83	41	21	98	31	21
6. Chemicals application						
Seeds	Furadan 3G 2 kg			Furadan 3G 2 kg		
Field	Furadan 3G 14.7 kg Azodrin 202R 1ℓ Brodan EC21 1ℓ Machete 5G 20 kg			Furadan 3G 14.7 kg Azodrin 202R 1ℓ Brodan EC21 1ℓ Machete 5G 20 kg		
7. Weeding	Two times about 20-25 and 35-40 days after emergence			Two times about 20-25 and 35-40 days after emergence		

Remarks: Bags of fertilizers used.

	14-14-14	Amm. phosphate	Urea	14-14-14	Amm. phosphate	Urea
Base	3	1	-	3	-	0.5
First top	-	1	0.5	-	1	1
Second top	-	-	1.5	-	-	1.5
Total	3	2	2.0	3	1	3.0

TABLE C.1.3-7 FARMING PRACTICE CRITERIA OF WATERMELON
FUTURE WITH PROJECT

(Unit : per ha)

Item	Dry season Sugar Baby, Charleston Gray
1. Culture method	Seeding in hole with fertilizers
2. Growing period (days)	80 - 85
3. Amount of seeds	2 kg
4. Land preparation	One plowing, one harrowing and one furrowing
5. Planting density	100 - 250 cm x 100 - 200 cm, 3 seeds/hill

6. Fertilizers application

Dressing	N	P_2O_5	K_2O
Base *	42	42	42
First top	46	-	-
Second top	23	-	-
Total	111	42	42

* Added with 200 kg of fully decomposed animal manure.

7. Agro-chemicals application

Furadan 3G	- kg
Azodrin 202R	2 ℓ
Sevin 85S	2 ℓ
Thiodan	2 ℓ
Methyl Paration	2 ℓ
Machete 5G	- kg

8. Weeding: Three times about 15, 30 and 45 days after planting.

Remarks : Bags of fertilizers used.

	14-14-14	Urea	(Time of application
Base	6	-	(Before sowing)
First top	-	2	(10 days after sowing)
Second top	-	1	(30 days after sowing)
Total	6	3	

TABLE C.1.3-8 FARMING PRACTICE CRITERIA OF POLE SITAO FUTURE WITH PROJECT

(Unit : per ha)

Item	Dry season Bulacan Strain, Yardlong Purple, Yardlong Green
1. Culture method	Pole-training method
2. Growing period (days)	100 - 110
3. Amount of seeds	6 kg
4. Land preparation	One plowing, one harrowing and one furrowing
5. Planting density	80 - 120 cm x 30 - 60 cm, 3 - 4 seeds/hill

6. Fertilizers applicaton

Dressing	N	P_2O_5	K_2O
Base	21	21	21
First top	39	20	-
Second top(side)	23	-	-
Total	83	41	21

7. Agro-chemicals application

Furadan 3G	- kg
Azodrin 202R	8 ℓ
Sevin 85S	6 ℓ
Thiodan	6 ℓ
Methyl Paration	- ℓ
Machete 5G	- kg

8. Weeding: Two times about 14 and 20 days after planting together with cultivation and poling/training.

Remarks: Bags of fertilizers used.

	14-14-14	Amm. phosphate	Urea	(Time of application)
Base	3	-	-	(Before sowing)
First top	-	2	1	(30 days after sowing)
Second top	-	-	1	(45 days after sowing)
Total	3	2	2	

TABLE C.1.3-9 FARMING PRACTICE CRITERIA OF GREEN CORN, FUTURE WITH PROJECT

(Unit : per ha)

Item	Dry season Sweet Corn, Glutinous Corn, Philippine Cross Bantam
1. Culture method	Drill-sowing
2. Growing period (days)	100 - 110
3. Amount of seeds	15 kg
4. Land preparation	One plowing, one harrowing and one furrowing
5. Planting density	80 - 100 cm x 30 - 50 cm, 2 - 3 seeds/hill

6. Fertilizers application

Dressing	N	P_2O_5	K_2O
Base	21	21	21
Top	46	-	-
Total	67	21	21

7. Agro-chemicals application

Furadan 3G	16.7 kg
Azodrin 202R	2 ℓ
Sevin 85S	- ℓ
Thiodan	- ℓ
Methyl Paration	- ℓ
Machete 5G	- kg

8. Weeding: Two times about 12 and 20 days after planting at the time of cultivation.

Remarks: Bags of fertilizers used.

	14-14-14	Urea	(Time of application)
Base	3	-	(Before sowing)
Top	-	2	(25 days after sowing)
Total	3	2	

TABLE C.1.3-10 FARMING PRACTICE CRITERIA OF YELLOW CORN, FUTURE WITH PROJECT

(Unit : per ha)

Item	Dry season Hybrid, IPB Var 1
1. Culture method	Drill-sowing
2. Growing period (days)	80 - 85
3. Amount of seeds	20 kg
4. Land preparation	One plowing, one harrowing and one furrowing
5. Planting density	75 cm x 25 - 50 cm, 2 seeds/hill
6. Fertilizers application	Dressing: Base — N 42, P_2O_5 42, K_2O 42; First top — N 46, P_2O_5 -, K_2O -; Second top — N 23, P_2O_5 -, K_2O -; Total — N 111, P_2O_5 42, K_2O 42
7. Agro-chemicals application	Furadan 3G 16.7 kg; Azodrin 202R 2 ℓ; Sevin 85S 1 ℓ; Thiodan 1 ℓ; Methyl Paration - ℓ; Machete 5G 20 kg
8. Weeding	Two times about 12 and 20 days after planting at the time of cultivation.

Remarks: Bags of fertilizers used.

	14-14-14	Urea	(Time of application)
Base	6	-	(Before sowing)
First top	-	2	(20 days sowing)
Second top	-	1	(45 days after sowing)
Total	6	3	

TABLE C.1.3-11 RICE PRODUCTION COST AND INCOME BY SEASON AND PLANTING METHOD IN FUTURE WITHOUT PROJECT

(Unit : ₱/ha)

Cropping Pattern	Item	Wet season			Dry season		
		Straight transplanting	Ordinary transplanting	Direct seeding	Straight transplanting	Ordinary transplanting	Direct seeding
A	Production cost (a)	3,705	3,705	3,529	3,956.2	3,956.2	3,788.2
	Gross income (b)	4,992	4,464	5,088	7,664	6,848	7,968
	Net income (b-a)	1,287	759	1,559	3,707.8	2,891.8	4,179.8
	Ratio (b-a/b, %)	25.8	17.0	30.6	48.4	42.2	52.5
B	Production cost (a)	3,689	3,689	3,513	3,940.2	3,940.2	3,772.2
	Gross income (b)	4,800	4,284	4,884	5,280	4,816	5,600
	Net income (b-a)	1,111	595	1,371	1,339.8	875.8	1,827.8
	Ratio (b-a/b, %)	23.1	13.9	28.1	25.4	18.2	32.6
E	Production cost (a)	-	-	-	3,956.2	3,956.2	3,788.2
	Gross income (b)	-	-	-	7,360	6,704	7,792
	Net income (b-a)	-	-	-	3,403.8	2,747.8	4,003.8
	Ratio (b-a/b, %)	-	-	-	46.2	41.0	51.4

Note : To calculate gross income, ₱ 1.20 and ₱ 1.60 of farm-gate price are used for wet and dry season crop, respectively.

TABLE C.1.3-12 PRODUCTION COST AND INCOME BY SEASON AND PLANTING METHOD IN FUTURE WITH PROJECT

I. Paddy

(Unit : ₱/ha)

Cropping Pattern	Item	Wet season		Dry season	
		Straight trans-planting	Direct seeding	Straight trans-planting	Direct seeding
A	Production cost (a)	4,174.7	4,006.7	4,425.9	4,269.1
	Gross income (b)	5,532	5,652	8,352	8,864
	Net income (b-a)	1,357.3	1,645.3	3,926.1	4,594.9
	Ratio (b-a/b, %)	24.5	29.1	47.0	51.8
B	Production cost (a)	4,158.7	3,990.7	4,409.9	4,253.1
	Goass income (b)	5,220	5,316	7,872	8,352
	Net income (b-a)	1,061.3	1,325.3	3,462.1	4,098.9
	Ratio (b-a/b, %)	20.3	24.9	44.0	49.1
C	Production cost (a)	4,174.9	4,006.7	(Upland)	(Upland)
	Gross income (b)	5,532	5,652	-	-
	Net income (b-a)	1,357.1	1,645.3	-	-
	Ratio (b-a/b, %)	24.5	29.1	-	-
D	Production cost (a)	4,158.7	3,990.7	4,409.9	4,253.1
	Gross income (b)	5,220	5,316	7,872	8,352
	Net income (b-a)	1,061.3	1,325.3	3,462.1	4,098.9
	Ratio (b-a/b, %)	20.3	24.9	44.0	49.1
E	Production cost (a)	-	-	4,425.9	4,269.1
	Gross income (b)	-	-	8,192	8,704
	Net income (b-a)	-	-	3,766.1	4,434.9
	Ratio (b-a/b, %)	-	-	46.0	51.0

II. Upland Crops (Dry Season)

Cropping Pattern	Item	Watermelon	Green Corn	Pole sitao	Yellow corn
C	Production cost (a)	4,194	3,046.5	8,226.5	4,363
	Gross income (b)	8,000	6,075	15,000	6,800
	Net income (b-a)	3,806	3,028.5	6,773.5	2,437
	Ratio (b-a/b, %)	47.6	49.9	45.2	35.8

Note : Farm-gate prices of upland crops are as follows;

	Watermelon	Green corn	Pole sitao	Yellow corn
(₱/kg)	1.0	2.25	2.0	1.7

TABLE C.1.3-13 LABOR, ANIMAL AND MECHANICAL POWER REQUIREMENTS IN FUTURE WITHOUT PROJECT IN AMRIS AREA

(Unit : day/ha)

Requirements	Transplanting						Direct seeding					
	Wet season			Dry season			Wet season			Dry season		
	Farmer	Hire	Total	Farmer	Hire	Total	Farmer	Hire	Total	Farmer	Hire	Total
1. Labor Force												
1) Seedbedding	2.0	-	2.0	2.0	-	2.0	-	-	-	-	-	-
2) Land preparation	5.0	5.1	10.1	5.0	5.1	10.1	5.0	5.1	10.1	5.0	5.1	10.1
3) Transplanting/Sowing	2.0	18.0	20.0	2.0	18.0	20.0	3.0	-	3.0	3.0	-	3.0
4) Fertilizing	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0
5) Spraying	4.5	-	4.5	4.5	-	4.5	4.5	-	4.5	4.5	-	4.5
6) Weeding	7.5	-	7.5	7.5	-	7.5	9.5	-	9.5	9.5	-	9.5
7) Water management*	5.0	-	5.0	5.0	-	5.0	5.0	-	5.0	5.0	-	5.0
8) Harvesting (Threshing)**	2.0	17.0	19.0	2.4	19.6	22.0	2.0	20.0	22.0	2.4	23.1	25.5
9) Post-harvesting	2.0	1.0	3.0	2.0	1.5	3.5	2.0	1.0	3.0	2.0	1.5	3.5
Total	33.0	41.0	74.1	33.4	44.2	77.6	34.0	26.1	60.1	34.4	29.7	64.1
2. Animal Power	-	2.1	2.1	-	2.1	2.1	-	2.1	2.1	-	2.1	2.1
3. Mechanical Power												
1) Land preparation	-	3.0	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0	3.0
2) Spraying	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0
3) Threshing	-	1.0	1.0	-	1.2	1.2	-	1.0	1.0	-	1.2	1.2
Total	3.0	4.0	7.0	3.0	4.2	7.2	3.0	4.0	7.0	3.0	4.2	7.2

Note : Operators of animal and machinery are summed up in labor force. These figures were obtained by proportion analysis of process types.
* 4.5 man-days with early maturing varieties ** Total labor from cutting to winnowing

TABLE C.1.3-14 LABOR, ANIMAL AND MECHANICAL POWER REQUIREMENTS IN FUTURE WITH PROJECT IN AMRIS AREA

(RICE)

(Unit : day/ha)

Requirements	Transplanting						Direct seeding					
	Wet season			Dry season			Wet season			Dry season		
	Farmer	Hire	Total	Farmer	Hire	Total	Farmer	Hire	Total	Farmer	Hire	Total
1. Labor Force												
1) Seedbedding	2.0	-	2.0	2.0	-	2.0	-	-	-	-	-	-
2) Land preparation	5.0	4.7	9.7	5.0	4.7	9.7	5.0	4.7	9.7	5.0	4.7	9.7
3) Transplanting/Sowing	2.0	18.0	20.0	2.0	18.0	20.0	3.0	-	3.0	3.0	-	3.0
4) Fertilizing	5.0	-	5.0	5.0	-	5.0	5.0	-	5.0	5.0	-	5.0
5) Spraying	4.5	-	4.5	4.5	-	4.5	4.5	-	4.5	4.5	-	4.5
6) Weeding	7.5	-	7.5	7.5	-	7.5	9.5	-	9.5	9.5	-	9.5
7) Water management*	6.0	-	6.0	6.0	-	6.0	6.0	-	6.0	6.0	-	6.0
8) Harvesting (Threshing)**	2.4	19.6	22.0	3.0	23.7	26.7	2.4	23.1	25.5	3.0	27.9	30.9
9) Post-harvesting	2.0	1.5	3.5	1.8	2.4	4.2	2.0	1.5	3.5	1.8	2.4	4.2
Total	36.4	43.8	80.2	36.6	48.8	85.6	37.4	29.3	66.7	37.8	35.0	72.8
2. Animal Power	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0
3. Mechanical Power												
1) Land preparation	-	3.7	3.7	-	3.7	3.7	-	3.7	3.7	-	3.7	3.7
2) Spraying	4.5	-	4.5	4.5	-	4.5	4.5	-	4.5	4.5	-	4.5
3) Threshing	-	1.2	1.2	-	1.5	1.5	-	1.2	1.2	-	1.5	1.5
Total	4.5	4.9	9.4	4.5	5.2	9.7	4.5	4.9	9.4	4.5	5.2	9.7

Note : Operators of animal and machinery are summed up in labor force. These figures were obtained by proportion analysis of process types.

* 5.0 man-days with early maturing varieties

* Total labor from cutting to winnowing

TABLE C.1.3-15 LABOR, ANIMAL AND MECHANICAL POWER REQUIREMENTS IN FUTURE WITH PROJECT IN AMRIS AREA - UPLAND CROPS (DRY SEASON)

(Unit : day/ha)

Requirements	First crops						Second crops					
	Watermelon			Green corn			Pole sitao			Yellow corn		
	Farmer	Hire	Total	Farmer	Hire	Total	Farmer	Hire	Total	Farmer	Hire	Total
1. Land Force												
1) Land preparation	-	4.0	4.0	-	6.0	6.0	-	6.0	6.0	-	6.0	6.0
2) Sowing	5.0	-	5.0	5.0	3.0	8.0	5.0	3.0	8.0	5.0	3.0	8.0
3) Cultivation	6.0	-	6.0	-	2.0	2.0	-	2.0	2.0	-	2.0	2.0
4) Poling/Training	-	-	-	-	-	-	5.0	5.0	10.0	-	-	-
5) Fertilizing	6.0	-	6.0	3.0	-	3.0	6.0	-	6.0	6.0	-	6.0
6) Spraying	6.0	-	6.0	3.0	-	3.0	5.0	25.0	30.0	5.0	-	5.0
7) Weeding	6.0	-	6.0	3.0	-	3.0	6.0	-	6.0	3.0	-	3.0
8) Water management	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0	3.0	-	3.0
9) Harvesting/Hauling*	10.0	20.0	30.0	8.0	-	8.0	5.0	25.0	30.0	4.0	8.0	12.0
Total	42.0	24.0	66.0	25.0	11.0	36.0	35.0	66.0	101.0	26.0	19.0	45.0
2. Animal Power	-	3.0	3.0	-	7.0	7.0	-	7.0	7.0	-	7.0	7.0
3. Mechanical Power												
1) Land preparation	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0
2) Spraying	6.0	-	6.0	3.0	-	3.0	5.0	25.0	30.0	5.0	-	5.0
3) Shelling	-	-	-	-	-	-	-	-	-	-	1.0	1.0
Total	6.0	1.0	7.0	3.0	1.0	4.0	5.0	26.0	31.0	5.0	2.0	7.0

Note : Operators are summed up in labor force.

* Including labor for grading, cleaning, bagging, etc.

TABLE C.1.3-16 MONTHLY LABOR REQUIREMENT AND BALANCE IN FUTURE WITH PROJECT IN AMRIS PROJECT AREA

(Unit : 1,000 man-days)

I. Labor Requirement for Farming (a)

Cropping Pattern	Planted Area Wet season (ha)	Planted Area Dry season (ha)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
A. Rice/Rice (well-drained)	20,212	20,212	224.4	97.0	181.9	553.8	8.1	133.4	402.2	252.7	93.0	151.6	572.0	337.5	3,007.5
B. Rice/Rice (droughty)	2,111	2,111	20.3	61.6	-	-	4.2	44.5	26.6	15.6	28.7	58.9	32.3	17.1	309.9
C. Rice/Upland x 2 (well-drained)	2,250	2,250	39.8	67.1	32.6	12.2	27.5	32.9	36.7	17.3	14.4	41.6	65.0	18.7	405.7
D. Rice/Rice (sl. submerged)	2,000	2,000	14.8	15.2	70.0	46.0	21.6	10.6	50.6	4.6	-	10.8	33.4	18.0	295.6
E. Fallow/Rice (submerged)	-	8,392	68.8	20.1	172.0	115.0	-	-	-	-	-	13.4	126.7	115.8	631.9
Total*	26,193	34,965	368.1 (58.6)	261.1 (92.4)	456.6 (336.5)	726.9 (603.9)	61.4 (20.9)	221.4 (80.8)	516.1 (230.5)	290.2 (70.5)	136.1 (20.3)	276.3 (166.9)	829.3 (507.0)	507.1 (125.7)	4,650.6 (2,313.9)
II. Labor Force Available (b)			1,621	1,621	1,621	1,621	1,621	1,621	1,621	1,621	1,621	1,621	1,621	1,621	19,452
III. Balance (b-a)			1,253	1,360	1,164	894	1,560	1,400	1,105	1,331	1,485	1,345	792	1,114	14,801

Note :

* Hired labor requirement is given in parenthesis.

TABLE C.1.3-17 OPERATION COST FOR IMPLEMENTING DEMONSTRATION FARM OF UPLAND CROPS (1)

A. Operation Cost (10 ha)

No. Field personnel	Gasoline allowance per month	Cost, ₱ per season (x6)
1. Man power		
10 WMT	120	7,200
6 SWMT	120	4,320
10 FMT	200	12,000
6 SFMT	200	7,200
2 Field Cordinators	200	2,400
Sub-total 34		33,120
2. Supply and materials		
Expense for field personnel	2 x 34 x 25 days/month	10,200
Seeds	254/season	254
Sprayers (Knapsak)	170 x 10/season	1,700
Fertilizers	1,123/season	1,123
Agro-chemicals	670/season	670
Baboos	720/season	720
Sub-total		14,667
Total		44,787
Grand total for 3 seasons		143,361
" for 8 seasons		358,296

TABLE C.1.3-17 OPERATION COST FOR IMPLEMANTING DEMONSTRATION FARM OF UPLAND CROPS (2)

(Unit : ₱/ha)

B. Production Cost

Item	Quantity	Unit price	Cost
1. Land preparation	1 ha	755	755
2. Labor cost	1) 0.3 ha (Yellow corn)	341	341
	2) 0.3 ha (Watermelon)	418	418
	3) 0.3 ha (Pole sitao)	704	704
	Sub-total		1,463
3. Materials			
Seed	1) 6.7 kg	17	114
	2) 0.67 kg	90	60
	3) 2 kg	40	80
	Sub-total		254
Fertilizers	1) 2 bag 14-14-14 1 bag urea	351	351
	2) Ibid	351	351
	3) Ibid	351	351
	Compost 0.7 ton	100	70
	Sub-total		1,123
Agro-chemicals	1)	160	160
	2)	140	140
	3)	370	370
	Sub-total		670
Bamboo poles	3,000	240/1,000	720
	Total		2,767
4. Production cost			4,985
5. Expected yield (Optimum) and Gross income			
	1) 1,500 kg	1.7	2,250
	2) 3,000 kg	1.0	3,000
	3) 3,000 kg	2.0	6,000
	Total		11,250
6. Net income			6,265
Ratio of net income (%)			55.7

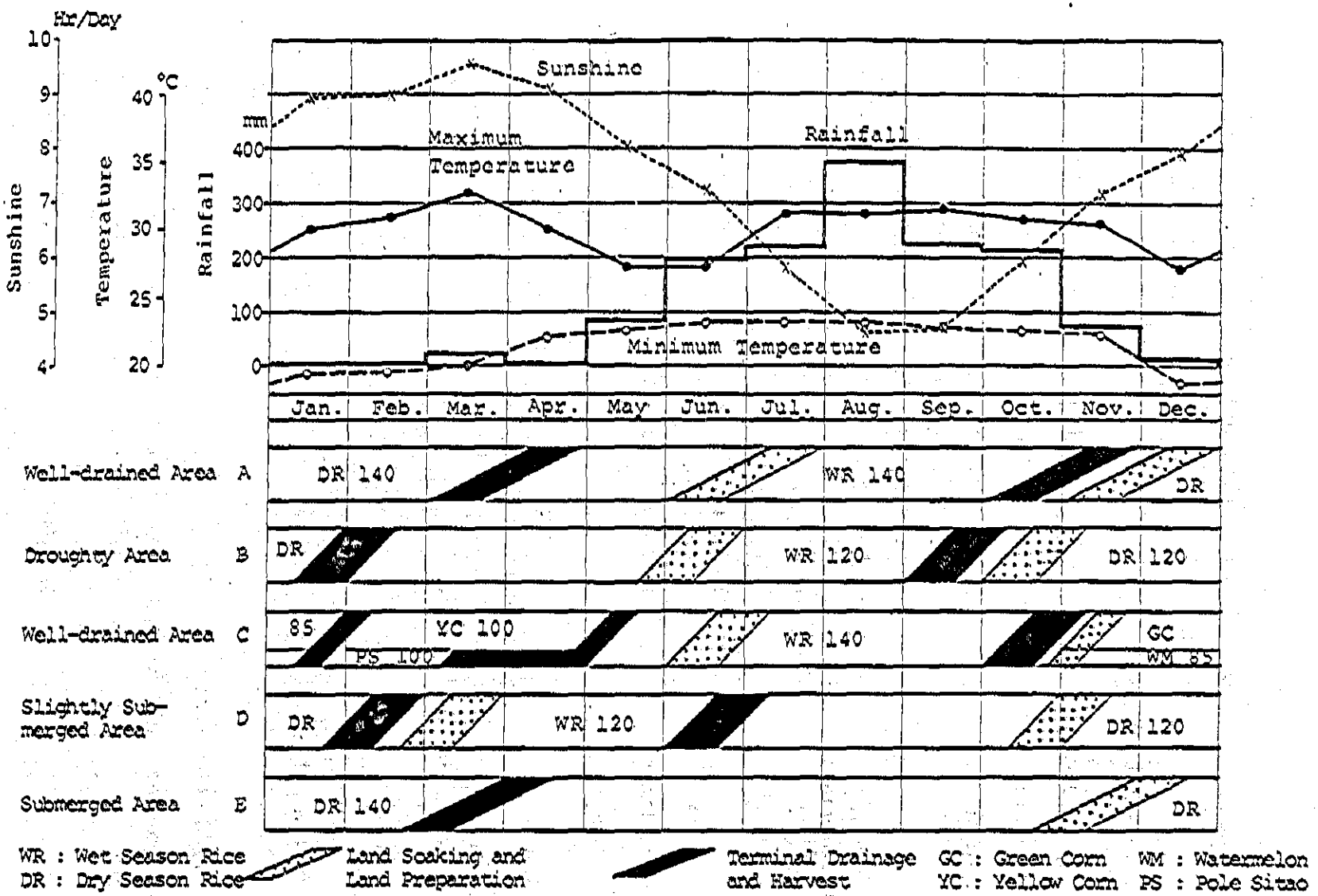


FIGURE C.1.3-1 PROPOSED CROPPING PATTERNS FOR AMRIS PROJECT AREA

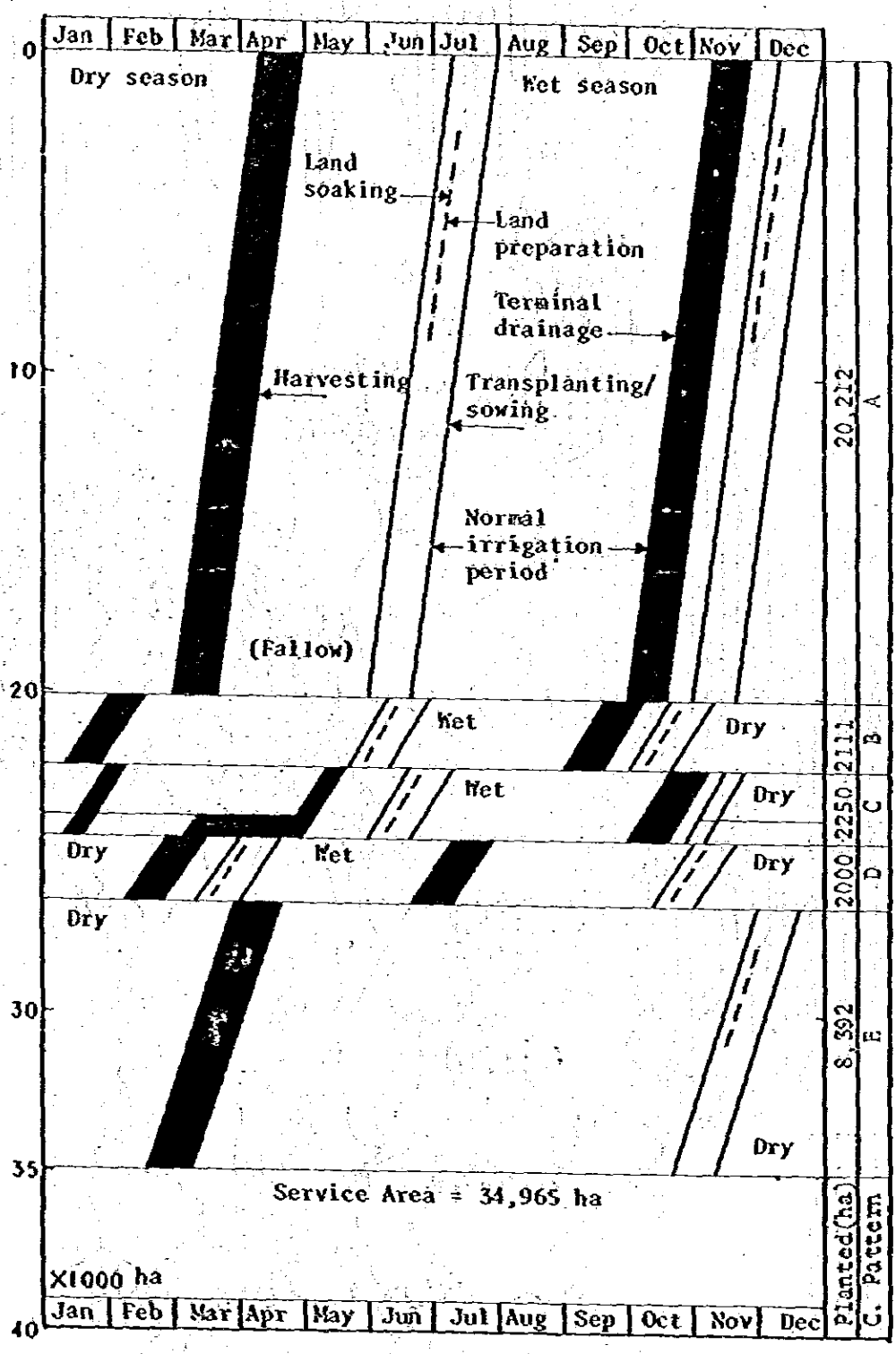


FIGURE C.1.3-2 PROPOSED CROPPING CALENDAR IN AMRIS PROJECT AREA

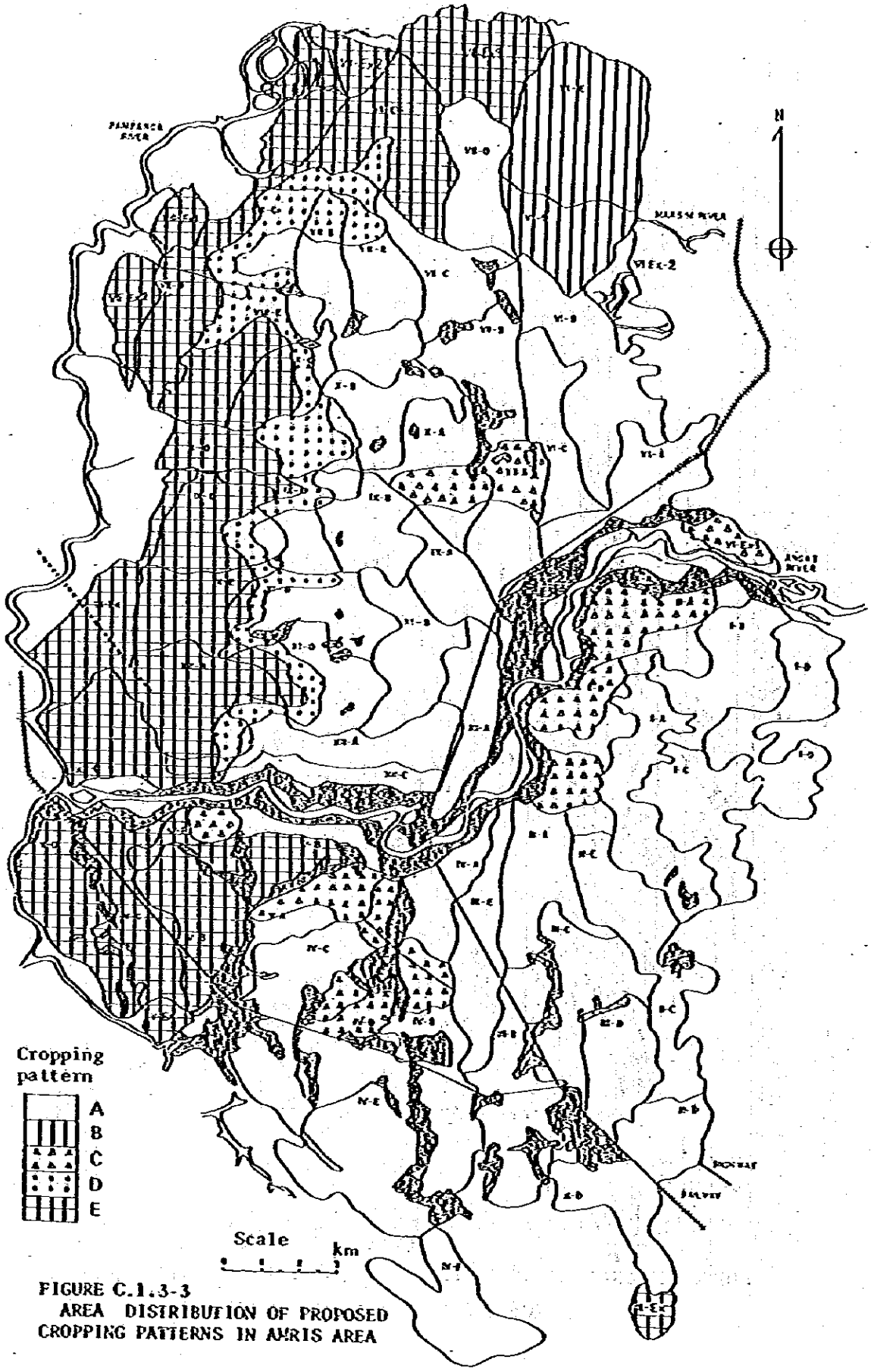


FIGURE C.1.3-3
AREA DISTRIBUTION OF PROPOSED CROPPING PATTERNS IN AURIS AREA

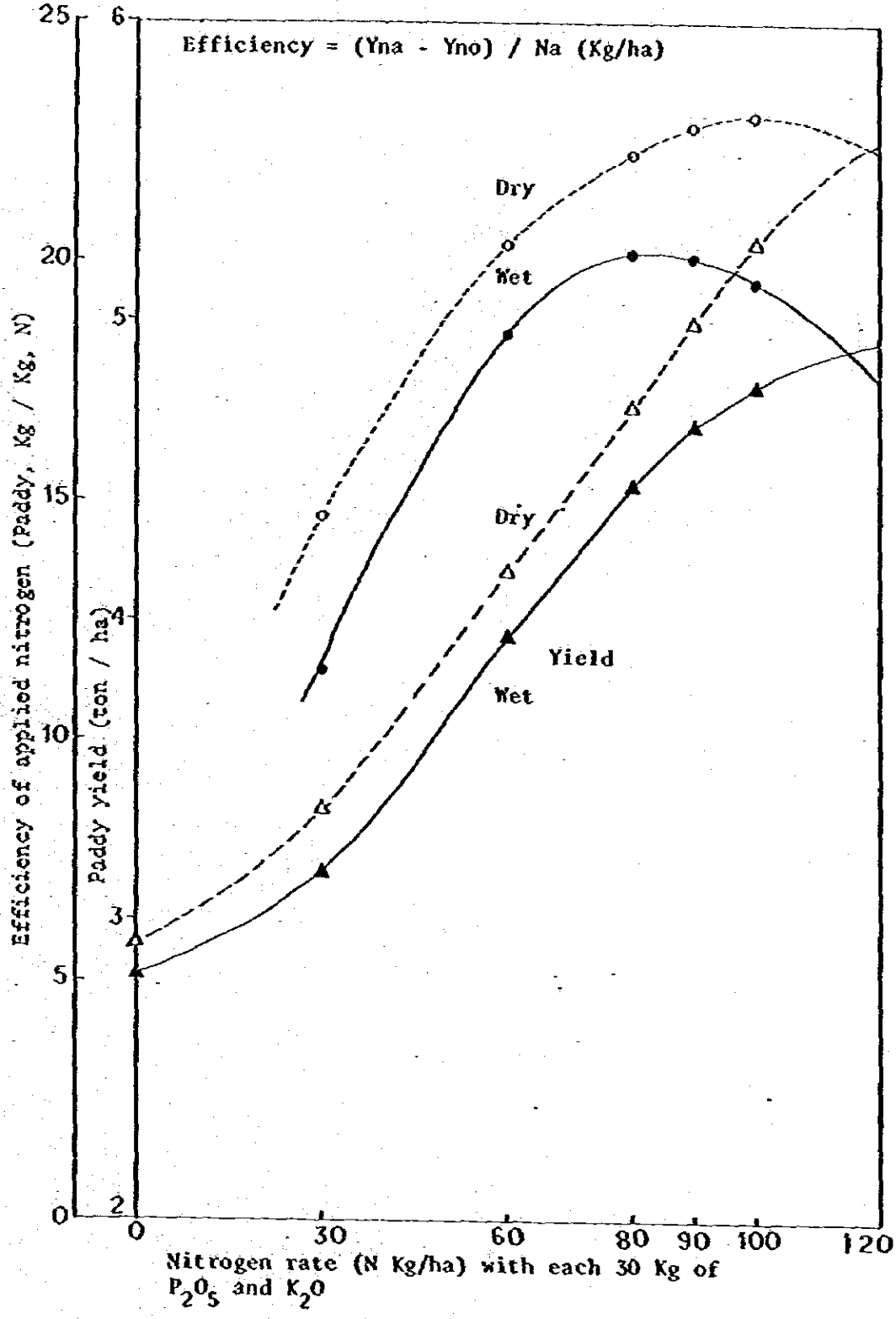


FIGURE C.1.3-4 EFFECT OF RATE OF NITROGEN APPLICATION ON PADDY YIELD AND ITS EFFICIENCIES IN PRODUCTION

(Summarized from field trials conducted in AMRIS Project Area from 1974 to 1977)

CHAPTER II. AGRI-INSTITUTION

CHAPTER II AGRI-INSTITUTION

2.1 Present Agri-Institution

2.1.1 Agricultural Research

The Project Area has no research institution under the Bureau of Plant Industry, the authority responsible for basic agricultural research. Its major institution of rice production techniques is the Maligaya Rice Research and Training Center (MRRTC) located in the Nueva Ecija Province of Region III.

The Research and Development Department of NIA Central Office has a Research Division under the direction of which Research Sections have been set up at each of the Regional Offices. Moreover, each Section has a Research Station which is served by about five specialists such as soil surveyer, agronomist and agri-institution expert. In the Project Area the Research Station (Ulingao) is located near the Region III Office at San Rafael where soil survey and field experiments in water management and fertilizer application have been carried out.

Research results thus obtained are used for technical guidance to farmers through the extension activity. Figure C.2.1-1 shows organization chart of research institutions together with training system. The Figure also refers to the activity of the Philippine Council for Agriculture and Resources Research and Development (PCARRD, formerly PCAAR established in 1972). It formulates the national research program reviews all of the research centers and line agencies, and develops the national research capabilities in terms of facilities, manpower and operational technology.

In connection with the research system NIA has its own training system as is shown in the Figure. The Personnel Management Department of NIA has established the Region Training Centers to conduct technical and managerial training including crop cultivation techniques. Thirteen Region Centers are currently actively engaged in these training programs and the Central Office Training Center is located at San Rafael. This Center concurrently provides the training for Region III area, too.

2.1.2 Agricultural Extension and Training

Agricultural extension services are rendered by BAEx (Bureau of Agricultural Extension), BPI (Bureau of Plant Industry), BAI (Bureau of Animal Industry), BS (Bureau of Soils), BCOD (Bureau of Cooperative Development), all of which belonging to the Ministry of Agriculture.

Particularly BCOD's assistance aims at establishing farmer's organizations like Samahang Nayong and so on.

The staffs of BPI and BAEx are primarily production technicians and farm management technologists, respectively. Masagana 99, the program for increased palay production, is taken care of by BAEx and PBI. (Refer to Figure C.2.1-2)

The roles of respective staff are as follows:

a) Staff of the BPI (Production Technician)

- °Guidance in techniques on the prevention of plant pests and insect damages
- ° Various experiments on the seed production and the prevention of plant pests and insect damages

b) Staff of the BAEx (Farm Management Technologist)

- ° Assistance in agricultural production
- ° Enlightenment of farmers through various demonstrations

c) Staff of the BS

- ° Analysis and classification of soils
- ° Guidance in techniques of optimal fertilization

d) Staff of the BAI

- ° Guidance in techniques of livestock and poultry breeding
- ° Operation of artificial insemination
- ° Activities on the prevention of livestock disease

e) Staff of the BCOD

- ° Establishment of the farmers' organizations like Samahang Nayong, Kilusang Bayan, and so on
- ° Promotion of systematization and management of the farmers' organizations

Respective staffs above-mentioned belong to the offices of the Ministry of Agriculture, are situated in 19 municipalities in the Project Area and carry out their duties dealing directly with the farmers.

The extension activities for the existing 1,041 compact farms in the Project Area are managed by the aforesaid five bureaus, but mainly BAEx and BPI. Particularly, staff of BAEx play an important role in the agricultural extension. Staff belonging to BAI and BS are very limited inthe Project Area.

Meanwhile, training programs for the farmers in the compact farms have been carried out from 1973 to 1978 as a part of the agricultural extension activities and 500 farmers were trained in 1980 but since 1977 the number of trained farmers decreased substantially owing to the reduction of the training staffs.

The farmers to be trained are selected by the WMTs (Water Management Technician) of each working station. Staffs of NIA, WMT, and at times, dealers of fertilizers and agricultural machinery give some lectures and guidance in agricultural techniques, agricultural management, distribution of irrigation water, operation and maintenance of the irrigation facilities, and others.

The number of staff in the AMRIS Area is as follows and each staff is responsible for about hundred (100) farmers in the Project Area.

Bureau	Number of Staffs (1980)
BPI	50
BAEx	166
BS	7
Total	223

2.1.3 Associations Related to Agricultural Production

(1) Samahang Nayon

Samahang Nayon is an association of some 25 to 200 farmers in a barangay. Its broad objective is to help improve the quality of life from the grass roots to the national level. It serves as an educational institution and as a means of generating savings and instituting discipline.

Started in 1973 by PD 175, it increasingly gained the membership of farmers and numbered 360 units with 21,609 members as of 1980. This means that almost all farmers have already been organized in the system. A tenant-tiller must become a member before he can receive the Certificate of Land Transfer. The sources of savings consist of the first compulsory one of three percent (3%) of loans obtained by members from the financial institutions and the second one of one cavan paddy per hectare per harvest. Each field-worker assigned by Ministry of Local Government and Community Development (MLGCD) is responsible for recruiting and training volunteer barrio workers who organize Samahang Nayon.

(2) Area Marketing Cooperative (AMC)

This is a full-fledged cooperative established by Samahang Nayon to serve as its marketing arm. Two AMCs and three Marketing Cooperatives have been set up in the AMRIS Area as of 1980. It plays a major role in procuring production equipment, supplies and inputs needed by farmers and in processing, storage, transportation and in selling farm produce to the National Food Authority (NFA) at the government support price.

Other group of Kilusang Bayan (economically viable Samahang Nayon) and Kilusang Kabuhayan at Kaunlaran (K.K.K. or National Livelihood Program) are being adopted as a current priority program, although little information is available about these in the Area.

Table C.2.1-1 summarizes other marketing services such as buying stations, retail, wholesale and transportation facilities installed privately or by NGA.

In spite of these organizations, many inconveniences have been pointed out and complaints voiced by farmers. For instance, most programs are insufficient in training in modern techniques, delivery of agricultural inputs (seeds and fertilizers) and credit is often delayed. Natural calamities beyond their means of control may also interfere with possible development of the farmers associations.

(3) Government Administration

National Economic and Development Authority (NEDA) is the central government body responsible for the formulation and coordination of the food production programs.

In connection with NEDA, the National Food and Agriculture Council (NFAC) was formed in 1969 by E.O. No.183 as the responsible body with broader scope, jurisdiction and authority over all government food production programs. The National Food Authority (NFA), a government corporation attached to the Office of the President plays an important role in price support and massive procurement duties. Its Bulacan branch office is located in Malolos Municipality.

2.1.4 Agricultural Credit and Input Distribution

Agrcultural credit institutions in the Project Area are one branch of the PNB (Philippine National Bank), one LB (Land Bank), one CRB (Cooperative Rural Bank) and nineteen RB's (Rural Bank). Other institutions that used to provide peasants with credit such as ACA (Agricultural Credit Association) and Samahang Nayon have been absorbed into the Land Bank.

Three types of credit, i.e., short-term (12% interest rate), medium-term (15%), and long-term (15%) are available depending on use such as purchasing agricultural input materials, machinery, or constructing a storage house.

Masagana 99 initiated in 1973 is also intended to provide interest-free loans to peasant farmers so that modern rice production technology can be diffused among them. The maximum amount of the above loan available for farmers in Bulacan and Pampanga is 1,600 Peso per hectare. Farmers also have access to Maisagana Program (Corn Production Program) and the loan from the local Rural Bank for vegetable production. (Refer to Figure C.2.1-3)

AMC (Area Marketing Cooperative) and Samahang Nayon were originally organized to help farmers purchase agricultural input materials, but so far these institutions except AMC established in 1981 in Bustos, have not been successful in rendering this kind of service. Farmers, therefore, have no alternative but to directly deal with the dealers.

2.1.5 Post-Harvest Facilities

Palay in the Project Area is dried after harvesting and threshing and then a part of it is removed to the rice milling plants.

The problem with palay processing is that there are only 16 mechanical driers with the capacity of 1,075 cavans/12 hours available in the Project Area. Presently most of harvested palay is dried in the sunlight on the roads or concrete floors. It is said that the moderate moisture of palay is around 14 percent when it is milled. It is possible to dry palay harvested in the dry season down to about 14 percent but in the wet season it is impossible to dry it in the sunlight on the roads. So, palay harvested in the wet season is sold immediately after harvesting and threshing which makes the quality of palay poor owing to insufficient dryness. The local buyers purchase those palay harvested in the wet season at a price of 1.1 pesos/kg to 1.4 pesos/kg, which is less than the government support

price of 1.7 pesos/kg. Consequently, the income of farmers has been reduced from 65 percent to 74 percent per hectare. It is considered that the introduction of mechanical driers with high capacity in the Project Area in the near future will contribute to improving farm income and management.

The standard mill charge is five pesos/cavan and the average recovery rate is 60 percent.

The current number and capacity of dryers, rice milling machines, and warehouses in the Project Area are as follows. There are two types of rice milling machine, so called Cono type and Kiskisan type and their capacity is 1,000 kg/hour and 200 kg/hour, respectively. The recovery rate, however, is higher for the Cono type.

Facilities	No.	Capacity	Remarks
Mechanical Dryer	16	1,075 cav/12 hrs	
Rice Milling Machine			
Cono	235	53,669 cav/12 hrs	NFA and privately owned
Kiskisan	107	4,551 cav/12 hrs	NFA and privately owned

With the existing milling capacity, it takes about 40 days for the plants to mill palay of 115,000 tons harvested in 1979 dry season.

Table C.2.1-1 MARKETING SERVICES IN AMRIS PROJECT AREA

	1973	1974	1975	1976	1977	1978	1979	1980
1. Samahang Nayon								
Number	167	237	257	280	290	295	297	360
Membership (farmers)	6,680	9,480	10,280	11,200	11,600	11,800	13,000	21,609
2. Area marketing Cooperatives								
Number	-	-	-	1	1	2	2	2
Membership (farmers)	-	-	-	500	5,000	6,000	6,000	6,000
3. Marketing cooperatives								
Number	-	1	1	1	1	1	3	3
Membership (farmers)	-	400	400	400	400	400	1,100	1,000
4. Buying stations								
Private	-	-	-	-	-	5	6	7
NGA	-	-	-	-	-	4	4	5
5. Retail and wholesale (Paddy)	-	-	-	-	569	561	512	-
6. Retail (Rice)	-	-	-	188	764	717	679	-
7. Jeep trailers/trucks								
Private	-	-	-	-	599	956	960	-
NGA Procurement Mobile Teams	-	-	-	-	-	10	15	18

Source : AMRIS, Region III, NIA (1981)

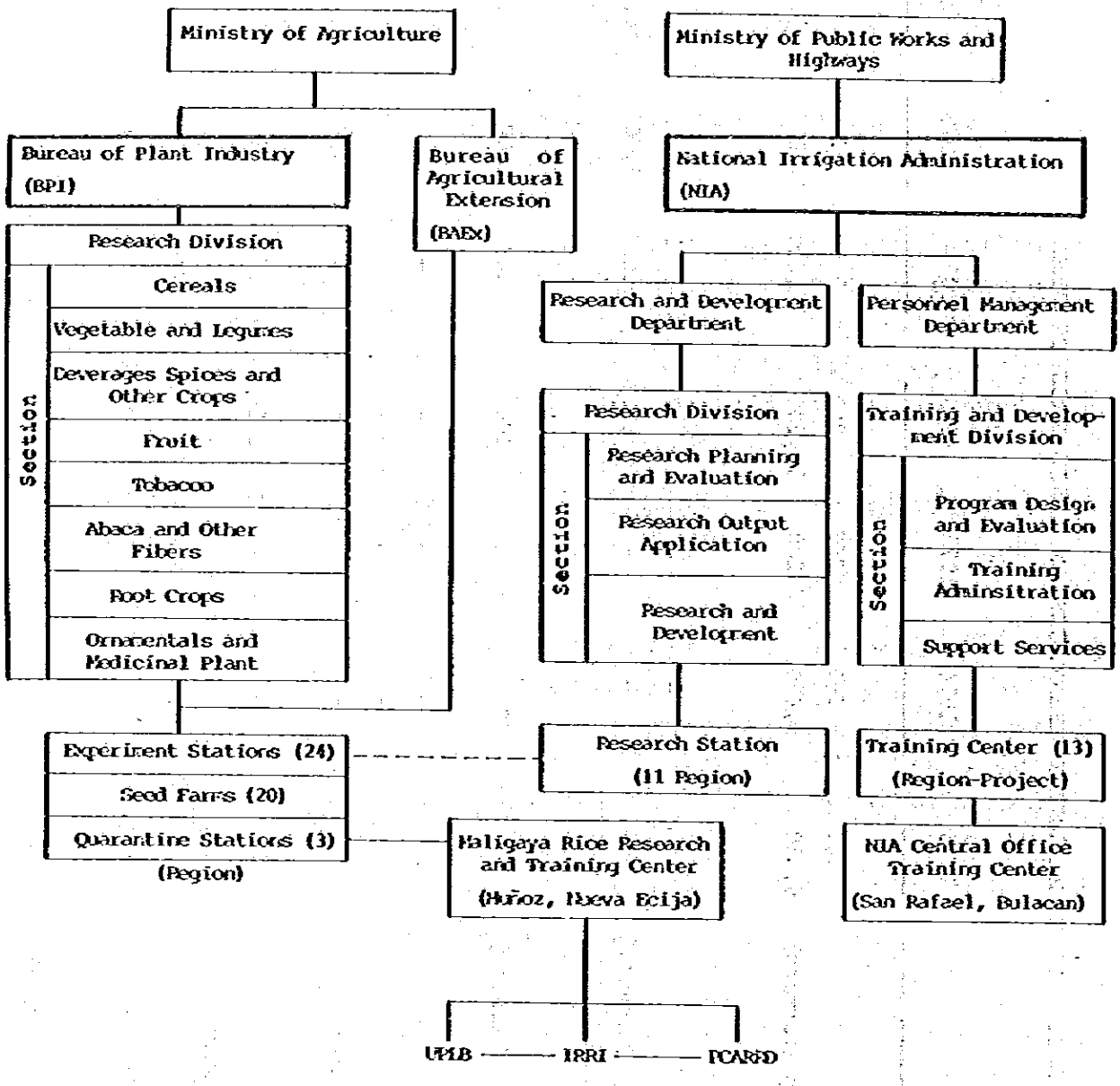


FIGURE C.2.1-1 ORGANIZATION CHART OF AGRICULTURAL RESEARCH AND TRAINING

FIGURE C.2.1-2 ORGANIZATION CHART OF AGRICULTURAL EXTENSION AT PROVINCIAL LEVEL

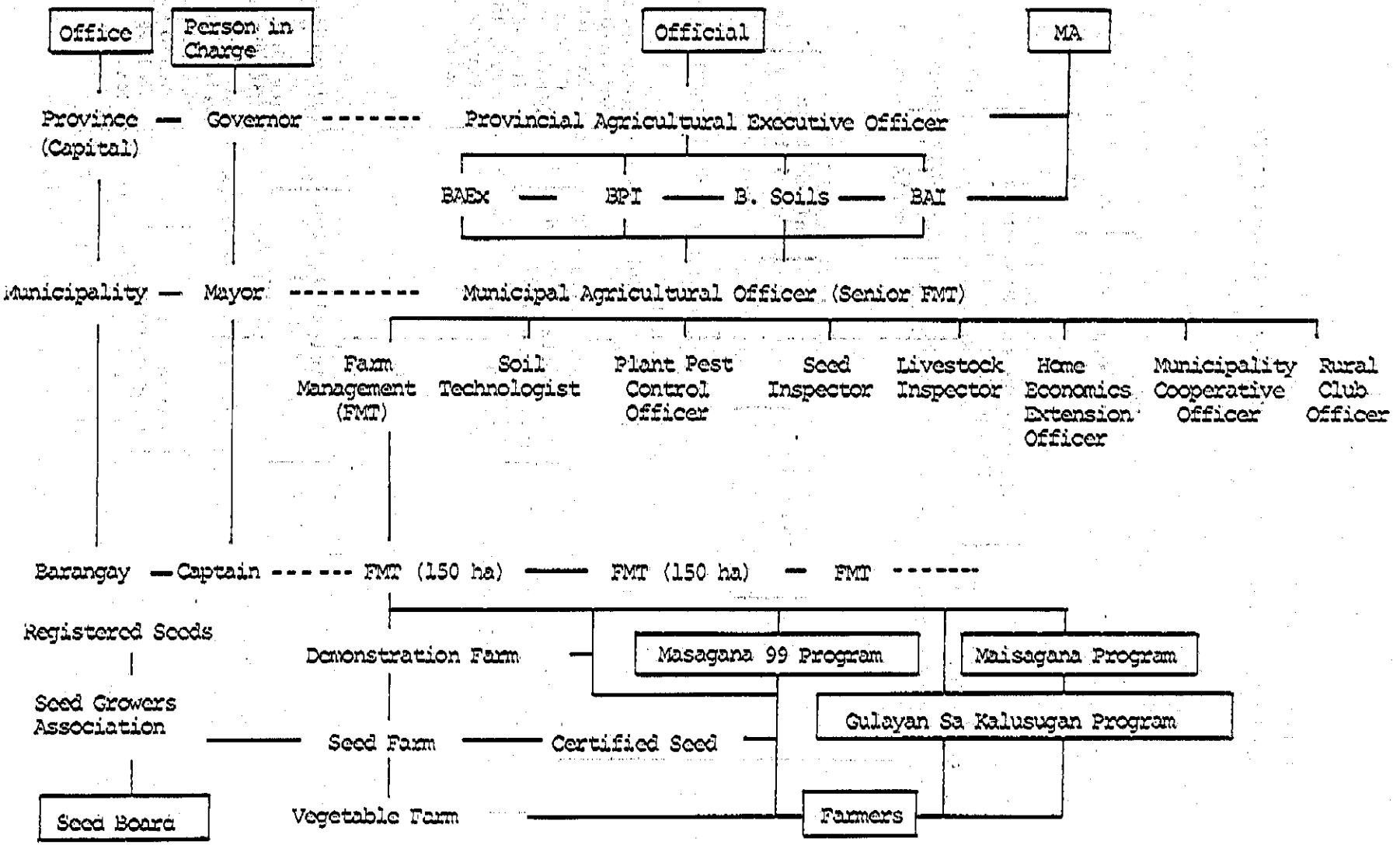
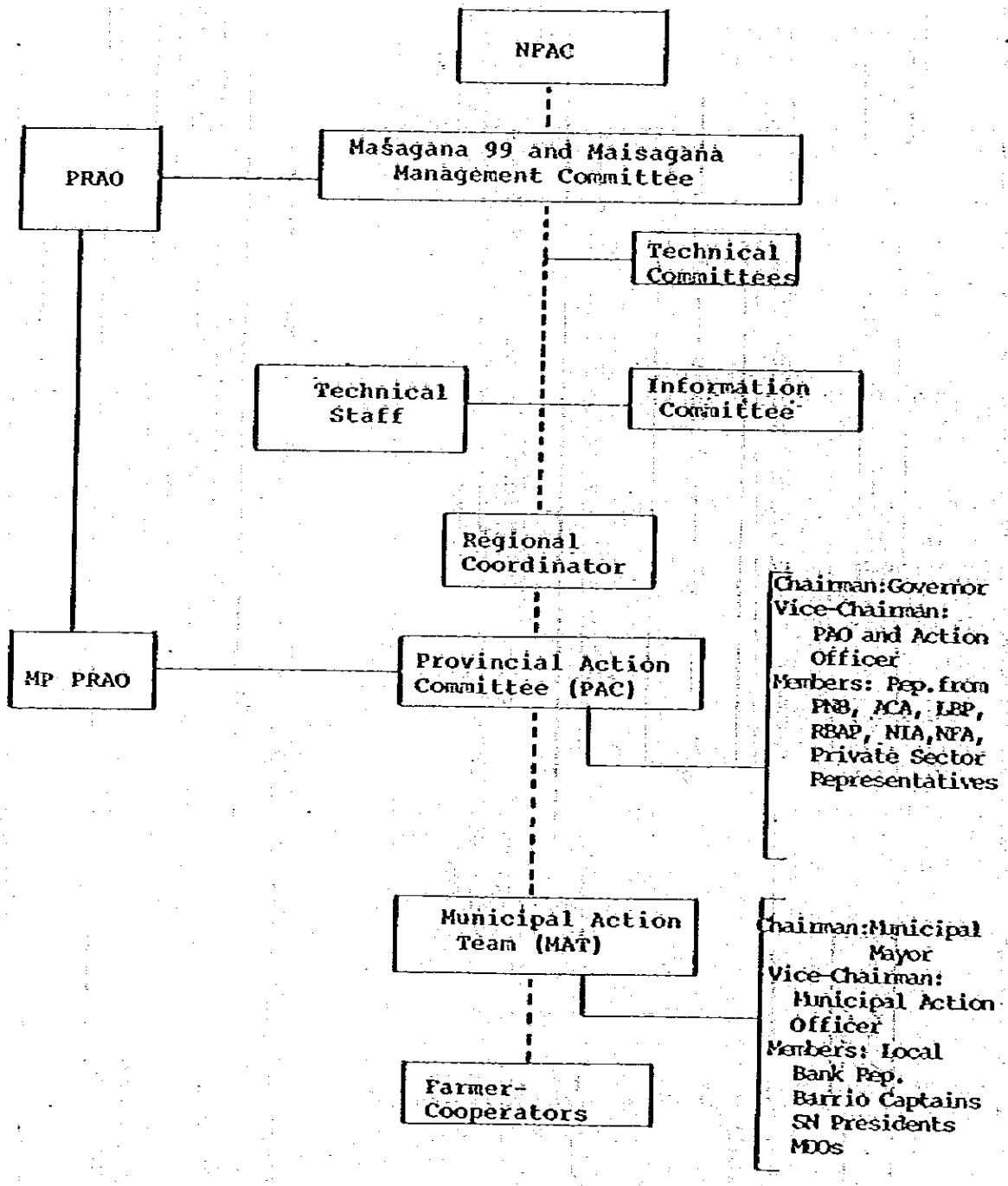


FIGURE C.2.1-3

ORGANIZATIONAL STRUCTURE - MASAGANA 99 and MAISAGANA



2.2 Proposed Agri-Institutional Development Plan

2.2.1 Agricultural Research

Fundamental research in crop production has been conducted in the National Experiment Stations and Universities whereas the Research Station attached to Region III Office shall undertake applied research in the field.

The following research items are suggested with respect to rice production and upland crops diversification in the Project Area.

(1) Trials on Rice Production

1) Effect of salinity and zinc deficiency of soils in the Candaba submerged area

2) Comparison of newly bred rice varieties to find more promising ones in terms of climatic and soil conditions in the Area

3) Effective use of agrochemicals by season and growth stage

4) Irrigation water requirement by soil condition and growth stage

(2) Trials on Crop Production

1) Adaptability of upland crops to post-paddy land conditions by crop season and drainage capacity

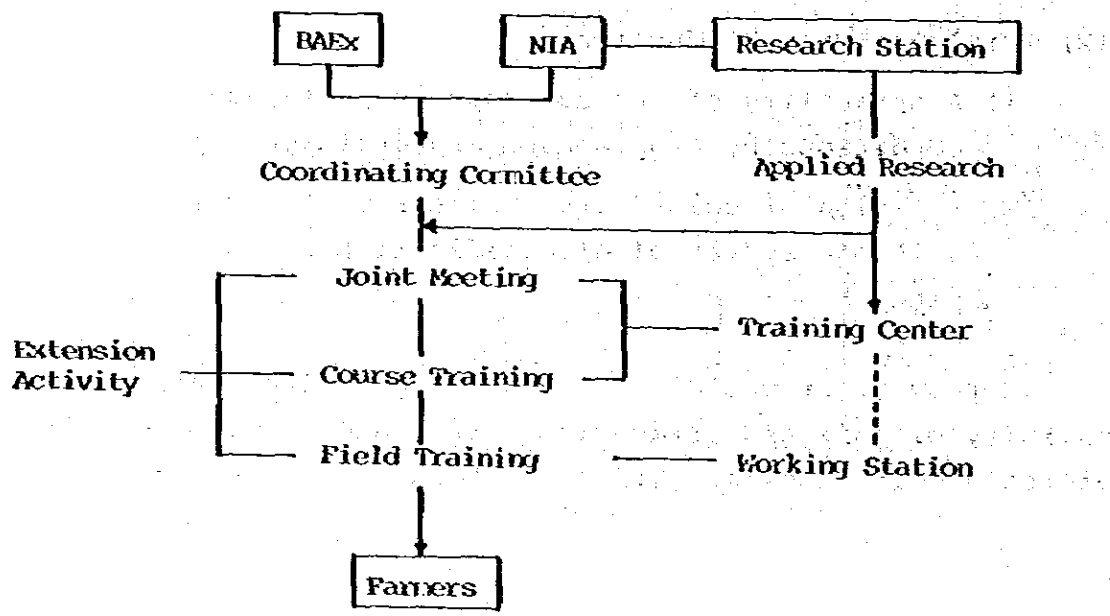
2) Rotation of upland crops with rice to verify the suitable system of diversification and multi-cropping.

Moreover, it would be desirable to monitor changes in the salinity of soil and irrigation water, and symptons of minor elements deficiencies. Trials pertaining to the upland crops

shall be carried out in cooperation with the Pilot Demonstration Farm Program. These activities shall be assisted and guided by BPI and BAEx Regional Offices in response to farmers intensions.

2.2.2 Agricultural Extension

Present status of extension workers who are assigned 140 ha each is considered adequate in number. This situation will be anticipated to become somewhat serious since the Executive Order, No.803 was signed in May, 1982. The Order was entitled "Establishing and integrated area management system for agricultural services", and directed the Ministry of Agriculture to implement and involve various government agencies in food production. Under the circumstances, extension workers will have to cover a broader area. Hence, a more intimate joint work with NIA will be needed as discussed in the Demonstration Farm Project, to cope with the administrative reform in the future. NIA Central Office Training Center at San Rafael can be successfully utilized for conducting planning, evaluation and farmers' training courses. Integrated technical instructions for farmers is also provided by field staffs at the Working Station Offices. The mutual assistance activity is illustrated below:



Greater participation of technicians in providing extension services would be difficult in the future. This will necessitate upgrading the personnel technological qualifications through more intensive inservice training, particularly with respect to upland crops management.

2.2.3 Agricultural Credit and Input Distribution

As mentioned previously, Rural Banks and other institutions have been providing credit to peasant farmers engaged in the production of rice, corn, vegetables, etc.

These programs are designed to promote the diffusion of modern technology and increased production. Though it is difficult to point out problems possibly involved in the programs themselves, these programs don't seem to have been successfully carried out as a package of technology diffusion and credit extension unlike the Masagana 99 Program. This is confirmed by the fact that credit under Masagana 99 Program has been extended in 1980 - 81 only to 9,110 ha of paddy field in the dry season and 10,770 ha in the wet season which respectively accounts for only 31 percent and 46 percent of the irrigated paddy field.

According to the status report of AHRIS Office, the low rate of credit extension to the farmers is atributed postly to difficulty in applying for further credit because of delinguency in credit loaned as well as poor harvests due to natural disasters.

As a result, the report points out, farmers have no other choice but to borrow a high-interest loan from the landowner.

Expansion of credit programs is expectrd to have positive effects on the diffusion of modern technology.

Considering the current agricultural extension activities under BAEx and BPI where an extension worker is assigned to 100 farm households, AMRIS district appears to lack sufficient extension workers to successfully carry out their activities together with credit expansion programs.

The introduction of vegetables is proposed in the AMRIS district, but since the farmers concerned have had little previous experience in upland crops, extension activities should be more intensified and credit programs be more expanded than those actually done under Masagana 99 Program, say for the credit expansion, by increasing the amount of credit per ha in proportion with the inflated agricultural input prices.

The Samahang Nayon and Area Marketing Cooperatives are responsible for the procurement of input materials, yet not many of them have been successful. AMC established at Bustos in 1981 has also been plagued by insufficient capital. Strengthening of these organizations is indispensable for the farmers to obtain at the right time input materials to their advantage.

In this respect, BCOD (Bureau of Cooperative Development) is anticipated to play an important role in promoting farmer's organizations.

2.2.4 Post-Harvest Facilities

One of the forgone explanations for the present agriculture in AMRIS Area was a serious shortage of farm machineries and processing facilities: two-wheel tractor in land preparation, power thresher in harvesting and mechanical dryer in post-harvest.

In the light of the expected acceleration in rice production in the future, it is vitally necessary to provide palay-drying facilities. This is quite a serious problem in the wet season when palay is being sold at an extremely low price due to its high moisture content and hence low yield rate in processing.

The commercial grain dryers have been developed using forced convection with heated or natural ambient air. These are available in three types which are divided by drying mechanics and capacity as described in Table C.2.2-1. The first type has been recommended for farmer level by NPA based on the utility of waste products such as paddy hulls which was proved in the research conducted by its Industrial Services and Development Division (1976). Procurement of this type may be managed by several farming participants under the existing loan systems such as Samahang Nayon. Soem domestic products are available in the market.

The second type driven by electric power would be adaptable to agricultural cooperative level. The third one is considered more grand in concept provided its construction and operation could be realized by the Government budget in the future. For this case, scale of the facilities would be designed as follows, assuming the highest paddy production of the wet season crop in the Area:

(1) Institutional Condition

1) Initial moisture content of paddy	28%
2) Final moisture content of paddy	14%
3) Grain holding capacity (one plant)	200 tons
4) Total paddy to be treated	123,000 tons
5) Team of operation	50 days

(2) Scale Deciding Factor

1) Moisture content to be decreased	14%
2) Moisture reduction rate	0.8%/hr
3) Hours to reach final moisture	17.5 hours
4) Average amount of daily reception	2,460 tons
5) Grain holding capacity of unit drier	20 tons
6) Grain holding capacity of unit storage bin	50 tons

(3) Set Institution

1) Total number of plants	12 plants
2) Number of drier per one plant	200÷20=10 units
3) Number of storage bin per one plant	200÷50= 4 units

(4) Construction Cost per One Set (₱ 1,000)

1) Kerosene-powered type	30,000
2) Rice hull-powered type	50,000

The NPA Grain Centers which have been constructed at Balagtas and San Ildefonso compounds are considered the results established in line with the above level of institution program. For further implementation in the future, the expenditures for construction and maintenance would be so far beyond the financing ability of government agency that concessional overseas loans should be reasonably envisaged for a long-term projection.

TABLE C.2.2-1 STANDARD PERFORMANCE AND UTILITY OF PADDY DRYER TYPES

Dryer Type	Grain Holding Capacity/Unit (metric ton)	Power source	Fuel	Moisture Reduction Rate (%/hr)	Unit Cost per One Tone grain (₱ 1,000)	Managerial Unit
Flatbed (Batch type)	2.0 (0.8 - 3.3)	motor/engine	Kerosene/ husk/saw dust	0.6 - 0.8	15/unit	Farmer
Circulation suction (Continuous-flow type)	3 - 10	motor	Kerosene	0.7 - 1.0	40/unit	Agricultural cooperative
Drying bin (Batch type)	10 - 30	motor/husk generator	Kerosene/ husk/saw dust	0.3 - 0.6	Kerosene : 100 Husk : 180	Government agency (NFA)

Source : Compiled from research data of Industrial Services and Development Division, NFA 1976 and others.

CHAPTER III. COST ESTIMATE

CHAPTER III COST ESTIMATE

3.1 Basic Concept on Cost Estimate

3.1.1 General

The construction works will be carried out on the Contract Basis following the Government policies currently executed in Republic of the Philippines except for on-farm development works which will be implemented on the Force Account Basis for securing seccessful coordination between NIA and the beneficiary farmers with their concensus throughout planning stage to completion.

The Project implementation works including one-year preparatory work are proposed to be comleted within seven years taking into account the construction quantity, budget support in Pesos, staffing capability of NIA and especially the establishment of viable irrigators' association.

3.1.2 Unit Cost

The costs of construction materials, labor and equipment to be used for the Project were estimated on the basis of the prices employed by NIA in 1983. The cost components are divided into two elements such as foreign currency components and local currency components. Cost components for major construction costs are as follows;

Item	Component in Percent	
	Foreign	Local
A. Materials		
1. Cement	50	50
2. Steel	100	0
3. Hardware	20	80
4. Lumber	0	100
5. Aggregate	20	80
6. Boulder	20	80
7. Miscellaneous Materials	20	80
B. Labor	0	100
C. Equipment		
1. Rental	80	20
2. Fuel & Oil	50	50
3. Equipment for Purchase	100	0

3.1.3 Cost Item

The Project cost consists of those costs for survey and design, civil works, procurement of equipment for on-farm facilities construction and post-project operation and maintenance of the systems, land acquisition, institutional development activities, project facilities, consulting services, administration as well as of the physical and price contingencies.

3.1.4 Project Cost Components

The major cost components of each item are described as follows.

(1) Cost of Civil Works

This item includes the construction costs for the Project which was estimated based on respective unit costs such as construction materials, fuel and oil, labor depreciation

and repairing cost of the construction equipment, and overhead charges for contractor. The civil works comprise the followings:

1) Diversion dam: to include earth and concrete works, and rubber dam and gate systems.

2) Irrigation canal: to include the rehabilitation and new construction works of the main, lateral and sub-lateral irrigation canals as well as feeder canals and appurtenant structures such as check gates, head gates, parshall flumes, siphons, culverts and turnouts.

3) Drainage canal: to include the rehabilitation and new construction works of the main drainages and creeks as well as appurtenant structures such as culverts, flap gates, siphons and bridges.

4) Roads: to include the rehabilitation and new construction of roads along the canals and access roads including gravel pavement.

5) On-farm facilities: to include the rehabilitation and new construction works of main and supplemental farm ditches, drains and appurtenant structures.

(2) Procurement of Equipment

The procurement of equipment entails providing equipment and vehicles for construction of on-farm facilities, heavy equipment and vehicles for post-project operation and maintenance, and office computer unit. The cost of equipment and spare-parts was estimated on the CIF Manila basis including inland transportation, delivery charges and other expenses.

(3) Land Acquisition

This item includes the cost required in procurement of the land to be occupied by irrigation, drainage and road facilities which will be constructed in the Project excepting the lands for on-farm facilities.

(4) Project Facilities

The cost covers the construction cost of buildings for the North and South Zone Engineers Offices with garages, water and electric supply facilities and office furniture.

(5) Institutional Development Programmes

This item includes the cost required for establishment of capable irrigators' association during the period of Project implementation and agricultural extension services of crop diversification programmes.

(6) Survey and Design

This item covers the cost required for field survey and geological investigation for detailed design and minor design works during the construction period.

(7) Consulting Services

The engineering fee for the consulting services by both foreign and local consultants including reimbursable cost and the cost for overseas training of the Philippines Government officials.

(8) Administration

The cost is estimated at ten percent of the above-mentioned investment cost items (1) to (7) taking into account actual costs required in projects similar to this area.

(9) Physical Contingency

The allocation of contingencies is made to cover minor differences between the actual and estimated quantities, unexpected difficulties in construction work and so forth. The contingency equivalent of 15 percent of the above-mentioned items has been employed.

(10) Price Contingency

Price escalation of 6.0 to 7.5 percent per annum for the foreign currency portion and 12.0 percent for the local currency portion are allowed respectively. Therefore, the accumulated percentage of the total price escalation was estimated at 27.6 percent of foreign currency and 59.1 percent of local currency, respectively.

3.2 Total Investment Cost and Disbursement Schedule

The total investment cost, including the cost for price escalation but excluding the interest during the construction period, was estimated at 511 million pesos (equivalent to US$ 46.45 million), of which about 250 million pesos will be foreign currency and about 261 million pesos shares local currency, respectively.

The summary of the project cost is tabulated in the following table and a breakdown table is attached hereto as Table C.3.2-1 disbursement schedule for the project cost is also tabulated in Table C.3.2-2 and the summary in shown below.

SUMMARY OF THE PROJECT COST

(Unit : P '000)

Description	Foreign Currency	Local Currency	Total
1. Survey design	-	4,000	4,000
2. Civil works	111,519	84,989	196,508
3. Procurement	33,430	1,070	34,500
4. Land acquisition	-	2,255	2,255
5. Project facilities	372	1,130	1,502
6. Institutional development	308	15,486	15,794
7. Consulting services	24,882	5,278	30,160
8. Administration	-	28,472	28,472
9. Physical contingency	25,489	21,320	46,809
10. Price Contingency	54,000	97,000	151,000
Total	250,000	261,000	511,000

SUMMARY OF THE DISBURSEMENT SCHEDULE

(Unit ₱ '000)

Project Year	Foreign Currency	Local Currency	Total	Proportion (%)
1st	13,652	9,279	22,931	6.4
2nd	58,746	28,669	87,415	24.3
3rd	23,863	25,756	49,619	13.8
4th	34,897	40,307	75,204	20.9
5th	26,184	25,710	51,895	14.4
6th	23,981	23,975	47,956	13.3
7th	14,676	10,304	24,980	6.9
Total	196,000	164,000	360,000	100.0

Note : The price escalation is excluded from the above figures.

The ratios of foreign currency and local currency to the total cost are 54.4 % of foreign components and 45.6 % of local components respectively.

The construction cost breakdown of irrigation systems, drainage systems, road systems and on-farm development are tabulated in Table C.3.2-3, C.3.2-4, C.3.2-5 and C.3.2-6 respectively.

The lists and costs for procurement of equipment for on-farm facilities construction and operation and maintenance work as well as office computer system are shown in Table C.3.2-7 and C.3.2-8.

The cost of institutional development and demonstration pilot scheme is summarized in the Table C.3.2-9 and the breakdown tables of the respective phase cost required

for institutional development scheme are also tabulated in Table C.3.2-10 and C.3.2-11 respectively.

The cost of consulting services including training cost for governmental officials concerned is estimated based on the mobilizations schedule as illustrated in Table 4.6-1 in Main Report. The breakdown table is tabulated in Tabel C.3.2-12.

The adopted price escalation ratio both for foreign and local currency as follows is based on the escalation tendency in recent years.

Year	Ratio for Foreign Currency	Ratio for Local Currency
1983	1.00	1.00
1984	1.075	1.120
1985	1.150 (1.070)	1.254 (1.120)
1986	1.219 (1.060)	1.405 (")
1987	1.292 (")	1.574 (")
1988	1.370 (")	1.762 (")
1989	1.452 (")	1.974 (")
1990	1.539 (")	2.211 (")

TABLE C.3.2-1 BREAKDOWN OF THE PROJECT COST

(Unit: ₱ '000)

Description	Foreign Currency	Local Currency	Total
1. Preparatory Works	-	4,000	4,000
2. Civil Works			
2.1. Irrigation Systems	60,926	43,813	104,739
Diversion Dams	18,553	5,217	23,770
Expansion of Canal	24,735	19,266	44,001
Rehabilitation of Canal	5,781	3,471	9,252
Structures	11,857	15,859	27,716
2.2. Drainage Systems	28,987	13,905	42,892
Expansion of Canal	2,272	1,079	3,351
Rehabilitation of Canal	22,569	10,366	32,935
Structures	4,146	2,460	6,606
2.3. Road Systems	17,935	11,084	29,019
Expansion of Road	11,588	5,889	17,477
Gravel Pavement	6,347	5,195	11,542
2.4. On-farm Development*	3,671	16,187	19,858
Extension	1,545	6,760	8,305
Rehabilitation	2,126	9,427	11,553
Sub-total	111,519	84,989	196,508
3. Procurement of Equipment	33,430	1,070	34,500
4. Land Acquisition	-	2,255	2,255
5. Project Facilities	372	1,130	1,502
6. Institutional Development	308	15,486	15,794
7. Consulting Services	24,882	5,278	30,160
Total (1 - 7)	170,511	114,208	284,719
8. Administration (10%)	-	28,472	28,472
Total (1 - 8)	170,511	142,680	313,191
9. Physical Contengencies	25,489	21,320	46,809
Total (1 - 9)	196,000	164,000	360,000
	(54.4%)	(45.6%)	(100.0%)
10. Price Escalation	54,000	97,000	151,000
Grand Total (1 - 10)	250,000	261,000	511,000
(Proportion)	(48.9%)	(51.1%)	(100.0%)

Note : * The cost of on-farm development is obtained by adding fuel cost, labor wages and depreciation costs other than those for heavy equipment cost. The cost of these procurement comprises 25.3 million pesos of foreign components and 0.7 million pesos of local components.

TABLE C.3.2-2 DISBURSEMENT SCHEDULE OF THE PROJECT COST (1)

(Unit: ₱ '.000)

Description	Total			1st			2nd (5, 12)			3rd (3,7)		
	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total
1. Preparatory Work												
Survey. Design Works	-	4,000	4,000	-	2,500	2,500	-	1,000	1,000	-	500	500
2. Civil Works												
2.1 Irrigation Systems												
Diversion Dams	18,553	5,217	23,770	-	-	-	3,000	1,250	4,250	5,089	1,780	6,869
Irrigation Canal (Ext.)	11,919	7,316	19,235	-	-	-	1,983	1,218	3,201	3,221	1,978	5,199
Irrigation Canal (Reh.)	5,781	3,471	9,252	-	-	-	1,415	841	2,256	822	494	1,316
Feeder Canal	12,816	11,950	24,766	-	-	-		-	-	-	-	-
Appurtenant Structure	11,857	15,859	27,716	-	-	-	966	1,420	2,280	1,878	2,938	4,816
Sub-total	60,926	43,813	104,739	-	-	-	7,264	4,729	11,993	11,010	7,190	18,200
2.2 Drainage Systems												
Drainage Canal (Ext.)	2,272	1,079	3,351	-	-	-	-	-	-	-	-	-
Drainage Canal (Reh.)	22,569	10,366	32,935	-	-	-	7,106	3,261	10,367	4,195	1,925	6,120
Appurtenant Structure	4,146	2,460	6,606	-	-	-	372	454	826	1,271	338	1,609
Sub-total	28,987	13,905	42,092	-	-	-	7,478	3,715	11,193	5,466	2,263	7,729
2.3 Road Systems												
Road (extension)	11,588	5,889	17,477	-	-	-	2,097	1,062	3,159	544	279	823
Pavement	6,347	5,195	11,542	-	-	-	1,010	837	1,847	564	468	1,032
Sub-total	17,935	11,084	29,019	-	-	-	3,107	1,899	5,006	1,108	747	1,855
2.4 On-farm Development												
Extension	12,192	7,052	19,244	-	-	-	807	467	1,274	1,483	858	2,341
Rehabilitation	16,779	9,835	26,614	-	-	-	2,625	1,539	4,164	3,022	1,771	4,793
Sub-total	3,671	16,187	19,858	-	-	-	3,432	2,006	5,438	4,505	2,629	7,134
Total	(28,971)	(16,887)	(45,858)									
	211,519	84,989	196,508	-	-	-	17,346	12,248	29,594	18,004	12,724	30,728
	(136,819)	(85,689)	(222,508)				(21,281)	(12,349)	(33,630)	(22,089)	(12,829)	(34,918)

*figures in parenthesis indicate construction cost including depreciation cost.

TABLE C.3.2-2 DISBURSEMENT SCHEDULE OF THE PROJECT COST (2)

(Unit: ₱ '000)

Description	TOTAL			1st			2nd			3rd		
	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total
3. Procurement of Equipment	33,430	1,070	34,500	-	-	-	28,400	750	29,150	330	70	400
4. Land Acquisition	-	2,255	2,255	-	20	20	-	365	365	-	367	367
5. Project Facilities	372	1,130	1,502	372	1,130	1,502	-	-	-	-	-	-
6. Institutional Development	308	15,486	15,794	308	1,153	1,461	-	2,665	2,665	-	4,056	4,056
7. Consulting Services	24,882	5,278	30,160	11,197	1,456	12,653	5,360	1,001	6,361	2,426	767	3,193
Grand Total (1 - 7)	170,511	114,208	284,719	11,877	6,259	18,136	51,106	18,029	69,135	20,760	18,484	39,244
8. Administration (10%)	-	28,472	28,472	-	1,814	1,814	-	6,914	6,914	-	3,924	3,924
Grand Total (1 - 8)	170,511	142,680	313,191	11,877	8,073	19,950	51,106	24,943	76,049	20,760	22,408	43,168
9. Physical Contingencies (15%)	25,489	21,320	46,809	1,775	1,206	2,981	7,640	3,726	11,366	3,103	3,348	6,451
Grand Total (1 - 9)	196,000 (54.4)	164,000 (45.6)	360,000 (100.0)	13,652	9,279	22,931	58,746	28,669	87,415	23,863	25,756	49,619
10. Price Escalation	54,000	97,000	151,000	2,024	1,113	2,137	8,812	7,282	16,094	5,226	10,431	15,657
Grand Total (1 - 10)	250,000 (48.9)	261,000 (51.1)	511,000 (100.0)	14,676	10,392	25,068	67,558	35,951	103,509	29,089	36,187	65,276

TABLE C.3.2-2 DISBURSEMENT SCHEDULE OF THE PROJECT COST (3)

(Unit: ₱ '000)

Description	4th (6)			5th (4,8)			6th (2,9,10)			7th (1,11)		
	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total
1. Preparatory work,												
Survey, Design Works	-	-	-	-	-	-	-	-	-	-	-	-
2. Civil Works												
2.1 Irrigation Systems												
Diversion Dams	2,239	572	2,811	5,796	1,185	6,981	2,429	430	2,859	-	-	-
Irrigation Canal (Ext.)	2,575	1,577	4,152	2,083	1,279	3,362	2,057	1,264	3,321	-	-	-
Irrigation Canal (Reh.)	497	293	790	1,015	599	1,614	1,580	967	2,547	452	277	729
Feeder Canal	12,816	11,950	24,766	-	-	-	-	-	-	-	-	-
Appurtenant Structure	4,517	3,560	8,077	2,112	3,401	5,513	1,727	3,290	5,017	757	1,250	2,007
Sub-total	22,644	17,952	40,596	11,006	6,464	17,470	7,793	5,951	13,744	1,209	1,527	2,736
2.2 Drainage Systems												
Drainage Canal (Ext.)	-	-	-	2,074	981	3,055	198	98	296	-	-	-
Drainage Canal (Reh.)	1,491	685	2,176	2,451	1,125	3,576	4,044	1,865	5,909	3,282	1,505	4,787
Appurtenant Structure	34	54	88	1,962	1,035	2,997	429	496	925	78	83	161
Sub-total	1,525	739	2,264	6,487	3,141	9,628	4,671	2,459	7,130	3,360	1,588	4,948
2.3 Road Systems												
Road (Extension)	1,660	839	2,499	2,573	1,318	3,891	3,566	1,804	5,370	1,148	587	1,735
Pavement	785	664	1,449	1,541	1,276	2,817	1,980	1,563	3,543	467	387	854
Sub-total	2,445	1,503	3,948	4,114	2,594	6,708	5,546	3,367	8,913	1,615	974	2,589
2.4 On-farm Development												
Extension	7,395	4,277	11,672	1,295	749	2,044	1,212	701	1,913	-	-	-
Rehabilitation	1,106	649	1,755	3,348	1,963	5,311	4,182	2,450	6,632	2,496	1,463	3,959
Sub-total	8,501	4,926	13,427	4,643	2,712	7,355	5,394	3,151	8,545	2,496	1,463	3,959
Total	28,622	24,915	53,537	21,396	14,789	36,185	19,076	14,806	33,802	7,075	5,507	12,582
	(35,115)	(25,120)	(60,235)	(26,250)	(14,911)	(41,161)	(23,404)	(41,928)	(38,332)	(8,680)	(5,552)	(14,232)

TABLE C.3.2-2 DISBURSEMENT SCHEDULE OF THE PROJECT COST (4)

(Unit: ₱ '000)

Description	4th			5th			6th			7th		
	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total
3. Procurement of Equipment	-	-	-	-	-	-	-	-	-	4,700	250	4,950
4. Land Aquisition	-	284	284	-	530	530	-	551	551	-	138	138
5. Project Facilities	-	-	-	-	-	-	-	-	-	-	-	-
6. Institutional Development	-	3,387	3,387	-	2,438	2,438	-	1,175	1,175	-	612	612
7. Consulting Services	1,736	533	2,269	1,384	507	1,891	1,787	533	2,320	992	481	1,473
Grand Total (1 - 7)	30,358	29,119	59,477	22,780	18,264	41,044	20,863	17,065	37,928	12,767	6,988	19,755
8. Administration (10%)	-	5,948	5,948	-	4,104	4,104	-	3,793	3,793	-	1,976	1,976
Grand Total (1 - 8)	30,358	35,067	65,425	22,780	22,368	45,148	20,863	20,858	41,721	12,767	8,964	21,731
9. Physical Contingencies	4,539	5,240	9,779	3,405	3,342	6,747	3,118	3,117	6,235	1,909	1,340	3,249
Grand Total (1 - 9)	34,897	40,307	75,204	26,185	25,710	51,895	23,981	23,975	47,956	14,676	10,304	24,980
10. Price Escalation	10,190	23,136	33,326	9,689	19,591	29,279	10,839	23,352	34,191	8,221	12,095	20,316
Grand Total (1 - 10)	45,087	63,443	108,530	35,873	45,301	81,174	34,820	47,327	82,147	22,897	22,399	45,296

TABLE C.3.2-3 SUMMARY OF CONSTRUCTION COST FOR IRRIGATION SYSTEMS

(Unit : 1,000 pesos)

Name of WS	Extension			Rehabilitation			Structures			Total		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1	-	-	-	106	62	168	251	379	630	357	441	798
2	464	286	750	212	133	345	382	613	995	1,058	1,032	2,090
3	29	18	47	338	206	544	573	914	1,487	940	1,138	2,078
4	209	127	336	235	144	379	1,129	1,793	2,922	1,573	2,064	3,637
5	1,331	817	2,148	677	417	1,094	424	739	1,163	2,437	1,973	4,405
6	2,575	1,577	4,152	497	293	790	4,517	3,560	8,077	7,589	5,430	13,019
7	3,192	1,960	5,152	484	288	772	1,305	2,024	3,329	4,981	4,272	9,253
8	1,874	1,152	3,026	780	455	1,235	983	1,608	2,591	3,637	3,215	6,852
9	1,592	979	2,571	985	601	1,586	622	860	1,482	3,199	2,440	5,639
10	-	-	-	383	233	616	723	1,817	2,540	1,106	2,050	3,156
11	-	-	-	346	215	561	506	871	1,377	852	1,086	1,938
12	653	400	1,053	738	424	1,162	442	681	1,123	1,833	1,505	3,338
FEEDER CANAL	9,571	8,711	18,282	-	-	-	3,246	3,249	6,495	12,816	11,960	24,776
Total	21,490	16,027	37,517	5,781	3,471	9,252	15,103	19,108	34,211	42,373	38,606	80,979

TABLE C.3.2-4 SUMMARY OF CONSTRUCTION COST FOR DRAINAGE SYSTEMS

(Unit : 1,000 pesos)

Name of WS	Extension			Rehabilitation			Structures			Total		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1	-	-	-	215	98	313	-	-	-	215	98	313
2	-	-	-	3,297	1,518	4,815	111	127	238	3,408	1,645	5,053
3	-	-	-	1,280	587	1,867	78	83	161	1,358	670	2,028
4	176	84	260	893	410	1,303	205	255	460	1,274	749	2,023
5	-	-	-	4,646	2,132	6,778	95	105	200	4,741	2,237	6,978
6	-	-	-	1,491	685	2,176	34	54	88	1,525	739	2,264
7	-	-	-	2,915	1,338	4,253	1,193	255	1,448	4,108	1,593	5,701
8	1,898	897	2,795	1,558	715	2,273	1,757	780	2,537	5,213	2,392	7,605
9	78	39	117	-	-	-	89	96	185	167	135	302
10	120	59	179	747	347	1,094	229	273	502	1,096	679	1,775
11	-	-	-	3,067	1,407	4,474	78	83	161	3,145	1,490	4,635
12	-	-	-	2,460	1,129	3,589	277	349	626	2,737	1,478	4,215
Total	2,272	1,079	3,351	22,569	10,366	32,935	4,146	2,460	6,606	28,987	13,905	42,892

TABLE. C.3.2-5 SUMMARY OF CONSTRUCTION COST FOR ROAD SYSTEM

(Unit : 1,000 pesos)

Name of WS	Extension			Gravel pavement			Total		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1	444	227	671	144	119	263	588	346	934
2	606	289	895	386	320	706	992	609	1,601
3	62	31	93	29	24	53	91	55	146
4	1,479	758	2,237	674	559	1,233	2,153	1,317	3,470
5	1,201	603	1,804	528	438	966	1,729	1,041	2,770
6	1,660	839	2,499	785	664	1,449	2,445	1,503	3,948
7	482	248	730	535	444	979	1,017	692	1,709
8	1,094	560	1,654	866	718	1,584	1,960	1,278	3,238
9	1,675	857	2,532	961	812	1,773	2,635	1,670	4,305
10	1,285	658	1,943	634	430	1,064	1,919	1,088	3,007
11	704	360	1,064	323	268	591	1,027	628	1,655
12	896	459	1,355	482	399	881	1,378	858	2,236
Total	11,588	5,889	17,477	6,347	5,195	11,542	17,935	11,084	29,019

TABLE C.3.2-6 SUMMARY OF CONSTRUCTION COST FOR ON-FARM FACILITIES

(Unit : 1,000 pesos)

Name of WS	Service Area (ha)			Rehabilitation			Expansion			Total		
	Reh.	Exp.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1	2,032	-	2,032	1,161	680	1,841	-	-	-	1,161	680	1,841
2	2,773	90	2,863	1,584	928	2,512	196	113	309	1,780	1,041	2,821
3	2,680	-	2,680	1,531	898	2,429	-	-	-	1,531	898	2,429
4	3,311	-	3,311	1,891	1,109	3,000	-	-	-	1,891	1,109	3,000
5	2,551	60	2,611	1,457	854	2,311	131	76	207	1,588	930	2,518
6	1,937	3,391	5,328	1,106	649	1,755	7,395	4,277	11,672	8,501	4,926	13,427
7	2,609	680	3,289	1,491	873	2,364	1,483	858	2,341	2,973	1,732	4,705
8	2,551	594	3,145	1,457	854	2,311	1,295	749	2,044	2,752	1,603	4,355
9	2,299	466	2,765	1,313	769	2,082	1,016	588	1,604	2,329	1,357	3,686
10	2,249	-	2,249	1,285	753	2,038	-	-	-	1,285	753	2,038
11	2,337	-	2,337	1,335	783	2,118	-	-	-	1,335	783	2,118
12	2,045	310	2,355	1,168	685	1,853	676	391	1,067	1,844	1,076	2,920
Procurement of equipment										(-) 25,300	(-) 700	(-) 26,000
										(28,971)	(16,887)	(45,858)
Total	29,374	5,591	34,965	16,779	9,835	26,614	12,192	7,052	19,244	3,671	16,187	19,858

TABLE C.3.2-7 LIST OF PROCUREMENT OF EQUIPMENT FOR ON-FARM FACILITY CONSTRUCTION

Item	Quantity	Unit Cost (₱ 1,000)	Total Cost (₱ 1,000)
1. Foreign Currency Portion			
Tractor, Crawler, 220HP	4	1,200	4,800
Tractor, Crawler, 140HP	8	700	5,600
Backhoe, Crawler, 0.4 cu.m	8	530	4,240
Motor grader, 75HP	7	430	3,010
Tire roller, 8 ton	7	280	1,960
Water tank truck, 10^4 liters	2	180	360
Concrete mixer, 140 ℓ	10	14	140
Dump truck, 6 ton	6	160	960
Pick-up truck, $^3/_4$ ton	10	40	400
Station wagon	4	140	560
Sub-total			22,030
Spare parts (15%)			3,270
Total			25,300
2. Local Currency Portion			
Inland transportation	L.S.		500
Delivery charge	"		100
Others	"		100
Total			700
Grand total			26,000

TABLE C.3.2-8 LIST OF PROCUREMENT OF EQUIPMENT FOR O & M

(Unit : P 1,000)

Item	Quantity	Unit Cost	Total Cost
1. Foregin Currency Portion			
Stake truck, 6.0 ton	4	120	480
Station wagon	3	140	420
Jeep	4	73	292
Pick-up truck, 3/4 ton	9	40	360
Centrifugal pump, 100 mm	6	12	72
Sand pump unit	2	800	1,600
Motor cycle	320	11	3,520
Office computer	1	330	330
Sub-total			7,074
Spare parts (15%)			1,056
Total			8,130
2. Local Currency Portion			
Inland transportation	L.S.		200
Delivery charges	"		120
Others	"		50
Total			370
Grand total			8,500

System Specification

NEC, System 50, Model 38
CPU : Fixed Dish
Capacity : 31 Mega Byte
Flopy Disk : 1.0 p.c
Magnet Tape : 1.0 "
Kee Board : 1.0 "
Display : 1.0 "
Printer : 1.0 "

Required Cost : 330,000 pesos

TABLE C.3.2-9 COST OF INSTITUTIONAL DEVELOPMENT

(Unit : ₱ 1,000)

Description	No. of IA	1st	2nd	3rd	4th	5th	6th	7th	Total
A. Establishment of IAs									
1. Sub-lateral group									
Basic cost per IA	-	117	116	116	-	-	-	-	349
First group	9	1,053	1,044	1,044	-	-	-	-	3,141
Second group	13	-	1,521	1,508	1,508	-	-	-	4,537
Third group	12	-	-	1,404	1,392	1,392	-	-	4,188
Sub-total	34	1,053	2,565	3,956	2,900	1,392	-	-	11,866
2. IA establishment									
Basic cost per IA	-	-	-	-	43	43	-	-	86
First group	9	-	-	-	387	387	-	-	774
Second group	13	-	-	-	-	559	559	-	1,118
Third group	12	-	-	-	-	-	516	512	1,028
Sub-total	34	-	-	-	387	946	1,075	512	2,920
Total		1,053	2,565	3,956	3,287	2,338	1,075	512	14,786
B. Agri-Extension	Demonstration for upland	100	100	100	100	100	100	100	700
Grand Total		1,153	2,665	4,056	3,387	2,438	1,175	612	15,486

TABLE C.3.2-10 COST REQUIRED OF IAs ESTABLISHMENT FOR PHASE - 1

(Unit : per 1,000 ha)

Work Description	Frequency	Persons	Amount	Remarks
1. Project orientation	Once	20	₱ 125	Refer to Fig. 4.4-1, item A1.1
2. Management, evaluation committee	Once/two months	20	2,250	" , " A1.2
3. Recruitment of FIOs	Once	140	11,200	" , " A2.3
4. Coordination meeting	Once/a month	9	17,040	" , " A2.6
5. Supervisory, assessment meeting	"	9	17,340	" , " A2.7
6. Technical inputs to FIOs	"	42	138,240	" , " A2.8
7. Seminor of staff development	Once/four months	2	1,612	" , " A2.9
8. Assessment session	Once/a month	8	2,475	" , " B3.4
9. Terminal group meeting	48 times	9	12,600	" , " B4
10. Irrigators association meeting	"	9	11,280	" , " B5
11. Travel, allowance for FIO and LTG	Continuously	42	66,150	
12. Workshop on diagnostic work	"	L.S.	800	" , " C1.1
13. Data gathering, processing	"	"	5,400	" , " C1.2
14. Data feedback and action planning	Once/four months	"	4,500	" , " C1.3
15. Monitoring and evaluation	"	"	4,500	" , " C2.2
16. Orientation and seminor of NIA staff	Three times	25	159	" , " D1.1
17. SFIO staff development	Once/four months	25	2,961	" , " D1.4
18. Pre-development training	Eight times	42	18,400	" , " D2
19. Pre-development practice	Once/a month	42	18,480	" , " D2
20. FIO development	Once/four months	42	14,107	" , " D2.6
Total			349,619	

TABLE C.3.2-11 COST REQUIRED OF FIAs ESTABLISHMENT FOR PHASE - 2

Work Description	Frequency	Persons	Amount	Remarks
1. Management, evaluation committee	Once/a month	52	₱ 1,500	Refer to Fig. 4.4-1, item 1
2. Supervisory, assessment and planning	Twice/a month	279	10,960	" , " 2
3. Coordination meeting	Once/a month	279	10,960	" , " 2
4. Recruitment of IA officer	Once	L.S.	1,530	" , " 3
5. Pre-development training	"	12	1,740	" , " 4
6. Formal staff development	"	12	2,310	" , " 3
7. Session with supervisor	3 times/a month	12	47,520	" , " 3
8. Workshop on diagnostic work	Once	L.S.	800	" , " 2
9. Data gathering, documentation	Continuously	"	4,500	" , " 2
10. Data feedback and action plan	Once/four months	"	3,000	" , " 2
11. Monitoring and evaluation	"	"	1,500	" , " 2
Total			86,320	

TABLE C.3.2-12 COST OF CONSULTING SERVICES

(Unit : ₱ 1,000)

A. Consulting Services		
1. Foreign Currency Portion		
1.1	Remuneration	20,800
	- Foreign consultants (145 MM)	14,500
	- Local consultants (175 MM)	6,300
1.2	Out-of-pocket expenses	720
	- International travel expenses	300
	- Reimbersable cost items	420
1.3	Contingencies	2,480
	Sub-total	24,000
2. Local Currency Portion		
2.1	Per diem, allowance	1,500
2.2	Transportation	2,390
2.3	Communication	350
2.4	Printing	300
2.5	Contingencies	460
	Sub-total	5,000
	Total	29,000
B. Training		
1. Foreign Currency Portion		
1.1	International travel expenses	150
1.2	per diem, allowance	315
1.3	Others	337
1.4	Contingencies	80
	Sub-total	882
2. Local Currency Portion		
2.1	Preparation expenses	100
2.2	Others	150
2.3	Contingencies	28
	Sub-total	278
	Total	1,160
	Grand Total	30,160
	Foreign Currency Portion	(24,882)
	Local Currency Portion	(5,278)

CHAPTER IV. FARM ECONOMY

CHAPTER IV FARM ECONOMY

4.1 Existing Area

Farmers in the AMRIS area are dependent on rice as the major source of income. Results of the farm management survey conducted in the first field survey of 150 farm households are summarized below.

1) About 73 percent of farm household surveyed are lease holders.

2) Average farm size per farm household is 1.1 to 2.1 ha.

3) About 67 percent of on-farm income is earned from dry season cropping.

4) Average lease imposed on leaseholder is 9.9 cavans in dry season and 9.4 cavans in wet season.

5) Average selling price of palay per kg is 1.6 pesos in dry season and 1.2 pesos in wet season. These are less than the government support price.

6) About 80 percent of farm households have sources of off-farm income.

7) 83 percent of farmers engaged in double palay cropping a year.

8) Average off-farm income per farm household is about 14,800 pesos.

9) Average household expenditure is 13,740 pesos per year.

10) Average net income of farm household including on-farm and off-farm income is 24,000 pesos.

Ratio of irrigation service fee over disposable income by land tenure and farm size is given in Tables C.4.1-1 and C.4.1-2.

Table C.4.1-1 shows that more than 80 percent of sample farm households engage in the double cropping and that the ratio of irrigation service fee to disposable income is high far leaseholders, low for owner operators (5.5 percent) and somewhere in between for amortizing owner.

Table C.4.1-2 reveals that weight average ratio of water charge to disposable income is 9.1 percent. For household with average farm size of 1.1 to 1.2 ha, the ratio is 7.5 percent.

The household with average farm size of 0.4 or 2.0 ha has a negative disposable farm income, which is compensated for by off-farm income.

Table C.4.1-3 shows the average income and expenditure per family by region in 1975. Family income and expenditure in region 3 where AMRIS area is located is 12,000 pesos and 14,500 pesos at present, respectively.

Even if the farmers in AMRIS area supplement their cost of living with off-farm income, their average living standard is higher than that of the farmers in region 3 and they have disposable income to expend on irrigation service fee. Since the lease holders account for 73 percent of the total households sampled, some effective strategies to raise the ratio of collection of irrigation service fee should be instituted.

Considering the farmers in AMRIS area have been producing a stable yield of palay of about four tons per ha, it is unlikely that they can afford to pay only nine percent of the disposable income as the irrigation service fee. In fact some farmers in AMRIS area irrigate their field with privately owned pump and pay high water charges of 8 to 11 cavans per ha in a year. Some farmers directly interviewed in the first field survey report that of 169 farmers who failed to pay irrigation service fee, 44 percent did so for financial seasons. In view of the above some farmers do not seem to quite recognize the importance of irrigation water in farming, instead they appear to give more priority to agricultural inputs and loans.

TABLE C.4.1-1 RESULT OF FARM MANAGEMENT SURVEY BY LAND TENURE

1. By Land Tenure

Item	Lease Holder	Amortizing Owner	Owner Operator
1) Average farm size (ha)	1.91	2.45	2.3
2) Gross income (₱)	38,530	50,860	45,670
On-farm income	24,380	27,430	29,820
Off-farm income	14,150	23,430	15,850
3) Expenditure (₱/year)	30,570	31,840	27,800
Cost of production	16,830	18,100	14,060
Living expenses	13,740	13,740	13,740
4) Disposable income (₱)	7,960	19,020	17,870
5) Ratio of water charge over disposable income (%)	10.2 1/	5.7	5.5

Note : 1/ $\frac{(2+3\text{cav.}) \times 1.91\ \text{ha} \times 50\ \text{kg} \times 1.7\ ₱/\text{kg}}{7,960}$

$= 10.2\ \%$

TABLE C.4.1-2 RESULT OF FARM MANAGEMENT SURVEY BY FARM SIZE

Items	Farm size 0.4 - 0.1	1.1 - 2.0	2.1 - 3.0	above 3.0
1. Disposable income per ha (₱)	7,165	5,642	3,742	2,211
2. No. of farm households sampled	30	59	32	10
3. No. of farm households with no disposable income (₱)	14	14	8	2
4. Ratio of number of farm households with no disposable income (₱)	47	24	25	20
5. Average farm size (₱)	0.86	1.55	2.64	4.42
6. Average water charge per ha 1/	425	425	425	425
7. Ratio of water charge over disposable income (%)	5.9	7.5	11.4	19.2

Note : 1/ (2+3 cav./ha) x 50 kg/cav. x 1.7 ₱
= 425 ₱/ha

TABLE C.4.1-3 AVERAGE FAMILY INCOME AND EXPENDITURE, 1975

(Unit : pesos)

Region	Average Income	Average Expenditure
Philippines	5,840	6,526
Metro Manila	10,469	10,248
Region 1	5,525	6,387
Region 2	5,102	5,751
Region 3	5,773	7,207
Region 4	5,441	6,155
Region 5	4,280	5,734
Region 6	5,484	5,932
Region 7	5,172	5,338
Region 8	4,834	4,938
Region 9	5,662	6,579
Region 10	3,803	4,434
Region 11	6,307	7,124
Region 12	5,025	6,755

Source : Philippine Statistical Yearbook 1982 - NEDA

4.2 Expansion Area

The farm management survey for the expansion area has been conducted in the second stage on 60 sample households. The survey reveals that while about 80 percent of the farmers in the existing area engage in double cropping, those in the expansion area, except the working station 6 Ex-1 and the working station 2, often plant a single crop a year due to the inundation in the wet season. Some farmers along the Pampanga River irrigate their fields with a pump in the dry season and, therefore, have to pay a higher water charge of 8 - 12 cavan/cropping per ha than that of AMRIS area.

The results of the second farm survey among 60 households are summarized below.

(1) Average farm size of 3.0 ha for lease holder and 1.7 ha for owner operator is larger than that of the existing area.

(2) Most of the area is rainfed, and especially the area along the Pampanga River often gets inundated in the wet season and is capable of a single crop a year.

(3) Average unit yield in the dry season is 3.1 ton/ha which is 30 percent lower than that of the existing area.

(4) About 90 percent of the total sample of 60 households had off-farm income, whose average is 14,200 pesos for lease holder and 13,000 pesos for owner operator.

TABLE C.4.2-1 RESULT OF FARM MANAGEMENT SURVEY IN EXPANSION AREA

Item	Lease Holder	Owner Operator
1) Average farm size	3.0 ha	1.7 ha
2) Gross Income (₱)	35,085	30,036
On-farm	20,874	16,978
Off-farm	14,211	13,058
3) Expenditure (₱)	20,907	18,732
Cost of production	7,167	4,992
Living Expenses	13,740	13,740
4) Disposable Income	14,178	11,324

CHAPTER V. PROJECT EVALUATION

TABLE C.4.2-1 RESULT OF FARM MANAGEMENT SURVEY IN EXPANSION AREA

Item	Lease Holder	Owner Operator
1) Average farm size	3.0 ha	1.7 ha
2) Gross Income (₱)	35,085	30,036
On-farm	20,874	16,978
Off-farm	14,211	13,058
3) Expenditure (₱)	20,907	18,732
Cost of production	7,167	4,992
Living Expenses	13,740	13,740
4) Disposable Income	14,178	11,324

CHAPTER V. PROJECT EVALUATION

CHAPTER V PROEJCT EVALUATION

5.1 Economic Prices of Agricultural Inputs and Outputs

The economic prices of agricultural inputs and outputs were estimated based on the unit prices collected in the survey whereas those of traded goods such as paddy and yellow corn, etc. were based on the forest of the World Bank.

Table C.5.1-1 to C.5.1-8 present the economic prices of various inputs and outputs used for the project evaluation.

5.2 Economic Cost of Farm Labor

Wages of farm labor in the area have been collected in the farm economic survey and supplemented by those at the BAEcon and AMRIS offices in Region III.

The average wage rate in 1982 was ₱ 15/day while it was ₱ 18 - 20 from January till August in 1983.

The eight month average is 18.80 Pesos/day. The wage rate obtained in the sample survey has been determined under the imperfect labor market conditions (lack of information due to insufficient road & communication net work and immobility of labor force) and, therefore, does not reflect the labor surplus which is likely to exist in the area.

In an attempt to correctly estimate the demand-supply conditions of the labor market, the concept of opportunity cost of labor is introduced by applying the conversion factor of 0.52 for unskilled labor in rural area.

The wage rate thus obtained reflects the opportunity cost of labor in the domestic market and the derivation of economic wage rate expressed in terms of boder price requires further application of conversion factor of 0.84 for consumption goods. Thus, the economic wage rate turns out to be 8.21 pesos/day.

Monthly Wage Rate 1983 (Jan. - Aug.)

(Unit : ₱/man day)

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.
18.0	18.0	18.0	18.0	18.0	20.0	20.0

Aug.	Sept.	Oct.	Nov.	Dec.	Average
20.0	-	-	-	-	18.8

Economic Wage Rate : 18.8 x 0.52 x 0.84

= ₱ 8.21/man day

TABLE C.5.1-1 FARM-GATE PRICES OF AGRICULTURAL INPUTS (ECONOMIC)

Item		1995 Unit	Economic
Seed	Paddy	₱/ton	2,000
	Yellow Corn	"	1,855
	Green Corn	"	1,650
	Water Melon	₱/kg	25
	Pole Sitao	"	25
Crops	Paddy	₱/ton	2,045
	Yellow Corn	"	1,910
	Green Corn	"	1,670
	Water Melon	₱/ton	1,460
	Pole Sitao	"	3,400
Fertilizers			
	N	₱/kg	9.4
	P_2O_5	"	8.6
	K_2O	"	3.6
Agro-Chemicals			
	Furadan	₱/kg	8
	Azodrin	₱/ℓ	52
	Brodan	"	52
	Machete	₱/kg	5
	Sevin	₱/ℓ	49
	Thiodan	"	49
	Methyl Paration	"	41
	Ratoxin	₱/kg	45
Animal	Plowing	₱/day	25
	Harrowing	"	25
Agri. Machineries			
Four Wheel Tractor			
	Plowing	₱/ha	399
Hand Tractor			
	Plowing	₱/ha	276
	Harrowing	"	213
Power Thresher		"	213
Shelling		"	265
Sprayer		"	15
Land Preparation		₱/ha	W/O 381
			W 458

TABLE C.5.1-2 PRICE STRUCTURE OF RICE[a/]

Item	Economic[b/] (1995) ₱/ton	US$/ton
Exprot price, F.O.B. Manila 25 - 35% brokens [c/]	3,540	322
Less:		
Port charges	60	
Port handling & storage	50	
Cost of transportation, project area to Manila	80	
Milling cost	110	
Plus:		
Value of milling by-products	85	
Price, ex-mill project area	3,325	
Paddy equivalent price (63% milling recovery)	2,095	
Less:		
Paddy procurement cost[d/]	50	
Farm-gate paddy price[e/]	2,045	

Note:

a/ All prices expressed in tern of 1983 values. US$ 1.00 = ¥ 11.0

b/ Economic prices have been determined by applying to transportation costs the conversion factor for transport (0.78) and for other items, the standard conversion factor (0.82).

c/ Derived by taking a 30% discount from the price of 5% brokens f.o.b. Bangkok.

d/ Includes cost of required storage capacity.

e/ Financial price for 1983 is actual, for 1993 it is the export parity price for paddy.

TABLE C.5.1-3 PRICE STRUCTURE OF CORN [a/]

Item	Economic [b/] (1995) ₱/ton	US$/ton
Export price, U.S. No.2 yellow F.O.B. gulf		155
Ocean freight & insurance to philippines port		25
Export price C.I.F. Manila	1,980	180
Port handling charges	90	
Transport cost to selling center	40	
Transport cost, mill to selling center	25	
Milling & packaging cost	150	
Handling & transport cost farm to mill	25	
Farm-gate price - Yellow	1,910	
- Green [c/]	1,670	

Note:

a/ All prices expressed at 1983 constant prices at shadow priced exchange rate of US$ 1.00 = ₱11.0

b/ Economic prices have been determined by applying to transportation cost the conversion factor for transportation cost the conversion factor for transport (0.78) and for other items, the standard conversion factor of (0.82).

c/ Estimated at 89% of the price of yellow corn in the domestic market.

TABLE C.5.1-4 FARM-GATE PRICE OF WATERMELON (ECONOMIC)

(Unit: ₱/ton)

1983		1995	
Financial	Economic	Financial	Economic
950	780	1,640	1,350

Note: Average farm-gate price per kg in the last three years is about 0.95 pesos. This price was used for economic evaluation.

TABLE C.5.1-5 FARM-GATE PRICE OF POLE SITAO

(Unit: ₱/ton)

1983		1995	
Financial	Economic	Financial	Economic
1,830	1,500	2,820	2,310

Note: Average farm gate price in the last three is about 183 pesos per kg. This price was used for economic evaluation.

TABLE C.5.1-6 PRICE STRUCTURE OF UREA[a/]

Item	Economic (1995) ₱/ton	US$/ton
Export price, F.O.B. Indonesia		303
Ocean freight & insurance		28
Import price, C.I.F. Manila	3,640	331
Port handling, storage and processing charges[b/]	105	
Importer's cost[b/]	370	
Average cost of transportation to & handling at distribution center[c/]	115	
Dealer's margin[b/]	70	
Average cost of transportation from distribution center to farm[c/]	15	
Urea farm-gate price (N: 46%)	4,315	
Nitrogen farm-gate price (per nutrient kg)	9.4	

Note:

a/ All values expressed in terms of constant 1983 prices. The peso is priced at the official exchange rate of US$ 1.00 = ₱ 11.0

b/ The economic price for these items was obtained by applying the standard conversion factor of 0.82.

c/ The economic prices for transportation were determined by applying the transportation conversion factor of 0.78.

TABLE C.5.1-7 PRICE STRUCTURE OF T.S.P [a/]

Item	Economic (1995) ₱/ton	US$/ton
Export price, F.O.B. U.S. Gulf		215
Ocean freight & insurance		70
Import price, C.I.F, Manila	3,135	285
Port handling, storage and processing charge [b/]	105	
Importer's cost [b/]	495	
Average cost of transportation to and handling at distribution center [c/]	115	
Dealer's margin [b/]	70	
Average cost of transportation from distribution center to farm [c/]	15	
T.S.P. farm-gate price (P: 46%)	3,935	
Phosphorus farm-gate price (per nutrient kg)	8.6	

Note:

a/ All values expressed in terms of constant 1983 prices. The peso is priced at the official exchange rate of US$ 1.00 = ₱ 11.0

b/ The economic price for these items was obtained by applying the standard conversion factor of 0.82.

c/ The economic prices for transportation were determined by applying the transportation conversion factor of 0.78.

TABLE C.5.1-8 PRICE STRUCTURE OF MURIATE OF POTASH[a/]

Item	Economic (1995) ₱/ton	US$/ton
Export price, P.O.B. Vancowver		121
Ocean freight & insurance		25
Import price, C.I.F. Manila	1,606	146
Port handling, storage and processing charges [b/]	105	
Importer's cost [b/]	245	
Average cost of transportation to and handling at distribution center [c/]	115	
Dealer's margin [b/]	70	
Average cost of transportation from distribution center to farm [c/]	15	
M. potash farm-gate price (K: 60%)	2,160	
Potassium farm-gate price (per nutrient kg)	3.6	

Note:

a/ All values expressed in terms of constant 1983 prices. The peso is priced at the official exchange rate of US$ 1.00 = ₱ 11.0

b/ The economic price for these items was obtained by applying the standard conversion factor of 0.82.

c/ The economic prices for transportation were determined by applying the transportation conversion factor of 0.78.

5.3 Economic Benefit and Cost

Initial economic costs of project have been estimated by multiplying the relevant conversion factors and various cost items in the local currency portion exclusive of the price contingency and land acquisition. The total economic cost is 332,542,000 pesos as given in Table C.5.3-1.

Tables C.5.3-2 and C.5.3-3 show the incremental O & M cost of 2,876,000 pesos per year.

Based on the production cost of various crops in Table C.5.3-4 and the farm gate price of various inputs in Table C.5.1-1, the agricultural production benefits with project have been calculated to be 75,667,000 pesos (see Table C.5.3-5) per annum.

Assuming that O & M equipment for irrigation and drainage has a life of 10 years and the pump 20 years, the replacement cost allocated is 804,000 pesos and 5,692,000 pesos respectively.

The streams of economic cost and benefit over the project life of 50 years have been converted into present worth values using various discount rates. Table C.5.3-6 presents the streams of economic cost, benefit, and present worth value. The economic internal rate of return thus calculated is 17.53 percent.

TABLE C.5.3-1 ECONOMIC PROJECT COST BY YEAR

(Unit : ₱ 1,000)

Description	1st	2nd	3rd	4th	5th	6th	7th	Total
1. Preparation	2,050	820	410	-	-	-	-	3,280
2. Civil Works	-	27,475	28,527	49,227	33,627	31,321	11,629	181,806
3. Procurement Equipment	-	29,049	391	-	-	-	4,916	34,356
4. Land Acquisition	-	-	-	-	-	-	-	-
5. Project Facilities	1,307	-	-	-	-	-	-	1,307
6. Institutional Developmet	1,135	1,830	3,326	2,777	1,999	-	-	13,006
7. Consulting Services	12,391	6,181	3,055	2,173	1,800	2,224	1,386	29,210
Sub-total (1 - 7)	17,001	65,710	35,709	54,177	37,426	34,509	18,433	262,965
8. Administration	1,700	6,571	3,571	5,418	3,743	3,451	1,843	26,297
Total (1 - 8)	18,701	72,281	39,280	59,595	41,169	37,960	20,276	289,262
9. Physical Contingency	2,806	10,842	5,892	8,940	6,175	5,694	3,041	43,390
10. Price Contingency	-	-	-	-	-	-	-	-
11. Grand Total	21,507	83,123	45,172	68,535	47,344	43,654	23,317	332,652

TABLE C.5.3-2 INCREMENTAL O&M COST PER HECTARE

Item	Future Without Project	O&M Cost Required with Project						Incremental O&M Cost	
		Phase-1			Phase-2				
		NIA	IA	Total	NIA	IA	Total	Phase-1	Phase-2
A. Financial Cost									
Total cost (₱1,000)	9,015	9,580	-	9,580	8,230	4,862	13,092	565	4,077
Service area (ha)	31,485	34,965	-	34,965	34,065	34,965	34,965	-	-
O&M cost per ha.	286	274	-	274	235	139	374	(-) 12	88
B. Economic Cost									
O&M cost per ha. (₱/ha)	235	225	-	225	193	114	307	(-) 10	72

Note : 1. Phase-1 and Phase-2 of the O&M cost required mean before and after partial turnover of operation and maintenance works to IAs.

2. Standard conversion factor of 0.82 was applied when economic cost is converted from financial cost.

TABLE C.5.3-3 INCREMENTAL O&M COST BY YEAR

Year	With Project							Without Project			Economic Incremental O&M Cost 1 - 2 (₱1,000)
	Impl'd Area (ha)	Remain' Area (ha)	Economic O&M Cost (₱/ha) Impl'd Area	Economic O&M Cost (₱/ha) Remain' Area	(₱1,000) Impl'd Area	(₱1,000) Remain' Area	(₱1,000) Total 1	Area (ha)	Economic O&M Cost (₱/ha)	O&M Cost 2 (₱1,000)	
1984	0	34,965	0	225	0	7,867	7,867	33,886	235	7,963	(-) 96
1985	4,966	29,999	225	225	1,117	6,750	7,867	"	"	"	(-) 96
1986	10,934	24,031	225	225	2,460	5,407	7,867	"	"	"	(-) 96
1987	16,262	18,703	225	225	3,659	4,208	7,867	"	"	"	(-) 96
1988	22,718	12,247	225	225	5,112	2,756	7,867	"	"	"	(-) 96
1989	30,595	4,370	307	225	9,393	983	10,376	"	"	"	2,413
1990	34,965	0	307	225	10,734	0	10,734	"	"	"	2,771
1991	34,965	0	307	225	10,734	0	10,734	"	"	"	2,771
1992	34,965	0	307	225	10,734	0	10,734	"	"	"	2,771

Note : Impl'd : Implemented
Remain': Remaining

TABLE C.5.3-4 SUMMARY OF CROP PRODUCTION COST

(Unit: Pesos)

Cropping Pattern	Without Project				With Project							
	A.D.		A.D.E.		A.B.C.D.		A.B.D.E.		C			
Season	Wet Season		Dry Season		Wet Season		Dry Season		Dry Season			
Method	T.P.	D.S.	T.P.	D.S.	T.P.	D.S.	T.P.	D.S.	Green Corn	Yellow Corn	Water Melon	Pole Sitao
Seed	200.0	260.0	200.0	260.0	120.0	160.0	120.0	160.0	24.8	37.1	50.0	150.0
Fertilizers												
N	672.1	672.1	780.2	780.2	780.2	780.2	921.2	921.2	629.8	1,043.4	1,043.4	780.2
P_2O_5	120.4	120.4	120.4	120.4	352.6	352.6	266.6	266.6	180.6	361.2	361.2	352.6
K_2O	50.4	50.4	50.4	50.4	75.6	75.6	75.6	75.6	75.6	151.2	151.2	75.6
Sub-total	842.9	842.9	951.0	951.0	1,208.4	1,208.4	1,263.4	1,263.4	886.0	1,555.8	1,555.8	1,208.4
Agro-chemicals												
Sub-total	360.1	360.1	360.1	360.1	360.1	360.1	360.1	360.1	237.6	435.6	180.0	3,070.0
Machineries												
Land preparation	1,143.0	1,143.0	1,143.0	1,143.0	1,694.6	1,694.6	1,694.6	1,694.6	458.0	458.0	458.0	458.0
Spraying	45.0	45.0	45.0	45.0	67.5	67.5	67.5	67.5	24.0	24.0	48.0	240.0
Threshing/Shelling	213.0	213.0	255.6	255.6	255.6	255.6	319.5	319.5	-	265.0	-	-
Sub-total	1,401.0	1,401.0	1,443.6	1,443.6	2,017.7	2,017.7	2,081.6	2,081.6	482.0	747.0	506.0	698.0
Draft Animal	52.5	52.5	52.5	52.5	25.0	25.0	25.0	25.0	175.0	175.0	75.0	175.0
Hired Labor	337.4	214.3	362.9	243.8	359.6	240.5	400.6	287.4	90.3	156.0	197.0	541.9
Miscellaneous	168.1	165.2	176.9	174.0	215.2	211.3	223.3	219.5	403.3	403.5	357.2	373.7
Total	3,362.0	3,296.0	3,547.0	3,485.0	4,306.0	4,223.0	4,474.0	4,397.0	2,299.0	3,510.0	2,921.0	6,217.0

Note : T.P. : Transplanting ; D.S. : Direct Seeding.

TABLE C.5.3-5 INCREMENTAL AGRICULTURAL BENEFIT 1/2

	A				B				C		
	Wet		Dry		Wet		Dry		Wet		Dry
	T.P	Direct	T.P	Direct	T.P	Direct	T.P	Direct	T.P	Direct	G. Corn
Without Project											
Yield (ton/ha)	3.94	4.24	4.49	4.98	3.79	4.07	3.16	3.50	-	-	-
Unit Price (₱/ton)	2,045	2,045	2,045	2,045	2,045	2,045	2,045	2,045	-	-	-
GPV (₱/ha)	8,057.3	8,670.8	9,182.1	10,184.1	7,750.6	8,323.2	6,462.2	7,157.5	-	-	-
PC (₱/ha)	3,362	3,296	3,547	3,485	3,362	3,296	3,547	3,485	-	-	-
NPV (₱/ha)	4,695.3	5,374.8	5,635.1	6,699.1	4,388.6	5,027.2	2,915.2	3,672.5	-	-	-
Cropped Area (ha)	15,144	6,491	10,441	10,441	1,478	633	301	302	-	-	-
Total NPV (₱1,000)	71,105	34,887	58,836	69,945	6,486	3,182	877	1,109	-	-	-
With Project											
Yield (ton/ha)	4.61	4.71	5.22	5.54	4.35	4.43	4.92	5.22	4.61	4.71	2.70
Unit Price (₱/ton)	2,045	2,045	2,045	2,045	2,045	2,045	2,045	2,045	2,045	2,045	1,670
GPV (₱/ha)	9,427.5	9,632.0	10,674.9	11,329.3	8,895.8	9,059.4	10,061.4	10,674.9	9,427.5	9,632.0	4,509.0
PC (₱/ha)	4,306	4,223	4,474	4,397	4,306	4,223	4,474	4,397	4,306	4,223	2,299
NPV (₱/ha)	5,121.5	5,409.0	6,250.9	6,932.3	4,589.8	4,836.4	5,587.4	6,277.9	5,121.5	5,409.0	2,210.0
Cropped Area (ha)	10,106	10,106	4,042	16,170	1,055	1,056	422	1,689	1,125	1,125	1,575
Total NPV (₱1,000)	51,757	54,663	25,064	112,095	4,842	5,107	2,357	10,603	5,762	6,085	3,481
Incremental NPV	-19,348	19,776	-33,772	42,150	-1,644	1,925	1,480	9,494	5,762	6,085	3,481

TABLE C.5.3-5 INCREMENTAL AGRICULTURAL BENEFIT 2/2

	C			D				E				
	Dry			Wet		Dry		Wet		Dry		
	W. Melon	Y. Corn	P. Sitao	T.P	Direct	T.P	Direct	T.P	Direct	T.P	Direct	Total
Without Project												
Yield (ton/ha)	-	-	-	-	-	-	-	-	-	4.40	4.87	
Unit Price (₱/ton)	-	-	-	-	-	-	-	-	-	2,045	2,045	
GPV (₱/ha)	-	-	-	-	-	-	-	-	-	8,998.0	9,959.2	
PC (₱/ha)	-	-	-	-	-	-	-	-	-	3,547	3,485	
NPV (₱/ha)	-	-	-	-	-	-	-	-	-	5,451.0	6,474.2	
Cropped Area (ha)	-	-	-	-	-	-	-	-	-	4,656	4,657	
Total NPV (₱1,000)	-	-	-	-	-	-	-	-	-	25,379	30,150	301,956
With Project												
Yield (ton/ha)	8.00	4.00	7.50	4.35	4.43	4.92	5.22	-	-	5.12	5.44	
Unit Price (₱/ton)	1,350	1,910	2,310	2,045	2,045	2,045	2,045	-	-	2,045	2,045	
GPV (₱/ha)	10,800.0	7,640.0	17,325.0	8,895.8	9,059.4	10,061.4	10,674.9	-	-	10,470.4	11,124.8	
PC (₱/ha)	2,921	3,510	6,217	4,306	4,223	4,474	4,397	-	-	4,474	4,397	
NPV (₱/ha)	7,879.0	4,130	11,108	4,589.8	4,836.4	5,587.4	6,277.9	-	-	5,996.4	6,727.8	
Cropped Area (ha)	675	1,575	675	1,000	1,000	400	1,600	-	-	1,678	6,714	
Total NPV (₱1,000)	5,318	6,504	7,498	4,590	4,386	2,235	10,044	-	-	10,062	45,170	377,623
Incremental NPV	5,318	6,504	7,498	4,590	4,386	2,235	10,044	-	-	-15,317	15,020	75,667

TABLE C.5.3-6 PROJECT ECONOMIC COST AND RETURN

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS	PROJECT RETURN	PRESENT WORTH VALUE	
	CAPITAL	O & M	TOTAL (1)	(2)	(3) =(2)-(1)	(3)*DISCOUNT RATE (17 %)	(18 %)
1 1984	21507.00	-96.00	21411.00	0.0	-21411.00	-18300.01	-18144.93
2 1985	83123.00	-96.00	83027.00	2270.00	-80757.00	-58994.19	-57998.51
3 1986	45172.00	-96.00	45076.00	6810.00	-38266.00	-23892.23	-23289.92
4 1987	68535.00	-96.00	68439.00	15890.00	-52549.00	-28042.89	-27104.28
5 1988	47344.00	-96.00	47248.00	27240.00	-20008.00	-9125.92	-8745.72
6 1989	43654.00	2413.00	46067.00	41617.00	-4450.00	-1734.79	-1648.43
7 1990	23317.00	2771.00	26088.00	54480.00	28392.00	9460.15	8913.01
8 1991	0.0	2771.00	2771.00	65073.00	62302.00	17742.66	16574.82
9 1992	0.0	2771.00	2771.00	71126.00	68355.00	16638.02	15411.16
10 1993	0.0	2771.00	2771.00	74910.00	72139.00	15007.76	13783.31
11 1994	0.0	3575.00	3575.00	75667.00	72092.00	12818.80	11673.17
12 1995	0.0	8463.00	8463.00	75667.00	67204.00	10213.40	9221.79
13 1996	0.0	2771.00	2771.00	75667.00	72896.00	9468.76	8477.00
14 1997	0.0	2771.00	2771.00	75667.00	72896.00	8092.97	7183.91
15 1998	0.0	2771.00	2771.00	75667.00	72896.00	6917.08	6088.06
16 1999	0.0	2771.00	2771.00	75667.00	72896.00	5912.04	5159.38
17 2000	0.0	2771.00	2771.00	75667.00	72896.00	5053.03	4372.36
18 2001	0.0	2771.00	2771.00	75667.00	72896.00	4318.83	3705.39
19 2002	0.0	2771.00	2771.00	75667.00	72896.00	3691.31	3140.17
20 2003	0.0	2771.00	2771.00	75667.00	72896.00	3154.97	2661.16
21 2004	0.0	3575.00	3575.00	75667.00	72092.00	2666.82	2230.35
22 2005	0.0	2771.00	2771.00	75667.00	72896.00	2304.75	1911.21
23 2006	0.0	2771.00	2771.00	75667.00	72896.00	1969.88	1619.67
24 2007	0.0	2771.00	2771.00	75667.00	72896.00	1683.66	1372.60
25 2008	0.0	2771.00	2771.00	75667.00	72896.00	1439.03	1163.22
26 2009	0.0	2771.00	2771.00	75667.00	72896.00	1229.94	985.78
27 2010	0.0	2771.00	2771.00	75667.00	72896.00	1051.23	835.41
28 2011	0.0	2771.00	2771.00	75667.00	72896.00	898.49	707.97
29 2012	0.0	2771.00	2771.00	75667.00	72896.00	767.94	599.98
30 2013	0.0	2771.00	2771.00	75667.00	72896.00	656.36	508.46
31 2014	0.0	3575.00	3575.00	75667.00	72092.00	554.80	426.14
32 2015	0.0	8463.00	8463.00	75667.00	67204.00	442.04	336.65
33 2016	0.0	2771.00	2771.00	75667.00	72896.00	409.81	309.46
34 2017	0.0	2771.00	2771.00	75667.00	72896.00	350.27	262.26
35 2018	0.0	2771.00	2771.00	75667.00	72896.00	299.37	222.25
36 2019	0.0	2771.00	2771.00	75667.00	72896.00	255.88	188.35
37 2020	0.0	2771.00	2771.00	75667.00	72896.00	218.70	159.62
38 2021	0.0	2771.00	2771.00	75667.00	72896.00	186.92	135.27
39 2022	0.0	2771.00	2771.00	75667.00	72896.00	159.76	114.64
40 2023	0.0	2771.00	2771.00	75667.00	72896.00	136.55	97.15
41 2024	0.0	3575.00	3575.00	75667.00	72092.00	115.42	81.42
42 2025	0.0	2771.00	2771.00	75667.00	72896.00	99.75	69.77
43 2026	0.0	2771.00	2771.00	75667.00	72896.00	85.26	59.13
44 2027	0.0	2771.00	2771.00	75667.00	72896.00	72.87	50.11
45 2028	0.0	2771.00	2771.00	75667.00	72896.00	62.28	42.46
46 2029	0.0	2771.00	2771.00	75667.00	72896.00	53.23	35.99
47 2030	0.0	2771.00	2771.00	75667.00	72896.00	45.50	30.50
48 2031	0.0	2771.00	2771.00	75667.00	72896.00	38.89	25.85
49 2032	0.0	2771.00	2771.00	75667.00	72896.00	33.24	21.90
50 2033	0.0	2771.00	2771.00	75667.00	72896.00	28.41	18.56
TOTAL	332652.00	138457.00	471109.00	3386096.00	2914987.00	6716.78	-5944.94

I E R R = 18 ..... 17 + 6716.78 / (6716.78 + 5944.94) = 17.53

5.4 Sensitivity Analysis

Sensitivity analysis attempts to assess the impact on EIRR of changes in such crucial factors as project cost, target yield, period in which full benefit is achieved, etc. EIRR's have been estimated for the above cases and are presented below. Details appear in Tables C.5.4-1 to C.5.4-8.

(1) 10% increase in project cost 16.15%
(2) 20% increase in project cost 14.98%
(3) 10% reduction in target yield 13.84%
(4) 2 years delay in attaining full benefit 15.72%
(5) Combination of cases (1) and (3) 12.73%
(6) Combination of cases (2) and (3) 11.77%
(7) Combination of cases (1) and (4) 14.57%
(8) Combination of cases (2) and (4) 13.58%

TABLE C.5.4-1 PROJECT ECONOMIC COST AND RETURN - Case (1)

10% INCREASE IN PROJECT COST

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS (2)	PROJECT RETURN (3) =(2)-(1)	PRESENT WORTH VALUE (3)*DISCOUNT RATE	
	CAPITAL	O & M	TOTAL (1)			(16 %)	(17 %)
1 1984	23657.69	-96.00	23561.69	0.0	-23561.69	-20311.80	-20138.21
2 1985	91435.25	-96.00	91339.25	2270.00	-89069.25	-66193.00	-65066.42
3 1986	49689.17	-96.00	49593.17	6810.00	-42783.17	-27409.40	-26712.63
4 1987	75388.46	-96.00	75292.46	15890.00	-59402.46	-32807.50	-31700.26
5 1988	52078.37	-96.00	51982.37	27240.00	-24742.37	-11780.19	-11285.33
6 1989	48019.38	2413.00	50432.38	41617.00	-8815.38	-3618.21	-3436.59
7 1990	25648.69	2771.00	28419.69	54480.00	26060.31	9220.94	8683.24
8 1991	0.0	2771.00	2771.00	65073.00	62302.00	19003.76	17742.66
9 1992	0.0	2771.00	2771.00	71126.00	68355.00	17974.21	16638.02
10 1993	0.0	2771.00	2771.00	74910.00	72139.00	16352.79	15007.76
11 1994	0.0	3575.00	3575.00	75667.00	72092.00	14088.06	12818.80
12 1995	0.0	8463.00	8463.00	75667.00	67204.00	11321.43	10213.40
13 1996	0.0	2771.00	2771.00	75667.00	72896.00	10586.49	9468.76
14 1997	0.0	2771.00	2771.00	75667.00	72896.00	9126.29	8092.97
15 1998	0.0	2771.00	2771.00	75667.00	72896.00	7867.50	6917.08
16 1999	0.0	2771.00	2771.00	75667.00	72896.00	6782.33	5912.04
17 2000	0.0	2771.00	2771.00	75667.00	72896.00	5846.83	5053.03
18 2001	0.0	2771.00	2771.00	75667.00	72896.00	5040.38	4318.83
19 2002	0.0	2771.00	2771.00	75667.00	72896.00	4345.16	3691.31
20 2003	0.0	2771.00	2771.00	75667.00	72896.00	3745.83	3154.97
21 2004	0.0	3575.00	3575.00	75667.00	72092.00	3193.55	2666.82
22 2005	0.0	2771.00	2771.00	75667.00	72896.00	2783.76	2304.75
23 2006	0.0	2771.00	2771.00	75667.00	72896.00	2399.80	1969.88
24 2007	0.0	2771.00	2771.00	75667.00	72896.00	2068.79	1683.66
25 2008	0.0	2771.00	2771.00	75667.00	72896.00	1783.44	1439.03
26 2009	0.0	2771.00	2771.00	75667.00	72896.00	1537.45	1229.94
27 2010	0.0	2771.00	2771.00	75667.00	72896.00	1325.39	1051.23
28 2011	0.0	2771.00	2771.00	75667.00	72896.00	1142.58	898.49
29 2012	0.0	2771.00	2771.00	75667.00	72896.00	984.98	767.94
30 2013	0.0	2771.00	2771.00	75667.00	72896.00	849.12	656.36
31 2014	0.0	3575.00	3575.00	75667.00	72092.00	723.93	554.80
32 2015	0.0	8463.00	8463.00	75667.00	67204.00	581.76	442.04
33 2016	0.0	2771.00	2771.00	75667.00	72896.00	544.00	409.81
34 2017	0.0	2771.00	2771.00	75667.00	72896.00	468.96	350.27
35 2018	0.0	2771.00	2771.00	75667.00	72896.00	404.28	299.37
36 2019	0.0	2771.00	2771.00	75667.00	72896.00	348.52	255.88
37 2020	0.0	2771.00	2771.00	75667.00	72896.00	300.44	218.70
38 2021	0.0	2771.00	2771.00	75667.00	72896.00	259.00	186.92
39 2022	0.0	2771.00	2771.00	75667.00	72896.00	223.28	159.76
40 2023	0.0	2771.00	2771.00	75667.00	72896.00	192.48	136.55
41 2024	0.0	3575.00	3575.00	75667.00	72092.00	164.10	115.42
42 2025	0.0	2771.00	2771.00	75667.00	72896.00	143.05	99.75
43 2026	0.0	2771.00	2771.00	75667.00	72896.00	123.32	85.26
44 2027	0.0	2771.00	2771.00	75667.00	72896.00	106.31	72.87
45 2028	0.0	2771.00	2771.00	75667.00	72896.00	91.64	62.28
46 2029	0.0	2771.00	2771.00	75667.00	72896.00	79.00	53.23
47 2030	0.0	2771.00	2771.00	75667.00	72896.00	68.11	45.50
48 2031	0.0	2771.00	2771.00	75667.00	72896.00	58.71	38.89
49 2032	0.0	2771.00	2771.00	75667.00	72896.00	50.61	33.24
50 2033	0.0	2771.00	2771.00	75667.00	72896.00	43.63	28.41
TOTAL	365917.01	138457.00	504374.01	3386096.00	2881721.99	2225.87	-12309.53

I R R = 16 ..... 16 + 2225.87 / (2225.87 + 12309.53) = 16.15

TABLE C.5.4-2 PROJECT ECONOMIC COST AND RETURN - Case (2)
20% INCREASE IN PROJECT COST

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS (2)	PROJECT RETURN (3) =(2)-(1)	PRESENT WORTH VALUE (3)*DISCOUNT RATE	
	CAPITAL	O & M	TOTAL (1)			(14 %)	(15 %)
1 1984	25808.40	-96.00	25712.40	0.0	-25712.40	-22554.75	-22358.61
2 1985	99747.58	-96.00	99651.58	2270.00	-97381.58	-74932.10	-73634.56
3 1986	54206.39	-96.00	54110.39	6810.00	-47300.39	-31926.51	-31100.83
4 1987	82241.99	-96.00	82145.99	15890.00	-66255.99	-39229.02	-37882.18
5 1988	56812.79	-96.00	56716.79	27240.00	-29476.79	-15309.39	-14655.22
6 1989	52384.79	2413.00	54797.79	41617.00	-13180.79	-6005.03	-5698.44
7 1990	27980.40	2771.00	30751.40	54480.00	23728.60	9482.90	8920.50
8 1991	0.0	2771.00	2771.00	65073.00	62302.00	21840.71	20366.75
9 1992	0.0	2771.00	2771.00	71126.00	68355.00	21019.89	19430.88
10 1993	0.0	2771.00	2771.00	74910.00	72139.00	19459.25	17831.78
11 1994	0.0	3575.00	3575.00	75667.00	72092.00	17058.41	15495.80
12 1995	0.0	8463.00	8463.00	75667.00	67204.00	13948.97	12561.01
13 1996	0.0	2771.00	2771.00	75667.00	72896.00	13272.30	11847.74
14 1997	0.0	2771.00	2771.00	75667.00	72896.00	11642.39	10302.39
15 1998	0.0	2771.00	2771.00	75667.00	72896.00	10212.63	8958.61
16 1999	0.0	2771.00	2771.00	75667.00	72896.00	8958.46	7790.10
17 2000	0.0	2771.00	2771.00	75667.00	72896.00	7858.30	6774.00
18 2001	0.0	2771.00	2771.00	75667.00	72896.00	6893.26	5890.44
19 2002	0.0	2771.00	2771.00	75667.00	72896.00	6046.72	5122.13
20 2003	0.0	2771.00	2771.00	75667.00	72896.00	5304.15	4454.03
21 2004	0.0	3575.00	3575.00	75667.00	72092.00	4601.45	3830.35
22 2005	0.0	2771.00	2771.00	75667.00	72896.00	4081.38	3367.89
23 2006	0.0	2771.00	2771.00	75667.00	72896.00	3580.16	2928.60
24 2007	0.0	2771.00	2771.00	75667.00	72896.00	3140.50	2546.61
25 2008	0.0	2771.00	2771.00	75667.00	72896.00	2754.82	2214.45
26 2009	0.0	2771.00	2771.00	75667.00	72896.00	2416.51	1925.61
27 2010	0.0	2771.00	2771.00	75667.00	72896.00	2119.75	1674.44
28 2011	0.0	2771.00	2771.00	75667.00	72896.00	1859.43	1456.04
29 2012	0.0	2771.00	2771.00	75667.00	72896.00	1631.08	1266.12
30 2013	0.0	2771.00	2771.00	75667.00	72896.00	1430.78	1100.98
31 2014	0.0	3575.00	3575.00	75667.00	72092.00	1241.23	946.81
32 2015	0.0	8463.00	8463.00	75667.00	67204.00	1014.97	767.49
33 2016	0.0	2771.00	2771.00	75667.00	72896.00	965.74	723.91
34 2017	0.0	2771.00	2771.00	75667.00	72896.00	847.14	629.49
35 2018	0.0	2771.00	2771.00	75667.00	72896.00	743.10	547.38
36 2019	0.0	2771.00	2771.00	75667.00	72896.00	651.85	475.98
37 2020	0.0	2771.00	2771.00	75667.00	72896.00	571.80	413.90
38 2021	0.0	2771.00	2771.00	75667.00	72896.00	501.58	359.91
39 2022	0.0	2771.00	2771.00	75667.00	72896.00	439.98	312.97
40 2023	0.0	2771.00	2771.00	75667.00	72896.00	385.95	272.15
41 2024	0.0	3575.00	3575.00	75667.00	72092.00	334.82	234.04
42 2025	0.0	2771.00	2771.00	75667.00	72896.00	296.97	205.78
43 2026	0.0	2771.00	2771.00	75667.00	72896.00	260.50	178.94
44 2027	0.0	2771.00	2771.00	75667.00	72896.00	228.51	155.60
45 2028	0.0	2771.00	2771.00	75667.00	72896.00	200.45	135.31
46 2029	0.0	2771.00	2771.00	75667.00	72896.00	175.83	117.66
47 2030	0.0	2771.00	2771.00	75667.00	72896.00	154.24	102.31
48 2031	0.0	2771.00	2771.00	75667.00	72896.00	135.30	88.97
49 2032	0.0	2771.00	2771.00	75667.00	72896.00	118.68	77.36
50 2033	0.0	2771.00	2771.00	75667.00	72896.00	104.11	67.27
TOTAL	399182.34	138457.00	537639.34	3386096.00	2848456.66	20030.15	-459.35

I E R R = 15 ..... 14 + 20030.15 / (20030.15 + 459.35) = 14.98

TABLE C.5.4-3 PROJECT ECONOMIC COST AND RETURN - Case (3)
10% REDUCTION OF TARGET YIELD

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS (2)	PROJECT RETURN (3) =(2)-(1)	PRESENT WORTH VALUE (3)*DISCOUNT RATE	
	CAPITAL	O & M	TOTAL (1)			(13 %)	(14 %)
1 1984	21507.00	-96.00	21411.00	0.0	-21411.00	-18947.80	-18781.59
2 1985	83123.00	-96.00	83027.00	1747.00	-81280.00	-63654.29	-62542.43
3 1986	45172.00	-96.00	45076.00	5242.00	-39834.00	-27607.05	-26886.89
4 1987	68535.00	-96.00	68439.00	12231.00	-56208.00	-34473.57	-33279.78
5 1988	47344.00	-96.00	47248.00	20968.00	-26280.00	-14263.81	-13649.07
6 1989	43654.00	2413.00	46067.00	32035.00	-14032.00	-6739.87	-6392.83
7 1990	23317.00	2771.00	26088.00	41937.00	15849.00	6736.84	6333.90
8 1991	0.0	2771.00	2771.00	50092.00	47321.00	17800.42	16588.94
9 1992	0.0	2771.00	2771.00	54751.00	51980.00	17303.53	15984.40
10 1993	0.0	2771.00	2771.00	57663.00	54892.00	16170.72	14806.93
11 1994	0.0	3575.00	3575.00	58246.00	54671.00	14252.78	12936.25
12 1995	0.0	8463.00	8463.00	58246.00	49783.00	11485.39	10333.04
13 1996	0.0	2771.00	2771.00	58246.00	55475.00	11326.19	10100.43
14 1997	0.0	2771.00	2771.00	58246.00	55475.00	10023.19	8860.04
15 1998	0.0	2771.00	2771.00	58246.00	55475.00	8870.09	7771.97
16 1999	0.0	2771.00	2771.00	58246.00	55475.00	7849.64	6817.53
17 2000	0.0	2771.00	2771.00	58246.00	55475.00	6946.59	5980.29
18 2001	0.0	2771.00	2771.00	58246.00	55475.00	6147.44	5245.88
19 2002	0.0	2771.00	2771.00	58246.00	55475.00	5440.22	4601.65
20 2003	0.0	2771.00	2771.00	58246.00	55475.00	4814.35	4036.54
21 2004	0.0	3575.00	3575.00	58246.00	54671.00	4198.75	3489.51
22 2005	0.0	2771.00	2771.00	58246.00	55475.00	3770.35	3105.99
23 2006	0.0	2771.00	2771.00	58246.00	55475.00	3336.60	2724.56
24 2007	0.0	2771.00	2771.00	58246.00	55475.00	2952.75	2389.97
25 2008	0.0	2771.00	2771.00	58246.00	55475.00	2613.05	2096.46
26 2009	0.0	2771.00	2771.00	58246.00	55475.00	2312.44	1839.00
27 2010	0.0	2771.00	2771.00	58246.00	55475.00	2046.41	1613.16
28 2011	0.0	2771.00	2771.00	58246.00	55475.00	1810.98	1415.06
29 2012	0.0	2771.00	2771.00	58246.00	55475.00	1602.64	1241.28
30 2013	0.0	2771.00	2771.00	58246.00	55475.00	1418.27	1088.84
31 2014	0.0	3575.00	3575.00	58246.00	54671.00	1236.92	941.28
32 2015	0.0	8463.00	8463.00	58246.00	49783.00	996.75	751.87
33 2016	0.0	2771.00	2771.00	58246.00	55475.00	982.93	734.94
34 2017	0.0	2771.00	2771.00	58246.00	55475.00	869.85	644.69
35 2018	0.0	2771.00	2771.00	58246.00	55475.00	769.78	565.51
36 2019	0.0	2771.00	2771.00	58246.00	55475.00	681.23	496.07
37 2020	0.0	2771.00	2771.00	58246.00	55475.00	602.85	435.15
38 2021	0.0	2771.00	2771.00	58246.00	55475.00	533.50	381.71
39 2022	0.0	2771.00	2771.00	58246.00	55475.00	472.13	334.83
40 2023	0.0	2771.00	2771.00	58246.00	55475.00	417.81	293.71
41 2024	0.0	3575.00	3575.00	58246.00	54671.00	364.39	253.91
42 2025	0.0	2771.00	2771.00	58246.00	55475.00	327.21	226.00
43 2026	0.0	2771.00	2771.00	58246.00	55475.00	289.56	198.25
44 2027	0.0	2771.00	2771.00	58246.00	55475.00	256.25	173.90
45 2028	0.0	2771.00	2771.00	58246.00	55475.00	226.77	152.55
46 2029	0.0	2771.00	2771.00	58246.00	55475.00	200.68	133.81
47 2030	0.0	2771.00	2771.00	58246.00	55475.00	177.60	117.38
48 2031	0.0	2771.00	2771.00	58246.00	55475.00	157.16	102.96
49 2032	0.0	2771.00	2771.00	58246.00	55475.00	139.08	90.32
50 2033	0.0	2771.00	2771.00	58246.00	55475.00	123.08	79.23
TOTAL	332652.00	138457.00	471109.00	2606506.00	2135397.00	15368.78	-3022.91

I E R R = 14 ..... 13 + 15368.78 / (15368.78 + 3022.91) = 13.84

TABLE C.5.4-4 PROJECT ECONOMIC COST AND RETURN - Case (4)
2 YEARS DELAY IN ATTAINING FULL BENEFIT

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS	PROJECT RETURN	PRESENT WORTH VALUE	
	CAPITAL	O & M	TOTAL (1)	(2)	(3) =(2)-(1)	(3)*DISCOUNT RATE (15 %)	(16 %)
1 1984	21507.00	-96.00	21411.00	0.0	-21411.00	-18618.27	-18457.76
2 1985	83123.00	-96.00	83027.00	1513.00	-81514.00	-61636.37	-60578.22
3 1986	45172.00	-96.00	45076.00	5296.00	-39780.00	-26156.05	-25485.39
4 1987	68535.00	-96.00	68439.00	11350.00	-57089.00	-32640.91	-31529.80
5 1988	47344.00	-96.00	47248.00	19673.00	-27575.00	-13709.69	-13128.84
6 1989	43654.00	2413.00	46067.00	29510.00	-16557.00	-7158.08	-6795.71
7 1990	23317.00	2771.00	26088.00	40860.00	14772.00	5553.37	5226.79
8 1991	0.0	2771.00	2771.00	51453.00	48682.00	15914.32	14849.30
9 1992	0.0	2771.00	2771.00	60534.00	57763.00	16419.95	15189.01
10 1993	0.0	2771.00	2771.00	68857.00	66086.00	16335.56	14980.67
11 1994	0.0	3575.00	3575.00	72640.00	69065.00	14845.17	13496.53
12 1995	0.0	8463.00	8463.00	74910.00	66447.00	12419.52	11193.91
13 1996	0.0	2771.00	2771.00	75667.00	72896.00	11847.74	10586.49
14 1997	0.0	2771.00	2771.00	75667.00	72896.00	10302.39	9126.29
15 1998	0.0	2771.00	2771.00	75667.00	72896.00	8958.61	7867.50
16 1999	0.0	2771.00	2771.00	75667.00	72896.00	7790.10	6782.33
17 2000	0.0	2771.00	2771.00	75667.00	72896.00	6774.00	5846.83
18 2001	0.0	2771.00	2771.00	75667.00	72896.00	5890.44	5040.38
19 2002	0.0	2771.00	2771.00	75667.00	72896.00	5122.13	4345.16
20 2003	0.0	2771.00	2771.00	75667.00	72896.00	4454.03	3745.83
21 2004	0.0	3575.00	3575.00	75667.00	72092.00	3830.35	3193.55
22 2005	0.0	2771.00	2771.00	75667.00	72896.00	3367.89	2783.76
23 2006	0.0	2771.00	2771.00	75667.00	72896.00	2928.60	2399.80
24 2007	0.0	2771.00	2771.00	75667.00	72896.00	2546.61	2068.79
25 2008	0.0	2771.00	2771.00	75667.00	72896.00	2214.45	1783.44
26 2009	0.0	2771.00	2771.00	75667.00	72896.00	1925.61	1537.45
27 2010	0.0	2771.00	2771.00	75667.00	72896.00	1674.44	1325.39
28 2011	0.0	2771.00	2771.00	75667.00	72896.00	1456.04	1142.58
29 2012	0.0	2771.00	2771.00	75667.00	72896.00	1266.12	984.98
30 2013	0.0	2771.00	2771.00	75667.00	72896.00	1100.98	849.12
31 2014	0.0	3575.00	3575.00	75667.00	72092.00	946.81	723.93
32 2015	0.0	8463.00	8463.00	75667.00	67204.00	767.49	581.76
33 2016	0.0	2771.00	2771.00	75667.00	72896.00	723.91	544.00
34 2017	0.0	2771.00	2771.00	75667.00	72896.00	629.49	468.96
35 2018	0.0	2771.00	2771.00	75667.00	72896.00	547.38	404.28
36 2019	0.0	2771.00	2771.00	75667.00	72896.00	475.98	348.52
37 2020	0.0	2771.00	2771.00	75667.00	72896.00	413.90	300.44
38 2021	0.0	2771.00	2771.00	75667.00	72896.00	359.91	259.00
39 2022	0.0	2771.00	2771.00	75667.00	72896.00	312.97	223.28
40 2023	0.0	2771.00	2771.00	75667.00	72896.00	272.15	192.48
41 2024	0.0	3575.00	3575.00	75667.00	72092.00	234.04	164.10
42 2025	0.0	2771.00	2771.00	75667.00	72896.00	205.78	143.05
43 2026	0.0	2771.00	2771.00	75667.00	72896.00	178.94	123.32
44 2027	0.0	2771.00	2771.00	75667.00	72896.00	155.60	106.31
45 2028	0.0	2771.00	2771.00	75667.00	72896.00	135.31	91.64
46 2029	0.0	2771.00	2771.00	75667.00	72896.00	117.66	79.00
47 2030	0.0	2771.00	2771.00	75667.00	72896.00	102.31	68.11
48 2031	0.0	2771.00	2771.00	75667.00	72896.00	88.97	58.71
49 2032	0.0	2771.00	2771.00	75667.00	72896.00	77.36	50.61
50 2033	0.0	2771.00	2771.00	75667.00	72896.00	67.27	43.63
TOTAL	332652.00	138457.00	471109.00	3311942.00	2840833.00	11832.30	-4654.74

I E R R = 16 ..... 15 + 11832.30 / (11832.30 + 4654.74) = 15.72

TABLE C.5.4-5 PROJECT ECONOMIC COST AND RETURN - Case (5)
COMBINATION OF CASES (1) AND (3)

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS (2)	PROJECT RETURN (3) =(2)-(1)	PRESENT WORTH VALUE (3)*DISCOUNT RATE	
	CAPITAL	O & M	TOTAL (1)			(12 %)	(13 %)
1 1984	23657.69	-96.00	23561.69	0.0	-23561.69	-21037.22	-20851.07
2 1985	91435.25	-96.00	91339.25	1747.00	-89592.25	-71422.43	-70164.02
3 1986	49689.17	-96.00	49593.17	5242.00	-44351.17	-31568.33	-30737.69
4 1987	75388.46	-96.00	75292.46	12231.00	-63061.46	-40076.76	-38676.94
5 1988	52078.37	-96.00	51982.37	20968.00	-31014.37	-17598.42	-16833.45
6 1989	48019.38	2413.00	50432.38	32035.00	-18397.38	-9320.71	-8836.66
7 1990	25648.69	2771.00	28419.69	41937.00	13517.31	6114.57	5745.72
8 1991	0.0	2771.00	2771.00	50092.00	47321.00	19112.22	17800.42
9 1992	0.0	2771.00	2771.00	54751.00	51980.00	18744.58	17303.53
10 1993	0.0	2771.00	2771.00	57663.00	54892.00	17673.82	16170.72
11 1994	0.0	3575.00	3575.00	58246.00	54671.00	15716.68	14252.78
12 1995	0.0	8463.00	8463.00	58246.00	49783.00	12778.12	11485.39
13 1996	0.0	2771.00	2771.00	58246.00	55475.00	12713.50	11326.19
14 1997	0.0	2771.00	2771.00	58246.00	55475.00	11351.35	10023.19
15 1998	0.0	2771.00	2771.00	58246.00	55475.00	10135.14	8870.09
16 1999	0.0	2771.00	2771.00	58246.00	55475.00	9049.23	7849.64
17 2000	0.0	2771.00	2771.00	58246.00	55475.00	8079.67	6946.59
18 2001	0.0	2771.00	2771.00	58246.00	55475.00	7214.00	6147.44
19 2002	0.0	2771.00	2771.00	58246.00	55475.00	6441.07	5440.22
20 2003	0.0	2771.00	2771.00	58246.00	55475.00	5750.96	4814.35
21 2004	0.0	3575.00	3575.00	58246.00	54671.00	5060.37	4198.75
22 2005	0.0	2771.00	2771.00	58246.00	55475.00	4584.64	3770.35
23 2006	0.0	2771.00	2771.00	58246.00	55475.00	4093.43	3336.60
24 2007	0.0	2771.00	2771.00	58246.00	55475.00	3654.85	2952.75
25 2008	0.0	2771.00	2771.00	58246.00	55475.00	3263.26	2613.05
26 2009	0.0	2771.00	2771.00	58246.00	55475.00	2913.62	2312.44
27 2010	0.0	2771.00	2771.00	58246.00	55475.00	2601.45	2046.41
28 2011	0.0	2771.00	2771.00	58246.00	55475.00	2322.73	1810.98
29 2012	0.0	2771.00	2771.00	58246.00	55475.00	2073.86	1602.64
30 2013	0.0	2771.00	2771.00	58246.00	55475.00	1851.66	1418.27
31 2014	0.0	3575.00	3575.00	58246.00	54671.00	1629.31	1236.92
32 2015	0.0	8463.00	8463.00	58246.00	49783.00	1324.68	996.75
33 2016	0.0	2771.00	2771.00	58246.00	55475.00	1317.98	982.93
34 2017	0.0	2771.00	2771.00	58246.00	55475.00	1176.77	869.85
35 2018	0.0	2771.00	2771.00	58246.00	55475.00	1050.69	769.78
36 2019	0.0	2771.00	2771.00	58246.00	55475.00	938.11	681.23
37 2020	0.0	2771.00	2771.00	58246.00	55475.00	837.60	602.85
38 2021	0.0	2771.00	2771.00	58246.00	55475.00	747.86	533.50
39 2022	0.0	2771.00	2771.00	58246.00	55475.00	667.73	472.13
40 2023	0.0	2771.00	2771.00	58246.00	55475.00	596.19	417.81
41 2024	0.0	3575.00	3575.00	58246.00	54671.00	524.60	364.39
42 2025	0.0	2771.00	2771.00	58246.00	55475.00	475.28	327.21
43 2026	0.0	2771.00	2771.00	58246.00	55475.00	424.36	289.56
44 2027	0.0	2771.00	2771.00	58246.00	55475.00	378.89	256.25
45 2028	0.0	2771.00	2771.00	58246.00	55475.00	338.29	226.77
46 2029	0.0	2771.00	2771.00	58246.00	55475.00	302.05	200.68
47 2030	0.0	2771.00	2771.00	58246.00	55475.00	269.69	177.60
48 2031	0.0	2771.00	2771.00	58246.00	55475.00	240.79	157.16
49 2032	0.0	2771.00	2771.00	58246.00	55475.00	214.99	139.08
50 2033	0.0	2771.00	2771.00	58246.00	55475.00	191.96	123.08
TOTAL	365917.01	138457.00	504374.01	2606506.00	2102131.99	15918.73	-6035.77

I E R R = 13 ..... 12 + 15918.73 / (15918.73 + 6035.77) = 12.73

TABLE C.5.4-6 PROJECT ECONOMIC COST AND RETURN - Case (6)
COMBINATION OF CASES (2) AND (3)

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS (2)	PROJECT RETURN (3) =(2)-(1)	PRESENT WORTH VALUE (3)*DISCOUNT RATE	
	CAPITAL	O & M	TOTAL (1)			(11 %)	(12 %)
1 1984	25808.40	-96.00	25712.40	0.0	-25712.40	-23164.33	-22957.50
2 1985	99747.58	-96.00	99651.58	1747.00	-97904.58	-79461.65	-78048.98
3 1986	54206.39	-96.00	54110.39	5242.00	-48868.39	-35732.22	-34783.60
4 1987	82241.99	-96.00	82145.99	12231.00	-69914.99	-46055.29	-44432.31
5 1988	56812.79	-96.00	56716.79	20968.00	-35748.79	-21215.23	-20284.86
6 1989	52384.79	2413.00	54797.79	32035.00	-22762.79	-12169.97	-11532.37
7 1990	27980.40	2771.00	30751.40	41937.00	11185.60	5387.67	5059.82
8 1991	0.0	2771.00	2771.00	50092.00	47321.00	20533.95	19112.22
9 1992	0.0	2771.00	2771.00	54751.00	51980.00	20320.39	18744.58
10 1993	0.0	2771.00	2771.00	57663.00	54892.00	19332.24	17673.82
11 1994	0.0	3575.00	3575.00	58246.00	54671.00	17346.33	15716.68
12 1995	0.0	8463.00	8463.00	58246.00	49783.00	14230.13	12778.12
13 1996	0.0	2771.00	2771.00	58246.00	55475.00	14285.73	12713.50
14 1997	0.0	2771.00	2771.00	58246.00	55475.00	12870.04	11351.35
15 1998	0.0	2771.00	2771.00	58246.00	55475.00	11594.64	10135.14
16 1999	0.0	2771.00	2771.00	58246.00	55475.00	10445.62	9049.23
17 2000	0.0	2771.00	2771.00	58246.00	55475.00	9410.48	8079.67
18 2001	0.0	2771.00	2771.00	58246.00	55475.00	8477.91	7214.00
19 2002	0.0	2771.00	2771.00	58246.00	55475.00	7637.77	6441.07
20 2003	0.0	2771.00	2771.00	58246.00	55475.00	6880.87	5750.96
21 2004	0.0	3575.00	3575.00	58246.00	54671.00	6109.15	5060.37
22 2005	0.0	2771.00	2771.00	58246.00	55475.00	5584.68	4584.64
23 2006	0.0	2771.00	2771.00	58246.00	55475.00	5031.25	4093.43
24 2007	0.0	2771.00	2771.00	58246.00	55475.00	4532.66	3654.85
25 2008	0.0	2771.00	2771.00	58246.00	55475.00	4083.48	3263.26
26 2009	0.0	2771.00	2771.00	58246.00	55475.00	3678.81	2913.62
27 2010	0.0	2771.00	2771.00	58246.00	55475.00	3314.25	2601.45
28 2011	0.0	2771.00	2771.00	58246.00	55475.00	2985.81	2322.73
29 2012	0.0	2771.00	2771.00	58246.00	55475.00	2689.92	2073.86
30 2013	0.0	2771.00	2771.00	58246.00	55475.00	2423.35	1851.66
31 2014	0.0	3575.00	3575.00	58246.00	54671.00	2151.56	1629.31
32 2015	0.0	8463.00	8463.00	58246.00	49783.00	1765.04	1324.68
33 2016	0.0	2771.00	2771.00	58246.00	55475.00	1771.94	1317.98
34 2017	0.0	2771.00	2771.00	58246.00	55475.00	1596.34	1176.77
35 2018	0.0	2771.00	2771.00	58246.00	55475.00	1438.15	1050.69
36 2019	0.0	2771.00	2771.00	58246.00	55475.00	1295.63	938.11
37 2020	0.0	2771.00	2771.00	58246.00	55475.00	1167.23	837.60
38 2021	0.0	2771.00	2771.00	58246.00	55475.00	1051.56	747.86
39 2022	0.0	2771.00	2771.00	58246.00	55475.00	947.36	667.73
40 2023	0.0	2771.00	2771.00	58246.00	55475.00	853.47	596.19
41 2024	0.0	3575.00	3575.00	58246.00	54671.00	757.75	524.60
42 2025	0.0	2771.00	2771.00	58246.00	55475.00	692.70	475.28
43 2026	0.0	2771.00	2771.00	58246.00	55475.00	624.05	424.36
44 2027	0.0	2771.00	2771.00	58246.00	55475.00	562.21	378.89
45 2028	0.0	2771.00	2771.00	58246.00	55475.00	506.50	338.29
46 2029	0.0	2771.00	2771.00	58246.00	55475.00	456.30	302.05
47 2030	0.0	2771.00	2771.00	58246.00	55475.00	411.08	269.69
48 2031	0.0	2771.00	2771.00	58246.00	55475.00	370.35	240.79
49 2032	0.0	2771.00	2771.00	58246.00	55475.00	333.65	214.99
50 2033	0.0	2771.00	2771.00	58246.00	55475.00	300.58	191.96
TOTAL	399182.34	138457.00	537639.34	2606506.00	2068866.66	20441.88	-6151.76

I E R R = 12 ..... 11 + 20441.88 / (20441.88 + 6151.76) = 11.77

TABLE C.5.4-7 PROJECT ECONOMIC COST AND RETURN - Case (7)
COMBINATION OF CASES (1) AND (4)

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS	PROJECT RETURN	PRESENT WORTH VALUE	
	CAPITAL	O & M	TOTAL (1)	(2)	(3) =(2)-(1)	(3)*DISCOUNT RATE (14 %)	(15 %)
1 1984	23657.69	-96.00	23561.69	0.0	-23561.69	-20668.16	-20488.43
2 1985	91435.25	-96.00	91339.25	1513.00	-89826.25	-69118.50	-67921.64
3 1986	49689.17	-96.00	49593.17	5296.00	-44297.17	-29899.42	-29126.17
4 1987	75388.46	-96.00	75292.46	11350.00	-63942.46	-37859.22	-36559.41
5 1988	52078.37	-96.00	51982.37	19673.00	-32309.37	-16780.55	-16063.52
6 1989	48019.38	2413.00	50432.38	29510.00	-20922.38	-9532.01	-9045.36
7 1990	25648.69	2771.00	28419.69	40860.00	12440.31	4971.65	4676.80
8 1991	0.0	2771.00	2771.00	51453.00	48682.00	17066.06	15914.32
9 1992	0.0	2771.00	2771.00	60534.00	57763.00	17762.74	16419.95
10 1993	0.0	2771.00	2771.00	68857.00	66086.00	17826.47	16335.56
11 1994	0.0	3575.00	3575.00	72640.00	69065.00	16342.16	14845.17
12 1995	0.0	8463.00	8463.00	74910.00	66447.00	13791.85	12419.52
13 1996	0.0	2771.00	2771.00	75667.00	72896.00	13272.30	11847.74
14 1997	0.0	2771.00	2771.00	75667.00	72896.00	11642.39	10302.39
15 1998	0.0	2771.00	2771.00	75667.00	72896.00	10212.63	8958.61
16 1999	0.0	2771.00	2771.00	75667.00	72896.00	8958.46	7790.10
17 2000	0.0	2771.00	2771.00	75667.00	72896.00	7858.30	6774.00
18 2001	0.0	2771.00	2771.00	75667.00	72896.00	6893.26	5890.44
19 2002	0.0	2771.00	2771.00	75667.00	72896.00	6046.72	5122.13
20 2003	0.0	2771.00	2771.00	75667.00	72896.00	5304.15	4454.03
21 2004	0.0	3575.00	3575.00	75667.00	72092.00	4601.45	3830.35
22 2005	0.0	2771.00	2771.00	75667.00	72896.00	4081.38	3367.89
23 2006	0.0	2771.00	2771.00	75667.00	72896.00	3580.16	2928.60
24 2007	0.0	2771.00	2771.00	75667.00	72896.00	3140.50	2546.61
25 2008	0.0	2771.00	2771.00	75667.00	72896.00	2754.82	2214.45
26 2009	0.0	2771.00	2771.00	75667.00	72896.00	2416.51	1925.61
27 2010	0.0	2771.00	2771.00	75667.00	72896.00	2119.75	1674.44
28 2011	0.0	2771.00	2771.00	75667.00	72896.00	1859.43	1456.04
29 2012	0.0	2771.00	2771.00	75667.00	72896.00	1631.08	1266.12
30 2013	0.0	2771.00	2771.00	75667.00	72896.00	1430.78	1100.98
31 2014	0.0	3575.00	3575.00	75667.00	72092.00	1241.23	946.81
32 2015	0.0	8463.00	8463.00	75667.00	67204.00	1014.97	767.49
33 2016	0.0	2771.00	2771.00	75667.00	72896.00	965.74	723.91
34 2017	0.0	2771.00	2771.00	75667.00	72896.00	847.14	629.49
35 2018	0.0	2771.00	2771.00	75667.00	72896.00	743.10	547.38
36 2019	0.0	2771.00	2771.00	75667.00	72896.00	651.85	475.98
37 2020	0.0	2771.00	2771.00	75667.00	72896.00	571.80	413.90
38 2021	0.0	2771.00	2771.00	75667.00	72896.00	501.58	359.91
39 2022	0.0	2771.00	2771.00	75667.00	72896.00	439.98	312.97
40 2023	0.0	2771.00	2771.00	75667.00	72896.00	385.95	272.15
41 2024	0.0	3575.00	3575.00	75667.00	72092.00	334.82	234.04
42 2025	0.0	2771.00	2771.00	75667.00	72896.00	296.97	205.78
43 2026	0.0	2771.00	2771.00	75667.00	72896.00	260.50	178.94
44 2027	0.0	2771.00	2771.00	75667.00	72896.00	228.51	155.60
45 2028	0.0	2771.00	2771.00	75667.00	72896.00	200.45	135.31
46 2029	0.0	2771.00	2771.00	75667.00	72896.00	175.83	117.66
47 2030	0.0	2771.00	2771.00	75667.00	72896.00	154.24	102.31
48 2031	0.0	2771.00	2771.00	75667.00	72896.00	135.30	88.97
49 2032	0.0	2771.00	2771.00	75667.00	72896.00	118.68	77.36
50 2033	0.0	2771.00	2771.00	75667.00	72896.00	104.11	67.27
TOTAL	365917.01	138457.00	504374.01	3311942.00	2807567.99	11079.86	-8329.43

I E R R = 15 ..... 14 + 11079.86 / (11079.86 + 8329.43) = 14.57

TABLE C.5.4-8 PROJECT ECONOMIC COST AND RETURN - Case (8)
COMBINATION OF CASES (2) AND (4)

(UNIT : THOUSAND PESO)

YEAR	PROJECT COST			INCREMENTAL BENEFITS	PROJECT RETURN	PRESENT WORTH VALUE	
	CAPITAL	O & M	TOTAL (1)	(2)	(3) =(2)-(1)	(3)*DISCOUNT RATE (13 %)	(14 %)
1 1984	25808.40	-96.00	25712.40	0.0	-25712.40	-22754.35	-22554.75
2 1985	99747.58	-96.00	99651.58	1513.00	-98138.58	-76857.06	-75514.59
3 1986	54206.39	-96.00	54110.39	5296.00	-48814.39	-33830.94	-32948.42
4 1987	82241.99	-96.00	82145.99	11350.00	-70795.99	-43420.70	-41917.08
5 1988	56812.79	-96.00	56716.79	19673.00	-37043.79	-20105.99	-19239.47
6 1989	52384.79	2413.00	54797.79	29510.00	-25287.79	-12146.28	-11520.85
7 1990	27980.40	2771.00	30751.40	40860.00	10108.60	4296.80	4039.80
8 1991	0.0	2771.00	2771.00	51453.00	48682.00	18312.38	17066.06
9 1992	0.0	2771.00	2771.00	60534.00	57763.00	19228.62	17762.74
10 1993	0.0	2771.00	2771.00	68857.00	66086.00	19468.38	17826.47
11 1994	0.0	3575.00	3575.00	72640.00	69065.00	18005.31	16342.16
12 1995	0.0	8463.00	8463.00	74910.00	66447.00	15329.92	13791.85
13 1996	0.0	2771.00	2771.00	75667.00	72896.00	14882.99	13272.30
14 1997	0.0	2771.00	2771.00	75667.00	72896.00	13170.80	11642.39
15 1998	0.0	2771.00	2771.00	75667.00	72896.00	11655.59	10212.63
16 1999	0.0	2771.00	2771.00	75667.00	72896.00	10314.69	8958.46
17 2000	0.0	2771.00	2771.00	75667.00	72896.00	9128.05	7858.30
18 2001	0.0	2771.00	2771.00	75667.00	72896.00	8077.93	6893.26
19 2002	0.0	2771.00	2771.00	75667.00	72896.00	7148.63	6046.72
20 2003	0.0	2771.00	2771.00	75667.00	72896.00	6326.22	5304.15
21 2004	0.0	3575.00	3575.00	75667.00	72092.00	5536.69	4601.45
22 2005	0.0	2771.00	2771.00	75667.00	72896.00	4954.37	4081.38
23 2006	0.0	2771.00	2771.00	75667.00	72896.00	4384.41	3580.16
24 2007	0.0	2771.00	2771.00	75667.00	72896.00	3880.01	3140.50
25 2008	0.0	2771.00	2771.00	75667.00	72896.00	3433.64	2754.82
26 2009	0.0	2771.00	2771.00	75667.00	72896.00	3038.62	2416.51
27 2010	0.0	2771.00	2771.00	75667.00	72896.00	2689.05	2119.75
28 2011	0.0	2771.00	2771.00	75667.00	72896.00	2379.69	1859.43
29 2012	0.0	2771.00	2771.00	75667.00	72896.00	2105.93	1631.08
30 2013	0.0	2771.00	2771.00	75667.00	72896.00	1863.65	1430.78
31 2014	0.0	3575.00	3575.00	75667.00	72092.00	1631.06	1241.23
32 2015	0.0	8463.00	8463.00	75667.00	67204.00	1345.55	1014.97
33 2016	0.0	2771.00	2771.00	75667.00	72896.00	1291.61	965.74
34 2017	0.0	2771.00	2771.00	75667.00	72896.00	1143.02	847.14
35 2018	0.0	2771.00	2771.00	75667.00	72896.00	1011.52	743.10
36 2019	0.0	2771.00	2771.00	75667.00	72896.00	895.15	651.85
37 2020	0.0	2771.00	2771.00	75667.00	72896.00	792.17	571.80
38 2021	0.0	2771.00	2771.00	75667.00	72896.00	701.04	501.58
39 2022	0.0	2771.00	2771.00	75667.00	72896.00	620.39	439.98
40 2023	0.0	2771.00	2771.00	75667.00	72896.00	549.02	385.95
41 2024	0.0	3575.00	3575.00	75667.00	72092.00	480.50	334.82
42 2025	0.0	2771.00	2771.00	75667.00	72896.00	429.96	296.97
43 2026	0.0	2771.00	2771.00	75667.00	72896.00	380.50	260.50
44 2027	0.0	2771.00	2771.00	75667.00	72896.00	336.72	228.51
45 2028	0.0	2771.00	2771.00	75667.00	72896.00	297.99	200.45
46 2029	0.0	2771.00	2771.00	75667.00	72896.00	263.70	175.83
47 2030	0.0	2771.00	2771.00	75667.00	72896.00	233.37	154.24
48 2031	0.0	2771.00	2771.00	75667.00	72896.00	206.52	135.30
49 2032	0.0	2771.00	2771.00	75667.00	72896.00	182.76	118.68
50 2033	0.0	2771.00	2771.00	75667.00	72896.00	161.74	104.11
TOTAL	399182.34	138457.00	537639.34	3311942.00	2774302.66	13451.35	-9689.26

I E R R = 14 ..... 13 + 13451.35 / (13451.35 + 9689.26) = 13.58

5.5 Farm Budget Analysis

Crop intensity in the area is expected to increase from 161.0 % without project to 182.4 % with project.

Farm budget analysis was attempted to investigate into the economic conditions with project of representative owner operator and lessee both with farm size of 1.4 ha.

Farm household income and expenditure in the AMRIS area has been calculated for the cases of with and without project based on the current market prices surveyed for the various agricultural inputs and projects.

Items considered are gross production value, production cost (inclusive of irrigation service fee, farm ways, and rent) and off-farm income.

Without Project, both typical owner operator and lessee, operating on the farm of 1.4 ha, plant 0.98 ha with wet season palay and 1.27 ha with dry season palay, resulting in a total palay planted area of 2.25 ha or a cropping intensity of 161%. Whereas with project both typical owner operator and lessee, equally operating on the farm of 1.4 ha, plant 1.15 ha and 1.4 ha with wet and dry season palay, respectively, resulting in a total palay planted area of 2.55 ha or an improved cropping intensity of 182.4%.

Table C.5.5-2 summarizes the farm budget, after the target yield is attained, for both the owner operator and lessee. Implementation of the project is expected to generate 9,114 pesos and 5,177 pesos of surplus for owner operator and lessee, respectively.

TABLE C.5.5-1 PRELIMINARY ESTIMATE OF FARM BUDGET

	Without Project		With Project	
	Owner Operator	Lessee	Owner Operator	Lessee
1. Farm Size (ha)	1.4	1.4	1.4	1.4
2. Cropping Intensity (%)	161	161	182.4	182.4
3. Farm Family Income (₱)				
- On-farm Income	13,757	13,757	18,055	18,055
- Off-farm Income 1/	15,850	14,150	15,850	14,150
Total	29,607	27,907	33,905	32,205
4. Expenditure (₱)				
- On-farm Expenditure	8,637	10,619	11,051	13,288
- Household Expenditures 2/	13,740	13,740	13,740	13,740
Total	22,377	24,359	24,791	27,028
5. Farm Family Surplus (₱)	7,230	3,548	9,114	5,177

Note: 1/ ; 2/ : Based on the result of 150 farms survey.