

13.3 Fertilization

Though the mung bean, like other legume crops, utilizes free nitrogen from the air, the use of small amounts of nitrogen fertilizer with phosphorous and potassium as a starter will yield satisfactory results. The suggested fertilizer rate in kg/ha is as follows:

<u>N</u>	<u>P</u>	<u>K</u>	<u>Fertilizer equivalent in bags</u>
20	30	30	one bag of urea, 3 bags of superphosphate, and one bag of potassim chloride

All fertilizer should be applied just before planting (basal application).

13.4 Water Management

Unlike rice, mung beans can not tolerate excess moisture within the root zone for more than 36 hours. The daily water consumption rate is 2 - 4mm. Depending on rainfall and soil characteristics, the frequency of irrigation water application varies from 2 - 3 times.

13.5 Cultivation and Weeding

Two weeks after germination or when the plants are about 20cm high, the field may be cultivated or hilled-up with a plow or hand rotavator and weeded by hand. After hilling-up and hand-weeding, irrigation water is applied whenever necessary.

The fact that the height of improved varieties of mung bean is generally low reveals that a pure culture is important to obtain maximum yield.

Chemical weed control is more advantageous and effective than hand-weeding as it frees the entire plantation of weeds, thus enhancing uniform plant growth. If the appropriate herbicide is used, plant population is not affected. Hand-weeding on the other hand, requires a large number of workers and disturbs the root system of the plants.

The most effective herbicides for mung beans are Daethal, Amiben and Patoran, which can be applied at the rates of 8 - 10kg, 2.5 - 3.5kg (active ingredient), and 3 - 4kg (active ingredient) per hectare,

respectively. The effectiveness of herbicides depends on the spray equipment for which the T-jet nozzle is most appropriate. Pressure should be constant for uniform distribution of the chemical on the plants. In addition, the soil should be well tilled and sufficiently moist in order to fix the chemical immediately.

13.6 Control of Insects and Diseases

Plant pests and diseases constitute one of the major hazards to crop production. Preventing losses from pests and diseases is thus fundamental to ensure stable farm income.

Pests and their control:

(a) Aphids, Aphis laburni Kaltenbach Generally wingless, minute, and green or blackish grey. Usually found on young shoots, leaves and pods. In sucking the plant sap, the aphid transmits virus diseases to the young shoots, leaves and pods causing them to curl. As well, fruits will be deformed and growth of the entire plant stunted.

Control - Aphids can be controlled by predatory lady-beetles and nymphal flies. Metasystox and Malathion may also be used at recommended rates.

(b) Beanfly, Agromyza phaseoli Cocquillet Minute yellowish to reddish maggot found inside the damaged stem. Usually found on young plants. Mines and tunnels the petioles and stems of young bean plants causing swelling and rupturing of the leaves and stalks. Serious cases may result in wilting. Prevalent during the late dry season.

Control - The time of planting should be properly adjusted to avoid late field seeding. Spraying with Thiodan and Metasystox provides effective control.

(c) Bean weevil, Bruchus chinensis Linn A serious pest of stored bean seeds. The beetle breeds within the seed, consuming the inside. Badly damaged seeds fail to germinate.

Control - Dust with DDT at the recommended rate.

Diseases and their control:

(a) Anthracnose, Colletotrichum lindemuthianum (Sass. & Magn.) Bri. & Car - a fungus. Sunken spots on the pods. Spots may also be present on the leaves. Brown depressed cankers are formed on the young stems and cotyledons of the growing plants. The veins on the under surface become blackened and destroyed.

Control - pick out the diseased pods and leaves and burn them. Save seeds from healthy plants. Plant clean seeds or disease-resistant varieties.

(b) Powdery mildew, Erysiphe polygona S.C. - a fungus. Appears as a whitish or grayish powder coating on leaves, stems and pods. Hinders growth of the plant and sometimes causes drying of the leaves. Dusting the diseased plants with sulphur dust or copper lime dust 15 - 80 or 20 - 80 will check the disease. Crop rotation is another means of control.

(c) Leaf spot, Cercospora vignae Bres Produces circular spots of varying sizes on leaves, which are reddish -brown on the upper surface of the leaves and grayish to black on the under side. Badly infected leaves drop off.

Control - Plant seeds from healthy plants and practice crop rotation.

(d) Pod spot, Phoma bakeriana Sacca A seed born parasite, forming irregular purplish or black spots on pods. Infection in growing pods may cause curling and shedding.

Control - To control the disease, do not plant in areas where pod spot has occurred. Obtain seeds from healthy plants. Spray with a copper fungicide at the first appearance of the spot.

(e) Rust, Uredo vignae Bres Rust sori or pustules break open and release spores which are carried by wind and other agents to healthy plants. Characterized by the presence of reddish pustules on the lower surface of the leaves. Severe infection may cause defoliation of the plants.

Control - The disease may be controlled by spraying with Bordeaux mixture. General sanitation and crop rotation should be practiced.

(f) Curly top - May be due to a virus which is commonly transmitted by certain types of insects, such as leaf hoppers and aphids. The first symptom, from which the disease is named, is wrinkling and curling of the leaves. Sometimes, the stem turns brown. Infected plants are stunted and may produce small underdeveloped Pods or none at all.

Control - The most satisfactory method of control is the use of disease-resistant varieties. Elimination of clover and other weeds from the bean field will help keep out the disease. Use of insecticides to kill aphids breeding on the plants will also prove beneficial.

Control of Other Pests

Observations on insect control show that Dipterex, Ambithion Cidial, Thiodan and Sevin are effective against *Homona* spp., *P. litura*, *A. Craccipora*, *H. armigara*, *N. viridula* and an unknown lepidopterous leaf miner. Other common pests effectively controlled by the application of Metasystox-R, Rogor 120, Cygon (systemic insecticides) are the Grey mealy bug (*Ferrisiana virgata*), Beanfly (*Melanagromyza phaseoli*), Aphids (*Aphis* spp.), spotted ladybird beetle (*Epilachna philippinensis*), and the bean pod borer (*Etiella zinchenella*).

13.7 Harvesting, Curing and Storing

Improved varieties of mung bean mature 60 - 70 days after planting. The pod may be harvested by hand or with the use of a scythe. After drying the pods, the seeds can be threshed with a portable thresher, by trampling, or, for large scale planting, with a combine. A delay in mechanical harvesting may result in great losses as the pods will separate and fall when the reel of the combine touches the pods. During the wet season, delayed harvesting results in sprouting of the

seeds. When using a combine, the seeds should be dried immediately after being unloaded from the seedhopper. The seeds should never be piled in bulk because the heat generated would cause swelling of the seeds, which would result in wrinkled seed coats once dried. Dried seeds should contain a 10 - 12% moisture level to avoid molding and weevil infection when stored.

14. PRESENT PROJECT AGRICULTURAL ECONOMY

14.1 Farm Size

The number and area of farms recorded in the January 1983 Project area farm management survey show the predominant farm area to be 1.0 - 2.5ha and the average farm size to be 1.64ha. These figures are slightly higher than the present average regional level farm size of 1.55ha^{1/} in the land reform program. TABLE IV-41 and IV-42 show farm sizes and the percent distribution of these sizes in the Project area.

14.2 Land Tenure

Around 26% of the farmers in the area own their land. TABLE IV-42 shows the percentage land tenure in the Project area. Late in 1972, a Presidential Decree called for the emancipation of tenant farmers. Land transfer to full owners however, has not yet been fully completed.

TABLE IV-42 shows the prevalence of share tenancy since the land reform program. Of the total number of farms, about 37% are classified as share tenants, a figure slightly higher than the 26% for owner cultivators. Approximately 22% were classified as amortizing owners and 12% as lessees. An eventual conversion of share tenants to either leasees or amortizing owners is anticipated in view of the on-going land reform program.

^{1/} Source: Statistics and Data Bank Division, 1983, Ministry of Agriculture

14.3 Tenancy and Land Reform

(1) Tenancy and Land Reform

Statistics from the District Office of the Ministry of Agrarian Reform at Bayombong show that, as of March 1982, there are 2,373 Operation Land Transfer (OLT) recipients in Nueva Vizcaya. The tenancy rate is 67.18%, and distribution of Certificates of Land Transfer (CLT) is 27.77%. Other details on tenancy are reflected in the following table:

Land Reform Program, Tenant/Landowners
Nueva Vizcaya 1982

Items	OLT	Leasehold Conversion
Number of tenants identified	2,373	6,430
Area (ha)	3,532.5537	9,595.0588
Number of Landowners	432	5,537
Parcel Tenants	3,324	9,644
Tenancy Rate (%)	67.18	71.13
Accomplishment (%)	27.77	94.21

Source: Ministry of Agrarian Reform, Nueva Vizcaya

(2) Agrarian Reform Program

The agrarian reform program has developed over a long period of time commencing with the benchmark purchase of Friar Lands in the first year of nationhood. Government agrarian reform was further strengthened with the creation of the Department of Agrarian Reform (now the Ministry of Agrarian Reform or MAR) and the passage of a series of presidential decrees, general orders, and letters of instruction from the President. These included the issuance of Presidential Decree (P.D.) 2 declaring the entire country to be a land reform area, and P.D. 27 emancipating the tenant-farmers.

P.D. 2 abolished the agricultural share crop system and called for the establishment of leaseholdings for tenanted rice and corn land with an area of 7ha or less. On the other hand, P.D. 27, the Tenant Emancipation Decree transferred the ownership of tenanted rice and corn land to the actual tillers in areas over 7ha.

In addition, public land has also been opened and developed for distribution to landless families and reformed rebels through the agricultural resettlement program. Support programs are also being implemented to facilitate land transfer, conversion to leaseholding and resettlement. These programs include compact farming, land consolidation, cooperative farming, intensive rice farming, education and training, and farmers organizations.

The MAR is working closely with other government agencies for program implementation. The Bureau of Lands is providing parcellary sketching and the Ministry of Local Government and Community Development is assisting the development of cooperatives.

The Tables in the DATA BOOK presents a summary of the program's status in the Project municipalities. While leasehold conversion has reached 97% in Solano, Bayombong, 91% in Bambang, and 98% in Bagabag, Villaverde, the accomplishment of Land Transfer has been much lower at 24%, 48%, and 27% respectively.

(3) Land Transfer

To transform the tenant-farmer into an owner-cultivator, P.D. 27 was issued on Oct. 21, 1972. This decree stated that tenant-farmers on private agricultural lands primarily devoted to rice and corn, whether the land was classified as landed estate or not, would hence forth be deemed the owner of a portion of the same land, the portion being equivalent to 5ha for un-irrigated land, and 3ha for irrigated land. Small landowners were allowed to retain no more than 7ha of their landholdings if they were going to till the same.

To implement P.D. 27, Operation Lands Transfer (OLT) was launched by MAR with the support of the Bureau of Lands, the Land Registration Commission, the National Computer Center and the Land Bank. The share tenancy system has been declared contrary to public policy throughout the nation.

(4) Resettlement

Resettlement involves the distribution of public agricultural land to needy families and the transfer of residency to the land received. In the Project area, the IMELDA Project (Integrated Management of Existing Linkage in Depressed Areas) is extending additional funds. All MAR technicians have pilot barangays in their assigned municipalities.

In the Project area Quezon, Tugal and Bascaran in Solano Municipality, and La Torre, Magsaysay and Bonfal West in Bayombong Municipality have been established as pilot barangays.

15. PROJECT BENEFITS AND FARM BUDGETS

15.1 Agricultural Benefits

The agricultural benefit is evaluated as the difference of net production value from crops in future between "without project" and "with project". TABLE IV - 43-49 show farm-gate prices of crops, crop production cost and economic benefit in full development stage in the Project area. Based on these TABLES the incremental net production value without labor cost at the full development stage is estimated at 111.0 million pesos.

15.2 Farm Budgets

In order to evaluate project feasibility from the financial aspect of farmers, typical farm budget analyses have been made under both "with project" and "without project" conditions as shown in TABLE IV - 50 and 51. Under "with project" conditions the capacity to pay is 8,466.1 pesos per average farm family.

PRESENT CROPPED AREA AND CROP PRODUCTION

	Block No. 1		Block No. 2		Block No. 3		Block No. 4		Block No. 5		Total			
	Area (ha)	Yield/ha (kg)	Area (ha)	Yield/ha (kg)	Area (ha)	Yield/ha (kg)	Area (ha)	Yield/ha (kg)	Area (ha)	Yield/ha (kg)	Area (ha)	Product (MT)		
Local Palay W.	1,530	1,629	1,700	1,419	2,412	2,130	2,160	4,601	520a 180b	1,419 1,971	738 355	713	6,390	11,311
HYV Palay W.	1,400	2,034	1,655	1,774	2,936	900	2,700	2,430	400	2,464	986		4,355	9,202
HYV Palay D.	930	3,500	640	3,450	2,208	2,270	3,550	8,059	430	3,450	1,784		300	3,450
Palay Total	3,860	2,227	3,995	1,891	7,556	5,300	2,867	15,090	1,530	2,329	3,563		630	2,775
Corn W.	170	929	158	929	153								1,230	929
Corn D.	420	929	390										1,230	929
Corn Total	590	929	548	929	153								1,230	929
Vegetable & Root Crops														
Orchard	20	18,720d	374	20	18,720d	374	10	18,720d	187				160	5,586c
Fallow Land	60		40										50	18,720d
Arable Land (ha)	3,430		3,580		3,040		1,100		1,890				280	
Cropped Land (ha)	4,470		4,180		5,310		1,530		2,070				100	
Cropping Intensity (%)	130.32		116.76		174.67		139.09		109.52				134.70	

Note: a - Cropped at La Torre
b - Cropped at Manantan and Sto. Domingo
c - Calculated with Sweet Potato
d - Calculated with Pomelo

PRESENT CROPPING PATTERN

Cropping Pattern		Block					Total	
Wet	Dry	No.1	No.2	No.3	No.4	No.5	Area	%
Local Palay	HYV Palay			2,130	180	300	2,610	20.0
HYV Palay	HYV Palay	930	640	140	250		1,960	15.0
Corn	Vegetable					160	160	1.2
Corn	Corn	170					170	1.3
HYV Palay	-	470	1,015	760	150		2,395	18.4
Local Palay	-	1,530	1,700		520	30	3,780	29.0
Corn	-		165			1,070	1,235	9.5
-	Corn	250					250	1.9
Orchard		20	20	10		50	100	0.8
Fallow		60	40			280	380	2.9
Total		3,430	3,580	3,040	1,100	1,890	13,040	100.00

TABLE IV-3
TABLE IV-4

FUTURE CROPPING PATTERN (WITHOUT PROJECT)

Wet Season	Dry Season	Area (ha)	C. I.*
Local Palay	-	3,780	29.0
Local Palay	HYV** Palay	2,610	40.0
HYV Palay	-	2,395	18.4
HYV Palay	HYV Palay	1,960	30.0
Corn	-	1,235	9.5
-	Corn	250	1.9
Corn	Corn	170	2.6
Corn	Vegetable	160	2.4
Orchard		100	0.8
Fallow		380	-
TOTAL		13,040	134.6

FUTURE CROPPING PATTERN (WITH PROJECT)

Wet Season	Dry Season	Area (ha)	C. I.*
HYV Palay	HYV Palay	7,230	113.1
HYV Palay	HYV Palay Mongo	3,600	84.5
HYV Palay	Corn	450	7.0
Corn	Peanut	1,000	15.6
Corn	Vegetable	400	6.2
Orchard		100	0.8
Total		12,780	227.2

Note: * Cropping Intensity (%)
** High Yielding Varieties

TABLE IV-5

PROPOSED CROPPING PATTERN AT FULL DEVELOPMENT

Cropping Pattern		Block					Total	
Wet	Dry	No. 1	No. 2	No. 3	No. 4	No. 5	Area (ha)	%
HYV Palay	HYV Palay	1,840	2,340	2,030	790	230	7,230	56.6
HYV Palay	HYV Palay Mango	1,000	1,200	1,000	300	100	3,600	28.2
HYV Palay	Corn	450					450	3.5
Corn	Peanut					1,000	1,000	7.8
Corn	Vegetable					400	400	3.1
Orchard		20	20	10		50	100	0.8
Total		3,310	3,560	3,040	1,090	1,780	12,780	100.0

TARGET YIELD OF CROP WITHOUT/WITH PROJECT

CROP	PRESENT	WITHOUT PROJECT	WITH PROJECT
	t/ha	t/ha	t/ha
Local Palay Wet	1.8	1.9	-
HYV Palay Wet	2.1	2.3	4.0
HYV Palay Dry	3.5	3.8	4.5
Corn Wet	0.9	1.1	3.0
Corn Dry	0.9	1.1	3.5
Mung Bean	-	-	1.2
Vegetable	5.6	6.0	10.0
Peanut	-	-	1.5
Orchard	1.9	1.9	1.9

CROPPED AREA AND YIELD

At Present

	Block 1		Block 2		Block 3		Block 4		Block 5		OVERALL TOTAL	
	ha	t/ha	ha	t/ha	ha	t/ha	ha	t/ha	ha	t/ha	ha	t/ha Prod. (t)
Local Palay Wet	1,530	1.63	1,700	1.42	2,130	2.16	520 ^a / 180 ^b	1.42 1.97	300	2.16	6,390	1.77 11,311
HYV Palay Wet	1,400	2.03	1,655	1.77	900	2.70	400	2.46			4,355	2.11 9,202
HYV Palay Dry	930	3.50	640	3.45	2,270	3.55	430	3.45	300	3.45	4,570	3.51 16,041
Corn Wet	170	0.93	165	0.93					1,230	0.93	1,565	0.93 1,454
Corn Dry	420	0.93									420	0.93 390
Root Crops (Camote)									160	5.59	160	5.59 894
Orchard (Pomelo)	20	18.72	20	18.72	10	18.72			50	18.72	100	18.72 1,872

With Project

	Block 1		Block 2		Block 3		Block 4		Block 5		OVERALL TOTAL	
	ha	t/ha	ha	t/ha	ha	t/ha	ha	t/ha	ha	t/ha	ha	t/ha Prod. (t)
HYV Palay Wet	3,290	4.0	3,540	4.0	3,030	4.0	1,090	4.0	330	4.0	11,280	4.0 45,120
HYV Palay Dry	2,840	4.5	3,540	4.5	3,030	4.5	1,090	4.5	330	4.5	10,830	4.5 48,735
Corn Wet									1,400	3.0	1,400	3.0 4,200
Corn Dry	450	3.5									450	3.5 1,575
Mung Bean	1,000	1.2	1,200	1.2	1,000	1.2	300	1.2	100	1.2	3,600	1.2 4,320
Vegetable (Onion)									400	10.0	400	10.0 4,000
Peanut									1,000	1.5	1,000	1.5 1,500
Orchard (Pomelo)	20	18.72	20	18.72	10	18.72			50	18.72	100	18.72 1,872

Note: HYV: High Yielding Varieties

^a/ : La Torre^b/ : Manamtan and Sto. Domingo

CROPPED AREA AND CROP PRODUCTION

		Cropped Area (ha)	Production (M.T.)
Palay	present	15,315	36,554
	without project	15,315	38,928
	with project	22,110	93,855
Corn	present	1,985	1,844
	without project	1,985	2,165
Mung Bean	with project	1,850	5,775
	present	0	0
	without project	0	0
	with project	3,600	4,320
Peanut	present	0	0
	without project	0	0
	with project	1,000	1,500
Vegetable	present	160	894
	without project	160	965
	with project	400	4,000

PROPOSED CROPPED AREA, TARGET YIELD AND PRODUCTION PROJECTION AT FULL DEVELOPMENT

	Block No. 1			Block No. 2			Block No. 3			Block No. 4			Block No. 5			Total		
	Area (ha)	Yield (kg/ha)	Product (MT)	Area (ha)	Yield (kg/ha)	Product (MT)	Area (ha)	Yield (kg/ha)	Product (MT)	Area (ha)	Yield (kg/ha)	Product (MT)	Area (ha)	Yield (kg/ha)	Product (MT)	Area (ha)	Yield (kg/ha)	Product (MT)
HYV Palay M.	3,290	4,000	13,160	3,540	4,000	14,160	3,030	4,000	12,120	1,090	4,000	4,360	330	4,000	1,320	11,280	4,000	45,120
HYV Palay D.	2,840	4,500	12,780	3,540	4,500	15,930	3,030	4,500	13,635	1,090	4,500	4,905	330	4,500	1,485	10,830	4,500	48,735
Palay Total	6,130	4,250	25,940	7,080	4,250	30,090	6,060	4,250	25,755	2,180	4,250	9,265	660	4,250	2,805	22,110		93,855
Corn M.													1,400	3,000	4,200	1,400	3,000	4,200
Corn D.	450	3,500	1,575														450	3,500
Corn Total		450	1,575										1,400	3,000	4,200		1,850	5,775
Mong Bean	1,000	1,200	1,200	1,200	1,200	1,440	1,000	1,200	1,200	300	1,200	360					3,600	1,200
Vegetables													400	10,000	4,000		400	10,000
Peanut													1,000	1,500	1,500		1,000	1,500
Orchard	20	18,720	374	20	18,720	374	10	18,720	187				50	18,720	936		100	18,720
Arable Land (ha)	3,310			3,560			3,040			1,090			1,780					12,780
Cropped Land (ha)	7,600			8,300			7,070			2,480			3,510					29,060
Cropping Intensity (%)	229.6			233.1			232.6			227.5			197.2					227.4

TABLE IV-9

Note: W. : Wet
D. : Dry
HYV : High Yielding Varieties
Vegetable : Mainly onion
Orchard : Pomelo

REGIONAL BREAKDOWN OF PEANUT PRODUCTION

(Unit: M.T.)

Region	Distribution	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	13 (%)	4,706	4,992	5,291	5,603	5,941	6,604	7,345	8,177	8,944	9,776
2	44	15,928	16,896	17,908	18,964	20,108	22,352	24,860	27,676	30,272	33,088
3	3	1,086	1,152	1,221	1,293	1,371	1,524	1,695	1,887	2,064	2,256
4	9	3,258	3,456	3,663	3,879	4,113	4,572	5,085	5,661	6,192	6,768
5	4	1,448	1,536	1,628	1,724	1,828	2,032	2,260	2,516	2,752	3,008
6	5	1,810	1,920	2,035	2,155	2,285	2,540	2,825	3,145	3,440	3,760
7	8	2,896	3,072	3,256	3,448	3,656	4,064	4,520	5,032	5,504	6,016
8	5	1,810	1,920	2,035	2,155	2,285	2,540	2,825	3,145	3,440	3,760
9	2	724	768	814	862	914	1,016	1,130	1,258	1,376	1,504
10	2	724	768	814	862	914	1,016	1,130	1,258	1,376	1,504
11	2	724	768	814	862	914	1,016	1,130	1,258	1,376	1,504
12	3	1,086	1,152	1,221	1,293	1,371	1,524	1,695	1,887	2,064	2,256
Total	100	36,200	38,400	40,700	43,100	45,700	50,800	56,500	62,900	68,800	75,200

Source: Bureau of Plant Industry, Ministry of Agriculture

LIVESTOCK & POULTRY PRODUCTION IN PROJECT MUNICIPALITIES, 1980

	CARABAO	CATTLE	GOAT	PIG	HORSE	SHEEP	POULTRY
PROVINCE	23,070	26,190	2,720	69,670	NA	400	503,620
BAGABAG	1,280	1,738	160	4,000	215	-	4,450
BAMBANG	4,758	7,889	438	5,626	339	-	38,470
BAYOMBONG	3,722	5,240	NA	8,693	NA	-	47,430
SOLANO	1,673	1,513	416	6,813	95	-	30,303
VILLAVERDE	1,038	1,178	122	3,135	NA	10	20,951
TOTAL	12,471	17,558	1,136	27,903	649	10	141,604

Source: Provincial Socio-Economic & Physical Profile 1982, N.V. et al

LIVESTOCK & POULTRY PRODUCTION BY YEAR, NUEVA VIZCAYA

POULTRY & LIVESTOCK	1976	1977	1978	1979	1980
CARABAO	21,540	20,620	21,500	22,940	23,070
CATTLE	38,860	24,150	27,450	26,560	26,190
HOG	65,860	45,150	51,820	54,570	60,670
CHICKEN	277,690	246,250	318,900	267,520	465,580
DUCK	38,880	35,910	22,080	26,700	38,040
TOTAL	431,830	372,080	441,750	398,290	622,450

Source: Beacon, Bayombong, N.V.

ANIMAL DISPERSAL PROGRAM, NUEVA VIZCAYA

LIVESTOCK	NO. OF DISPERSAL	
	1977	1980
CATTLE	95	208
CARABAO	10	14
GOAT	40	428
SWINE	30	50
TOTAL	175	700

Source: BAI, Bayombong, N.V.

FISH LANDED BY SOURCE, KIND AND POINT OF LANDING
NUEVA VIZCAYA, 1980

FISH LANDED BY SOURCE	AREA	PRODUCTION METRIC TONS	KIND	POINT OF LANDING
Inland Fishing Lakes, Rivers			C. carps T. mozambique T. nilotica	Public Market of Nueva Vizcaya
Magat River	50 ha	7.00	Gourami Catfish Mudfish, etc.	

Source: BFAR, N.V.

FISHPOND OPERATION IN NUEVA VIZCAYA, 1980

FISHPOND OPERATION	LOCATION	AREA COVERED	PRODUCTION (MT)
Freshwater	-	57.9303 ha	4.42
Marshes & Lakes	Tulag Lake	20.0	3.00
	Palayan ng Bayan	7.0	2.00
	Polloc Lake	2.5	1.00
TOTAL		87.4303	10.42

Source: Provincial Socio-Economic & Physical Profile 1982, N.V.

RICE-FISH CULTURE PROGRAM
CUMULATIVE FROM JAN. '82 - JUNE '82

SL. NO.	MUNICIPALITY	NO. OF PROD. TECHNICIANS	NO. OF BARANGAY	NO. OF FARMER	AREA PLANTED
					(ha)
1.	Dupax del Sur	1	1	1	0.30
2.	Kasibu	1	2	2	0.40
3.	Villaverde	4	4	8	1.35
4.	Diadi	1	1	1	0.10
5.	as of Jan. to May '82	11	12	20	3.70
6.	as of June '82 by BFAR	3		17	4.16
	TOTAL	21	20	49	10.01

Source: BFAR & MA. N. V.

FISHPOND CONCESSIONS OPERATORS, AREA OF OPERATION
NUEVA VISCAYA, 1981

SL. NO.	MUNICIPALITIES	NO. OF OPERATORS	COVERAGE AREA (ha)	PRODUCTION (MT)
1.	Aritao	8	1.8908	0.112
2.	Bagabag	12	9.2727	0.868
3.	Bambang	21	9.726	0.851
4.	Bayombong	32	10.9944	1.238
5.	Dupax del Norte	20	1.0334	0.26
6.	Kasibu	3	0.08	0.025
7.	Kayapa	3	0.29	0.07
8.	Quezon	9	7.75	0.772
9.	Sta Fe	3	0.27	0.005
10.	Solano	24	13.923	0.014
11.	Villaverde	6	2.7	0.205
TOTAL		141	57.9303	4.42

Source: BFAR, N.V.

SUMMARY OF HOUSEHOLD POPULATION AND AGE GROUP IN 1980

	Total House- hold	Farm House- hold	Total Population	Farm Household Population	Age Group/Farm Household			
					0-14	15-19	20-59 60 and Over	
Block No.1	4,892	2,428	25,064	12,865	5,718	1,555	4,978	614
Block No.2	5,252	2,607	26,910	13,816	6,140	1,670	5,345	659
Block No.3	4,493	2,230	23,022	11,817	5,253	1,428	4,572	564
Block No.4	1,178	786	6,033	4,086	1,792	497	1,591	208
Block No.5	2,632	1,306	13,478	6,919	3,075	836	2,677	331
Total	18,447	9,357	94,507	49,503	21,978	5,986	19,163	2,376

LABOR AVAILABLE IN ONE FARM HOUSEHOLD IN 1980

Age Group	Family Member	Labor Force	rate %	Labor Force
0 - 14	2.35	0		0
15 - 19	0.64	50		0.32
20 - 59	2.05	100		2.05
60 & Over	0.25	50		0.13
Total	5.29			2.5

TABLE IV-20

CALCULATION OF LABOR USE FOR ALL PRODUCTS AT PRESENT IN THE PROJECT AREA

														(Unit: man-day)	
Items	Area	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total	
1. Labor Requirement per hectare															
1) Block No. 1															
1st Local Palay	1	2.31	0.64	16.72	16.83					11.03	30.02	20.71	5.98	104.24	
1st HYV Palay	1	17.02	16.83							11.14	30.81	21.95	6.49	104.24	
2nd HYV Palay	1			5.24	18.10	33.30	10.68	6.60	21.27	4.95				100.14	
1st Corn	1	2.70	10.70	11.30							19.70	10.25	5.10	59.75	
2nd Corn	1					19.70	10.25	5.10	2.70	10.70	11.30			59.75	
Coconut etc.	1	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	14.40	
2) Block No. 2															
1st Local Palay	1	21.03	7.77	6.14	22.38	5.62						11.03	30.27	104.24	
1st HYV Palay	1	21.95	6.49	17.02	16.83							11.14	30.81	104.24	
2nd HYV Palay	1					5.24	18.10	33.30	10.68	6.60	21.27	4.95		100.14	
1st Corn	1	2.70	10.70	11.30							19.70	10.25	5.10	59.75	
2nd Corn	1					19.70	10.25	5.10	2.70	10.70	11.30			59.75	
Coconut etc.	1	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	14.40	
3) Block No. 3															
1st Local Palay	1	2.08	17.29	16.83					5.29	18.18	30.48	6.81	7.28	104.24	
1st Local Palay	1	22.38	5.62						5.29	18.83	33.93	11.69	6.50	104.24	
2nd HYV Palay	1		5.24	18.10	33.30	10.68	6.60	21.27	4.95					100.14	
1st Corn	1	2.70	10.70	11.30							19.70	10.25	5.10	59.75	
2nd Corn	1					19.70	10.25	5.10	2.70	10.70	11.30			59.75	
Coconut etc.	1	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	14.40	
4) Block No. 4															
1st Local Palay	1	17.29	16.83					5.29	18.18	30.48	6.81	7.28	2.08	104.24	
1st Local Palay	1	21.03	7.77	6.14	22.38	5.62			5.29	18.83	33.93	11.69	6.50	104.24	
2nd HYV Palay	1	5.62							5.29	18.83	33.93	11.69	6.50	104.24	
2nd HYV Palay	1		5.24	18.10	33.30	10.68	6.60	21.27	4.95					100.14	
5) Block No. 5															
1st Local Palay	1	16.72	16.83						10.96	28.34	18.23	7.70	5.46	104.24	
2nd HYV Palay	1		5.24	18.10	33.30	10.68	6.60	21.27	4.95					100.14	
1st Corn	1	3.65	14.70	4.00						9.90	19.70	2.90	4.90	59.75	
Camote etc.	1		10.30	28.00	6.70	7.00			14.60	7.40				74.00	
Coconut etc.	1	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	14.40	
2. Total Labor Requirement (1,000 man-day)															
1) Block No. 1															
1st Local Palay	1,530	3.5	1.0	25.6	25.7					16.9	45.9	31.7	9.1	159.4	
1st HYV Palay	1,400	23.8	23.6							15.6	43.1	30.7	9.1	145.9	
2nd HYV Palay	930			4.9	16.8	31.0	9.9	6.1	19.8	4.6				93.1	
1st Corn	170	0.5	1.8	1.9							3.3	1.7	0.9	10.1	
2nd Corn	420					8.3	4.3	2.1	1.1	4.5	4.7			25.0	
Coconut etc.	20														
Sub-Total	4,470	27.8	26.4	32.4	42.5	39.3	14.2	8.2	20.9	41.6	97.0	64.1	19.1	431.5	
2) Block No. 2															
1st Local Palay	1,700	35.8	13.2	10.4	38.0	9.6						18.8	51.5	177.3	
1st HYV Palay	1,655	36.3	10.7	28.2	27.9							18.4	51.0	172.5	
2nd HYV Palay	640					3.4	11.6	21.3	6.8	4.2	13.6	1.2		64.1	
1st Corn	165	0.4	1.8	1.9							3.3	1.7	0.8	9.9	
Coconut etc.															
Sub-Total	4,180	72.5	25.7	40.5	65.9	11.0	11.6	21.7	6.8	4.2	16.9	42.1	101.1	421.8	
3) Block No. 3															
1st Local Palay	2,130	4.4	36.8	35.8					11.3	38.7	64.9	14.5	15.5	221.4	
1st HYV Palay	900	20.1	5.1						4.8	16.9	30.5	10.5	5.9	93.8	
2nd HYV Palay	2,270		11.9	41.1	75.6	24.2	15.0	48.3	11.2					227.3	
Coconut etc.	10														
Sub-Total	5,310	24.5	53.8	76.9	75.6	24.2	15.0	48.3	27.3	55.6	95.4	25.0	21.4	563.0	
4) Block No. 4															
1st Local Palay	180	3.1	3.0					1.0	3.3	5.5	1.2	1.3	0.4	18.8	
1st Local Palay	520	10.9	4.0	3.2	11.6	2.9						5.7	15.7	54.0	
1st HYV Palay	400	2.2						2.1	7.6	13.6	4.7	2.6	9.0	41.8	
2nd HYV Palay	430		2.3	7.8	14.3	4.6	2.8	9.1	2.1					43.0	
Sub-Total	1,530	16.2	9.3	11.0	25.9	7.5	2.8	12.2	13.0	19.1	5.9	9.6	25.1	157.6	
5) Block No. 5															
1st Local Palay	330	5.5	5.6						3.6	9.4	6.0	2.5	1.8	34.4	
2nd HYV Palay	300		1.6	5.4	10.0	3.2	2.0	6.4	1.5					30.1	
1st Corn	1,230	4.5	18.1	4.9						12.2	24.2	7.6	6.0	73.5	
Camote etc.	160		1.6	4.5	1.1	1.1			2.3	1.2				11.8	
Coconut etc.	50														
Sub-Total	2,070	10.0	26.9	14.8	11.1	4.3	2.0	6.4	7.4	22.8	30.2	6.1	7.8	149.8	
Total Labor Requirement		151.0	142.1	175.6	221.0	88.3	45.6	96.4	75.4	143.3	245.4	146.9	176.7	1,707.7	
3. Available Labor Force															
		459.3	414.8	459.3	444.5	459.3	444.5	459.3	459.3	444.5	459.3	444.5	459.3	5,407.9	
4. Balance (3 - 2)															
		+308.3	+272.7	+283.7	+223.5	+371.0	+398.9	+362.9	+383.9	+301.2	+213.9	+297.6	+282.6	+3,700.2	

Available Labor Force = 9,357 (Total Farm Household) x 2.5 (Average Available Labor Force per Farm Household) x 20 days x 0.95 (rate of Farm Labor) = 444,457.5 man-day (per 30 day-month)

CALCULATION OF ANIMAL LABOR USE FOR ALL PRODUCTS
AT PRESENT IN THE PROJECT AREA

(Unit: animal-man-day)

Items	Area	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
1. Animal Labor Requirement per hectare														
1) Block No. 1														
1st Local Palay	1			1.30	2.61					7.71	7.71	3.80		23.13
1st HYV Palay	1	1.30	2.61							7.71	7.71	3.80		23.13
2nd HYV Palay	1			1.82	7.64	7.65			1.83	0.91				21.85
1st Corn	1	4.00	0.70	1.30							16.00	8.00	2.00	32.00
2nd Corn	1					16.00	8.00	2.00	4.00	0.70	1.30			32.00
Coconut etc.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
2) Block No. 2														
1st Local Palay	1	3.80			2.61	1.30						7.71	7.71	23.13
1st HYV Palay	1	3.80		1.30	2.61							7.71	7.71	23.13
2nd HYV Palay	1					3.82	7.64	7.65			1.83	0.91		21.85
1st Corn	1	4.00	0.70	1.30							16.00	8.00	2.00	32.00
Coconut etc.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
3) Block No. 3														
1st Local Palay	1		1.30	2.61						3.80	7.71	7.71		23.13
1st HYV Palay	1	2.61	1.30							3.80	7.71	7.71		23.13
2nd HYV Palay	1			3.82	7.64	7.65		1.83	0.91					21.85
Coconut etc.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4) Block No. 4														
1st Local Palay	1	1.30	2.61					3.80	7.71	7.71				23.13
1st Local Palay	1	3.80			2.61	1.30						7.71	7.71	23.13
1st HYV Palay	1	1.30						3.80	7.71	7.71			2.61	23.13
2nd HYV Palay	1		3.82	7.64	7.65			1.83	0.91					21.85
5) Block No. 5														
1st Local Palay	1	1.30	2.61						7.71	7.71	3.80			23.13
2nd HYV Palay	1			3.82	7.64	7.65		1.83	0.91					21.85
1st Corn	1		1.30	0.70						8.00	16.00	2.00	4.00	32.00
Camote etc.	1		10.30	20.70					1.30	0.70				33.00
Coconut etc.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Total Animal Labor Requirement (1,000 animal-man-day)														
1) Block No. 1														
1st Local Palay	1,530			2.0	4.0					11.8	11.8	5.8		35.4
1st HYV Palay	1,400	1.8	1.7							10.8	10.8	5.3		32.4
2nd HYV Palay	930			3.6	7.1	7.1			1.7	0.8				20.3
1st Corn	170	0.7	0.1	0.2			6.7	3.4	0.8	1.7	0.3	0.6	1.4	5.9
2nd Corn	420					6.7	3.4	0.8	1.7	0.3	0.6			13.5
Coconut etc	20													
Sub-Total	4,470	2.5	3.8	5.8	11.1	13.8	3.4	0.8	3.4	23.7	25.9	12.5	0.8	107.5
2) Block No. 2														
1st Local Palay	1,700	6.5			4.4	2.2						13.1	13.1	39.3
1st HYV Palay	1,655	6.3		2.2	4.3							12.8	12.8	38.4
2nd HYV Palay	640					2.4	4.9	4.9			1.2	0.6		14.0
1st Corn	165	0.7	0.1	0.2							2.6	1.3	0.3	5.2
Coconut etc	20													
Sub-Total	4,180	13.5	0.1	2.4	8.7	4.6	4.9	4.9			3.8	27.8	26.2	96.9
3) Block No. 3														
1st Local Palay	2,130		2.8	9.6					8.1	16.4	16.4			53.3
1st HYV Palay	900	2.3	1.2						3.4	6.9	6.9			23.7
2nd HYV Palay	2,270		8.7	17.3	17.4			4.2	2.1					49.7
Coconut etc.	10													
Sub-Total	5,310	2.3	12.7	26.9	17.4			4.2	13.6	23.3	23.3			123.7
4) Block No. 4														
1st Local Palay	180	0.2	0.5					0.7	1.4	1.4				4.2
1st Local Palay	520	2.0			1.4	0.7						4.0	4.0	12.1
1st HYV Palay	400	0.5						1.5	3.1	3.7			1.3	9.8
2nd HYV Palay	430		1.6	3.3	3.3			0.8	0.4					9.4
Sub-Total	1,530	2.7	2.1	3.3	4.7	0.7		3.0	4.9	5.1		4.0	5.0	35.5
5) Block No. 5														
1st Local Palay	330	0.4	0.9						2.5	2.5	1.3			7.6
2nd HYV Palay	300		1.1	2.3	2.3			0.5	0.3					6.5
1st Corn	1,230		1.6	0.9						9.8	19.7	2.5	4.9	39.4
Camote etc.	160		1.6	3.1					0.2	0.1				5.2
Coconut etc	50													
Sub-Total	2,070	0.4	5.2	6.5	2.3			0.5	3.0	12.4	21.0	2.5	4.9	58.7
Total Animal Labor Requirement		21.4	23.9	44.9	44.2	19.1	8.3	13.4	24.9	64.5	74.0	46.8	36.9	422.3
3. Available Animal Labor Force														
Force		130.8	118.1	130.8	126.5	130.8	126.5	130.8	130.8	126.5	130.8	126.5	130.8	1,539.7
4. Balance (3 - 2)														
		+109.4	+94.2	+85.9	+82.3	+111.7	+118.2	+117.4	+105.9	+62.0	+56.8	+79.7	+93.9	
Available Animal Labor Force = 9,514 (Total Number of Carabao) x 0.7 (Working Carabao Rate) x 20 days x 0.95 (rate of Farm Labor)														
= 126,536.2 animal-man-day (per 30 day-month)														

POPULATION PROJECTION IN THE PROJECT AREA

	1980	1982	1984	1986	1988	1990	1992	1994
Block No. 1	25,064	26,137	27,257	28,425	29,643	30,914	32,238	33,620
Block No. 2	26,910	28,063	29,265	30,519	31,827	33,191	34,613	36,096
Block No. 3	23,022	24,008	25,037	26,110	27,228	28,395	29,612	30,881
Block No. 4	6,033	6,291	6,561	6,842	7,135	7,441	7,760	8,092
Block No. 5	13,478	14,055	14,657	15,285	15,940	16,623	17,336	18,079
Total	94,507	98,554	102,777	107,181	111,773	116,564	121,559	126,768

PROJECTION OF FARM HOUSEHOLD POPULATION IN THE PROJECT AREA

	1980	1982	1984	1986	1988	1990	1992	1994
Block No. 1	12,865	13,416	13,991	14,590	15,215	15,867	16,547	17,256
Block No. 2	13,816	14,408	15,025	15,669	16,340	17,040	17,771	18,532
Block No. 3	11,817	12,323	12,851	13,402	13,976	14,575	15,199	15,851
Block No. 4	4,086	4,261	4,443	4,634	4,832	5,039	5,255	5,480
Block No. 5	6,919	7,215	7,524	7,847	8,183	8,533	8,899	9,280
Total	49,503	51,623	53,834	56,142	58,546	61,054	63,671	66,399

CALCULATION OF LABOR USE FOR ALL PRODUCTS (FUTURE)

(Unit: man-day)

Items	AREA	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
1. Labor Requirement per hectare														
HV Paddy Wet	1	19.69	31.19	16.48		9.96	24.33	24.16	11.98	33.91	25.63	1.81	14.42	131.20
HV Paddy Dry	1									3.06	15.46	25.81	14.42	126.11
Corn Wet	1	14.49	1.52	5.10	1.63	92.4	3.26	24.24	1.52	5.10	1.63	58.98	14.94	109.67
Corn Dry	1												13.01	128.15
Mung Bean	1	17.13	3.50	7.50	2.00	4.75							14.87	70.00
Peanut	1	87.81	9.79	9.79	10.29	7.84	42.03	20.00				3.25	22.23	213.00
Vegetable	1	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	14.40
Coconut etc.	1													
2. Total Labor Requirement (Unit: 1,000)														
HV Paddy Wet	11,280	213.2	337.8	178.5		112.3	275.0	272.5	135.1	382.5	289.1	13.3	156.2	1,479.8
HV Paddy Dry	10,830									33.1	167.4	279.5	156.2	1,365.7
Corn Wet	1,400	6.5	0.7	2.3	0.7	41.6	4.6	33.9	2.1	7.1	2.3	82.6	5.9	153.5
Corn Dry	450													57.7
Mung Bean	3,600	106.2	14.4	65.7	17.1								14.9	203.4
Peanut	1,000	17.1	3.5	7.5	2.0	25.0						1.3	8.9	70.0
Vegetable	400	35.1	3.9	3.9	4.1	3.1	16.8	8.0	0.1	0.1	0.1	0.1	0.1	85.2
Coconut Etc.	100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.4
Total Labor Requirement		272.0	452.2	206.7	72.6	199.2	296.5	314.5	137.3	422.8	458.9	376.8	206.9	3,416.9
3. Available Labor Force		590.8	533.6	590.8	571.7	590.8	571.7	590.8	590.8	571.7	590.8	571.7	590.8	6,956.0
4. Balance (3 - 2)		+318.8	+81.4	+384.1	+499.1	+391.6	+275.2	+276.3	+453.5	+148.9	+131.9	+194.9	+383.9	
5. Surplus Ratio (%)		54.0	15.3	65.0	87.3	66.3	48.1	46.8	76.8	26.0	22.3	34.1	65.0	

Available Labor Force = 12,936 (Total Farm Household) x 2.5 (Average Available Labor Force per Farm Household) x 20 days x 0.95
 (rate of Farm Labor = 571,710 man-day (per 30 day-month))

CALCULATION OF ANIMAL LABOR USE FOR ALL PRODUCTS (FUTURE)

Items	AREA	(Unit: animal-man-day)												Total
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1. Animal Labor Requirement per hectare														
HYV Paddy Wet	1					6.78	6.78	5.66	0.37	2.81	2.81	0.57	25.78	
HYV Paddy Dry	1	0.98	1.95	1.95						2.70	6.85	6.86	23.99	
Corn Wet	1					3.26	18.74	0.82		3.90	1.28	4.23	34.72	
Corn Dry	1	8.99	0.82	3.90	1.28								36.40	
Mung Bean	1		24.00	3.00	4.50								32.00	
Peanut	1	10.99	1.50	1.50		2.00							29.00	
Vegetable	1	15.41										0.25	13.01	
Coconut etc.	1												16.84	
													34.50	
2. Total Animal Labor Requirement (Unit: 1,000)														
HYV Paddy Wet	11,280					76.5	76.5	63.8	4.2	31.7	31.7	6.4	290.8	
HYV Paddy Dry	10,830	10.6	21.1	21.1						29.2	74.2	74.3	259.8	
Corn Wet	1,400					4.6	26.2	1.1		5.5	1.8	5.9	48.6	
Corn Dry	450	4.0	0.4	1.8	0.6								16.4	
Mung Bean	3,600		86.4	10.8	16.2								115.2	
Peanut	1,000	11.0	1.5	1.5		0.8						0.1	25.0	
Vegetable	400	6.2											13.8	
Coconut etc.	100													
Total Animal Labor Requirement	31.8	109.4	35.2	16.8	84.1	81.9	90.0	5.3	66.4	107.7	86.7	58.3	773.6	
3. Available Animal Labor Force														
		160.6	145.1	160.6	155.5	160.6	160.6	160.6	155.5	160.6	155.5	160.6	160.6	
4. Balance (3 - 2)		+128.8	+35.7	+125.4	+138.7	+76.5	+73.6	+70.6	+155.3	+69.1	+52.9	+68.8	+102.3	
5. Surplus Ratio (%)		80.2	24.6	78.1	89.2	47.6	47.3	44.0	96.7	57.3	32.9	44.2	63.7	
Available Animal Labor Force = 11,688 (Total Number of Carabao) x 0.7 (Working Carabao ratio) x 20 days x 0.95 (rate of Farm Labor) = 155,450.4 animal-man-day (per 30 day-month)														

IRRI-DESIGNED BATCH-DRYER SPECIFICATION

<u>Machine specifications</u>	<u>Ratings</u>
Power	5 hp gasoline engine
Weight	364 kg
Length	344 cm
Width	173 cm
Height	158 cm
Capacity	2 tons/load
Construction	wood and steel
Fuel consumption	
Engine	1.5 liters gasoline/hr.
Burner	2.7 liters kerosene/hr.
Drying rate	2% points/hr
Blower speed	2,000 rpm
Grain Bed Thickness	46 cm
Fan	56 cm dia. tube-axial
Drying Air Temperature	43°C

TABLE IV-27
TABLE IV-28

NUMBER AND CAPACITY OF PADDY THRESHERS IN PROJECT MUNICIPALITIES, 1980

	HOLD-ON TYPE		THROW-IN TYPE		CAPITALIZATION (PESOS)
	UNIT	CAV/HR	UNIT	CAV/HR	
PROVINCE	56	1,236	84	4,536	4,779,064.90
BAGABAG	23	670	10	455	1,056,345.00
BAMBANG	15	15	15	909	882,835.86
BAYOMBONG	1	30	9	589	598,032.00
SOLANO	1	30	23	1,629	946,977.83
VILLAVERDE	1	30	6	185	156,173.00
TOTAL	41	775	63	3,767	3,640,363.69

Source: NFA, Bayombong, N.V.

WAREHOUSE FACILITIES IN THE PROJECT MUNICIPALITIES, 1980

	CONVENTIONAL TYPE		OTHERS (STORAGE, ETC.)		TOTAL	
	UNIT	CAPACITY	UNIT	CAPACITY	UNIT	CAPACITY
PROVINCE	37	161,334	22	30,200	59	192,434
BAGABAG	6	36,675	3	4,000	9	41,675
BAMBANG	6	39,060	2	1,500	8	40,560
BAYOMBONG	6	27,350	1	500	7	27,850
SOLANO	3	13,000	9	19,000	12	32,000
VILLAVERDE	4	15,000	-	-	4	15,000
TOTAL	25	132,085	15	25,000	40	157,085

Source: NFA, Bayombong, N.V.

RICE AND CORN MILLS IN THE PROJECT MUNICIPALITIES, 1980

Municipality	RICE MILL				CORN MILL				Capitalization (Pesos)		
	Cono Unit	Capacity	Kiskisan Unit	Capacity	Centrifugal Unit	Capacity	Rubber Roll Unit	Capacity		Corn Grinder Unit	Capacity
Province	67	725.20	83	502.27	3	22.00	7	101.00	27	115.76	4,711,552.30
Bagabag	8	95.00	10	47.00					6	17.00	532,894.00
Bambang	15	190.50	10	57.91	3	22.00			4	12.50	1,223,121.84
Bayombong	11	104.00	11	65.50			3	40.00	4	28.50	783,285.00
Solano	8	91.40	17	110.20			3	41.00	4	13.40	563,212.60
Villaverde	6	54.50	6	44.30					4	18.20	307,012.00
Total	48	535.40	54	324.91	3	22.00	6	81.00	22	89.60	3,409,525.44

Note: Capacity - Cavan/hour

Source: NFA, Bayombong, N.V.

TABLE IV-29

NUMBER OF RETAILERS, WHOLESALERS AND CAPITALIZATION, 1980

(Unit: Pesos)

Municipality	RETAIL ONLY		WHOLESALE ONLY		RETAIL AND WHOLE SALE		WHOLESALE			CAPITALIZATION		
	Persons	Unit	Persons	Unit	Persons	Unit	Rice	Corn	Others	RETAILING		
										Rice	Corn	Others
Province	148	195	53	59	134	143	4,244,900	225,500	89,000	1,478,943	76,000	96,620
Bagabag	23	49	6	6	7	9	394,855	-	-	222,661	-	-
Bambang	21	21	8	10	27	27	826,000	55,000	27,500	218,450	17,000	2,320
Bayombong	31	35	6	7	21	21	649,000	26,000	-	283,200	4,000	43,000
Solano	33	41	18	19	20	20	1,103,244	90,000	57,000	246,022	20,000	49,000
Villaverde	1	2	2	2	5	5	359,000	20,000	-	27,500	11,000	-
Total	109	148	40	44	80	82	3,332,104	191,000	84,500	997,833	52,000	94,320

Source: NFA, Bayombong, N.V.

TABLE IV-30

STATISTIC OF RICE PRODUCTION
IN NUEVA VIZCAYA PROVINCE

	<u>Production (MT)</u>	<u>NFA Project (MT)</u>		<u>Marketable Surplus (MT)</u>
1977	108,095	4,714	(8.7)*	54,048
1978	118,428	1,893	(3.4)	55,988
1979	129,249	3,547	(5.7)	61,714
1980	117,484	2,174	(3.8)	56,474
1981	105,783	2,398		

Note: * shows buying ratio of marketable surplus.

Source: NFA, 1981, Nueva Vizcaya

TABLE IV-32

POST HARVEST OPERATION ANALYSIS IN THE PROJECT AREA

Items	Potential Capacity		Required Capacity		Balance of Capacity	
	Present	w/o Project	Present	w/ Project	Present	w/ Project
Thresher	908.4 MT/day	304.6 MT/day	327.5 MT/day	782.1 MT/day	+603.8 MT/day	+580.9 MT/day
Rice Mill	38,135.0 MT/year	36,554.0 MT/year	39,301.0 MT/year	93,855.0 MT/year	+1,581.0 MT/year	+1,166.0 MT/year
Corn Grinder	5,734.4 MT/year	1,844.0 MT/year	1,923.7 MT/year	5,775.0 MT/year	+3,891.4 MT/year	+3,810.7 MT/year
Warehouse	3,900.0 MT	19,199.0 MT	20,612.0 MT	49,815.0 MT	-15,299.0 MT	-16,712.0 MT
Vehicles	140,000.0 MT/year	102,000.0 MT/year	111,000.0 MT/year	210,000.0 MT/year	+38,000.0 MT/year	+29,000.0 MT/year
						-55,720.0 MT/year
						-40.6 MT/year
						-45,915.0 MT
						-70,000.0 MT/year

RATINGS OF IR RICE VARIETIES FOR 1981 MASAGANA 99
(Data from IRRI 1979 Wet season, arranged Jan. 1981)

Character	IR 32	IR 36	IR 42	IR 44	IR 46	IR 48	IR 50	IR 52	IR 54
VG Vigor	3	2	2	2	3	4	8	2	3
FL Flowering, days	103	80	100	92	79	99	77	86	87
MAT Maturity days	132	110	132	123	112	127	107	117	119
HT Plant height (cm)	101	92	108	100	102	112	97	101	104
TIL Tillering ability	12	12	12	12	13	12	12	12	12
LDG Lodging	4	7	6	8	1	3	7	1	4
YLD Yield/ha (ton)	6.6	6.9	7.1	7.0	6.6	6.7	6.2	6.7	7.0
TOT % Milled rice	62	67	65	62	64	67	61	53	54
MRP Milled rice protein (%)	7.2	7.5	8.1	7.3	5.9	6.5	8.9	6.9	7
AMY Amylose content	9	9	9	9	9	9	7	9	9
GEL Gel consistency, softness		1	5	9	9	1	3	1	7
ALD Alkali digestion	5	6	7	7	6	7	5	7	7
BL Blast (nursery)	4	4	4	5	8	5	8	6	4
BB Bacterial blight (field)	1	1	1	1	3	1	1	1	1
SHB Sheath blight field	4	5	4	6	5	4	4	6	6
RTV ₂ Rice tungro virus (field)	4	2	6	4	3	6	1	3	1
RTV Tungro (g'house %)	90	88	91	69	80	92	36	74	50
GSV ₃ Grassy stunt (greenhouse)	16	13	12	8	10	0	2	5	2
RRS ₂ Ragged stunt (greenhouse, %)	74	93	66	66	65	58	51	61	56
CLS ₂ Cercospora leaf spot (inoc)	7	5	5	5	7	1	1	7	3
BPH ₁ Brown planthopper (greenhouse)	1	3	3	1	3	1	1	1	1
BPH ₂ Brown planthopper (greenhouse)	3	3	3	3	7	3	3	3	3
BPH ₃ Brown planthopper (greenhouse)	3	3	3	3	3	3	3	3	3
GLH Green leafhopper (greenhouse)	7	5	9	7	7	5	3	3	3
WBPH Whitebacked plant hopper (greenhouse)	9	9	9	7	7	9	7	7	7
RWH Rice whorl maggot damaged (field)	9	9	9	9	9	9	9	9	9
SAL Salinity (greenhouse)	4	4	3	3	4	3	4	4	3
P Phosphorous (g'house)	3	3	5	1	3	5	3	5	3
ZN Zinc deficiency (greenhouse)	3	2	5	5	4	5	3	5	3
SUB Submergence tolerance	7	7	7	5	5	5	5	7	7
DRT ₃ Drought tol. -score	7	5	5	5	3	5	5	3	5
DRT ₅ Recovery score	3	1	1	1	1	1	1	1	1

Ratings: 1, 2, 3 = (Resistant), 4.5 = MR (Moderately Resistant),
6, 7 = Moderately Susceptible, 8, 9 = S (Susceptible).
IR46 has field resistance to all biotypes of BPH.

SEQUENCE AND RATE OF FARM OPERATIONS AND WAITING PERIOD

Prime Power and Operation	Rate	Waiting period*
<u>Hand tractor:</u>		
Plowing	2	5 to 7
First harrowing	2	5 to 7
Second harrowing	1	5 to 7
Final harrowing (levelling)	1	
<hr/>		
Total days spend before planting a hectare using 1 tractor	(6)	15 to 21 days
<hr/>		
<u>Carabao:</u>		
Plowing	6	5 to 7
First harrowing	6	5 to 7
Second harrowing (optional)	4	5 to 7
Final	3	
<hr/>		
Total days spent before planting a hectare using a carabao	(19)	15 to 21 days
<hr/>		

* Waiting period before
next operation for irrigated
rice field.

TABLE IV-35

GRANULAR HERBICIDES FOR WEED CONTROL IN TRANSPLANTED RICE
(Inter-agency weed control recommendation)

	Brand Name	Percent Active Ingredients (a.i.)	Recommended dosage a.i. (kg/ha)	Recommended Rate of Prod. (kg/ha)
Benthiocard	Saturn ^c	5	1.25	25 ^d
Benthiocard + 2,4-D (IPP)	Saturn D	4 + 5	1.00 + 0.5	25 ^d
Butachlor	Machete 50 ^c	5	1.25	25 ^d
2,4-D isoprophylester (IPE)	Ciba-Geigy 4-D	3.2	0.3	25
2,4-D isoprophylester (IPE)	Hedonal G Granules	3.2	0.8	25
2,4-D isobutylester (IBE)	Hoechst 2,4-D	3.2	0.8	25
2,4-D isobutylester (IBE)	Planters 2,4-D	3.2	0.8	25
2,4-D isoctylester (IOE)	Plantguard	3.2	0.8	25
2,4-D isobutylester (IBE)	Shell 2,4 EG	3.2	0.8	25
MCPA, K salt	Agroxone G	3.2	0.8	25
MCPA, K salt	MCPAG	3.2	0.8	25
Nitrofen	TOK	7.94	2.0	25
Trifluralin + 2,4-D (IPE)	Treflan R	2.13 + 1.6	0.6	37.5

Source: Philippines Recommendation for Rice, 1977 and Masagana 99 plus 10 (Phase XI), Implementing Guidelines, 1978.

- a. Uniformly broadcast granular herbicides before emergence of weeds (pre-emergence application) 3-5 days after transplanting of wetbed, drybed or dapog seedlings.
Broadcast granular into flooded fields (not more than 3.5cm of water depth) and do not drain for 10-14 days.
- b. Do not store herbicides near palay seeds because fumes will reduce germination of seed.
- c. Saturn and Machetete may be used for direct seeded flooded rice or puddled soil. Broadcast Saturn at 6-8 days after sowing.
- d. Broadcast 4-6 days after transplanting.
- e. Somewhat less effective.
- f. Especially effective where water depth is less than 3cm.

SPRAYABLE HERBICIDES FOR WEED CONTROL IN TRANSPLANTED RICE
(Inter-agency recommendation, 1976)

Common Name, LC	Brand Name	Lb. of Active Ingredient (a.i.) per gallon	Percent Active Ingredient	(qts/ha) of labeled prod.	Tablespoon (100cc size sprayer load using 400 liters water/ha)
2,4-D amine, LC	Amina (Shell)	3.34	40	2.0	5
2,4-D amine	Hedonal	3.34	40	2.0	6
2,4-D amine	Hoechst	4.00	50	1.5	5
2,4-D amine	Macondray	3.34	40	2.0	6
2,4-D amine	Planters	3.34	40	2.0	6
2,4-D amine	WB, 2,4-amine	4.00	50	1.5	5
2,4-D amine	U-46-D	4.00	50	1.5	6
2,4-D Isobutylester (IBE)	Hedonal liquid	3.34	40	2.0	6
2,4-D Isobutylester (IBE)	Macondray	3.34	40	2.0	6
2,4-F Isobutylester (IBE)	Weedrol 2,4-D EG	3.34	40	2.0	6
2,4-D Isobutylester (IBE)	Ciba-Geigy	3.34	40	2.0	6
2,4-D Isobutylester (IBE)	Hoechst	3.34	40	2.0	6
2,4-D Isobutylester (IBE)	Amchem	4.00	50	1.5	5
2,4-D Isobutylester (IBE)	Planters	3.34	40	2.0	6
2,4-D Ethylester (EE)	Weedone Conc.	48	38	2.0	6
2,4-D Sodium salt, (NSP)	Hedonal		80	1kg	30kg
MCPA, EC	Agroxones	3.34	40	2.0	6
MCPA, EC	Hedonal M	3.34	40	2.0	6
MCPA, EC	Hoechst	3.34	40	2.0	6
Benthicarb	Saturn EC	3.34	50	2.0	6
Trifluralin + MCPA	Treflan R	1.6 + 2.13	38	1.5	

Sources: Philippines recommendations for rice, 1977 and Masagana 99 plus 10 (Phase XI), Implementing Guidelines, 1978.

GUIDE IN THE MANAGEMENT OF INSECT PESTS OF IRRIGATED RICE

<u>Management Guide (Stage of growth)</u>	<u>Name of Pests</u>	<u>Management Input**</u>
<u>Vegetative stage before booting stage</u> <u>(11 to 40 DTA)</u>		Apply 15kg of MIPC (Trade name Mipcin), Ryttox, Etrofbin + 1.5 qts. mentnyl parathion (T.N. - Dyper 50, Folidol M - 50 etc.) 5 DAT
- presence of damage on newly opened leaves	Whorl maggot (Hkyrellia Philippina)	
- affected leaves dry up, giving seriously infested field a scorched appearance	Leaf folder (chapholocrosio medianalis)	
- Larvae in great number eat and damage the leaves and stem	Green leafhopper (Nephotettix impecticips, N apicalis)	
- Transmit grassy stunt and Tungro disease		
<u>Pre-booting up to soft dough stage (30 DAT)</u>		
-if more than 20 brown plant hoppers found in the base of plant apply insecticide	Brown plant hoppers (Nilaparvata lugens)	Apply either chlorodimenform 1.5kg a.i. per ha (T.N. Spanone 3G) or diazinon 1.5kg a.i./ha (T.N. Basudin 10 G, or Dianol 5G) or carbofuran 1.5kg a.i./ha (T.N. Buradan 3G)
<u>Pre-Flowering to maturity (50 DAT)</u>		
Visible damage is "dead heart" or "white head" indicated by dried growing points or panicles	Rice stemborer (Tryporzy innotata, T. incertulas, Chilosuppressolis and Sesamia inferens)	If there is more than 10% "dead heart" apply any of the following insecticides Mephosfolan" 1.5kg a.i./ha (T.N. Cytorolene 3G) or Gamma BHC + Carboonyl 1.-1.5kg a.i. (T.N. Sevicol 8 + 8) or Endosulfan 1.5kg a.i./ha (T.N. Throdan 50)

TABLE IV-37

* High dermal toxicity should be applied by person wearing mask and gloves to avoid contact with skin.
 * Mention of trade name does not necessarily indicate favorable endorsement of the product.

RECOMMENDED GRANULAR INSECTICIDES AGAINST SERIOUS PESTS OF WETLAND TRANSPLANTED RICE

Insect pest	Insecticide		Rate/ha of (a.i.)	Rate/ha of Commercial product	Cost/ha Application as of June 1978 (P)
	Common Name	Brand Name			
1. Green leafhoppers, stem borers and whorl maggots	Cabofuran 1,2,4/	Furadan 3 G	1 kg	34 kg	335
	Diazinon 1,2/	Basudin 10 G	1 "	10 "	236
	Diazinon 1,2/	Basudin 5 G	1 "	20 "	256
2. Green leafhoppers and stem borers	Gamma BHC + cabaryl	Sevidol	1 "	16 "	122
	Gamma BHC + MIPC	Gamma Hytox G	1 "	20 "	150
3. Stem borers	Endosulfan 4/	Thiodan 5G	1 "	20 "	150
	Endosulfan 4/	Endosulfan 5 G	1 "	20 "	145
	Gamma BHC 3/	Agroocide 6 G	1 "	16 "	88
	Gamma BHC 3/	Lindane 6 G	1 "	16 "	86
	Gamma BHC 3/	Lindol 6 G	1 "	16 "	86

1. Also effective against lowland infestation of brown plant hoppers (biotypes 1 & 2).

2. Effective against pink stem borers.

3. Can not satisfactorily control pink stem borer.

4. Highly toxic to human, animals and fish. Follow all precautions on label.

Source: Philippines recommendations for rice, 1977 and

Masagana 99 plus 10 (Phase XI), Implementing guidelines, 1978.

RECOMMENDED SPRAYABLE INSECTICIDES AGAINST SERIOUS PESTS OF WETLAND TRANSPLANTED RICE

Emulsifiable concentrates (EC) and wettable powder (WP). Apply early in morning of a sunny day when the air is calm using as many sprayer loads/ha as needed to thoroughly wet the plants.

Insect Pest	Common Name	Insecticide		Common Name	Rate/ha (a.i.) in 300 gal water	Rate/ha Commercial Product/300 gal. water	Cost/ha application of June 1976 (P)
		Common Name	Common Name				
1. Stem borers, green leafhoppers, army worms, caseworms and leaf folders	Diazinon	Basudin 60 EC	Basudin 60 EC	0.75 kg	1.5 qts.	128	
		Basuding 20 EC	Basuding 20 EC	0.75 kg	1.0 qts		
2. Stem borers, green leafhoppers and rice bugs	Fenthothion	Sumithion 30 EC	Sumithion 30 EC	0.75 kg	2.5 qts	92	
		Endosulfan 1/	Alexin 36 EC	0.75 kg	2.0 qts		
3. Stem borers, green leafhoppers, army worms, cutworms, leaf folder & rice bugs	Methyl parathion 1/	Biodan 36 EC	Biodan 36 EC	0.75 kg	2.0 qts	91	
		Fitra 40 EC	Fitra 40 EC	0.75 kg	2.0 qts		
3. Stem borers, green leafhoppers, army worms, cutworms, leaf folder & rice bugs	Methyl parathion 1/	Gusathion 40 EC	Gusathion 40 EC	0.75 kg	1.0 qts	108	
		Dypar 50 EC	Dypar 50 EC	1.75 kg	1.5 qts		
3. Stem borers, green leafhoppers, army worms, cutworms, leaf folder & rice bugs	Methyl parathion 1/	Polidol 14-50 EC	Polidol 14-50 EC	0.75 kg	1.5 qts	42	
		Methyl forpero. 50 EC	Methyl forpero. 50 EC	0.75 kg	1.5 qts		
3. Stem borers, green leafhoppers, army worms, cutworms, leaf folder & rice bugs	Methyl parathion 1/	Meptox 50EC	Meptox 50EC	0.75 kg	1.5 qts.	57	
		Parapest M-50 EC	Parapest M-50 EC	0.75 kg	1.5 kg		

1/ Highly toxic to human, animals and fish, should be applied by trained personnel. Follow all prescription.

* Sources: Philippines Recommendations for Rice, 1977 and Masayana 99 plus 10 (Phase XI), Implementing Guidelines, 1978

IMPORTANT CHARACTERISTICS OF RECOMMENDED MUNG BEAN VARIETIES

Variety	Maturity (days)		Growth Habit		Plant Height(cm)		Shattering Tendency	Disease Reaction	Seed Color	Yield per ha. (tons)	
	Dry	Wet	Dry	Wet	Dry	Wet				Dry	Wet
MG50-10A 1/ (Glossy Green S1 X Glabrous Cgree)	58.5	65.7	Erect	Erect	55.0	67.5	Non-shattering	fairly Resistant to powdery mildew	green	1.16	1.32
BPI Glabrous 3 (MG50-10A X Ilag S6A) 2/	57.5	65.0	Erect	Erect	62.5	72.5	- do -	- do -	- do -	1.21	1.24
MD-15-2 (Glossy 3/ Green S x Dull green 28-1)	67.5	72.5	Prostrate	Prostrate	72.5	82.5	- do -	- do -	- do -	1.12	0.79
Glossy Green S1 4/ Selection from Ilagan green mung. bean	80.0	85.0	Erect	Prostrate	75.0	80.0	- do -	- do -	- do -	0.57	0.41

- NOTE: 1. Pods concentrated on the upper portion of the plant. Responsive to heavy complete fertilizer application. Recommended for both dry and wet seasons, better yield than BPI Glabrous No. 3 uniform early maturity suitable for mechanized harvesting. High carbohydrate content making same suitable for noodle or sotanghon manufacture.
2. Bigger seed size 10 gr/100 seeds, pods devoid of pubescence; rich in carbohydrate and protein; uniform early maturity; non-seasonal; adapted for mechanized harvesting. Ideal for sprouting mung bean and suitable as green snap vegetable.
3. Recommended for dry season. Extra length and size of pods. Size of seeds-9 gr./100 seeds).
4. Produce more vegetative growth, uneven maturity; medium late. Bigger seeds (10gr./100 seeds).

DISTRIBUTION OF FARMS AND AREA BY SIZE AND TENURE OF OPERATOR

IN THE PROJECT AREA, 1983

Tenure of Operator	Average Farm Area (ha)	Number of Farms	Farm Size in Hectares						TOTAL			
			Below 1.0		1.0 - 1.5		1.6 - 2.5		Above 2.5			
			Farm Area (ha)	Farm Area (ha)	Farm Area (ha)	Farm Area (ha)	Farm Area (ha)	Farm Area (ha)	Farm Area (ha)	Farm Area (ha)		
Owner Cultivator	2.18	1,227	268	138.47	450	520.81	230	475.96	279	1,542.93	1,227	2,678.17
Amortizing Owner	1.35	1,058	459	278.77	284	348.86	202	404.25	113	392.31	1,058	1,424.19
Lessee	1.82	558	73	40.06	220	261.67	150	309.35	115	407.00	558	1,018.08
Share Tenant	1.36	1,735	648	381.62	618	747.36	296	593.01	173	631.32	1,735	2,353.31
Others ^{1/}	1.96	139	23	13.00	41	50.29	33	47.30	42	161.69	139	272.28
All Operators	1.64	4,717	1,471	851.92	1,613	1,928.99	911	1,829.87	722	3,135.25	4,717	7,746.03

Note: ^{1/} includes Part Owner - Lessee, Part Owner - Share Tenant, Certificates of Land Transfer - Owner, Certificates of Land Transfer - Lessee.

Source: Farm Survey by PDD-NIA and JICA personnel in the project area, January 24 - 29, 1983.

TABLE IV-41

PERCENT DISTRIBUTION OF FARMS BY SIZE AND TENURE OF OPERATOR
IN THE PROJECT AREA, 1983

Tenure of Operator	Average Farm Area (ha)	Number of Farms	Farm Size (percent) in Hectares						TOTAL Farm Area		
			Below 1.0		1.0 - 1.5		1.6 - 2.5			Above 2.5	
			Farm Area	Farm Area	Farm Area	Farm Area	Farm Area	Farm Area		Farm Area	Farm Area
Owner Cultivator	2.18	1,227	22	5	36	19	18	23	58	100.0	
Amortizing Owner	1.35	1,058	43	20	27	24	28	11	28	100.0	
Lessee	1.82	558	13	4	39	26	30	21	40	100.0	
Share Tenant	1.36	1,735	37	16	36	32	25	10	27	100.0	
Others ^{1/}	1.96	139	17	5	29	19	17	30	59	100.0	
All Operators	1.64	4,717	31	11	34	25	24	15	40	100.0	

Note: ^{1/} includes Part Owner - Lessee, Part Owner - Share Tenant, Certificates of Land Transfer - Owner, Certificates of Land Transfer - Lessee.

Source: Farm Survey by PDD-NIA and JICA personnel in the project area, January 24 - 29, 1983.

PRICE STRUCTURE OF PALAY, 1983^{1/} (Unit: ₱/ton)

Description	1983		1985		1990	
	Fin.	Eco.	Fin.	Eco.	Fin.	Eco.
Export Price, Thai 5% broken, FOB Bangkok ^{2/}	US\$ 338	US\$ 338	US\$ 425	US\$ 425	US\$ 425	US\$ 425
Grade Differential (30% discount) ^{3/}	237	237	298	298	298	298
FOB Manila Value ^{4/}	₱2,133	₱2,133	₱2,683	₱2,683	₱2,683	₱2,683
Port Handling Charge ^{5/}	100	82	100	82	100	82
Average Transport Cost to Project Site ^{6/}	160	124	160	124	160	124
Transport Cost, Mill to Selling Center ^{7/}	26	20	26	20	26	20
Price, Exmill Project Area	2,047	2,071	2,597	2,621	2,597	2,621
Paddy Equivalent Price ^{8/}	1,269	1,284	1,610	1,625	1,610	1,625
Paddy Procurement Cost ^{9/}	45	37	45	37	45	37
Farm-gate Paddy Price	1,224	1,247	1,565	1,588	1,565	1,588
Farm-gate Paddy Price(P/cavan)	61	62	78	79	78	79

Note: 1/ All prices are expressed in terms of 1983 value. Peso is shadow-priced at exchange rate of US\$1.00 = ₱10.00

2/ Based on Price Prospects for Major Primary Commodities, IBRD, July 1982

3/ Derived by taking a 30% discount from the price of 5% broken FOB Bangkok

4/ Freight & Insurance: about 7% of 5% broken FOB Bangkok value

5/ Standard conversion factor: 0.82

6/ Conversion factor for transportation: 0.777

7/ Based on Farm Survey by PDD-NIA and CKC personnel in the project area, January 24-29, 1983

8/ Milling Recovery: 62%, NFA, Nueva Vizcaya, July 1982

9/ about 1.8% Exmill price

Fin.: Financial, Eco.: Economic

PRICE STRUCTURE OF CORN, 1983

(Unit: ₱/ton)

Description	1983		1985		1990	
	Fin.	Eco.	Fin.	Eco.	Fin.	Eco.
Export Price, U.S. No.2 yellow, FOB Gulf/	US\$ 117	US\$ 117	US\$ 137	US\$ 137	US\$ 142	US\$ 142
Ocean Freight, Insurance to Manila	30	30	30	30	30	30
CIF Manila Value	₱1,470	₱1,470	₱1,670	₱1,670	₱1,720	₱1,720
Port Handling Charge	100	82	100	82	100	82
Average Transport Cost to Project Site	160	124	160	124	160	124
Price, Ex-mill, Project Area	1,410	1,428	1,610	1,628	1,660	1,678
Milling and Package Cost	100	82	100	82	100	82
Corn Procurement Cost	45	37	45	37	45	37
Farm-gate Corn Price	1,265	1,309	1,465	1,509	1,515	1,559

Note: 1/ Based on Price Prospects for Major Primary Commodities, IBRD, July 1982

PRICE STRUCTURE OF UREA, 1983^{1/}
(Unit: ₱ /Ton)

Description	1983		1985		1990	
	Fin.	Eco.	Fin.	Eco.	Fin.	Eco.
Export Price, FOB Europe, bagged ^{2/}	US\$ 191	US\$ 191	US\$ 213	US\$ 213	US\$ 265	US\$ 265
Ocean Freight, Insurance to Manila	40	40	40	40	40	40
CIF Manila Value	₱2,310	₱2,310	₱2,530	₱2,530	₱3,050	₱3,050
Port Handling Charge	60	51	60	51	60	51
Importers' Cost ^{3/}	58	58	63	63	76	76
Average Transport Cost to Project Site	160	124	160	124	160	124
Dealers' Handling Cost	45	37	45	37	45	37
Farm-gate Urea Price	2,633	2,580	2,858	2,805	3,391	3,338
Farm-gate Nitrogen Price (P/kg N)	5.9	5.7	6.4	6.2	7.5	7.4

Note: ^{1/} In view of the recent market weakness, the short-term price forecasts for Urea, TSP and KCL will be revised downward.

^{2/} Based on Price Prospects for Major Primary Commodities, IBRD, July 1982

^{3/} 2.5% of CIF Manila Value

PRICE STRUCTURE OF T.S.P., 1983

(Unit: ₱/Ton)

Description	1983		1985		1990	
	Fin.	Eco.	Fin.	Eco.	Fin.	Eco.
Export Price, FOB U.S. Gulf, bulk ^{1/}	US\$ 163	US\$ 163	US\$ 174	US\$ 174	US\$ 195	US\$ 195
Ocean Freight, Insurance to Manila	30	30	30	30	30	30
CIF Manila Value	₱1,930	₱1,930	₱2,040	₱2,040	₱2,250	₱2,250
Port Handling Charge	60	51	60	51	60	51
Importers' Cost ^{2/}	48	48	51	51	56	56
Average Transport Cost to Project Site	160	124	160	124	160	124
Dealers' Handling Cost	38	31	38	31	38	31
Farm-gate T.S.P. Price	2,236	2,234	2,349	2,297	2,564	2,512
Farm-gate Phosphate Price (₱/kg P)	5.0	5.0	5.2	5.1	5.7	5.6

Note: ^{1/} Based on Price Prospects for Major Primary Commodities, IBRD, June 1981^{2/} 2.5% of CIF Manila Value

PRICE STRUCTURE OF POTASSIUM CHLORIDE, 1983

(Unit: ₱/Ton)

Description	1983		1985		1990	
	Fin.	Eco.	Fin.	Eco.	Fin.	Eco.
Export Price, FOB Vancouver, bulk ^{1/}	US\$ 95	US\$ 95	US\$ 103	US\$ 103	US\$ 110	US\$ 110
Ocean Freight, Insurance to Manila	22	22	22	22	22	22
CIF Manila Value	₱1,170	₱1,170	₱1,250	₱1,250	₱1,320	₱1,320
Port Handling Charge	60	51	60	51	60	51
Importers' Cost ^{2/}	29	29	31	31	33	33
Average Transport Cost to Project Site	160	124	160	124	160	124
Dealers' Handling Cost	22	18	22	18	22	18
Farm-gate Potassium Chloride	1,441	1,392	1,523	1,474	1,595	1,546
Farm-gate Potassium Price (₱/kg K)	2.4	2.3	2.5	2.5	2.7	2.6

Note: ^{1/} Based on Price Prospects for Major Primary Commodities, IBRD, June 1981^{2/} 2.5% of CIF Manila Value

CROP PRODUCTION COST

	Unit	Without Project						With Project					
		(Wet)			(Dry)			(Wet)			(Dry)		
Variable Cost													
(1) Seed	P/ha												
Local Paddy		100			-			-			-		
HYV Paddy		100			100			100			100		100
Corn		30			30			30			30		30
Mungo		-			-			-			-		113
Veg. & Root Crops		-			124			-			124		124
Peanut		-			-			-			-		300
(2) Fertilizer	P/ha	N	P	K	N	P	K	N	P	K	N	P	K
Local Paddy		244	100	44	-	-	-	-	-	-	-	-	-
HYV Paddy		295	129	57	459	291	104	607	336	135	644	403	135
Corn		259	140	65	259	140	65	681	420	156	703	476	156
Mung Bean		-	-	-	-	-	-	-	-	-	148	168	78
Veg. & Root Crops		-	-	-	333	168	78	-	-	-	444	224	104
Peanut		-	-	-	-	-	-	-	-	-	185	252	117
(3) Chemicals	P/ha	I ^{1/}	H ^{2/}	R ^{3/}	I	H	R	I	H	R	I	H	R
Local Paddy		80	58	5	-	-	-	-	-	-	-	-	-
HYV Paddy		80	58	5	200	100	6	200	155	5	200	100	6
Corn		20	9	5	23	11	6	110	82	5	141	71	6
Mungo		-	-	-	-	-	-	-	-	-	23	11	6
Veg. & Root Crops		-	-	-	200	100	6	-	-	-	200	100	6
Peanut		-	-	-	-	-	-	-	-	-	23	11	6
Miscellaneous Cost (15%)													
Local Paddy		93			-			-			-		-
HYV Paddy		107			186			227			234		234
Corn		78			78			218			233		233
Mungo		-			-			-			-		81
Veg. & Root Crops		-			149			-			177		177
Peanut		-			-			-			-		132
<hr/>													
TOTAL	P/ha												
Local Paddy		724			-			-			-		-
HYV Paddy		831			1,446			1,765			1,822		1,822
Corn		606			612			1,702			1,816		1,816
Mung		-			-			-			-		628
Veg. & Root Crops		-			1,158			-			1,379		1,379
Peanut		-			-			-			-		1,026

Note: 1/ Insecticides, 2/ Herbicides, 3/ Rodenticides
Source: Bureau of Agricultural Economics. M.A.

ECONOMIC BENEFIT OF IRRIGATION SCHEME (FULL DEVELOPMENT STAGE)

	Local Paddy		HYV Paddy		HYV Paddy		Corn		Mungo		Veg. & Root Crops		Peanut	Total
	Wet	Wet	Wet	Dry	Wet	Dry	Wet	Dry						
<u>Without Project</u>														
Yield (ton/ha)	2.04	2.45	4.07	1.25	1.37	0.85	6.03						1.03	-
Eco. Farm-gate Price (₹/ton)	1,588	1,588	1,588	1,559	1,559	7,089 ^{2/}	5,730 ^{2/}						4,210 ^{2/}	-
Gross Production Value (₹/ha)	3,240	3,891	6,463	1,949	2,136	6,026	34,552						4,336	-
Production Costs (₹/ha) ^{1/}	724	831	1,446	606	612	-	1,158						-	-
Net Production Value (₹/ha)	2,516	3,060	5,017	1,343	1,524	-	33,394						-	-
Cropped Area (ha)	6,390	4,355	4,570	1,565	420	-	160						-	17,460 ha
Total N.P.V. (₹ million)	16.1	13.3	22.9	2.1	0.6	-	5.3						-	60.3
<u>With Project</u>														
Yield (ton/ha)	-	4.0	4.5	3.0	3.5	1.2	10.0						1.5	-
Eco. Farm-gate Price (₹/ton)	-	1,588	1,588	1,559	1,559	7,089 ^{2/}	5,730 ^{2/}						4,210 ^{2/}	-
Gross Production Value (₹/ha)	-	6,352	7,146	4,677	5,457	8,507	57,300						6,315	-
Production Costs (₹/ha) ^{1/}	-	1,765	1,822	1,702	1,816	628	1,379						1,026	-
Net Production Value (₹/ha)	-	4,587	5,324	2,975	3,641	7,879	55,921						5,289	-
Cropped Area (ha)	-	11,280	10,830	1,400	450	3,600	400						1,000	28,960 ha
Total N.P.V. (₹ million)	-	51.7	57.7	4.2	1.6	28.4	22.4						5.3	171.3
Incremental Net Production Value Without Costing Labor (₹ million)														111.0
Incremental Economic Cost of Farm Labor (₹ million)														25.1
Economic Benefit at Full Project Development (₹ million)														85.9

Note: ^{1/} not including labor cost, irrigation water cost, interest on capital and taxes.

^{2/} Prices at Farm Level, Cagayan Valley 1981, BAECON

TABLE IV-50
(1 of 2)

Farm Budgets (Full Development) (1.64 ha Farm)

Item	Unit	Present		Without Project		With Project	
		(Wet)	(Dry)	(Wet)	(Dry)	(Wet)	(Dry)
1) Cropped Area	(ha)	2.21		2.21		3.72	
1. Local Paddy		0.81	-	0.81	-	-	-
2. HYV Paddy		0.55	0.58	0.55	0.58	1.45	1.39
3. Corn		0.20	0.05	0.20	0.05	0.18	0.06
4. Mungo		-	-	-	-	-	0.46
5. Veg. & Root Crops		-	0.02	-	0.02	-	0.05
6. Peanut		-	-	-	-	-	0.13
2) Cropping Intensity	(%)	135		135		227	
3) Production	(ton/ha)						
1. Local Paddy		1.77	-	2.04	-	-	-
2. HYV Paddy		2.11	3.51	2.45	4.07	4.0	4.5
3. Corn		0.93	0.93	1.25	1.37	3.0	3.5
4. Mungo		-	-	-	0.85	-	1.2
5. Veg. & Root Crops		-	5.59	-	6.03	-	10.0
6. Peanut		-	-	-	1.03	-	1.5
4) Gross Production Value	(₱)	9,947		11,541		32,049	
1. Local Paddy		2,773	-	3,196	-	-	-
2. HYV Paddy		2,244	3,937	2,606	4,565	11,217	12,097
3. Corn		282	70	379	104	818	318
4. Mungo		-	-	-	-	-	3,913
5. Veg. & Root Crops		-	641	-	691	-	2,865
6. Peanut		-	-	-	-	-	821
5) Production Cost (excluding labor)	(₱)	2,057		2,057		5,998	
1. Local Paddy		586	-	586	-	-	-
2. HYV Paddy		457	839	457	839	2,559	2,533
3. Corn		121	31	121	31	306	109
4. Mungo		-	-	-	-	-	289
5. Veg. & Root Crops		-	23	-	23	-	69
6. Peanut		-	-	-	-	-	133
6) Cost of Hired Labor	(₱)	41.3		-		1,302	
7) Net Production Value before irrigation fee	(₱)	7,848.7		9,484		24,749	
8) Irrigation Fee including O & M Cost	(₱)	674.1		674.1 ^{1/}		1,741 ^{2/}	
9) Net Agricultural Income	(₱)						
9)-1 Owner Cultivator		7,174.6		8,809.9		23,008	
9)-2 Amortizing Owner (Annual payment for land ^{3/})		4,576.6		6,211.9		20,410	
		(2,598)		(2,598)		(2,598)	

TABLE IV-50
(2 of 2)

<u>Item</u>	<u>Present</u>	<u>Without Project</u>	<u>With Project</u>
9)-3 Share Tenant (Annual payment for land ^{4/})	3,891.6 (3,283)	5,000.9 (3,809)	12,432 (10,576)

Note: 1/ 2 cavans/ha and 3 cavans/ha in the wet and dry season respectively

2/ 6 cavans/ha as a total in the wet and dry season

3/ Based on the annual amortizing of 15 years with 6% interest rate on price of land of 2.5 times present G.P.V.

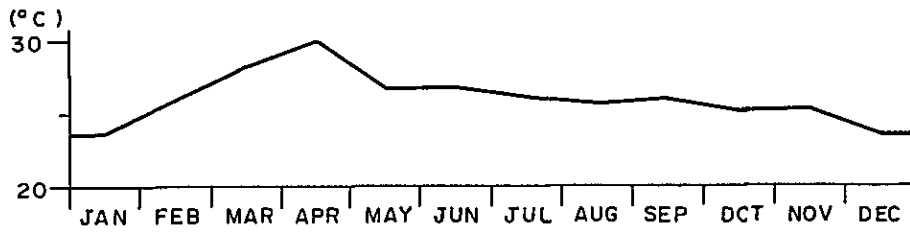
4/ Rent to landlord from share tenant amounts to 33% of G.P.V.

FARM BUDGET AFTER FULL DEVELOPMENT

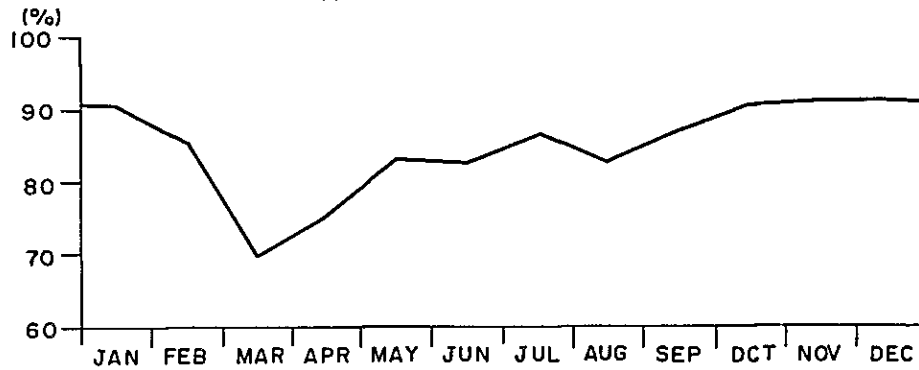
I.	Farm Size:	1.64 ha		
II.	Farm Family Size:	5.29 persons		
III.	Farm Income		<u>Without Project</u>	<u>With Project</u>
	1.	Net Agricultural Income	₱ 6,241.9	₱ 16,781.0
	2.	Off/non-farm Income	503.2	388.0
	3.	Living Expenses	6,185.4	6,185.4
	4.	Taxes and Interest	312.0	2,517.5
	5.	Net Income (Capacity to pay)	247.7	8,466.1

CLIMATOLOGICAL DATA IN THE SERVICE AREA

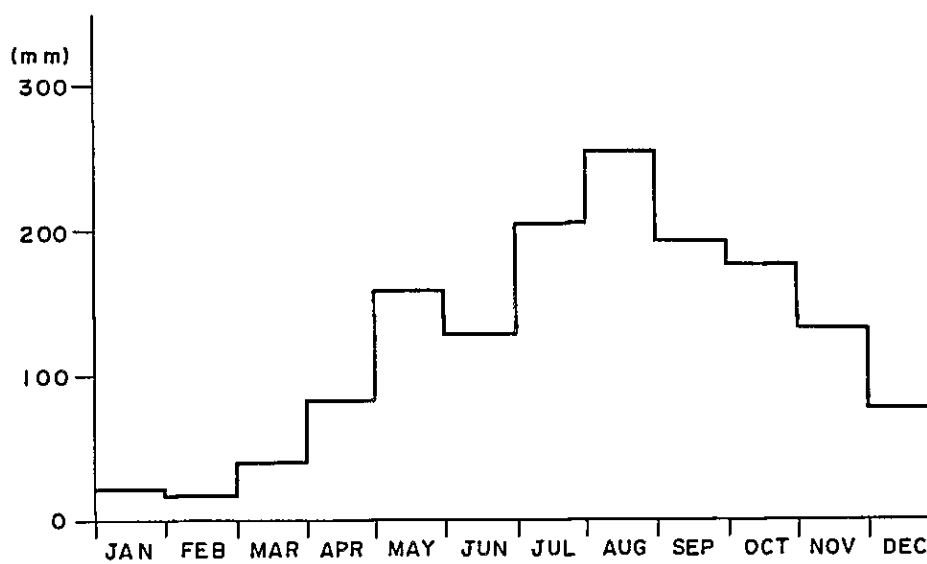
TEMPERATURE



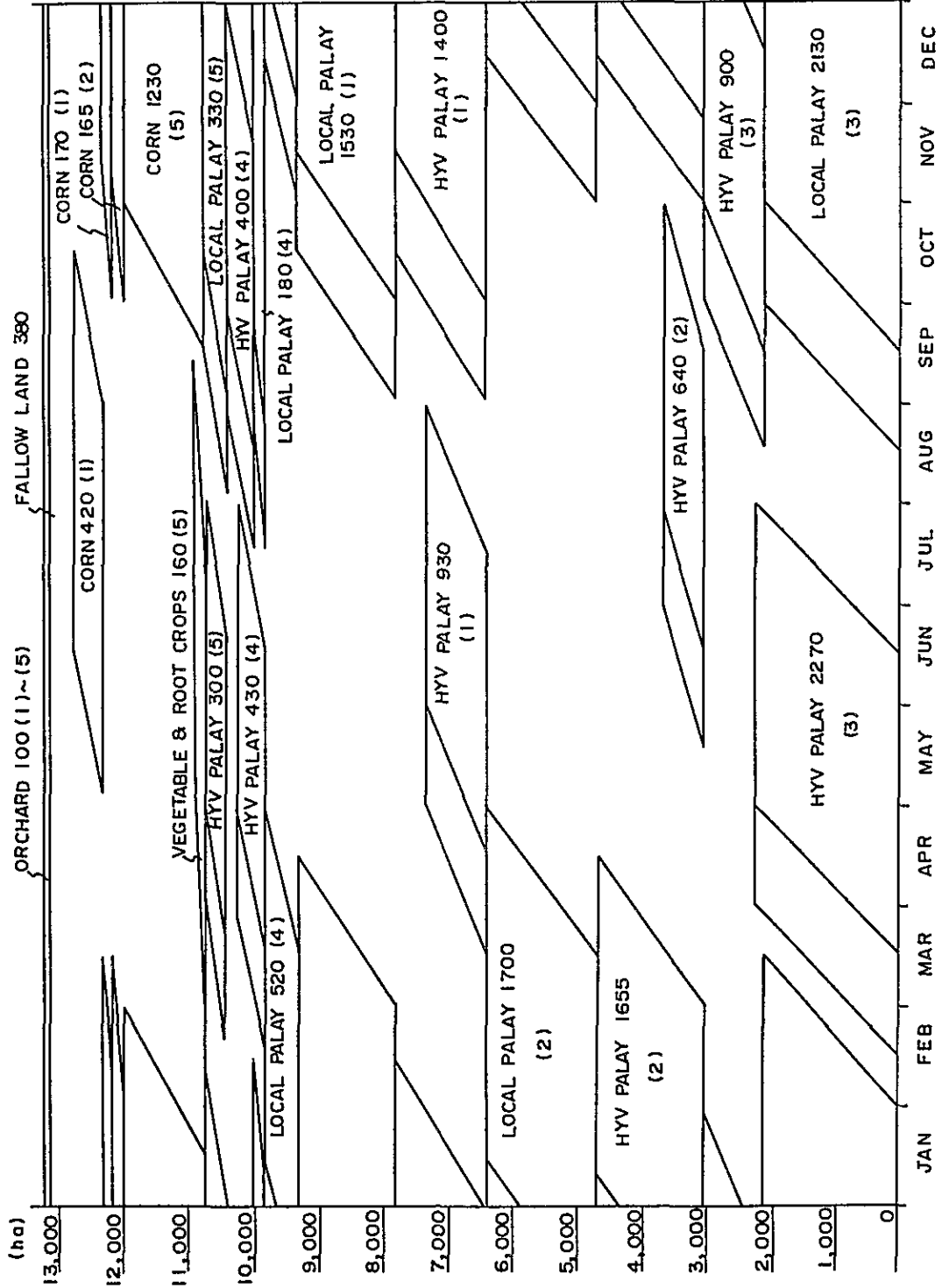
RELATIVE HUMIDITY



RAINFALL



PRESENT CROPPING PATTERN



Land Area : 13,040 ha

Cropped Area : 17,560 ha

Cropping Int. : 134.7%

Note :

1. Land Area excludes area of Right of Way

2. (1)~(5) indicates

Block number

FIG. IV - 2

PROPOSED CROPPING PATTERN

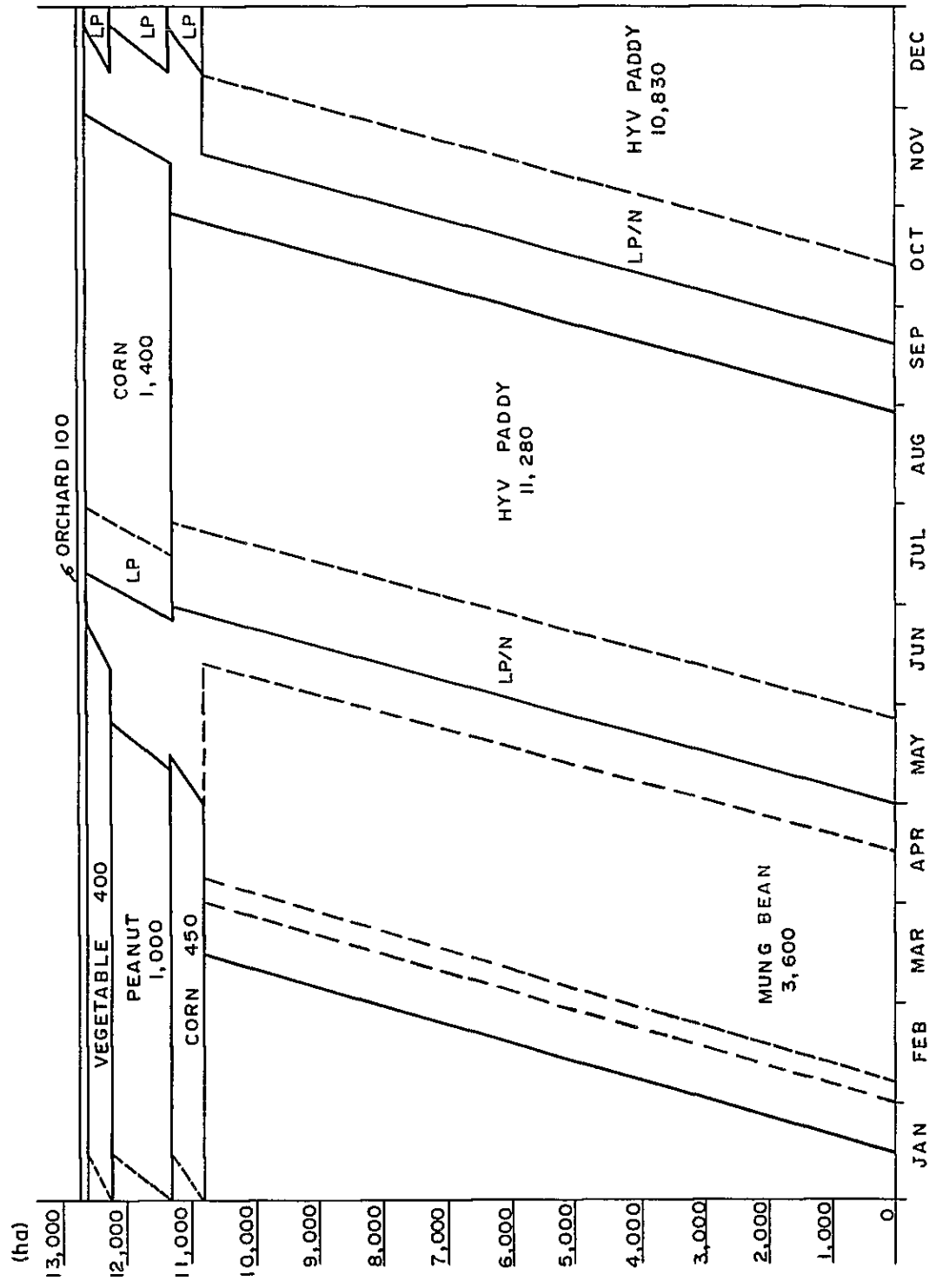
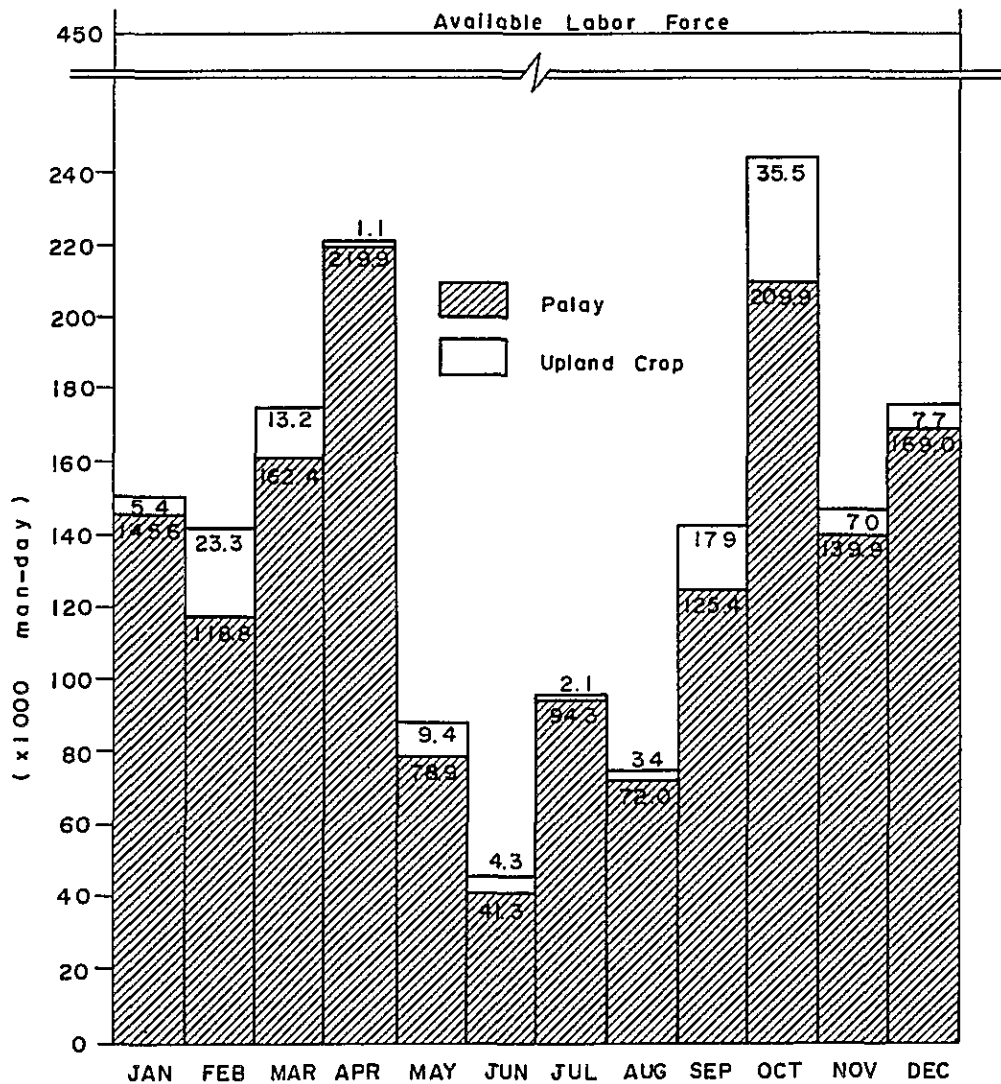
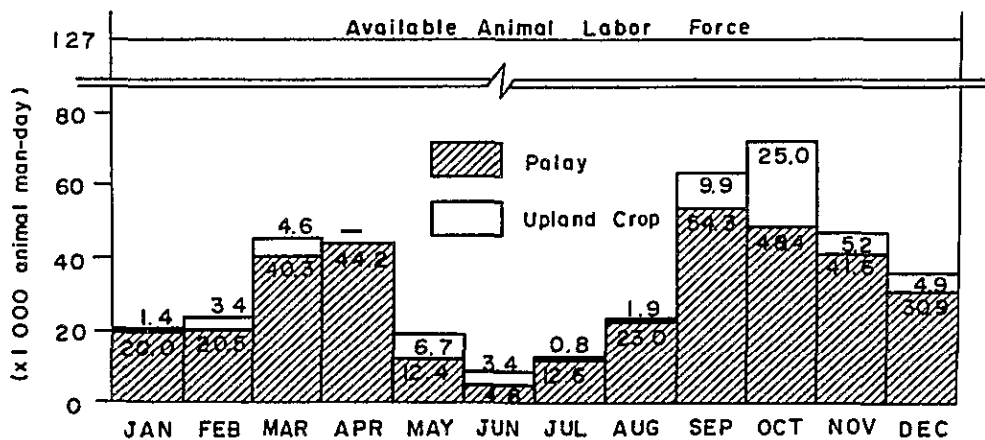


FIG. IV - 3

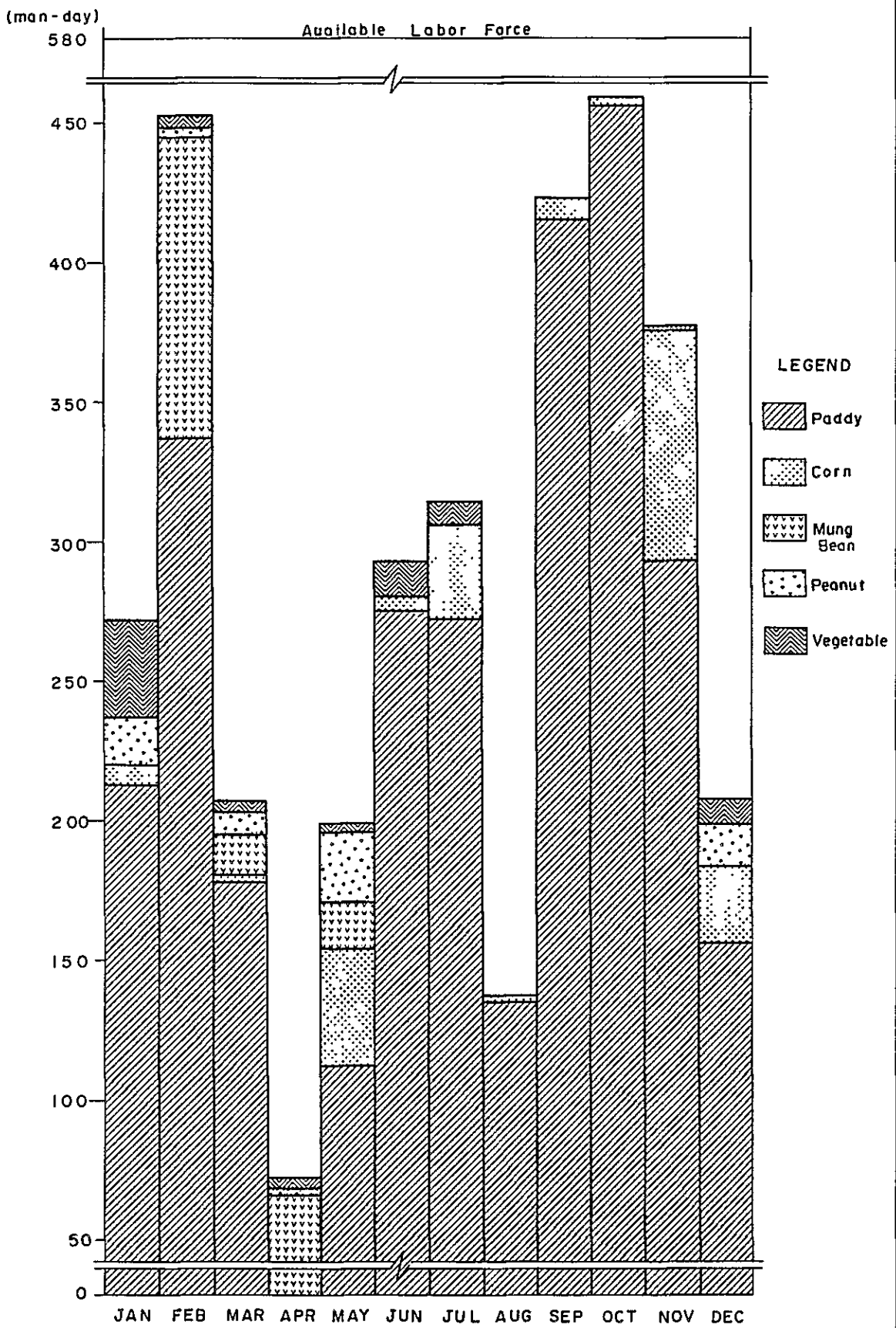
LABOR USE FOR ALL PRODUCTS (AT PRESENT)



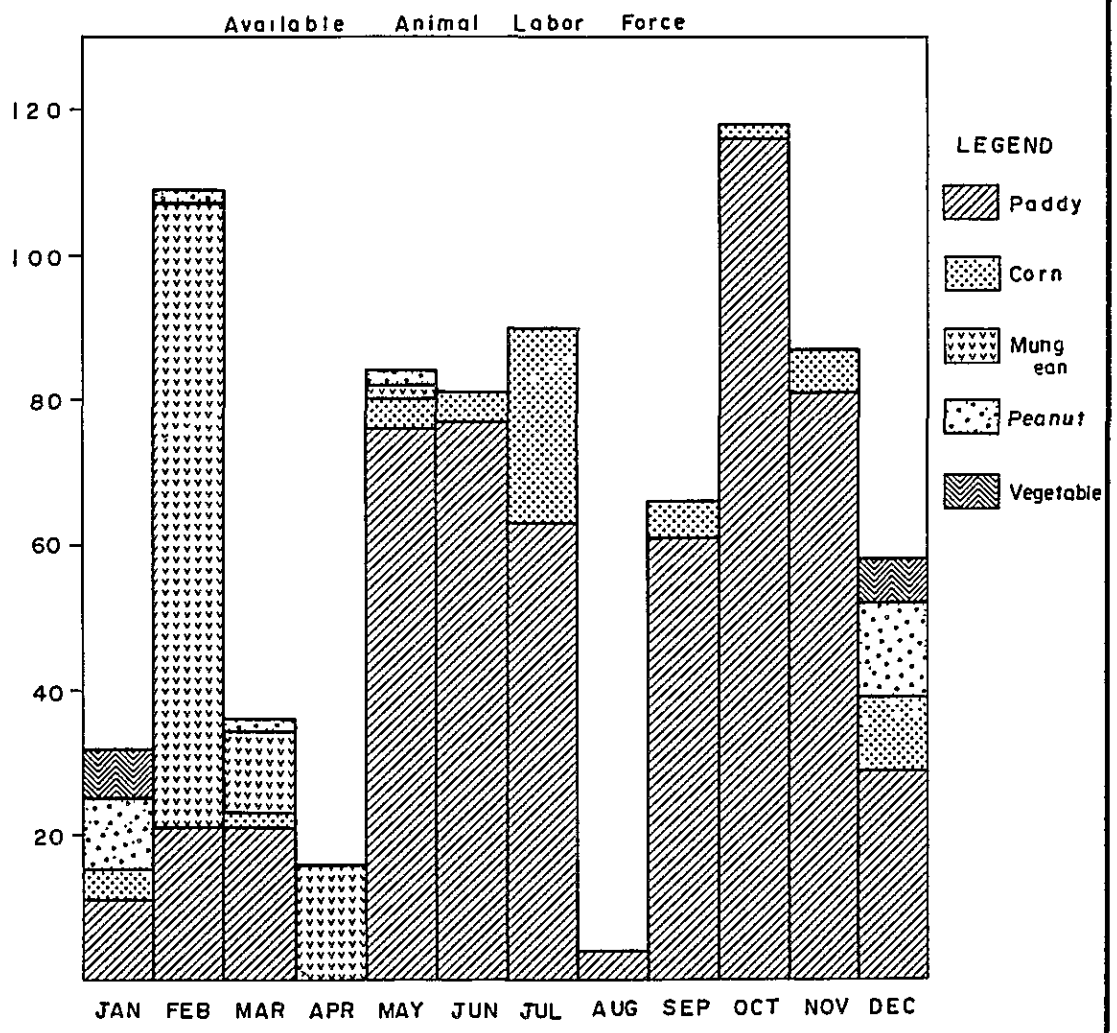
ANIMAL LABOR USE FOR ALL PRODUCTS (AT PRESENT)



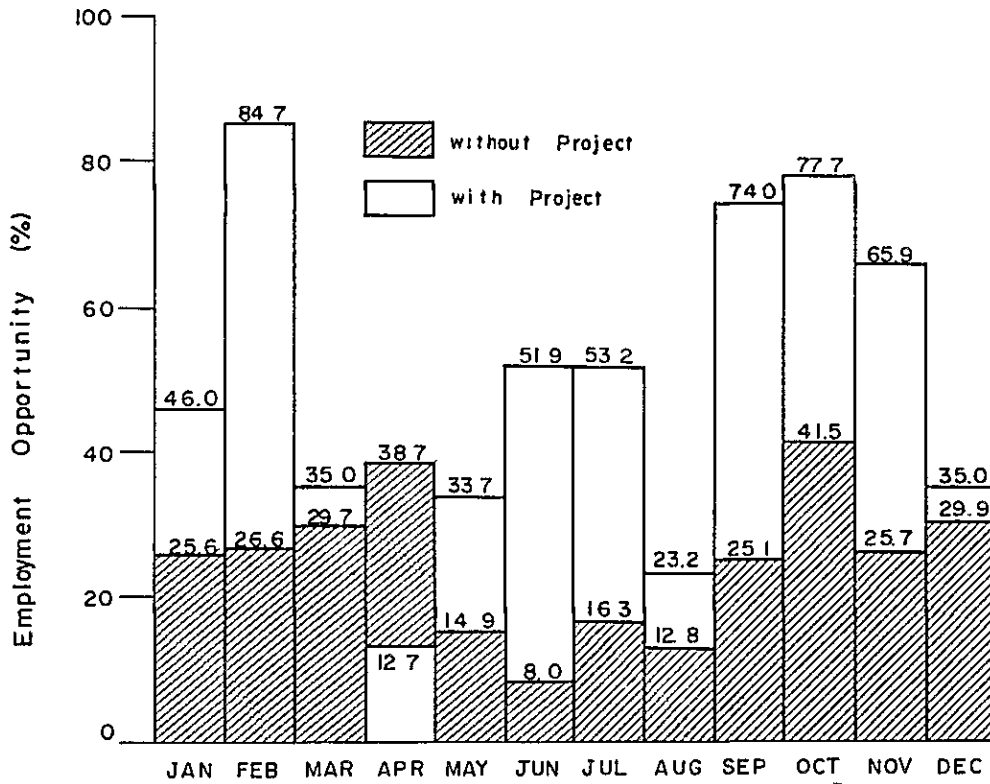
LABOR USE FOR ALL PRODUCTS(FUTURE) FIG IV - 6



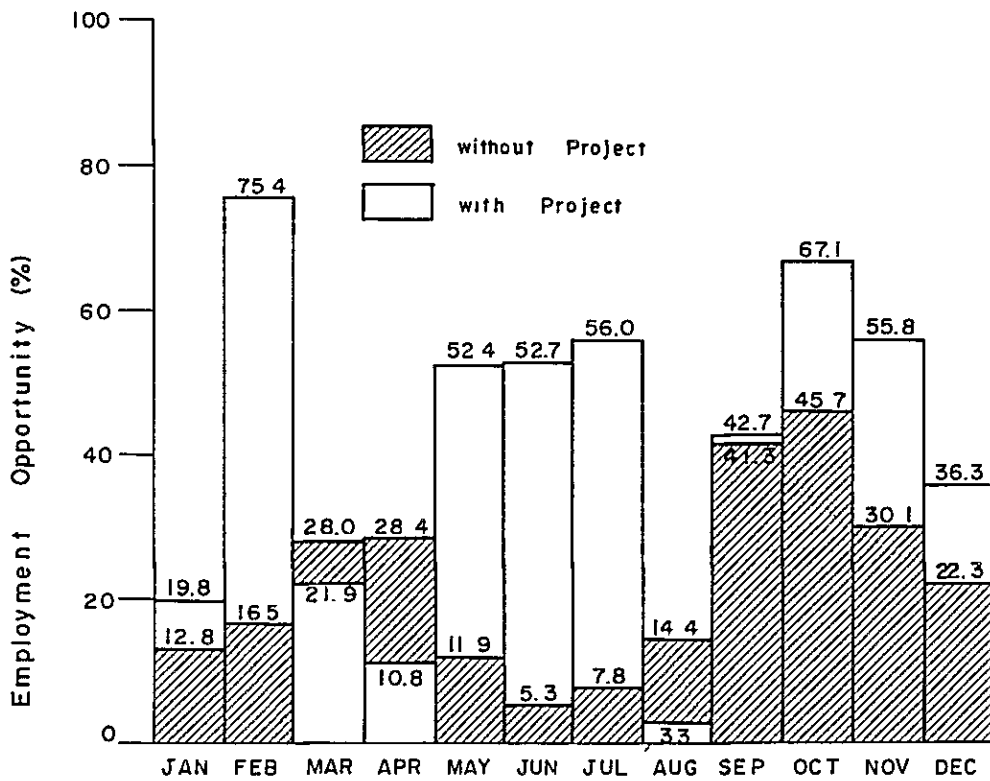
ANIMAL LABOR USE FOR ALL PRODUCTS (FUTURE)



HUMAN LABOR BALANCE



CARABAO LABOR BALANCE



APPENDIX I - V

SOCIO - ECONOMY

APPENDIX I-V

SOCIO-ECONOMY

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APPENDIX I-V
SOCIO-ECONOMY

1. EPITOME OF THE INSTITUTIONAL SURVEY

During the feasibility study period, the Team carried out several field surveys to identify the institutional conditions in the Project area and its vicinity. The aim of these surveys was to grasp the actual socio-economic condition in the area from the broad perspective, including but not limited to, living conditions, economic activities, farmers' associations and their activities, and farmers' attitudes towards farming as a livelihood. The investigation was mainly conducted in the field, with data analysis support. Although these surveys proved to be insufficient to present a clear guide for developing agricultural and economic activities in the area, the final objective of the Project, nevertheless, valuable data was obtained for a feasibility study level investigation.

The following surveys were carried out by the Team in cooperation with the counterpart staff of NIA.

- (1) Data Collection and Analyses: throughout the survey period
- (2) Barangay Survey: Feb. 1982 (about 1 month)

Barangay Survey was carried out in the field to identify socio-economic conditions in the areas of land use, land value, land rent charge, land holding status, agricultural products and their prices.

Results of the survey are summarized as:

- (a) Land area of Nueva Vizcaya: 3,904km² (1.3% of the entire country)
- (b) Population of Nueva Vizcaya: Estimated population for 1975 is 213,151, an increase of 40,953 or 23.8% from 1970. Annual population growth rate during this period was 4.3%, while 2.85% is estimated for the period between 1975 and

1980. Population density increased from 44.1 persons/km² in 1970 to 54.6 persons/km² in 1975 and further increased to 61.9km² in 1980. (Such a rapid rise greatly affects the formulation of the economic plan.)

(c) Industry: Agriculture, hunting, forestry and fishery makes up 68.2% of the labor force, while mining, commerce, and etc. comprise the remainder of those gainfully employed.

(d) Agriculture: Out of the total area, 10.15% is devoted to agriculture, with an additional 17% as pasture land. The agricultural area is comprised of 42.1% irrigated paddy, 29.5% rainfed paddy, 3% upland, and the remaining percentage cultivated in crops for private consumption and commercial crops.

(e) Labor force: Total labor force in 1975 is estimated at 147,898 persons representing 69.38% of the population. Out of this number, those 10 years old or over (42.6%) are gainfully employed.

(f) Local financial institutions: There are 16 banks in the area, consisting of, 9 Rural Banks, 6 Commercial Banks and 1 Samahang Nayan Cooperative Rural Bank.

(g) Education: There are a total of 231 educational institutions in the area, including 218 public elementary schools, 10 private elementary schools and 3 colleges.

(h) Health facilities: There are 3 government and 2 private hospitals and 90 health centers and clinics in the province.

(i) Land value: Land value is tabled as:

(Average P/ha)

	Irrigated Palay	Rainfed Palay	Corn Land
Bayombong	20,166	12,333	7,333
Solano	22,000	13,555	-
Bagabag	15,000	9,692	-
Villaverde	-	13,833	-
Bambang	15,000	-	-

(j) Land rental: Land rental is tabled as:

	(Average P/ha)		
	Irrigated Wet Palay	Rainfed Palay	Irrigated Dry Palay
Bayombong	1,280	844	-
Solano	940	1,092	1,019
Bagabag	839	505	1,003
Villaverde	1,040	-	-
Bambang	15,000	-	-

(3) Communal Irrigation System (CIS) Survey: Feb. 1982 (about 3 weeks)

The present CIS in the Project area were investigated by the interview method, with special focus on facilities, drainage conditions, irrigated area, water service fee, amortization and farmers' consciousness toward this Project. The results of this survey are summarized below:

(a) General information of each CIS is tabled as:

Name of CIS	No.	Command Irrigation Area (ha)	No. of Families Benefited
Colocol M.C.	30	3,077	2,694
Lanog R.	24	4,084	3,395
Lamut R.	9	530	475
Apad C.	9	764	619
Magat R.	1	25	20
Matuno R.	2	544	380
Total	75	9,024	7,583

(b) Farmers' attitude toward Project: The sample survey indicated that area farmers are interested in the implementation of the Project as soon as possible. Readiness to cooperate and to pay water service fees were also noted provided irrigation water would be assured whenever the need arose.

(4) Sample Interview Survey: July - Aug. 1982

During the survey period a sample interview of area farmers was taken throughout the Project barangays to identify conditions of farmer's livelihood, farming practices and the rural community situation. The results of the survey are summarized below:

- (a) Management of each barangay, social pattern, etc. for such things as the use of water are slightly different.
- (b) In the Project area, peanuts and mung beans are not extensively cultivated. However, these crops have a long history in the area and are thereby cultivated by many farmers as a subsidy crop.
- (c) Farmers in the area have a common right to the western hill area (government land) for collecting fuel wood, bamboo, and cogon grass, the latter used as house construction materials as to feed well as their livestock.
- (d) Farmer's interest in HYV paddy is quite high, and they recognize the necessity to obtain new certified seed every three to four years.

(5) Institutional Survey: July - Aug. 1982

Beside visits to and interviews held at several institutions, the Team also prepared a questionnaire and sent the same to such organizations as agricultural credit agencies, local administrative bodies, and other related supporting institutions. The results of the survey are summarized below:

- (a) Among the barangays within the Project, there is a significant difference in loan amount under the Masagana 99 and Maisagana programs. Similarly, the repayment ratio of the Rural Banks ranges from 99% to less than 20%.
- (b) The relationship between the Area Marketing Cooperative and the Cagayan Valley Development Cooperatives is being formed as a network for marketing agricultural products in the entire Cagayan Valley region is a potential result.

(6) Irrigators' Association Survey: July - Aug. 1982

During the survey period, the Team conducted several interview surveys at the Colocol Federal Communal Irrigation Association as well as with its member CIAs and some sample CIA in different locations. The results of the survey are summarized below:

(a) Each individual CIA has its own organization and function. Organization and management of each CIA differs slightly depending on the size of CIS. There are three different local federal CIAs in the Project area -- Bayombong, Solano and Bagabag. In Bagabag, during the survey period irrigators had already formed a "Bagabag Gravity and Pump Irrigators Association". Colocol CIA is composed of the federal CIA of Bayombong, Solano and Colocol canal beneficiaries under Bagabag CIA.

(b) Water distribution in the upper and lower part of the irrigation canal systems is uneven. Usually the beneficiaries in the upper portion of the system enjoy sufficient water while downstream users face water supply shortages.

(c) During the rainy season, the lower reaches of the irrigation system at some CIS have problems with drainage caused by overflow water from the upper reaches of the system.

(7) Reservoir Inventory Survey: July - Aug. 1982

If the "B₂" dam plan is carried out, land of the following households will be inundated by the proposed reservoir.

- Households: 17
- Population: 74
- Ethnic Group: Igorot 4 families, Ilocano 13 families
- Years settled: 5 - 20 years
- Area cultivated: approx. 66ha (identified as gently inclining cultivated upland crops)

(8) Barangay Flood Damage Survey: Aug. 1982

Survey of Barangays have been carried out to determine the amount of flood damage for the recent 5 years by interview with special concern for facilities, agricultural machinery, housing, livelihood and economic activities.

The survey confirmed that a significant amount of flood damage occurred during several past large scale floods. However, the exact amount of damage could not be clearly ascertained and thus estimates of damage have been assumed along the riversides, irrigation canal, low land and creeks in the western hill area. Records of crop yield do, however, indicate that during large scale flooding agricultural output drastically decreased.

(9) Inundated Property Survey: Nov. 1982

Chronically inundated area has been classified through analyses of the Barangay Flood Damage Survey and a flood mark survey. This survey was carried out by the sample interview method to establish the average flood damage to properties in rural and urban areas and subsequently calculated and itemized in terms of Pesos. In this way, the difference between flood damage in rural and urban areas has been distinguished as follows:

Value of Household Property (Pesos/family)

Item	Rural Area	Urban Area
Building	8,233	8,794
Living Necessities	5,904	8,602
Vehicles	1,212	2,892
Domestic Water	233	160
Agri. Concern	6,229	3,743
Domestic Animals	1,288	1,007
Total	23,099	25,198

(10) Farmers' Consciousness Study: Jan., 1983

To ascertain farmers' attitudes towards the Project, an interview survey was carried out in sample areas along the Colocol

Irrigation Canal network. The results are summarized as presented below.

- (a) All respondents stated their willingness to join a new irrigator's association/farmers' cooperative.
- (b) Farmers all recognize the need to improve farming by sufficient and continuous supply of irrigation water.
- (c) Farmers are willing to apply improved agricultural technology made possible by the provision of irrigation water to increase crop production.
- (d) Farmers are ready to invest in their farms for provision of on-farm facilities for irrigation. At survey, 65% desired equal distribution of water to farms, while 35% sought to have additional water supplied.

2. LOCAL INCENTIVE

2.1 Farmers' Incentives

The following policies are indispensable factors to give farmers' incentive toward continued production farming:

- (a) support prices for palay and other crops to help farmers increase income; (This will encourage farmers to increase their yields and production.)
- (b) free education/seminars on improved agricultural technology to farmers; (This will improve the knowhow of farmers particularly on the proper application of fertilizers and pesticides, proper varieties of seeds to be used and other improved techniques in farming that will lead to increase yields and production and thereby improved farm income.)
- (c) free assistance from government extension workers/technicians in the field to improved farming practices; (Adding to item (2) above, dissemination of improve farming practices by technicians to area farmers will help increase production.)

- (d) financial assistance through loans and agricultural credit extensions;
- (e) subsidies for fertilizers and other farm inputs; and,
- (f) establishment of cooperatives/irrigators associations to assist farmers with other vital needs.

2.2 Results/Observation of Farmers' Attitude

A survey of farmers' attitudes within the Project area was conducted from January 25-29, 1983. The interviews were centered on the following items:

- Willingness of the farmers to join new irrigation associations/farm cooperatives if organized in the locality.
- Willingness of the farmers to apply or practice improved agricultural technology on the farm if adequate water supply will be available.
- Willingness to invest in the provision of on-farm facilities for irrigating their farms.

The majority of the farmers, barangay captains and even the officials of various municipalities in the Project area expressed the desire for early completion of the Project. Item (3) above particularly underlines their thinking. The following views represent the basic desires of the farmers:

(1) "Come again with Water"

This view is most often expressed by area farmers (see TABLE V-1) in the municipality of Villaverde. It is thus clear that continuous water supply is important to farmers in the downstream basin. Repeatedly, farmers expressed concern over the situation that previous to construction of facilities on the upper reaches of their concerned water source, a greater steady water supply was forthcoming, whereas subsequent to provision of such facilities water supply was irregular and even harmful, with insufficient supply in the dry season, and inundation in the wet season.

(2) "More Benefits with the Project"

All farmers in the Project area eagerly anticipate increased benefits with the Project. Proper water supply is very important to their cultivation. Therefore, they expressed their willingness to join new irrigators' associations/farmers' cooperatives if organized in the locality and if by so doing a timely, adequate water supply could be assured.

(3) "Equal Distribution of Water"

This view demonstrates that area farmers intend to invest in on-farm irrigation facilities to increase their production. Therefore very efficient water management through all areas of the Project is required.

(4) "Production and Income Improved"

Farmers' attitudes toward improved production are impressive. Desire for on-farm practice of improved agricultural technology in the field to increase farm income was prevalent.

3. REVIEW OF REGIONAL SECTORAL DEVELOPMENT PLAN

The implementation of the overall plan and various programs under each sectoral development plan at the regional or provincial level has a significant interrelation with the proposed Project. These plans involve the participation of both government agencies and private sectors. In some sectors however, government participation in the implementation plan is more dominant at the regional level as may be understood from the following discussion.

(1) Irrigation

Under the implementation plan for irrigation development at the regional level is the participation of the National Irrigation Administration (NIA) and Farm System Development Corporation (FSDC). However, at the provincial level some

irrigation plans are projected as a part of the nationwide scheme, such as the Communal Irrigation Development Project, Improvement and Rehabilitation of National Irrigation System II both by NIA, and Small Farmers System II by FSDC.

(2) Agriculture

There are various different development plans in the sectors of agriculture, forestry, fisheries, cooperative development and agricultural credit as national or regional on-going projects and as a scheme proposed by NEDA. In Region II, increase in vegetable production is accorded the first priority within the promotion of multiple cropping patterns. In recent years, the average annual growth rate of both vegetable production and area planted have been distinguishably increased as shown in TABLE V-2. Nevertheless, there still exists a substantial deficit in vegetable production/supply.

The establishment of the Land Settlement Package II by the Ministry of Agrarian Reform at Quirino, involving 40,000ha includes the identification of tenants, issuance of CLTs, construction of settlement areas and the introduction of income generating projects into the settlement area.

(3) Power and Reservoir

In the region, several power and reservoir development projects are listed under the plan of NPC and NEA. Beside large scale hydro-electric power projects located on the Magat, Chico, Disuyan and Abulog rivers, other power schemes are envisioned, namely, Daklan Geothermal Project, Dendro-Thermal Power Development Project and mini-hydro power development projects either on-going or proposed. In this connection, a pre-feasibility study of the Magat watershed was submitted to NIA in 1982.

(4) Infrastructure

Among the many projects Region II and the Project province, major plans for the development of infrastructures such as the

Fifth IBRD Highway Project (182km), Pangasinan-Nueva Vizcaya Road (69km) and Provincial Water Supply III are all significantly linked to the Project.

(5) Social Services

In the northern region the on-going major social services scheme is the establishment of the "Hospital Development for Region I and II Project". Other schemes which are relative to the area are on the national program level such as telecommunication technology, nutrition and health.

(6) Industries

In the Region no specific development programs for industrial development are assumed to have a significant relation to the Project. However, various national and local government agencies are now promoting many types of projects such as forest products, commerce and agro-industries which have been realistically planned to match the actual socio-economic condition of the area. The regional integrated action programs for each sector are tabulated in TABLE V-3.

4. POPULATION AND SOCIO-ECONOMIC CONDITIONS

Total population in the province of Nueva Vizcaya is reported by the National Census and Statistic Office at about 241,690 in 1980. However, population in the Project area which involves 5 municipalities and 55 barangays is estimated at about 94,300, sharing about 39% of the total population in the province as indicated in TABLE V-4.

Within the Project area, 20,528 (21%) of the population reside in Bagabag municipality, 2,124 (2%) in Bambang municipality, 30,483 (31%) in Bayombong municipality, 36,710 (37%) in Solano municipality while 9,478 (10%) live in Villaverde municipality.

Population density in the entire Project area is 487 persons/km², with about 340 persons/km² residing in the Project municipalities as

shown in FIG. V-1 and TABLE V-5. Total land area of the five concerned municipalities of the Project is 93,547ha. Land sharing in the Project area mostly occurs in the lowland area where the population depends upon commerce, industry and agricultural processing, representing 20.6% of the municipalities' population. Among the 5 municipalities located in the Project area, the highest population density is registered in Solano municipality (376/km²) and the lowest in Bagabag (62/km²).

As shown in TABLE V-6 1960-80 annual population growth rate in the concerned province is 3.84%, but the trend of annual population growth rate showed a decrease in the 5 years from 1975-80 as low as 2.86%, particularly in Villaverde and Bagabag municipalities. The decrease in population growth rate in these two municipalities is due to agricultural and socio-economic constraints. Residents of these areas migrate to nearby municipalities such as Solano, Bayombong outside the Project area where the socio-economic conditions are more favorable. Most of these migrants are reportedly landless farmers.

In 1980, the total number of households in the concerned province was 45,029. Of this amount 18,446 resided in the Project area. The average family size in the Project area is estimated at 5.12 persons per household, and 9,355 families (50.7%) are farmers with an average family size of 5.29 persons per household.

The economy of the province is basically agriculture. Paddy is the major crop grown in the Project area. Other major crops are corn, root crops, bananas and vegetables. Though rich in water resources, the province has no pronounced developed areas for fishing. This economic activity is purely confined to inland operation, the main sources of which are the Magat, Lamut and Matuno rivers. Mineral deposits such as copper, zinc, gypsum and gold are claimed to be found in the vicinity of the Project area; however, active commercial exploitation is not presently on-going. The province is also rich in forest products, but commercial activity is limited.

The main occupation in the Project area is farming, about 50.7% as shown in TABLE V-7. One half of all farmers reside in rural areas while the remainder reside in urban areas. About 14% of residents are full-time employees while the remainder are contracted labors such as

drivers, carpenters, midwives, etc. Distribution of urban/rural population in Nueva Vizeaya is tabulated in TABLE V-8. Average family income derived from full-time employment is about ₱15,740 per annum, income from farming is about ₱19,050 per annum and income from other sources is about ₱11,680 per annum.

Generally, farm families in the area earn the average family income, namely, ₱19,050. This annual income enables the same to buy some luxuries. It is reported that about 85% of urban and 46% of rural families have electricity service connections. Among the high value items owned by the residents are motor vehicles, refrigerators, TV sets, stereo sets and jewelry.

In the urban areas domestic water is provided to only 5% of households, while 75% use hand pumps. In rural areas, 83% of the households use hand pumps while the rest utilize open wells.

5. ADMINISTRATIVE JURISDICTION

The Provincial Government of Nueva Vizcaya has functioned as a political body since its formal organization in 1839. However, since the issuance of P.D. No. 826 there have been changes in the provincial government structure. Under P.D. No. 826, the Provincial Governor remains as head of the provincial government, while all provincial boards and municipal councils were converted into Municipal Councilors (Sangguniang Bayan). This restructuring provides for the membership and participation in local legislative bodies of ordinary citizens from labor, agricultural, professional and commercial sectors, and barangay and youth groups previously divorced from actual government affairs.

There are 6 Board Members who serve for an indefinite term. Termination of a member is by the Ministry of Local Government. The Governor is the presiding officer. Members are to be responsible to the local legislation. Directly under the Governor are thirteen different offices as shown in the organization chart (FIG. V-2).

Municipal mayors are the heads of municipalities. They are empowered to exercise administrative control over all affairs of the

municipal government, execute laws and ordinances, and issue orders to local police. Directly under the Mayor is the Municipal Administrator who performs the work of vice-mayors.

Local legislation is handled by the Sangguniang Bayan which is usually composed of 6 members, with the Municipal Mayor as the presiding officer. Members receive salaries from the local government. Sangguniang Bayan has one Municipal Secretariat who provides administrative and auxiliary services for the members. Offices attached to the Mayor's Office are Budget Office, Municipal Development Coordinator, General Services, Municipal Treasurer, Assistant Municipal Treasurer and Municipal Assessor. An organization chart of the municipal government is provided in FIG. V-3.

Barangays or Barrios are the smallest political unit in the country. One barangay is composed of an average of about 500 families. Each barangay is headed by a Barangay Captain usually elected by the local population after residing for at least 6 months in the Barangay. He administers the affairs of the barangay while the Barangay Council takes charge of legislation. At least 6 members compose the Barangay Council. Barangays have three main units -- Barangay Youth (Kabataang Barangay), Barangay Brigade and Barangay Tanod (Barangay Police). The Barangay Brigade is composed of a Women's Auxiliary, Fire Brigade, Volunteer Brigade and Disaster Brigade. Members of the Barangay are all volunteers. An organization chart of a typical Barangay is provided in FIG. V-4.

6. AGRICULTURAL SUPPORT SERVICES

6.1 Ministry of Agriculture

The Ministry of Agriculture is presently undergoing reorganization. Different bureaus under the Ministry are now integrated into one, under the umbrella of the Ministry of Agriculture. Said affected Bureaus are:

- Bureau of Agricultural Extension (BAEx)
- Bureau of Animal Industry (BAI)

- Bureau of Soil (BS)
- Bureau of Plant Industry (BPI)
- Bureau of Cooperative Development (BCD)

The Bureau of Cooperative Development originally was under the Ministry of Local Government and Community Development but was transferred to the Ministry of Agriculture by virtue of a Letter of Instruction from the same. Reorganization commenced in March 1980. The Bureau of Agricultural Economics is not affected by the above reorganization.

One of the present programs of the Ministry is the Complementation Program. This program involves local residence, local government, schools and private sectors. The extension program is being strengthened thru this Complementation Program. For its part the Ministry of Agriculture has its own personnel with different activities.

Rural Youth Development Officer (RYDO) or Farm Children (Anak Bukid) was formerly the 4-H Club. Both male and female youth are involved in the organization. At least one RYDO is assigned for every municipality. The target of RYDO is to organize at least 23 clubs per year.

Home Management Technician (HMT) concerns the mothers residing in the area. HMT are organized under the Rural Improvement Club (RIC). Mothers are instructed in the care and management of home, nutrition, cooking, dress making, etc. In the province there are 87 RIC organized. In order to pursue various programs within the RIC, the Ministry of Agriculture sometimes solicits financial assistance from the National Nutrition Council.

The Ministry of Agriculture is also involved with the Program Kilusang Kabuhayan at Kaunlaran or livelihood program (KKK). KKK is concerned with such projects as the Agro-Forestry Program including Ipil-ipil Tree Farms and Fruit Tree Farms. The Ministry also promotes under the KKK program, cattle fattenings/slaughter, goat slaughter, swine fattenings/slaughter, sweet potato production, mango production, peanut production and cassava production. The Ministry has further established in nearby Dupax del Norte, Nueva Vizcaya a 100ha livestock breeding station under the KKK program.

Another program of the Ministry is the Seed Multiplication Program. Seed Inspectors supervise seed producers especially for rice and corn. Seed growers are registered under the Ministry of Agriculture. Before seeds are released for distribution, the same are examined by the Seed Board in Ilagan, Isabela. Seed testing includes purity, germination and moisture content analysis. In the province two seed inspectors are presently serving the area. A Seed Growers Association has been formed by the Seed Inspectors. Different technicians who work in the program of the Ministry of Agriculture are shown in FIG. V-5.

6.2 Extension Services

One way of increasing family income and improving the quality of rural family and community life is through effective agricultural extension. The main functionaries for extension are the BAEx and BPI of Ministry of Agriculture. Other agencies, however, provide extension services through their own programs.

Masagana 99 is the major rice production program of the Ministry of Agriculture. The extension phase is carried out intensively to encourage farmers to adopt a package of technology which includes a supervised credit scheme. In phase XVIII (November 1981 - April 1982), the supervised scheme of Masagana 99 covered 10,722 farmers, or about 13,480ha in the province. Extension services have been rendered by 90 Production Technicians.

The Masiagana program, another government project, involves the production of white corn for human consumption and yellow corn as feed grains. The feed grain program aims at satisfying the food requirement of the expanding poultry and livestock industry. The emphasis of extension services is focused on the planting of HYV's with proper cultural practices such as the appropriate application of fertilizer and insecticides to control pests and diseases.

While the extension workers' main concern is on Masagana 99 and Masiagana, they possess a general knowledge of agricultural practices and as such, provide technical assistance on other farm activities. In

the event that highly technical services are required the extension worker coordinates the needed assistance with other technical agencies. Distribution of BPI extension workers in the Project municipalities is shown in TABLE V-9.

Staff development of extension workers has been continuous and sustained. For example, new rice specialists, sponsored by the National Food and Agriculture Council (NFAC) are being instructed every year at the College of Agriculture, Los Banos, under the Unified Rice Applied Research Training and Information Program. To keep abreast with development in modern agriculture, extension workers attend conventions where results of experiments are discussed.

The Ministry of Agrarian Reform (MAR) train field workers in land reform while the Ministry of Agriculture has been concerned with cooperative development and agricultural technology. MAR personnel are dispensed in teams to the field. Stationed in designated municipalities they cover the whole province wherever land reform programs are being implemented. Presently, a total of 208 employees constitute the field force for extension and other related non-formal educational programs.

The present ratio between field workers and supervised farms is 1:119. Farmers included in this ratio are both rainfed and irrigated and either do or do not require credit. Based on the national average ratio of 1:110, it can be concluded that there is a need for additional extension workers in the province. The number of extension workers in different institutions is provided on the following page.

List of Extension Workers in Project Municipalities

Institution	Extension Workers
Bureau of Cooperative Development	1
Bureau of Plant Industry	29
Bureau of Agricultural Extension	50
Ministry of Local Government	5
Bayombong Rural Bank	1
Bambang Rural Bank	7
Bagabag Rural Bank	14
Villaverde Rural Bank	3
Solano Rural Bank	5
Philippine National Bank	16
Development Bank of the Philippines	7
National Irrigation Administration	1
National Food Authority	1
Bureau of Fishery and Aquatic Resources	3
TOTAL	143

6.3 Ministry of Human Settlement (MHS)

Ministry of Human Settlement (MHS) which is located in Solano, is engaged in four major activities: Shelter Development, Community Services Development Program, Integrated Area Livelihood Program and KKK Program.

The shelter development program in the Project area is presently located in Solano, called the Rural Bliss Project, with the municipalities of Bagabag and Bayombong projected as future Rural Bliss Projects.

For promoting the Community Services Development Program, at least one Human Settlement Officer in the municipality is assigned by MHS to:

- i) assist in preparation of a Development Plan for the municipality;
- ii) identify needs; and,
- iii) prepare a municipal socio-economic profile.

The livelihood programs are under the Human Settlement Development Corporation which is the corporate arm of the Ministry of Agriculture.

Its purpose is to provide maximum flexibility to the Ministry in activities related thereto.

Under the KKK Program, mayors are municipal coordinators. The program commenced in September 1981, and the maximum amount released per beneficiary is P15,000.00. The committee members of KKK program under the leadership of the Provincial Action Officer of MHS are listed in FIG. V-6.

6.4 Other Institutions

Two BPI Experiment Stations have direct influence on agriculture in the Project area; one is Cagayan Valley Experiment Station, San Malco, Isabela and the other is Maligaya Experiment Station, Nueva Ecija. Both stations concentrate on rice experiments.

In the Project area, one NIA demonstration farm was established in 1981 in order to train farmers in fertilizer and pesticide application.

7. COOPERATIVE DEVELOPMENT AND FARMERS' ASSOCIATIONS

Organization of Farmer's Associations (Samahang Nayon or SN) and development of cooperatives is a major thrust of the Ministry of Agriculture.

SNs are organized as a pre-cooperative organization composed of 25 to 200 farmers residing in the geographical limits of one barangay for the purpose of improving life therein. Although initially launched to support the Agrarian Reform Program, the SN is being expanded as the rural foundation of the whole cooperative development program.

Stage I of the program focuses on organization, Stage II on the development of SNs into full-fledged cooperatives, Stage III consists of organizing consumers' cooperatives to serve primarily as outlets for agricultural products and Stage IV aims to integrate the entire system. Registered cooperative organizations in the province of Nueva Vizcaya are listed in TABLE V-10. As of December 1981 there are 113 SN's registered with a total membership of about 8,310 in Nueva Vizcaya.

The compulsory saving program makes up the Barangay Savings Fund and the Barangay Guarantee Fund. The Barangay Savings Fund mobilizes funds by withholding 3% of all production loans acquired by members from various financing institutions. If a member is non-borrowing, he is required to contribute P5.00 per month. On the other hand, the Barangay Guarantee Fund is plenished through members contribution of one cavan of palay per hectare per harvest.

The Area Marketing Cooperative (AMC) was formed under Presidential Decree 175 on 5 May 1975; however, actual operation in Nueva Vizcaya did not occur until 1 November 1975. AMC is the marketing arm of SN on a multi-municipal or provincial level. Its main functions are to procure and distribute production inputs needed by members and to store, process, transport and sell farm produce. A minimum paid-up capital of P100,000.00 is required to organize one AMC.

The Nueva Vizcaya AMC has 68 SN with a total membership of about 3,400. Out of this amount 48 SN are in the Project area. As of 30 June 1981 the capital structure of AMC is as follows:

- Authorized capital	P2,500,000.00
- Subscribed capital	P565,000.00
- Paid-up capital	P202,000.00

AMC is controlled by the following officers:

- Board of Directors	11
- Manager	1
- Secretary	1
- Other staff	1

In order for AMC to promote business, two buying stations have been established in Bagabag and Solano. Other post harvest facilities handled by AMC are a rice mill, corn shelter and warehouse.

The Cooperative Rural Bank of Nueva Vizcaya is organized as a financing arm of SN and SN members. Samahang Nayon Cooperative Rural Bank (CRB) extends loans for M-99, Maisagana and carabao as shown in TABLE V-11. Under these programs the members of SN can avail themselves of a loan without collateral at 12% per annum which is comparatively low, provided they form a "Damayan" or a group of 3 farmers.

The minimum paid-up capital necessary to establish a CRB is P500,000.00. The Nueva Vizcaya CRB was registered with the Central Bank on 12 December 1979. As of 30 June 1981 its capital structure is as follows:

- Authorized capital	P3,000,000.00
- Subscribed capital	P723,000.00
- Paid-up capital	P1,024,000.00

In order to develop and strengthen SN which form the nucleus of AMCs, the Cagayan Valley Development Cooperative (CAVADECO) was established by AMCs of Nueva Vizcaya, Isabelita and Cagayan-Kalinga Apayao on 27 May 1975. The organization of CAVADECO is shown in FIG. V-7.

CAVADECO, is a joint undertaking of the Canadian International Development Agency and the Philippine Government under the Regional Cooperatives Development Program. The target of the undertaking is 95 SN in 3 provinces. Authorized capitalization is P5 million out of which P1,250,000.00 has been subscribed with an initial paid-up capital of P250,000.00.

Other cooperatives organized in the province include 4 Credit Unions and one Consumer's Cooperative. Of these, three Credit Unions and one Consumer's Cooperative are located in the Project area. Activities of selected Credit Unions and Vizcaya Savings and Loan Association are shown in TABLE V-12 to V-14.

The Nueva Vizcaya Seed Growers Association has 64 members, mostly rice seed growers cultivating about 135.5ha. Of this amount, 19 members plant approximately 36ha in the Project area as shown in TABLE V-15.

Seed growers are required to register with the Ministry of Agriculture. The same must also from time to time submit seeds for certification.

Since organization of the Nueva Vizcaya Fishpond Operators' Association in 1978, as of June 1982, the number of fishpond operators have increased to 103. Total area utilized for fishpond operation is about 80ha.

8. IRRIGATORS' ASSOCIATIONS

The Colocol Communal Irrigation System is the largest CIS in the province. The system is composed of 30 small irrigation systems, varying in size of which 20 are directly served while 10 are supplemental. Service area extends to the municipalities of Bayombong, Solano and Bagabag. In addition, small irrigation systems flowing from tributaries of the Lanog and Lamut rivers and Apad Creek serve the area.

Farmers Irrigators' Associations are organized under individual irrigation systems. These associations are controlled by a set of officers, the number of which depend on the area. The associations serve as a foundation in strengthening the Agrarian Reform and Cooperative Development Program. These association also serve as a point of convergence of financial and technical assistance and other services from government and private sectors. In addition, the associations facilitate repayment of loan members by loan amortization and collection of irrigation fees. Marketing of farm products are also processed through the association.

Irrigation systems and their associations served by the Colocol canal are under the Federal Farmers Irrigators' Association as indicated in FIG. V-8. This association is controlled by a President and two Vice Presidents each coming from the municipalities served. At present, the President comes from Bayombong, while the Vice Presidents derive from Solano and Bagabag.

The following are the sources of revenue of the Federal Colocol Association:

- i) P10.00/ha/member/cropping season operation and maintenance fee;
- ii) P5.00/member membership fee regardless of farm size collected only once; and
- iii) P15.00/day/member as penalty charge for not repairing physical structures.

In case the funds in the treasury are not sufficient for major repairs, other sources of funds come from the Presidential Assistance on National Minorities (PANAMIN), provincial government, etc.

For operation and maintenance of manual labor a system of rotation is practiced. The members from the three municipalities contribute

their labor free of charge on different days. For its part the provincial government provides a bulldozer also free of charge. However, services of the operator and crude oil costs are borne by the members. Meal allowances of operators are paid by CIA during Saturdays and Sundays while the provincial government pays the operators during week days.

Aside from the Federal Colocol, the Project area is served by several individual irrigation systems each with its own CIA. Although the collection of fees differs with each association, operation and maintenance is similar to the Colocol Canal Association. Labor is provided free of charge by members in the repair work.

The Farm System Development Corporation (FSDC) provides irrigation facilities in the Project area in terms of pump and gravity irrigation projects. Existing FSDC projects are:

- i) Nanguyatan CIS, Solano;
- ii) Gannib-Cabaritan, Bagabag; and
- iii) Sta. Cruz-Careb, Bagabag.

Each of the above projects has its own CIA controlled by different officers such as a President, Secretary, Treasurer and Auditor.

The following fees are collected for each of the schemes:

- i) P10.00/member membership fee regardless of farm size;
- ii) P5.00/member annual fee; and,
- iii) P10.00/member penalty fee when absent from a meeting.

FSDC financed the construction of the Gannib-Cabaritan project at a cost of P390,000.00 in 1976. Although there was no collateral for the loan, the association was required to register with the Securities and Exchange Commission (SEC). Technical advisors were provided by NIA through the provincial office. The right of way for the main canal and facilities was solicited by designated officers. The usual procedure to allocate land is for NIA to pay the land value based on market value assessed by the Provincial Assessor's Office. However, for the Gannib-Cabaritan project the right of way was provided free of charge by the landowners.

In order to repay the loan, the irrigation association collects 4 cavans/ha/cropping seasons from the farmers for a 25 years period. To facilitate collection Block Leaders (KAISAHAN) have been elected. The amount collected by these leaders is deposited with the Treasurer. Fees are either paid in kind or cash. The Treasurer takes charge of selling any good paid in kind. The CIA pays amortization of P11,000.00/year to FSDC for use of the loan.

9. AGRICULTURAL CREDIT INSTITUTIONS

9.1 Present Conditions

Credit requirements in the Project area are provided by 5 rural banks, Philippine National Bank, Development Bank of the Philippines, and other private lending institutions such as Samahang Nayon Cooperative Rural Bank and Cooperative Credit Unions as shown in TABLE V-16. The Rural Banks and the Philippine National Bank are the main credit arm of the Masagana 99 rice production program and the Maisagana corn production program. The credit condition of these lending institutions including supervised and non-supervised credit is tabulated in TABLES V-17 to V-19.

Farmers joining the Masagana 99 Program are extended loans without collateral through a supervised farm credit scheme. The program consists of a package of technology using recommended HYV and other farm inputs. Of the total credit given to any borrower, 60% is given in the form of farm inputs, while the remaining 40% is given in cash. The program which was launched in May 1973, and Phase XVIII completed in May 1982.

The Maisagana Program was officially launched on December 15, 1981, to increase corn yields and ultimately boost the country's self-reliance in food. The country is self sufficient in white corn, but it is deficient in yellow corn, which is needed for animal feed. The program is patterned after the Masagana 99 Program, which provides loans to farmers through supervised farm credit. Loan ceilings have been raised for corn farmers from P900 under the previous corn program to P1,450 per/ha for every crop season.

The 5 Rural Banks and the Philippine National Bank have provided an average of P1,430 per/ha to 34,041 farmers in the Project area and its vicinity. The total amount extended is about P48 million under the Masagana 99 Program. On the other hand, about 2,212 farmers have been granted an average of about P900 per/ha under the Maisagana Program. A total of about P2 million has been extended by different banks to the Maisagana Program.

The various existing banking institutions in the Project area are more than enough to meet the credit requirement of farmers. However, the overall financing scheme deserves scrutiny due to low repayment of loans. For example Villaverde Rural Bank has reported a high 99% repayment of outstanding loans while Solano Rural Bank reports a very low repayment of less than 20%.

9.2 Proposed Agricultural Credit Institutions

Both Masagana 99 and Maisagana programs are servicing the Project area and presently envision an increased lending amount in the future. These programs integrate the use of recommended technology with financing. The essential features of the programs include:

- (a) formulation of Damayan or Selda which are composed of 3 to 15 farmers in a group to cooperatively obtain a loan on a joint-liability basis;
- (b) formulation of farm development plans and budgets as a basis for the loan;
- (c) extension of non-collateral but partly government guaranteed and subsidized loans by various rural banks, the Agricultural Credit Administration, Philippine National Bank and Development Bank of the Philippines;
- (d) use of checks for loans granted by obtaining fertilizer and other inputs from authorized dealers, and cash to cover investment for cost cultivation of other areas; and,
- (e) provision of technical advice and supervision of farm operations by specifically assigned farm management technicians.

The extent of Masagana 99, phase XVI and XVII are summarized in TABLE V-20.

The on-going Masagana 99 and Maisagana programs as well as other supervised credit programs need to be expanded as land use increases. Improvement of a farming system based on an income generating plan for farmers by appropriate coordination with banks and other financing agencies must be established. The credit program requires re-evaluation to overcome many pressing issues. Some of these are:

(a) In the province in general or the Project area in particular, the management of supervised agricultural credit is not smoothly operated whereas the banking facilities are more than enough to meet the credit requirement in the area. This is the main cause of low level repayment particularly with the banks which have a significant lending amount.

(b) In the province, there are only 30 dealers in fertilizers and chemicals which are accredited by the Fertilizer and Pesticide Authority (FPA), an inadequate number for the needs of the farming population.

(c) The number of technicians who supervise farm operation under credit are insufficient and there is also a lack of concentrated guidance to the farmers principally due to lack of transportation facilities.

(d) Some systems such as share-tenant, land lease, and or middle-men are increasingly becoming obstacles to the credit development program.

10. INFRASTRUCTURE

10.1 Transportation and Communication

The province is provided with a secondary airport which is operated and maintained by the Bureau of Air Transportation. The airport is located at Lantap, Bagabag. Philippine Air Lines ceased operation to this port in 1978; however, it is still used for military,

private, and general aviation and chartered flights as shown in TABLE V-21.

The main artery of transportation in the province is the Maharlika Highway. This highway connects the province to Nueva Ecija at Santa Fe in the south and Isabela at Diadi in the north. In addition to this national road, a provincial municipal and barangay road network connects different Project municipalities to urban areas such as Solano and Bayombong. Roads are either concrete, asphalt, gravel or dirt type. Information regarding transportation is provided in FIG. V-9, TABLE V-22, and TABLE V-23.

Different types of motor vehicles registered by the Bureau of Land Transportation are serving the province as shown in TABLE V-24. Motor vehicles serving the Project municipalities consist of 4 heavy trucks, 53 light trucks, 102 bantams and 155 private trucks. The average number of motor vehicles is around 3:1,000 population. The largest quantity of these transports is in Bayombong while Villaverde registered the lowest.

The ratio of transportation network to transports is inadequate. The whole stretch of the Maharlika Highway carries the bulk of traffic from the provinces of Cagayan, Isabela and Kalinga-Apayao in the north to Metro Manila in the south. The area is linked with the various provinces by the following principal roads: Nueva Vizcaya - Mt. Province Road (Ifugao Province), Nueva Vizcaya - Pangasinan Road (Pangasinan Province) Nueva Vizcaya - Benguet Road (Bengnet Province). Movement of traffic in the province is more confined in the Project area, municipalities being the center of commerce and education.

The Project municipalities are each provided with a Post Office headed by a Postmaster. Post Offices are usually located inside Municipal Buildings; however, operation and maintenance are handled by the national government under the Bureau of Post.

Bayombong is the center of mail distribution in the province. Mail coming from Metro Manila and other provinces is first handled by the Bayombong Post Office before being distributed to other municipalities. Every post office has a daily delivery of mail within a five kilometers radius from the poblacion and at least three times a

week delivery to outlying Barangays. Transports include 7 mail trucks serving the province routes of Bayombong-Tuguegarao, Bayombong -Banaue, and Bayombong-Metro Manila and vice versa.

Private telegraph stations serving the province are the PT&T, RCPI and Universal. In addition, public telegraph stations serve the municipalities of Bayombong, Solano, Bagabag and Bambang. Radio and television transmitting stations are located at Bangan Hill, Bayombong and at the capital. The only radio station in the province is located in Solano.

Solano and Bayombong are the only municipalities presently served by telephone services. Telephone operation and maintenance is handled by the Bureau of Telecommunication with an estimated subscription of about 600.

10.2 Public Infrastructure

Each Project municipality has a rotating public market day. Market day is at least once a week except in Solano where market occurs daily. This system of rotating schedule of market operation is an advantage to the farmers. Farmers in need of immediate cash can bring their products to a nearby municipality if the market in the municipality they normally use is not operating on that day.

The public market of Bayombong serves residents and non-residents as far as Ambaguio and Quezon while Bagabag serves residents as far as Diadi in the north.

Usually markets are composed of one to three open buildings with several small stalls. Most vendors sell their products outside these buildings either under the heat of the sun or under the cover of improvised cloth shelters. Temporary vendors occupying open spaces are charged according to the volume of products they sell while vendors occupying permanent stalls are charged according to the space occupied.

Power energy is provided by the NUVELCO (Nueva Vizcaya Electric Cooperative, Inc.). NUVELCO has a total capitalization of about P12 million loaned from the National Electrification Administration on a long term basis.

In the Project municipalities, about 4,920 consumers are served by the NUVELCO. Most of the power connections are in Solano, being the center of commerce, followed by Bayombong, as the center of education. Total maximum power demand of the Project municipalities is about 395kW.

11. LOCAL INSTITUTIONS FOR COMMUNITY DEVELOPMENT

The rural and urban communities of the Project area consist of different tribal groups; the original inhabitants being the Gaddangs, joined later by migrating groups of Ilocanos, Pangasinans and Tagalogs. The development of the community was sometimes fragmented and limited under this circumstance. The local community is however, served by different government agencies and local institutions which include the participation of barangay assembly members. The following institutions are the nucleus of the community to date.

(1) Barangay Youth (Kabataang Barangay)

The main objectives of this barangay youth group are to assist in the cleanliness and beautification program, green revolution project, sport development competition by the Kabataang Barangay Municipal Federation and various other activities.

(2) Samahang Nayon and Other Cooperatives

Based on the SN membership and area of land cultivated, the SN program aims to accumulate annual capital representing the 3 types of SN capital, namely; General Fund, Barangay Guarantee Fund and Barangay Saving Fund. Some portion of the above resources are invested in the following cooperative ventures:

- i) Cooperative Insurance System of the Philippines
- ii) Capital Subscription in the Nueva Vizcaya Area Marketing Cooperatives; and
- iii) premiums for Cooperative Insurance System of the Philippines for insurance coverage of SN members.

The general objectives of the SN program are to develop a dynamic cooperative structure in the area aside from the program of building up SN capital, provide continuing education to strengthen and develop SN through pre-membership education programs for prospective members and provide SN Management Courses, Technical Agricultural Courses and carry out Project demonstration for both SN officers and members.

(3) Barangay Government

(4) Municipal Development Council and Committee

The Municipal Development Council (MDC) is composed of the Mayor as Chairman and Municipal Treasurer, President of the Association of Barangay Council, a member of the Sangguniang Bayan, and a Municipal Development Officer.

MDC is assisted particularly in the formulation of plans by the staff serving as the technical arm under the Office of the Municipal Mayor. The Municipal Rural Development Council is a large body composed of office heads, national government agencies operating in the municipality, and representatives of civic and religious groups in the community. One of the main functions of MDC is to assist in the formulation of socio-economic development plans which include involvement and participation of the government as well as the private sector.

Action Committees are organized to facilitate implementation programs like sports development, nutrition, cooperatives, green revolution, cleanliness and beautification.

(5) Government Technicians and Civic Organizations

The municipality is served by school teachers, technicians from concerned government agencies, health personnel, social welfare personnel and community development workers. Several different government agencies and provincial government organizations also assist in providing other necessary services to the community.

Community improvement activities and services are also provided by civic and religious organizations like the Lions, Masons, Knight of Columbus, Catholic Womens League, Puericulture and Family Planning Center, Filipino-Chinese Chamber of Commerce, Market Venders Association, Irrigation Association, etc.

FARMER'S ATTITUDE QUESTIONNAIRE

Respondents	Area (ha)	Are you willing to join New Irrigator's Asso./ Farmers' Cooperatives if Organized in your Locality?	Answers / Reasons	Are you willing to apply or practice Improved Agricultural Technology in your farm, if the water will be Available?	Answers / Reasons	Are you willing to invest in the provision of on-farm facilities for irrigating your Farm?	Answers / Reasons
<u>UPPER STREAM</u>							
<u>BAYOMBONG</u>							
Respondent 1	0.5	Yes	1. To improve ways of farming & livelihood 2. To increase production	1. To increase production 2. To improve methods of planting rice	1. To control water supply 2. To facilitate equal distribution of water		
Respondent 2	1.0	Yes	1. Continuous flow of irrigation water 2. Higher production	1. Increase of income 2. Higher production	1. Control the irrigation water 2. Equal distribution of water		
Respondent 3	6.0	Yes	1. For the benefits to be taken	1. Increase production	1. Equal distribution of farmers		
Respondent 4	3.0	Yes	1. Benefits of farmers	1. Increase production	1. Equal distribution of farmers		
<u>STO. DOMINGO</u>							
Respondent 1	1.5	Yes	1. To enjoy benefits	1. Increase production	1. To have more water & increase production		
Respondent 2	3.25	Yes	1. To avail financing assistance & benefits	1. To increase production	1. To have more water		
Respondent 3	6.0	Yes	1. To avail benefits	1. To increase production & income	1. To have equal water distribution		
<u>SOLANO</u>							
Respondent 1	3.0	Yes	1. To have no problem in irrigation water	1. To improve production	1. Equal distribution of water		
Respondent 2	5.0	Yes	1. To continue farming & produce more production	1. Higher yield & for the good of the farm	1. Sufficient supply of water		
Respondent 3	1.5	Yes	1. So that there will be fluent flow of irrigation water	1. Increase production	1. Equal distribution of water		
Respondent 4	2.0	Yes	1. Avail benefits	1. Improve production	1. Equal distribution of water		
<u>DOWN STREAM</u>							
<u>VILLAVERDE</u>							
Respondent 1	1.5	Yes	1. To get more benefits & increase production	1. To increase production to get more income	1. To get equal distribution of water 2. To avail water supply		
Respondent 2	3.0	Yes	1. Avail more benefits	1. Production will improve	1. Good of farms & equal distribution of water		
Respondent 3	6.0	Yes	1. To improve production and 2. to get more benefits	1. Increase production	1. To avail equal distribution of water		
<u>STA. LUCIA</u>							
Respondent 1	3.0	Yes	1. To get more benefits & production	1. To increase production	1. Equal distribution of water		
Respondent 2	0.5	Yes	1. For higher yields & sufficient supply of irrigation water	1. Increase production	2. Equal distribution of water		
Respondent 3	6.0	Yes	1. Continuous flow of irrigation water	1. Increase production	1. Control irrigation water & equal distribution		
<u>BAGABAG</u>							
Respondent 1	4.0	Yes	1. To avail benefits	1. Increase production	1. Irrigation flow/equal distribution		
Respondent 2	1.0	Yes	1. Sufficient supply of irrigation water	1. More production	1. Equal distribution of water		
Respondent 3	5.0	Yes	1. Yes, for the benefits of farmers	1. Higher production	1. Good flow of irrigation water		

Source: Farm Survey by PDD-NIA and JICA personnel in the project area, January 24-29, 1983.

TABLE V-2

SECTORAL PROFILE: AGRICULTURE PROJECT IN REGION II

Group Production	1975	1979	Four-Year Growth Rate (%)
1. Palay Production			
Area Planted (000 Has.)	321.0	321.0	—
Area Harvested (000 Has.)	414.0	416.1	0.5
Average Yield/Ha. (M.T.)	2.48	3.02	21.8
Volume (000 M.T.)	795.0	969.6	21.8
2. Corn Production			
Area Planted (000 Has.)	138.0	134.9	(2.2)
Area Harvested (000 Has.)	345.0	330.4	(4.5)
Average Yield/Ha. (M.T.)	0.8	1.02	27.5
Volume (000 M.T.)	277.0	338.1	22.1
3. Tobacco Production			
Area Planted (000 Has.)	17.0	14.6	(14.1)
Area Harvested (000 Has.)	17.0	14.6	(14.1)
Average Yield/Ha. (M.T.)	1.0	0.85	(15.0)
Volume (M.T.)	17.0	12.4	(27.1)
4. Sugarcane Production			
Area Planted (000 Has.)	0.2	4.6	220
Area Harvested (000 Has.)	0.2	4.6	220
Average Yield/Ha. (M.T.)	2.5	4.7	88.0
Volume (000 M.T.)	5.0	22.0	340
5. Peanut Production			
Area Planted (000 Has.)	6.0	7.7	28.3
Area Harvested (000 Has.)	12.0	13.5	12.5
Average Yield/Ha. (M.T.)	0.58	1.0	72.4
Volume (000 M.T.)	7.0	13.5	92.9
6. Fruits and Nuts Production			
Area Planted (000 Has.)	18.0	19.9	10.5
Area Harvested (000 Has.)	15.7	13.3	(15.3)
Average Yield/Ha. (M.T.)	2.51	9.38	273.7
Volume (000 M.T.)	74.6	124.4	66.8
7. Roots/Bulbs/Tubers			
Area Planted (000 Has.)	2.0	5.5	175.0
Area Harvested (000 Has.)	8.5	11.0	29.4
Average Yield/Ha. (M.T.)	4.25	5.22	9.9
Volume (000 M.T.)	36.5	57.3	57.0
8. Vegetable Production			
Area Planted (000 Has.)	4.0	6.1	52.5
Area Harvested (000 Has.)	5.7	8.8	54.4
Average Yield/Ha. (M.T.)	2.51	2.84	13.1
Volume (000 M.T.)	14.3	25.1	75.5
9. Coffee Production			
Area Planted (000 Has.)	3.0	4.4	46.7
Area Harvested (000 Has.)	3.0	3.6	20.0
10. Coconut Production			
Area Planted (000 Has.)	4.0	6.3	57.5
Area Harvested (000 Has.)	4.0	4.4	10.0
Average Yield/Ha. (M.T.)	0.5	1.2	140.0
Volume (000 M.T.)	2.0	5.3	165.0
B. Livestock and Poultry Production (000 Heads)			
1. Cattle	203.1	207.6	2.2
2. Carabao	411.5	494.6	20.2
3. Hogs	749.9	753.4	0.5
4. Goat	—	22.9	—
5. Poultry	3,462.9	4,864.6	40.5
C. Fishery			
Fish Production (000 M.T.)	3.0	9.4	213.0

Source: Philippine Development Vol. IX, No. 14 (1981), NEOA

REGIONAL INTEGRATED SECTORAL ACTION PROGRAM

TABLE V-3
(1 of 4)

Project Name & Classification	Subjected Area	Agency	Target	Source of Funding	Duration	Estimated E(\$)	Cost \$(\$)	Status
A Irrigation Project								
1. Chico River Irrigation Project; Stage II	Kalinga Apayao, Cagayan, Isabela	NIA	15,000ha	IDRD	1976-1981	123.7	13.5	F/S depend on Chico Dam IV
2. Casacnan Transbasin (Nakban Diversion Scheme)	Central Luzon	NIA	6m x 2.6k 180MW Add. 200 MW	IDRD	1986-1990	4,560.0	380.0	F/S on going
3. Communal Irrigation Development Project (CIDP)	Nationwide	NIA	144 CIP/36 Province	IDRD	1983-1987	400.0	70.0	Project appraisal completed. Negotiation schedule in May 1982
4. Improvement & Rehabilitation of National Irrigation System II	Nationwide	NIA	4,000ha	OECF	1981		2.4	F/S undertaken
5. Central Luzon Ground-water Irrigation Project	Central Luzon	NIA	12,000ha	OECF	1981		2.4	Yen credit secured in 1981
6. Small Farmers System II	Nationwide	FSDC		USAID	1980-1985	50.0	16.0	
B Agriculture, Forestry, Fishery								
1. Land Settlement Project Package II	Region II, VIII	DAR, MAR	N.V.40,000ha S. Leyte 13,000ha	IDRD		265.0	32.0	D. Final report submitted
2. Philippine Rural Infrastructure Project II	Nationwide, 1st Package: Northern Luzon, Visayas,	DOH, NIA DPWTC, NEDA		IDRD		190.0	35.0	Pre-F/S completed
3. Agricultural Support Services II	Nationwide	MA		IDRD	1981	202.0	4.0	L.A. was signed Aug. 1981
4. DBP Commercial Production & Processing	Nationwide	DBP		IDRD			75.0	F. Appraisal schedule Aug 1981
5. Fruit Industry Development Project	Nationwide	MA, BPI	80,20ha	IDRD	1981-1986	424.7	49.73	F/S
6. Smallholder Dairy Development	Nationwide	BAI	Phase I Phase II	ADB		75.0	8.0	L.A. signed Dec. 1981
7. Agricultural Credit II	Nationwide	ACA, RCD		ADB	1981	40.0	10.0	
8. Cotton Development Project	Nationwide	PCA	Self suf -ficiency within 5 years	ADB		650.0	538.2	F/S on going
9. Cagayan Valley Area Development Project (Additional Component)	Region II	CIADP		OECF	5-10years	646.0	73.0	Pre-F/S to be undertaken
10. TRC Agro-Industrial Project	Nationwide	TRC, MHS		OECF	1982-1987	102.1	25.0	10years yen credit Feb. 1982

TABLE V-3
(2 of 4)

Project Name & Classification	Subjected Area	Agency	Target	Source of Funding	Duration	Estimated P(M)	Cost \$(M)	Status
11. Agro-Forestation II	Nationwide	BFD		USAID	1981		2.0	F/S completed
12. Establishment of Fishermen Cooperatives	Nationwide	BFAR, BCD		USAID	1980-1988	78.0	5.0	Newly identified
13. Natural Resources Management Project	Nationwide	NRRI, BFD, BFAR		USAID			1.5	Program for 1981
14. Rehabilitation of Existing 8 BAI Stockfarms	Nationwide	BAI			1982-1987	7.0	3.0	Pre-F/S
15. Agril. Equipment Support	Nationwide	MA					0.5	Newly identified
16. Transport Facilities of Agril. Ext. Workers	Nationwide	DAE				5.0		"
17. Upgrading of Bureau of Soil Laboratory Facilities	Nationwide	BS				5.0	0.5	"
18. Strengthening of the MA's Communication Networks	Nationwide	DAECON				0.5		"
19. Forest Protection & Fire Control Program	Nationwide	BFD			1980	8.0	3.5	"
20. Integrated Pest Control (IPC)	Nationwide	BPI				27.0	7.0	Identified Project
21. Silk Industry Development Project in the Philippine Agril. Aspect	Nationwide	Phil. Textile Research Inst.			1981-1985	6.0	1.0	"
22. Upland Development & Training Program	Nationwide	BS, MA			1981-1984	6.0	1.0	"
23. Processing Plant for Utilization of Wood Waste	Nationwide	BFD, DFPNDC				15.0	8.6	"
C Power and Reservoir								
1. Chico IV Hydro-electric Power Project	Region II	NPC	360MW	IRRD	1983-1987	1,724.0	340.0	Final F/S report submitted
2. Nagat Hydro-electric Project	Region II, III		668MCH	IRRD	1981-1986	160.0	100.0	F/S completed
3. Rural Electrification	Nationwide	NEA		ADB			87.5	L.A. signed Dec. 1981
4. Transmission Lines & Substations	Luzon, Visayas	NPC		ADB	1982-1984	168.4	25.6	Under review
5. Diduyan Hydroelectric Power Project D/E	Region II	NPC	350MW 972GWH	OECF	1981-1982	1,193.0	247.0	Final F/S submitted 1980
6. Abulog Hydro-electric Project	Region II	NPC	400MW	OECF	1980-1988	3,058.0	355.0	Loan obtained 1977
7. Daklan Geothermal Power Project	Region II	NPC	55MW	"	1981-1984	190.0	72.0	

TABLE V-3
(3 of 4)

Project Name & Classification	Subjected Area	Agency	Target	Source of Funding	Duration	Estimated P(H)	Cost \$(M)	Status
8. Dendro-thermal Power Develop Project in the Cagayan valley and Bicol Regions	Region II, V	NEA	Cagayan 5 Bicol 6	"	1982-1984	2.9	1.6	
9. Hagat River Multi-Purpose Project (Power Phase)	Region II, III	NPC	360MW		1983-1989	1,780.0	114.0	
10. Apayao-Abulug Hydro-electric Power Project	Region II	NPC	600 MW		1982-1987	3,058.0	355.0	
11. Construction Program of the National Electrification Administration for 1982-87	Nationwide	NEA				2,550.0	360.0	
12. Mini Hydro Development Project	Nationwide	NEA	177 sites/ 341,339KW		1981-1990	1,254.0	111.0	828,211 KV of potential is identified
D Infrastructure								
1. Fifth IBRD Highway Project	Region I, II, VI, VII, IX, X	NPPI	Region II 182km	IBRD	1982-1985	393.0	55.0	D/E on going
2. Provincial Water Supply III	Nationwide	LNUA		IBRD		3,000.0	405.0	D/E on going
3. Fishing Port Complex Project Package II	Nationwide	MPW		OECF	3 years	13.2 (D.E.) 334.4*	2.5 37.3	D/E
4. Rural Telecommunications Development Project	Region I, II	BUTEL		OECF	1980-	155.6	35.9	Construction
5. Barangay Water Supply II	Nationwide	RLGCD		USAID		11.2	7.5	L.A. signed 1981
6. Nationwide Municipal Fishing Port and Fish Market Program	Nationwide	PFMA			1985	40.0	12.5	F/S proposed to UNDP T/A
7. Pangasinan-Nueva Vizcaya Road	Region I, II	MPH	69km		1980	42.0	4.0	Pre-engineering
8. North-Central Luzon Road Package	Region I, II	MPH				293.0	27.0	F/S by 1980
9. National Road Rehabilitation Program	Nationwide	MPH			1982		450.0	
10. Cagayan Valley Railroad Extension Project	Region II	PNR	281km					
11. Small-Scale Water Impounding Program	Nationwide	MPW	600 projects		7 years	468.0	42.0	
12. Catchment Basins and Impounding Reservoir in Region I and II	Region I, II	MPWTC	30 projects			63.0	8.5	
13. Post Office Building Program	Nationwide	BOF, DLGCD, DPWTC				33.0		Newly identified

* Construction

TABLE V-3
(4 of 4)

Project Name & Classification	Subjected Area	Agency	Target	Source of Funding	Duration	Estimated P(H)	Cost \$(M)	Status
E Social Services								
1. Communications Technology (COMTECH)	Nationwide	EDPITAF		IBRD			25.0	Pilot project is undertaken
2. Hospital Development for Region I and II	Region I, II			OECD	1981-1986	200.0	39.0	Proposed yen credit
3. Upgrading of Regional Health Facilities Phase II	Nationwide	HOH		OECD		120.0	24.0	Identified project
4. Establishing a Domestic Contraceptive Industry	Nationwide	POPCOM/OECD		USAID				Pre-F/S completed
5. Assault on Malnutrition	Nationwide	DSSD				25.75	5.53	Newly identified
6. Health Project I	Nationwide	HOH					40.0	Community health Worker will be recruited
7. Philippine Food and Nutrition Plan I	Nationwide	MA, NMC						
F Industry								
1. Small and Medium Industries	Nationwide	DBP		IBRD			75.0	Project appraisal completed
2. Development Finance Corporation	"	DfP		"	1981		150.0	Loan signed 1981
3. Industrial Estate Development Program	"	Various national & local gov't agencies				628.0	69.0	F/S on going
4. Mineral Resources Development	"	MNR		ADB	1981		15.0	F/S completed
5. Industrial Guarantee and Loan Fund	"	ICLF		ADB				Loan will be made 1981

Source: List of Proposed/Pipeline Projects by Source and by Sector as of December 31, 1981, NEDA, Manila

TABLE V-4
(1 of 2)

TOTAL & PRIVATE HOUSEHOLD POPULATION BY SEX & NUMBER OF
PROVINCE, MUNICIPALITY & BARANGAY IN THE PROJECT AREA, 1980

MUNICIPALITY AND BARANGAY	TOTAL POPULATION			PRIVATE HOUSEHOLD POP.			NO. OF PRIVATE HOUSEHOLDS
	BOTH SEXES	MALE	FEMALE	BOTH SEXES	MALE	FEMALE	
NUEVA VISCAYA	241,690	122,579	119,111	241,010	122,138	118,872	45,029
BAGABAG M.	20,855	10,504	10,351	20,853	10,502	10,351	3,786
1. BAKIR	550	294	256	550	294	256	101
2. BARETBET	1,878	961	917	1,878	961	917	363
3. CAREB	1,557	827	730	1,557	827	730	279
4. LANTAP	1,865	895	970	1,865	895	970	342
5. MURONG	1,907	963	944	1,907	963	944	339
6. NANGALISAN	1,156	575	581	1,156	575	581	208
7. PANIKI	1,165	578	587	1,165	578	587	206
8. POGNSIONO	656	310	346	656	310	346	121
9. SAN GERONIMO	1,376	689	687	1,374	687	687	251
10. SAN PEDRO	1,428	712	716	1,428	712	716	242
11. SANTA CRUZ	686	342	344	686	342	344	125
12. SANTA LUCIA	1,676	847	829	1,676	847	829	304
13. TUAO	2,566	1,290	1,276	2,566	1,290	1,276	464
14. VILLA COLOMA	1,342	687	655	1,342	687	655	234
15. QUIRINO	720	357	363	720	353	363	139
SUB-TOTAL	20,528	10,327	10,201	20,526	10,325	10,201	3,718
BAMBANG M.	26,204	13,350	12,854	26,147	13,301	12,846	4,778
1. MANAMTAN	399	211	188	399	211	188	83
2. STO. DOMINGO	1,725	857	868	1,725	857	868	332
SUB-TOTAL	2,124	1,068	1,056	2,124	1,068	1,056	415
BAYOMBONG	32,066	16,008	16,058	31,858	15,893	15,965	6,204
1. BONFAL EAST	1,614	812	802	1,474	744	730	267
2. BONFAL PROPER	2,641	1,311	1,330	2,641	1,311	1,330	527
3. BONFAL WAST	1,968	1,002	966	1,968	1,002	966	365
4. BUSILAC	1,098	556	542	1,098	556	542	195
5. CASAT	1,528	814	714	1,528	814	714	289
6. LA TORRE	2,051	997	1,054	2,051	997	1,054	469
7. MAGAPUY	418	215	203	418	215	203	83
8. MAGSAYSAY	1,468	753	715	1,468	753	715	304
9. MASOC	1,135	585	550	1,135	585	550	231
10. DISTRICT 1	6,393	3,116	3,277	6,373	3,115	3,258	1,227
11. DISTRICT 2	3,808	1,327	1,481	2,799	1,320	1,479	573
12. DISTRICT 3	3,208	1,624	1,584	3,208	1,624	1,584	614
13. DISTRICT 4	3,014	1,515	1,499	2,975	1,476	1,499	563
14. VISTA HILL	1,139	555	584	1,139	555	584	205
SUB-TOTAL	30,483	15,182	15,301	30,275	15,067	15,208	5,912

TABLE V-4
(2 of 2)

MUNICIPALITY AND BARANGAY	TOTAL POPULATION			PRIVATE HOUSEHOLD POP.			NO. OF PRIVATE HOUSEHOLDS
	BOTH SEXES	MALE	FEMALE	BOTH SEXES	MALE	FEMALE	
SOLANO	36,710	18,225	18,485	36,609	18,172	18,437	6,758
1. AGGUB	1,769	891	878	1769	891	878	331
2. BANGAAN	552	292	260	552	292	260	96
3. BANGAR	571	296	275	571	296	275	105
4. BASCARAN	3,189	1,624	1,565	3,173	1,609	1,564	593
5. CURIFANG	1,898	977	921	1,898	977	921	344
6. DADAP	803	410	393	803	410	393	153
7. LACTAWAN	834	427	407	834	427	407	155
8. OSMENA	3,284	1,593	1,691	3,284	1,593	1,691	605
9. POBLACION N.	1,648	769	879	1,627	755	872	302
10. POBLACION S.	2,082	988	1,094	2,082	988	1,094	366
11. QUEZON	3,232	1,573	1,659	3,232	1,573	1,659	617
12. QUIRINO	5,538	2,712	2,826	5,505	2,693	2,812	1,033
13. ROXAS	4,536	2,353	2,283	4,505	2,248	2,257	780
14. SAN JUAN	986	488	498	986	488	498	173
15. SAN LUIS	1,464	754	710	1,464	754	710	272
16. TUCAL	720	366	354	720	366	354	135
17. UDDIAWAN	2,748	1,365	1,383	2,748	1,365	1,383	535
18. WACAL	856	447	409	856	447	409	163
SUB-TOTAL	36,710	18,225	18,485	36,609	18,172	18,437	6,758
VILLAVERDE	10,644	5,423	5,221	10,590	5,416	5,174	1,904
1. BINTAWAN	3,465	1,764	1,701	3,429	1,763	1,666	586
2. IBUNG	2,868	1,414	1,454	2,850	1,408	1,442	503
3. NAGBITIN	1,208	620	588	1,208	620	588	208
4. PIEZA	671	363	308	671	363	308	119
5. SAWMILL	869	445	424	869	445	424	156
6. TUROD	397	205	192	397	205	192	71
SUB-TOTAL	9,478	4,811	4,667	9,424	4,804	4,620	1,643

Source: NCSO. Manila

POPULATION DENSITY PER SQUARE KILOMETER IN THE PROJECT MUNICIPALITY

PROVINCE/MUNICIPALITY	POPULATION DENSITY/KM ²
NUEVA VISCAYA	61.9
BAGABAG	80.2
BAMBANG	86.2
BAYOMBONG	198.3
SOLANO	376.3
VILLAVERDE	94.5

Source: PDS H.V.

POPULATION AS ENUMERATED IN VARIOUS CENSUS YEARS OF MUNICIPALITY CONCERNED

PROVINCE/ MUNICIPALITIES	1960 Feb 15	1970 May 6	1975 May 1	1980 May 1	1960 - '80 Annual Pop. Growth rate	1975 - '80 Annual Pop. Growth rate
NUEVA VISCAYA	113,734	172,198	209,914	241,690	3.84%	2.86%
BAGBAG	13,805	16,327	19,188	20,855	2.08	1.68
BAMBANG	15,502	20,474	23,073	26,204	2.66	2.58
BAYOMBONG	17,499	25,212	27,987	32,066	3.07	2.76
SOLANO	22,523	27,032	33,036	36,710	2.47	2.13
VILLAVERDE	7,129	8,709	10,590	10,644	2.03	0.10
TOTAL	76,449	97,754	113,874	126,479	2.55	2.12

Source: Data from Provincial Socio-Economic and Physical Profile, N.V. 1982

POPULATION OF PROJECT BARANGAYS BY MUNICIPALITY, 1980

	BAGABAG	BAMBANG	BAYOMBONG	SOLANO	VILLA- VERDE	TOTAL
No. of barangay	15	2	14	18	7	55
Total Household	3,718	415	5,912	6,759	1,643	18,447
Farm Household ratio (%)	66.85	97.59	38.78	44.07	79.83	50.7
No. of Farm Household	2,486	405	2,173	2,979	1,312	9,355
Total Population	20,528	2,124	25,667	36,710	9,478	94,507
Farm Household Population	13,723	2,072	9,954	16,178	7,566	49,493

Source: Data form Provincial Socio-Economic and Physical Profile. N.V. 1982

DISTRIBUTION OF URBAN-RURAL 15 YEARS OLD AND OVER IN NUEVA VISCAYA, 1980

EMPLOYMENT STATUS AND AREA	URBAN			RURAL		
	BOTH SEXES	MALE	FEMALE	BOTH SEXES	MALE	FEMALE
15 years old and over	23,238	11,340	11,898	111,018	54,621	56,397
In the labor force	16,167	9,082	7,085	92,413	50,452	41,961
Not in the labor force	7,071	2,258	4,813	18,605	4,169	14,436
In the labor force	16,167	9,082	7,085	92,413	50,452	41,961
Employed	15,571	8,563	7,008	92,365	50,452	41,913
Unemployed	596	519	77	48	-	48
Employed	15,571	8,563	7,008	92,365	50,452	41,913
In agriculture	4,887	2,457	2,430	70,509	41,001	29,508
Non-agriculture	10,684	6,106	4,578	21,856	9,451	12,405

Source: NCSO. Bayombong

DISTRIBUTION OF BPI EXTENSION WORKERS IN THE PROJECT MUNICIPALITIES

MUNICIPALITIES	TECHNICIANS No.	AREA SERVED (ha)	FARMERS SUPERVISED (No.)
Province	29	20,690	13,777
Bagabag	4	3,099	1,878
Bambang	3	2,400	1,969
Bayombong	1	1,740	1,571
Solano	2	2,983	1,986
Villaverde	3	2,671	1,310
Total	13	12,893	8,714

REGISTERED COOPERATIVES IN NUEVA VIZCAYA, 1981

Cooperative Organizations	Location
1. Area Marketing Cooperative	Solano, N. V.
2. Cooperative Rural bank	Bayombong, N. V.
3. St. Vicent Credit Union	Dupax de Sur, N. V.
4. Bayombong Credit Union	Bayombong, N. V.
5. Rang-ay Credit Union	Solano, N. V.
6. Villaverde Credit Union	Ibung, Vjillaverde, N. V.
7. Rang-ay Consumer's Coop.	Solano, N. V.

CREDIT AMOUNT

SAMAHANG NAYON COOPERATIVE RURAL BANK OF N.V., INC.

1981

Type of Loans	Amount (P)	No. of Borrowers
a. Supervised Credit		
1. Masagana 99	827,198.96	421
2. Maisan 77	101,250.00	78
3. Onion Production	484,000.00	306
4. Piggery	41,500.00	9
5. Poultry	48,441.00	15
b. Non-Supervised Credit		
1. Rice Production	730,700.00	364
2. Corn Production	7,200.00	5
3. Piggery	46,800.00	11
4. Poultry	1,300.00	1
5. Purchase of machinery	14,500.00	2
6. Farm Improvement	52,000.00	11
7. Purchase of Carabao	87,100.00	29
8. Purchase of Cow	27,200.00	15
9. Commercial Loan	98,000.00	30
10. Industrial Loan	18,000.00	2
TOTAL	P2,585,189.96	1,299

BAYOMBONG COOPERATIVE CREDIT UNION, INC.

1979 - 1980

Type of Loans	1980	
	Borrower	Amount (P)
Educational	7	2,850.00
Business	3	1,150.00
Fertilizer	8	1,650.00
Total	18	P=5,650.00

THE SOLANO RANG-AY COOPERATIVE CREDIT UNION, INC.

Type of Loans	1976		1977		1978	
	Borrowers	Amount	Borrowers	Amount	Borrowers	Amount
Productive Loan	187	134,686.05	177	138,234.30	167	154,548.80

VIZCAYA SAVING & LOAN ASSOCIATION, INC. 1981

Type of Loans	Borrowers	Amount (P)
1. Agril. Palay Production	235	1,270,900.00
2. Commercial	92	1,638,200.00
3. Industrial	8	64,000.00
4. Consumption	522	1,029,700.00
TOTAL	857	P =4,002,800.00

NUMBER AND AREA CULTIVATED FOR SEED MULTIPLICATION

IN PROJECT MUNICIPALITIES

Municipalities	Number of Seed Growers	Area Cultivated
Bayombong	2	2
Solano	6	11
Bagabag	9	22
Villaverde	2	1
Total	19	36

LIST OF LENDING INSTITUTIONS IN THE PROJECT MUNICIPALITIES

Sl. No.	Lending Institutions	Location	Lending Capacity	Capitalization
1	Rural Bank of Bagabag	Bagabag	3.0 Million	500,000.00
2	Rural Bank of Solano	Solano	Unlimited	1,910,741.82
3	Rural bank of Bayombong	Bayombong		500,000.00
4	Cordillera Savings and Thrift Bank	Bayombong		2,916,686.67
5	Rural Bank of Villaverde	Villaverde	1.2 Million	1,500,000.00
6	Rural Bank of Bambang	Bambang	15.0 Million	
7	Cordillera Savings and Thrift Bank	Bambang		
8	Vizcaya Savings and Loan Association	Solano		
9	Metro Bank	Solano		
10	Philippine National Bank	Bayombong	Unlimited	
11	Development bank of Philippine	Bayombong	Unlimited	16,900,000.00
12	Samahang Nayon Cooperative Rural Bank	Bayombong	Unlimited	
13	Rang-ay Credit Cooperative	Solano		94,153.45
14	Alicia Maranon Pawnshop	Solano		104,545.00
15	Bayombong Credit Cooperative	Bayombong		

Source: PDS Survey, N.V.

CREDIT CONDITION OF RURAL BANKS IN THE PROJECT MUNICIPALITIES, 1978

(Unit: 1,000 Peso)

Type of Loans	Bagabag		Bambang		Bayombong		Solano		Villaverde	
	Borrower	Amount	Borrower	Amount	Borrower	Amount	Borrower	Amount	Borrower	Amount
I. Agricultural Loan										
a. Supervised Credit										
1. Masagana 99	5	7.92	148	202.20	906	1,158.70	1,592	2,999.12	18	28.30
2. Masagana Maisan	2	3.60					33	33.70		
3. Hog Fattening			5	23.90	167	574.70	306	1,167.00		
4. Cattle Fattening			7	76.00	169	628.25	282	699.40		
5. Vegetable product.							38	84.08		
6. Poultry	4	5.50			9	45.90	116	319.95		
7. Rice-Supervised					359	1,058.40				
8. Goat					1	2.00				
9. Palay					2,041	5,277.00				
b. Non-Supervised Credit										
1. Ordinary Agril. Loan	434	964.43	768	2,048.18			2,631	6,666.20	419	685.82
2. CB & IBRD Term Loans							38	708.62		
c. Other Supervised										
Agril. Loan			240	584.80						
II. Commercial	7	44.00	33	237.50	260	611.90	519	1,972.35		
III. Industrial	4	56.00					90	443.30		
IV. Others										
1. Farm Machinery					7	359.00				
2. Housing					1	80.00				
3. Loan Salary					51	58.70				
4. Personal Loan	18	91.10								
5. Secured	435	971.38								
6. Un-Secured	39	201.17								
TOTAL	948	2,345.10	1,201	3,172.06	3,971	9,854.55	5,977	16,431.17	432	714.12

Note: CB - Central Bank

IBRD - International Bank for Rural Development

Source: Provincial Socio-Economic & Physical Profile 1982, N.V.

CREDIT AMOUNT OF
DEVELOPMENT BANK OF THE PHILIPPINES

Type of Loans	As of 9-26-77		As of 11-29-'79		As of 7-31-'81	
	Borrowers	Amount (P '000)	Borrowers	Amount (P '000)	Borrowers	Amount (P '000)
Agricultural Loans	1,661	14,306	2,606	25,959	3,180	35,873
Industrial Loans	138	674	276	3,057	290	4,820
Real Estate Loans	298	1,949	580	5,116	754	14,273
Educational Ass. Loans (study now pay later plan)			1	6	42	74
TOTAL	2,097	16,929	3,463	34,136	4,266	55,040

Source: DDS Survey, N.V.

CREDIT AMOUNT OF PHILIPPINE NATIONAL BANK

Type of Loans	1976		1977		1980	
	Borrowers	Amount (P '000)	Borrowers	Amount (P '000)	Borrowers	Amount (P '000)
Time loan agri- culture	295	1,513.89	190	729.12	803	5,260
Time loan comm- ercial	173	2,583.8	23	259.35		
Masagana 99 palay crop loan	1,096	1,246.25	395	536.82	4,495	5,648
Study now pay later plan					28	131
Commercial loan					435	8,718
TOTAL	1,564	5,343.94	603	1,525.29	5,761	19,758

Source: DDS Survey, N.V.

PROJECT GOALS AND ACCOMPLISHMENTS

<u>Items</u>	<u>Phase XVI</u> (ha)	<u>Phase XVII</u> (ha)
1. Total Target		
a. Irrigated	14,415	13,988
b. Rainfed	297	774
2. Total area actually planted		
a. Irrigated	14,439	15,928
b. Rainfed	98	687
3. Area harvested	14,537	1,547
4. Production	1,112,300	124,369
5. Average Production	77	80
6. No. of manpower	110	110
7. No. of participating municipalities	13	13
8. No. of participating credit institutions	7	7
a. rural banks		
1. No. of farmers served	1,633	1,406
2. Amount of loan approved	₱3,457,260	₱3,045,308
3. Area financed	3,453	2,745
b. PNB		
1. No. of farmers served	1,074	1,288
2. Amount of loan approved	₱2,101,734	₱2,579,411
3. Area financed	1,794	2,075
9. Total loans approved (RB+PNB)	₱5,548,944	₱5,624,719

AIRCRAFT PASSENGER & CARGO TRAFFIC IN NUEVA VIZCAYA, 1980

1. AIRCRAFT	NUMBER
Military	68
Private/General Aviation	1,200
Chartered	60
Scheduled	0
2. GARGO CARRIED	
Unloaded	200,000kgs
Loaded	100,000kgs
3. PASSENGERS CARRIED	
Arrivals	3,154
Transients	520
Departures	582

Source: PAL, SIL, BAT, Bagabag Airport

KILOMETER RANGES OF ROAD BY TYPE OF ADMINISTRATION, NUEVA VISCAYA

1. National Road	110,545.00km
2. National Secondary Road	228,965.20km
3. Provincial Road	404,676.00km
4. Municipal Road	195,394.00km
5. Barangay Road	1,204,226.00km
TOTAL	2,143,806.20km

ROADS BY TYPE OF CONSTRUCTION NUEVA VISCAYA

BY TYPE OF ADMINISTRATION	CONCRETE (KMS)	ASPHALT (KMS)	GRAVEL (KMS)	EARTH/DIRT (KMS)	TOTAL (KMS)
1. National	107,445	3,100	-	-	110,545.00
2. National Secondary	-	-	126,026.60	103,938.60	228,965.20
3. Provincial	1,300	6,830	241,050.00	155,496.00	404,676.00
4. Municipal	800	6,445	120,819.00	67,330.00	195,394.00
5. Barangay	-	-	826,400.00	377,826.00	1,204,226.00
TOTAL	109,545	16,375	1,314,295.00	704,635.60	2,143,806.20

Source: Provincial Engineering office, MPH, N.V.

LIST OF THE NUMBERS OF MOTOR VEHICLES REGISTERED IN NUEVA VIZCAYA AND PROJECT MUNICIPALITY, 1980

MUNICIPALITY	TYPE/DENOMINATION																TOTAL TOTAL			
	H	L	B	J	T	S	U	MC	TH	RP	MTC	MCH	PUJ	PUB	TRJ	RPT		TRHB	RPTR	RPMC
BAGABAG	0	2	5	9	21	19	0	28	1	2	18	15	8	3	5	0	0	0	3	139
BAMBANG	0	5	6	25	17	26	2	51	3	3	57	43	52	0	11	2	0	0	2	305
BAYOMBONG	1	15	37	53	27	67	0	82	9	33	168	77	46	1	14	13	0	0	11	654
SOLANO	3	25	36	78	40	64	3	68	3	3	111	3	53	5	10	0	1	0	0	506
VILLAVEVERDE	0	1	1	1	2	2	0	2	0	1	9	4	8	0	5	0	0	0	0	37
PROVINCE	4	53	102	221	155	250	5	284	17	43	436	186	221	11	59	16	1	0	17	2,081

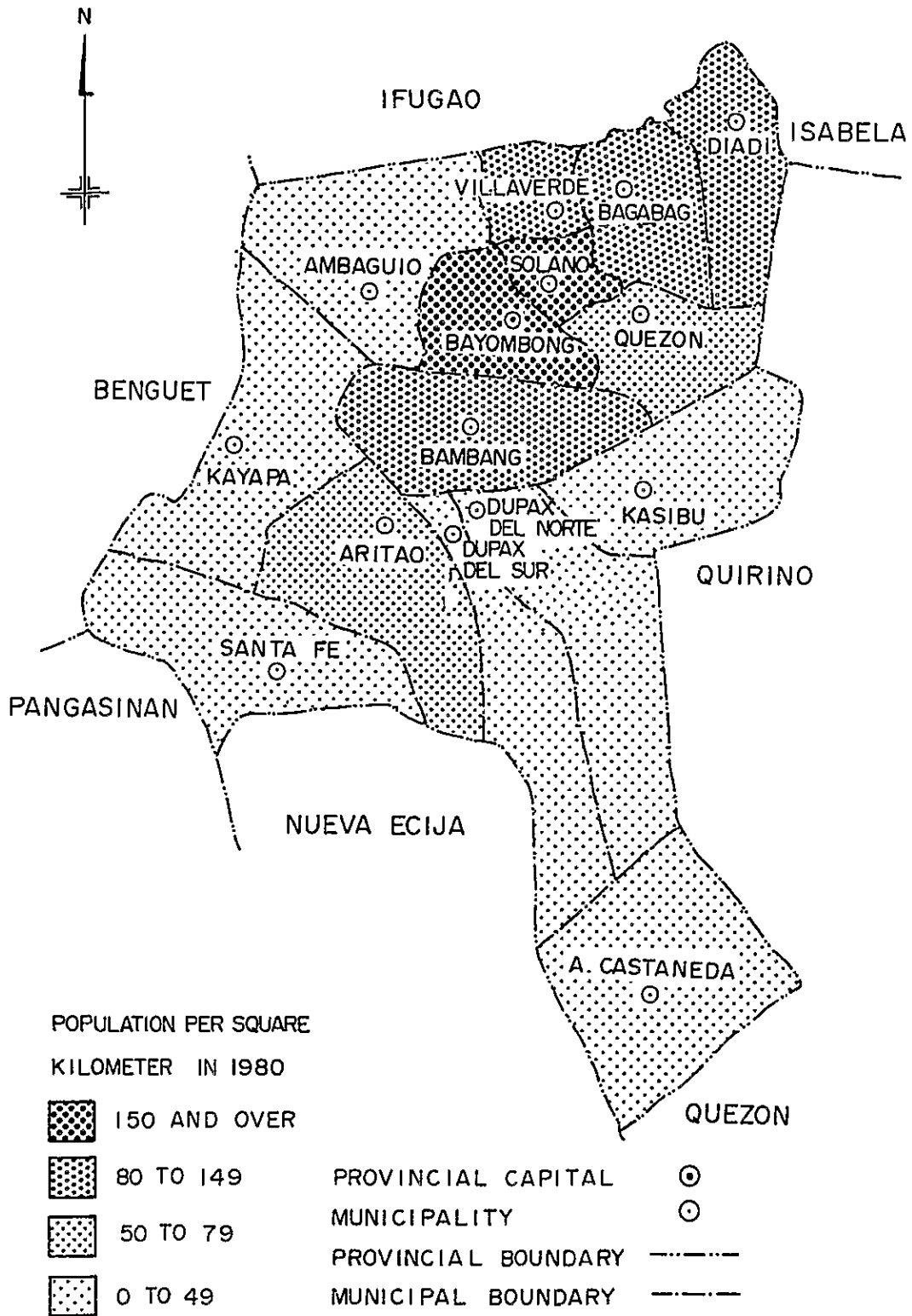
LEGEND:

H - Heavy	S - Service	NTC - Motor Tri-Cycle	TRHB - Trailer Highbed
L - Light	U - Undertaker	MCH - Motorcycle for Hire	RPTR - Republic Trailer
B - Bantam	MC - Motor Cycle	PUJ - Public Utility Jeepney	RPMC - Republic Motorcycle
J - Jeep	TH - Truck for Hire	PUB - Public Utility Bus	
T - Truck (Private)	RP - Republic Vehicle	TRJ - Jeep Trailer	

Source: BLT Agency, Bayombong, N.V.

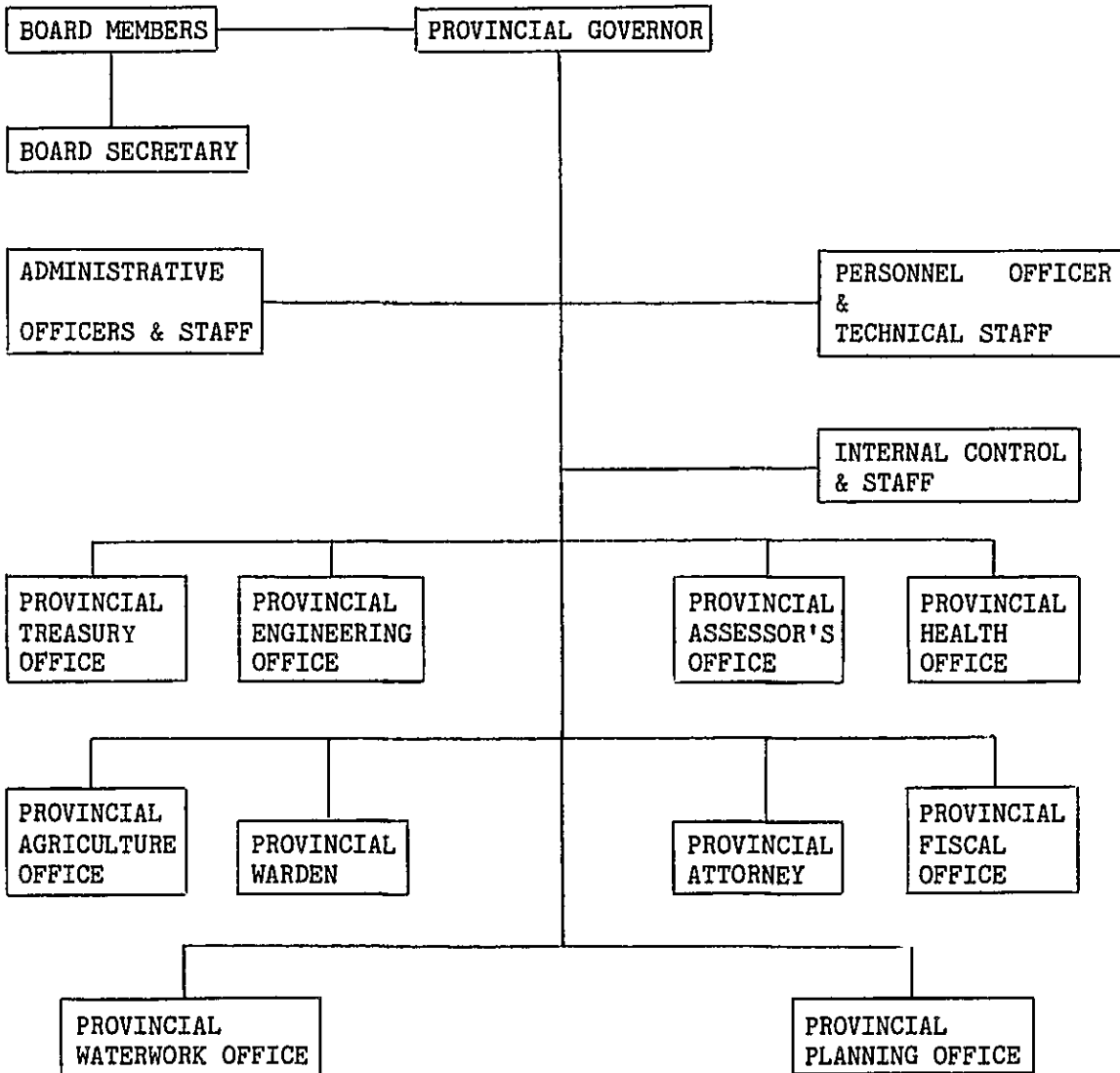
FIG. V-1

NUEVA VIZCAYA POPULATION DENSITY

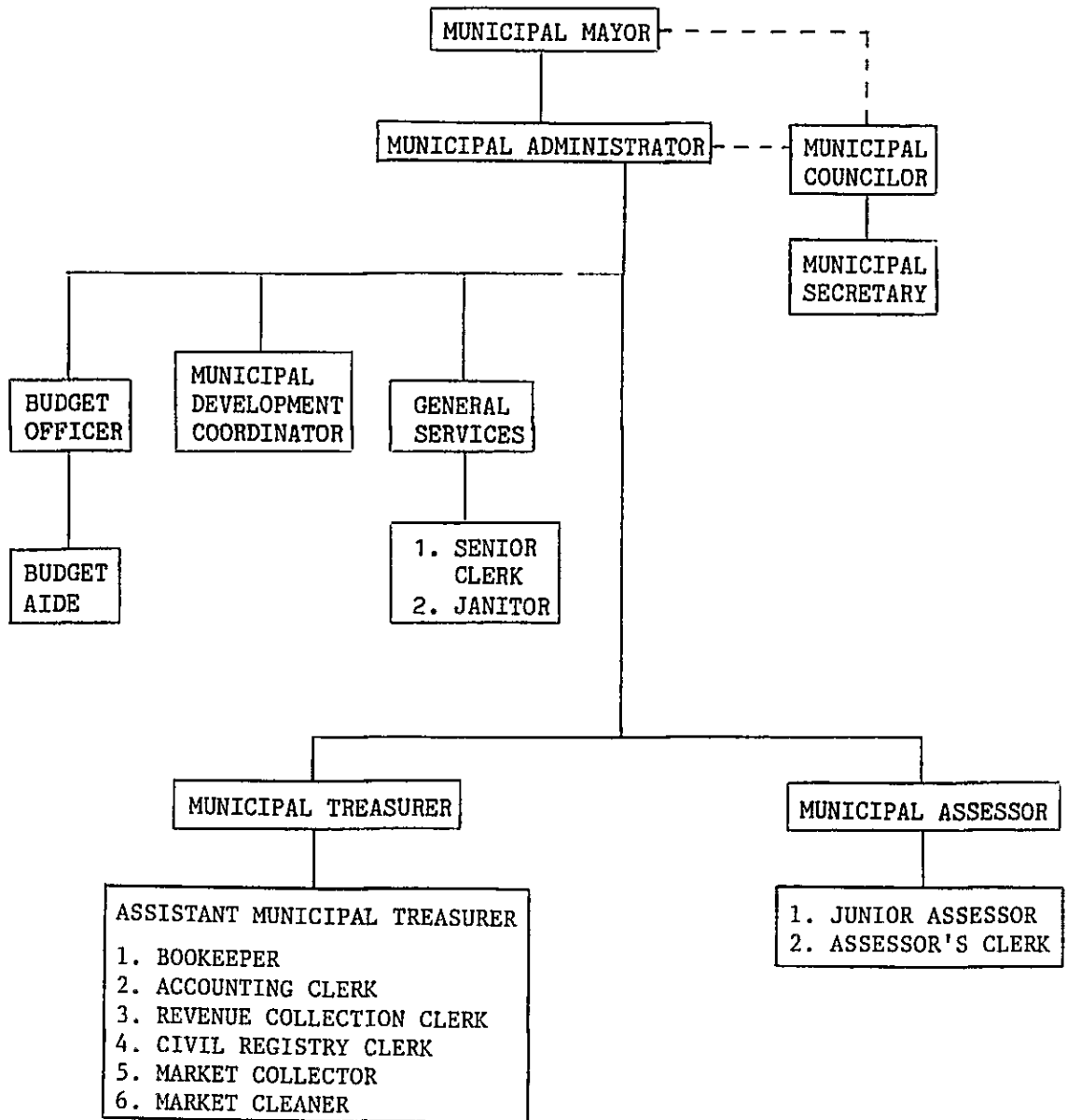


Source: Provincial Socio-Economic and Physical Profile, NV, 1982

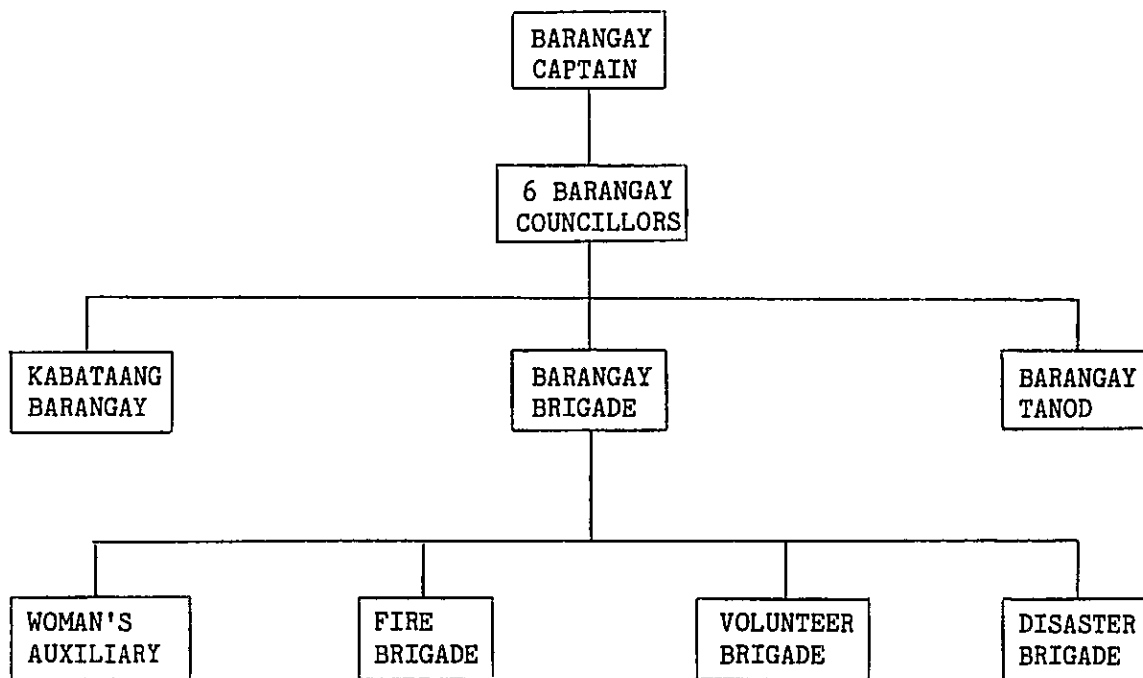
PROVINCE OF NUEVA VISCAYA
ORGANIZATION CHART



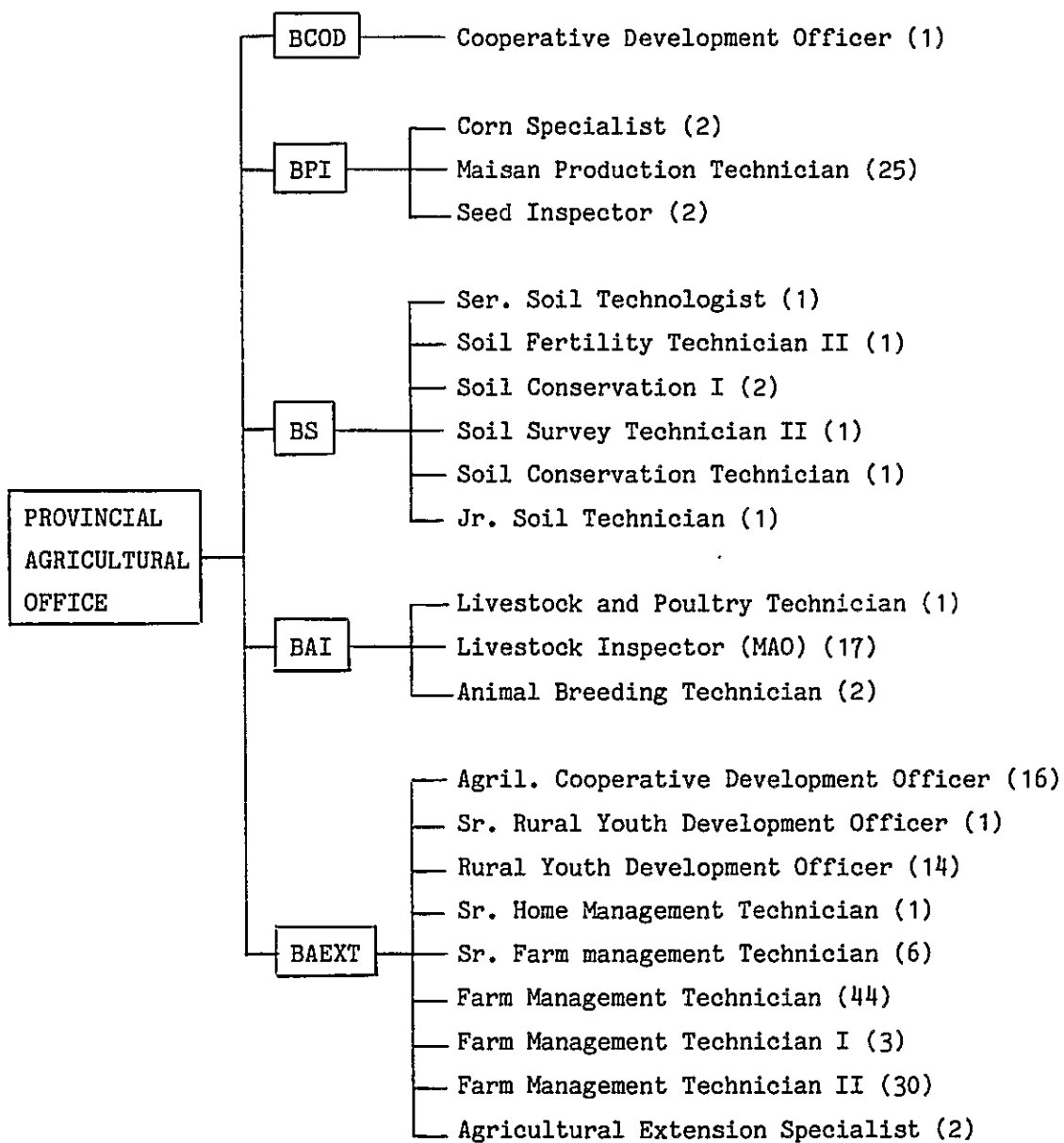
ORGANIZATION CHART OF MUNICIPAL GOVERNMENT



BARANGAY
ORGANIZATIONAL CHART

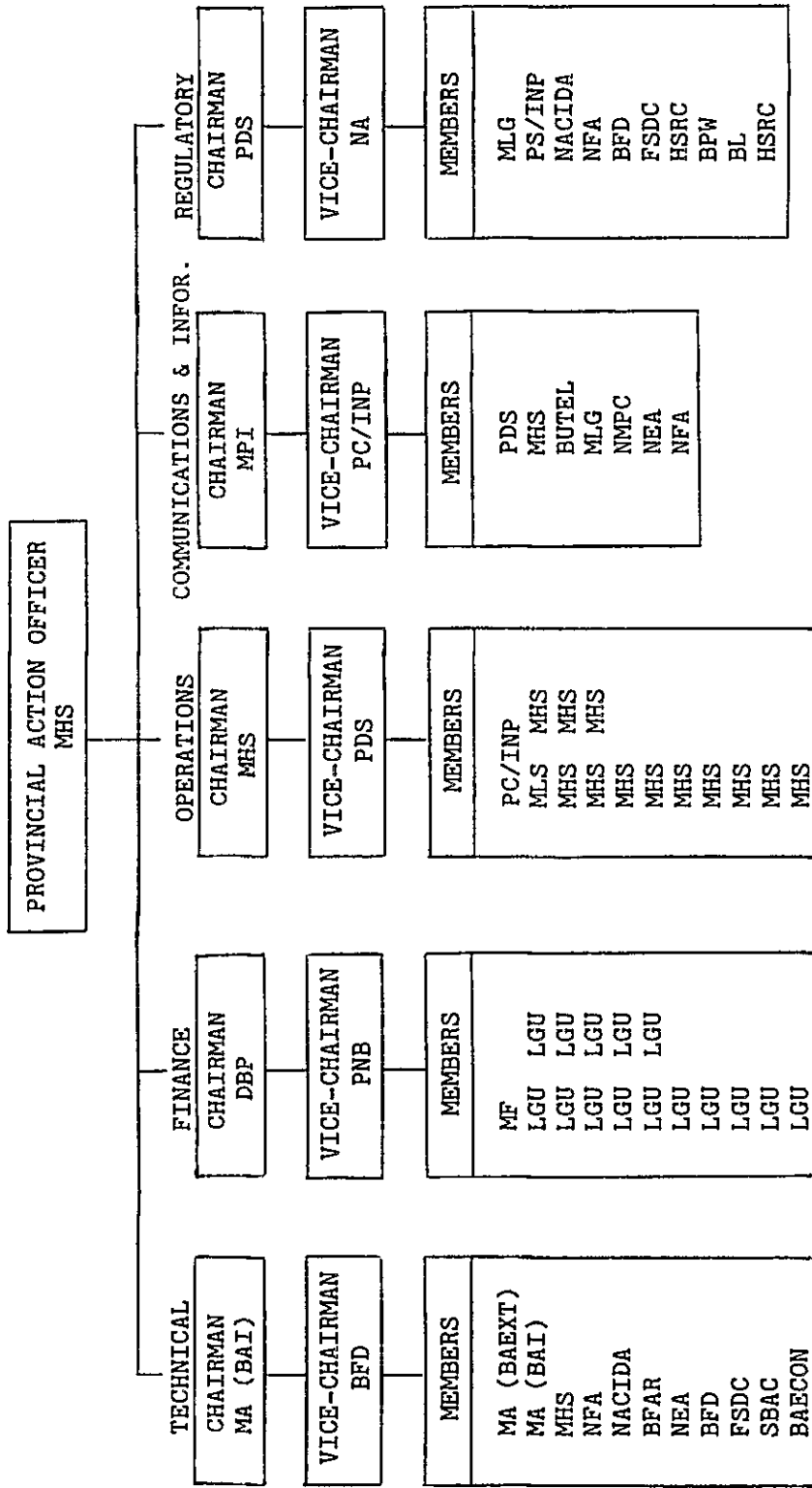


ORGANIZATION CHART OF MINISTRY OF AGRICULTURE, NUEVA VIZCAYA

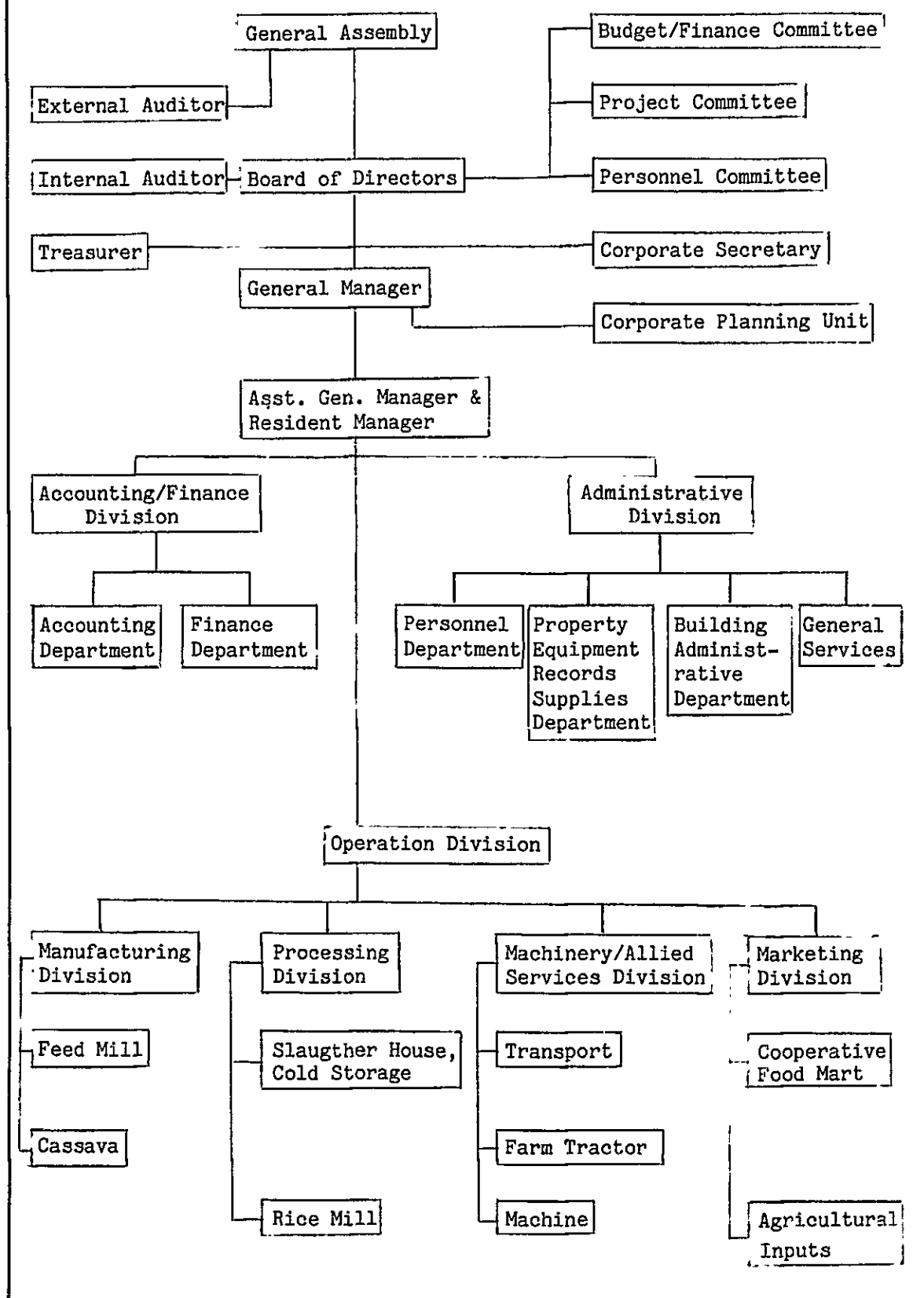


() indicates the number of technicians

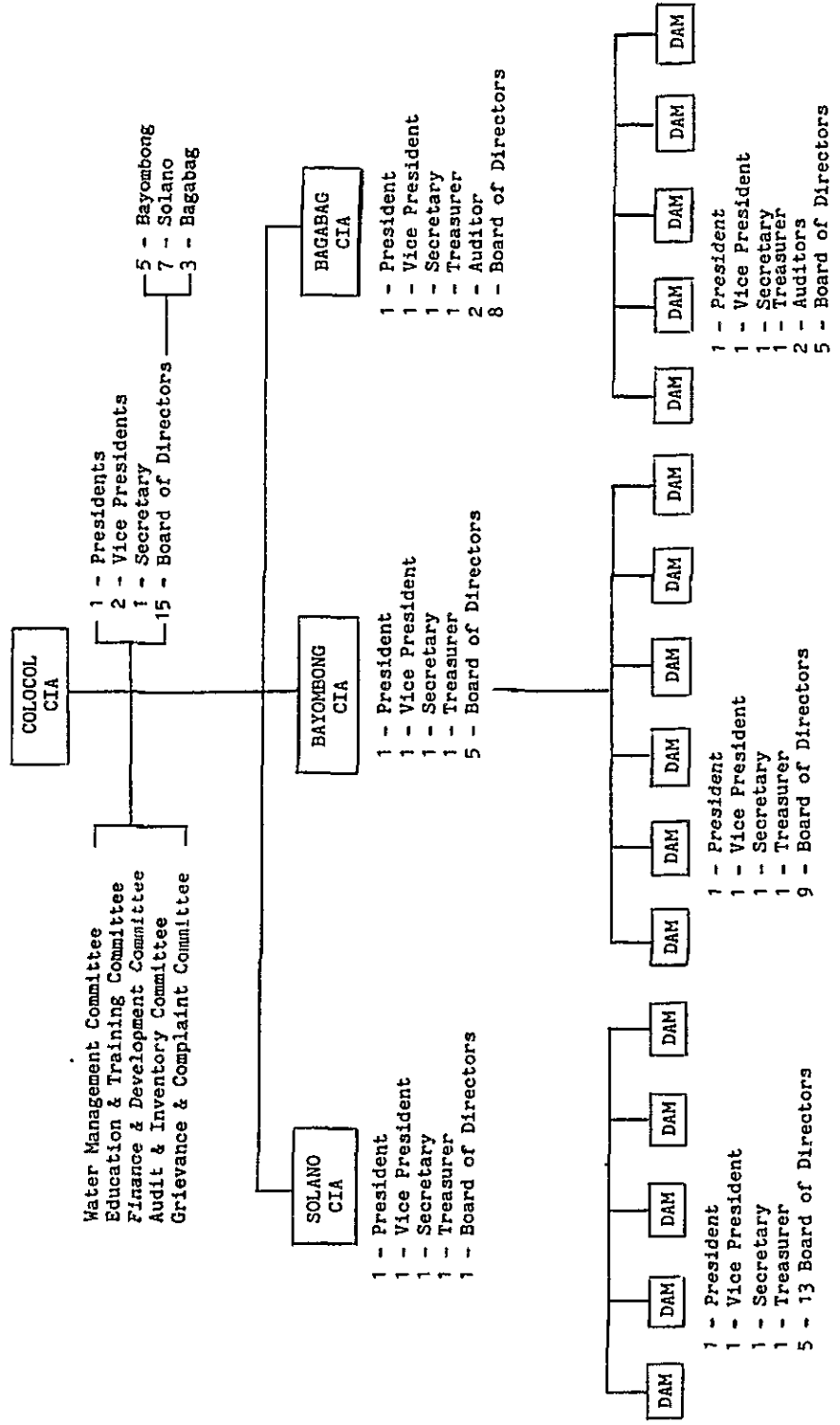
REGION 12 KKK PROVINCIAL SECRETARIAT, NUEVA VIZCAYA



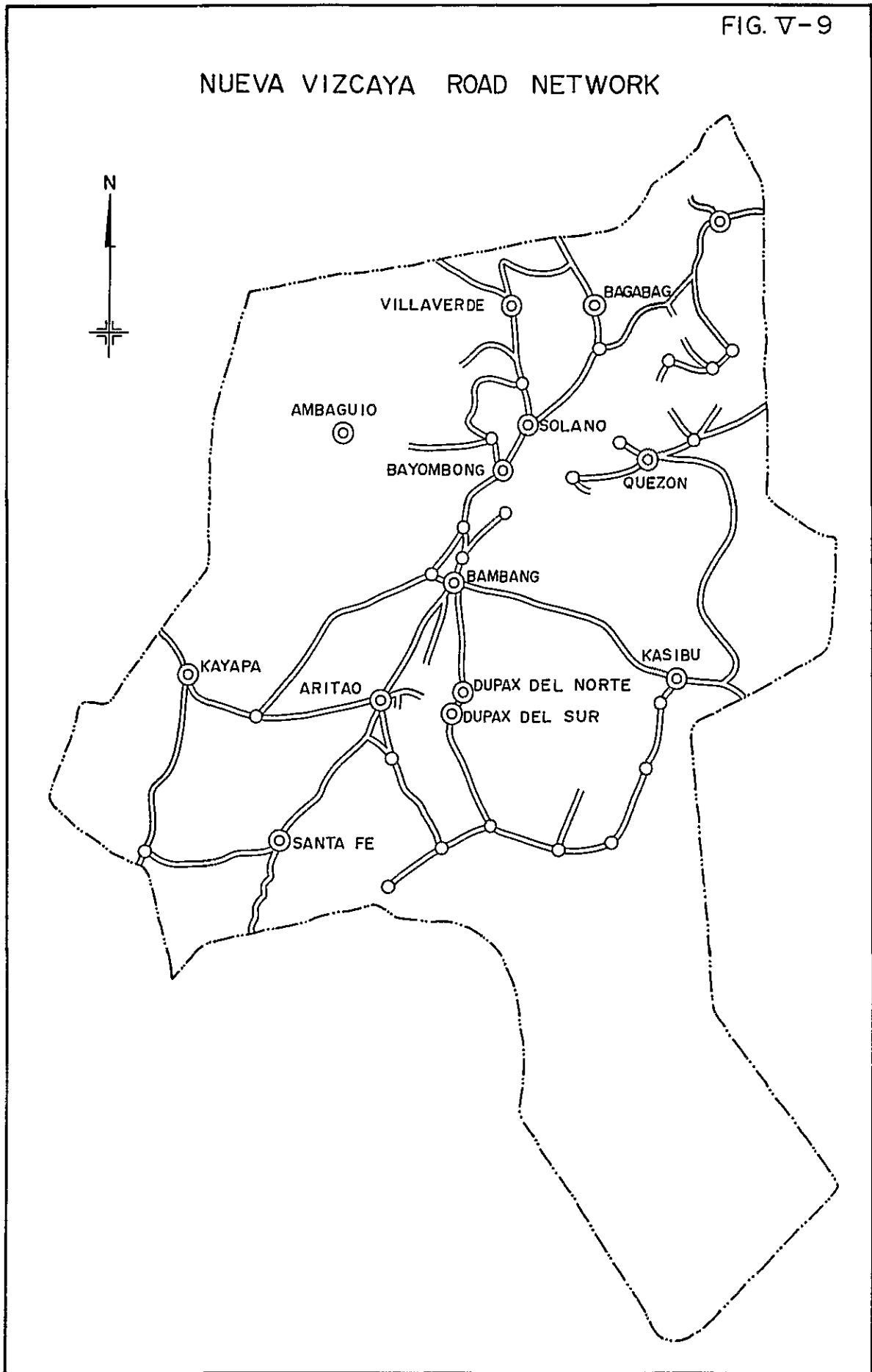
ORGANIZATION SET-UP OF GAVADECO



ORGANIZATIONAL SET-UP OF COLOCOL CIA



NUEVA VIZCAYA ROAD NETWORK



APPENDIX I - VI

WATER RESOURCES DEVELOPMENT

APPENDIX I-VI
WATER RESOURCES DEVELOPMENT

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APPENDIX I-VI
WATER RESOURCES DEVELOPMENT

1. GENERAL

To clarify optimum scale of agricultural development in relation to hydropower development, an optimization study was made for various alternative plans on the basis of a water balance study and project investment scale.

During the first phase survey from January to March, 1982, the irrigation team focused on a dam scheme incorporating irrigation and flood control components. The Team centered major attention on candidate sites B₂ and C on the Matuno River. The power team, on the other hand, primarily conducted field surveys on a dam scheme for power development at candidate sites A and B₁ located on Matuno River.

In the second and third-phase survey beginning in July 1982, both teams carried out additional detailed studies on approaches formulated during the first-phase survey. Also, the irrigation team further explored the feasibility, first identified during the initial survey, of irrigation by a diversion dam on the Magat River site at Bayombong.

The 3 major components of this multi-purpose Project are irrigation, hydropower and flood control. In regard to flood control, as discussed in APPENDIX I-VIII, FLOOD CONTROL, the dam will not incorporate flood control capacity. Therefore, in this section an alternative study is carried out focusing on both irrigation and hydropower components.

Alternative studies of hydropower development were carried out such as a comparative study on the dam site and power generation scheme. The irrigation development plan concerns the comparative study of water source and canal alignment. From the results of the alternative studies the most relevant combination was adopted.

2. ALTERNATIVE PLAN

2.1 Alternative Plan for Hydropower Development

The details of the alternative plan for hydropower development are discussed in the APPENDIX II, HYDROPOWER COMPONENT. A brief outline of the alternative plan is presented hereafter.

Hydropower development of the Matuno River can be divided into two plans, i.e., main stream plan and diversion plan. In the main stream plan, water intake and discharge is along the Matuno River. On the other hand, the diversion plan envisages diverting water from the Matuno River and releasing the same into the Magat River through the power station. The main stream plan and diversion plan have 4 possible alternatives as outlined below and are in accordance with the alternative location of dam sites presented in FIG. IX-I.

The concepts of each plan are as follows:

(1) Main Stream Plan

Plan P1 Construction of a high dam at site A on the Matuno River to generate peak; construction of an additional afterbay dam at site C downstream of site A also to generate power.

Plan P2 Construction of a high dam at site B (herein after site B means B₁ or B₂) on the Matuno River, to generate peak power; construction of an afterbay dam at site C downstream of site B to generate additional power.

(2) Diversion Plan

Plan P3 Construction of a high dam at site B on the Matuno River, leading water through a headrace tunnel to generate power at the station installed at Barangay Busilak; discharge tailrace water into the Magat River 4km upstream of Colocol intake.

Plan P4 Construction of a high dam at site A on the Matuno River, to generate power; construction of a re-regulating dam at site B downstream of site A to generate power as in Plan P3.

Of the two alternatives in the main stream plan, the superior alternative can be selected independently on the basis of the advantages of power generation with no relation to the irrigation plan, thus Plan P1 has been considered most optimal for the main stream plan as discussed in APPENDIX II HYDROPOWER COMPONENT. In the same manner for the diversion plan, plan P3 has been selected as the advantageous plan.

2.2 Alternative Plan for Irrigation Development

The alternative plan for irrigation development can be divided into 2 schemes, namely the Matuno River and the Magat River plans. In the case of the Magat River source, some portion of irrigable area depends on the Matuno River, due to elevation of the major irrigable area.

The alternative plan for irrigation development is as follows:

(1) Matuno River Plan

Plan A1 Water source will be limited to the Matuno River with construction of a diversion dam at Manamtam site on the Matuno River for serving the entire irrigable area.

Plan A2 This plan is adapted to the diversion plan of the hydropower scheme which envisions construction of the powerhouse at Barangay Busilak. Water will be released directly into the irrigation canal from the tailrace. 580ha of land located upstream of the Magat River will receive water supply via a diversion dam constructed at Manamtam located on the Matuno River.

(2) Magat River Plan

Plan A3 Major water source will be the Magat River with construction of diversion dam at Bayombong site on the

Magat River, and the area will be irrigated via two main canals; the Colocol and mountain side canals. 1090ha located upstream will be irrigated by water diverted from the Matuno River diversion dam constructed at the Manamtam site.

2.3 Alternative Plan for Multi-Purpose Development

Among the alternative plans for hydropower and irrigation development, a combination of alternative plans was studied, resultant in the alternative plans for multi-purpose development as mentioned below.

Plan-1: A1-P1

A high dam at site A, and an afterbay dam at site C on the Matuno River will be constructed for power generation. Irrigation water will be diverted by a newly constructed Manamtam diversion dam to serve 12,680 ha of irrigable land. The main canal will start from Manamtam diversion dam, and stretch along the western foot hill with an elevation range from 350-240m terminating at Lamut along the right bank. Construction of about 800m of tunnel, with a flow capacity of $25\text{m}^3/\text{s}$, is required at the upper stream of the main canal and total length of the main canal will be about 40km. At the western section of La Torre, construction of a regulating pond is planned for appropriate water management, and operation and maintenance of facilities. Diversion to the Colocol main canal will be from this mountain side main canal.

Plan-2: A2-P3

The hydropower development plan envisions a high dam constructed at site B on the Matuno River, where water will be diverted through a headrace tunnel to the powerhouse. The proposed powerhouse will be located about 2km downstream from Batu bridge, and the

tailrace water level will be at EL. 300.0m.

Irrigation water will be diverted directly from the tailrace to the main canal which will follow along the foot of the western mountain to the right bank of the Lamut River. About 580ha of irrigable area upstream of the proposed power house will be irrigated by the proposed Manamtam diversion dam on the Matuno River through the newly constructed main canal and rehabilitated Sto. Domingo canal.

Plan-3: A3-P3

This hydropower development plan is generally the same as Plan-2, namely, water will be taken in at site B high dam, diverted by tunnel, used for peak power generation at Busilak, and will be released into the Magat River.

Irrigation water will be mostly diverted from the Magat River. A diversion dam at the San Vicente site where the existing Colocol intake weir is located will be constructed with a water intake level of EL. 273.6m.

The main canal systems will be composed of the existing Colocol main canal and newly constructed mountainside main canal along the western foothill extending to the right bank of the Lamut, with an elevation range from 270-240m. The planned service area of these main canals will be 11,590ha. The remaining 1,090ha of irrigable land located at an elevation of 350-295m will be served by a newly constructed main canal along the western foothill, with irrigation water diverted from the newly proposed Manamtam diversion dam on the Matuno River.

3. WATER BALANCE STUDY

Water balance studies are made in this section with regard to irrigation water. Water balance and optimization studies for hydropower generation are made in APPENDIX II HYDROPOWER COMPONENT.

For all 3 alternative multi-purpose development plans, the source of irrigation water is mainly the Matuno River in Plan-1 and Plan-2, and the Magat River in Plan-3. Accordingly, studies have been carried out for the Matuno River water source in Case-1 and for the Magat River in Case-2.

The comparison of irrigation water requirement and river discharge for a 20-year period from 1957-76 was made, and the result of Case-1 is shown in TABLE VI-1 and that of Case-2 in TABLE VI-2. Based on the comparison, TABLE VI-3 indicates shortages of irrigation water requirement by month and year.

In the wet season, both in Case-1 and Case-2 shortage of irrigation water occurred in 1969 and 1975. In respect to the dry season, a deficit occurred only in 1968 for in Case-1.

4. COMPARATIVE STUDY

Although three alternative plans for multi-purpose development were finally selected as mentioned above, Plan-2 has to be further divided into two cases for the comparative study to determine if the agriculture or hydropower water will preferentially be released. In Plan-2-1 the priority is given to the agricultural component, released water through the power station thereby satisfying the irrigation water requirement, hence peak power generation cannot be fully planned. On the other hand in Plan-2-2, the priority is given to the hydropower component to generate peak power, accordingly possible irrigation area is limited.

4.1 Assumption and Estimate

(1) Benefit

Irrigation service area for each alternative plan was determined by a soil and land use survey and available irrigation water source as shown below. At full development, 12,680ha of irrigable area, whose target net incremental benefit is US\$10.53 million per annum, is assumed.

For the hydropower component, kW and kWh values are calculated at US\$134.34/kW, US\$0.0471/kWh for firm and US\$0.0243/kWh for secondary. The proposed installed capacity and annual average energy are estimated for each alternative Plan is presented below.

unit: US\$ million

	<u>Hydropower</u>		<u>Agriculture</u>		Total
	<u>Installed Capacity (Annual Energy)</u>	<u>Benefit</u>	<u>Irrigated Area</u>	<u>Benefit</u>	
Plan 1	130MW (380GWh)	32.51	12,680ha	10.53	43.04
Plan 2-1	150MW (528GWh)	39.82	12,680ha	10.53	50.35
Plan 2-2	180MW (528GWh)	45.06	10,140ha	8.42	53.48
Plan 3	180MW (528GWh)	45.06	12,680ha	10.53	55.59

(2) Cost

Construction costs for each alternative plan were estimated. Engineering and administrative cost was assumed to be 11.4% of the estimated direct cost, while physical contingencies were also conservatively assumed to be 10% of the construction cost plus engineering and administrative costs.

The economic cost of the Project for each alternative plan is thus estimated as tabulated below.

unit: US\$ million

	Agriculture Component	Hydropower Component	Total
Plan 1	36.4	220	256.4
Plan 2-1	59.5 ^{1/}	211.8	271.3
Plan 2-2	31.3	255	286.3
Plan 3	34.9	255	289.9

^{1/} includes allocated cost of B high dam

4.2 Evaluation

The economic evaluation for each alternative plan is made in terms of net present worth and B/C ratio on the basis of the assumption and estimate provided above. The results of the economic evaluation are summarized below.

unit: US\$ million

	B	C	B-C	B/C
Plan 1	223	164	59	1.36
Plan 2-1	260	172	88	1.51
Plan 2-2	276	183	93	1.51
Plan 3	287	187	100	1.53

4.3 Selection of Definite Plan

As clearly shown in the above table, Plan 3 is justified as the most preferable plan from the view points of B/C both ratio and net present worth. In addition, Plan 3 has another advantage of enabling the Project to introduce staged development, while Plan 2 is only applicable to simultaneous development. Plan 1 is disadvantageous from

not only an economical view point but also from a geological view point, since the proposed afterbay site "C" is porous limestone.

In conclusion, Plan 3, the Magat diversion dam and Matuno B dam, is selected as the most appropriate plan, being a multi-purpose development scheme. In addition, the above study reveals that the provision of Magat Diversion Dam in Plan 3 is more beneficial to the agriculture component than to the hydropower component.

5. STAGE DEVELOPMENT FORMULATION

5.1 Introduction of Stage Development

The Feasibility Study for the Matuno River Development Project commenced on the basic assumption that a multi-purpose dam would be constructed on the Matuno River for irrigation, power generation and flood control. On the basis of individual sector development proposals formulated at the interim report stage, the Teams conducted a comparative study of alternative dam sites, dam heights, etc. towards synthesis of the optimum approach for best achieving all intended functions for the envisaged dam as discussed earlier.

As the above mentioned alternative plans include a plan for utilizing Magat River water, from the beginning, the irrigation team focused not only on the Matuno river, but also on the ample resources of the Magat river as an irrigation source. This was undertaken to identify the approach which would minimize initial investment in light of current Philippine conditions relevant to local and international financing. As a result of the study, the Team concluded that utilization of water resources from the Magat River for stage development, rather than simultaneous development, represents the most realistic approach. The conditions to be imposed on such stage development are (i) Stage I will bring immediate benefits to the Project area, (ii) Stage II will result in substantial enlargement of benefits effected in Stage I, and (iii) Stage II development will not nullify any of the functions of Stage I development. Such stage development would take the form presented on the following page.

Stage I A diversion dam will be constructed on the Magat River at Bayombong, and discharge water diverted for agricultural development. Embankments at points along the Magat River where flood damage is most severe will be constructed.

Stage II A dam will be constructed on the Matuno River for power generation and to secure a stable irrigation source.

Stage development is justified for the following reasons. The irrigation target area is of medium scale, about 13,000ha. Given the urgent need for irrigation and the subsequent priority for prompt availability of water, the said area can satisfactorily, albeit with some imperfection, be serviced by means of a diversion dam constructed on the Magat River. Although the Project area clearly offers good potential for hydropower generation, 4 units (360,000kw) out of a total of 6 (540,000kw) at Magat Dam downstream will be sufficient to satisfy power demand until at least 1990 when a further two units at the Magat Dam will become operational. This indicates that power development under the Project would be most effective if implemented subsequent to such time as full operation of Magat Power Station is realized.

5.2 Stage I Development Plan

(1) Main Features of Stage I

The concept of stage development was thus formulated, and components for the final development plan were divided into two stages. In Stage I development, irrigation and flood control components are introduced.

The main features of Stage I development are to construct a diversion dam on the Magat River at Bayombong to irrigate 11,590ha of land through two main canals; the newly constructed mountainside canal and the existing Colocol canal. Approximately 2,745ha in the lower part of the area along the Lanog River will be served by the newly proposed Lanog diversion dam which collects

the return flow from the upper area, in addition to new water sources provided under the Project. The remaining 1,090ha of land around Barangay Sto. Domingo is irrigated by the newly proposed Manamtam diversion dam planned on the Matuno River downstream.

In conjunction with agricultural development, a flood protection plan was also introduced into Stage I to support effective agricultural development. The envisaged plan is to construct embankments at critical points along the Magat river. Details are discussed in APPENDIX I-VIII, FLOOD CONTROL.

(2) Evaluation

An evaluation was made to clarify whether the proposed plan satisfies the imposed condition of 5.1 "Stage I will bring immediate benefits to the Project area".

As discussed in VI-3. WATER BALANCE STUDY, the proposed irrigation plan in Stage I, mainly served by the proposed Magat diversion dam, will have a water shortage. A study was made to evaluate how this water shortage depresses the anticipated benefit at full development stage.

Shortage of irrigation water during the crop growing stage causes reduction in yield. For Stage I of the proposed multi-purpose development plan, irrigation water shortage is estimated at 33.8% for the last 20 years or an average of 1.7%/yr. Accordingly, based on the J. Doorenbos's study regarding the relationship between water shortage and yield reduction, a reduction in the anticipated annual net incremental benefit was estimated at US\$0.15 million.

(3) Effect on Magat River Multi-purpose Project

After development under Stage I, the introduced cropping system will increase evapotranspiration and subsequently reduce annual flow of the Magat River in the downstream area. Since the reduced river flow would adversely effect the existing Magat River Multi-purpose Project (MRMP), the Team quantitatively assessed this effect.

On the basis of the present and the proposed cropping pattern presented in FIG. IV-2 and 3 respectively, and the proposed evaporation in the Project area presented in TABLE I-4, the monthly evapotranspiration under the present and proposed condition are estimated below.

Unit: MCM

	JAN	FEB	MAR	APR	MAY	JUN	
Proposed	10.05	7.04	5.92	7.72	6.88	11.01	
Present	9.40	9.54	9.96	7.33	6.14	6.04	
Difference	0.65	-2.50	-4.04	0.39	0.74	4.97	

	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Proposed	17.96	18.74	11.87	8.13	10.00	10.80	126.12
Present	3.80	2.23	4.33	6.50	7.38	8.55	81.20
Difference	14.16	16.51	7.54	1.63	2.62	2.25	44.92

Note: Minus value shows decreased evapotranspiration under proposed condition.

As shown in the above, annual increased evapotranspiration under the Project amounts to 44.9 MCM. Quantitative assessment on the effect to MRMP has been carried out based on the above monthly evapotranspiration difference and Project Design Report, MRMP, Stage II. According to the reservoir operation study (over 15 years from 1958-72) presented in the Design Report, MRMP II, water shortage at Maris Diversion Dam and at Baligatan, and spillway release can be as summarized on the following page.

Unit: MCM

Year	Month	Shortage		Spillway Release
		at Maris	at Baligatan	
1958	May	149.5	68.0	-
1963	May	125.6	76.6	-
1964	Oct - Nov	-	-	589.1
1967	Sep - Nov	-	-	1,034.1
1968	Sep	-	-	25.0
1969	Apr - May	441.1	136.5	-
1970	Oct - Nov	-	-	2,132.7
1971	Sep - Dec	-	-	1,993.6
1972	Jul - Aug	-	-	450.3

Note: Simulation period Jan. 1958 - Dec. 1972

The Team carefully studied reservoir operation and the results revealed that the increased evapotranspiration would not increase the shortage in irrigation water at Maris and Baligatan, and would only decrease secondary energy. Thereby the adverse effect on MRMP can be evaluated only from generated power reduction.

Based on the operation study, annual average parameters for power generation over 15 years (1958-76) are summarized below.

- power plant net efficiency: 0.87
- average net head : 81.6m
- average days in year : 365.27 days

Although annual evapotranspiration increase has been estimated at 44.9 MCM, certain detail correction is necessary. Namely, for the month in operation study, if there is a spillway release greater than the monthly amount of spillway release the evapotranspiration of the same month increases, but with no adverse effect. Annual average evapotranspiration which does not adversely effect MRMP is estimated based on the tables presented above at 4.8 MCM. Then, the effective evapotranspiration increase is evaluated approximately at 40 MCM (44.9-4.8). The annual

average power reduction has been thus calculated at 0.88MW and accordingly annual average energy reduction is 7.7 GWh.

Estimated annual average energy reduction is considered secondary energy, the reduction in power benefit of MRMP is estimated at US\$ 0.15 million by multiplying 7.7GWh by 19.1 mills/kWh. The value US\$0.15 million is 1.4% of anticipated net incremental benefit of US\$ 10.53 million of the Project.

5.3 Stage II Development Plan

In Stage II development, construction of a dam on the Matuno River is envisaged for power generation and to ensure a constant, adequate irrigation source. A comparison of the power component of the Project with other typical hydropower projects on Luzon Island indicates the following advantages:

- i) close proximity of the proposed dam site to a national highway facilitates transport of construction materials;
- ii) compensation for inundated land is minimal; and,
- iii) the site is also near the solano substation.

The necessity for Stage II development subsequent to Stage I development are outlined as below.

(1) Effect on water rights and Magat Dam

There are 47 cases of registered water rights for a total of 15.85m³/s of discharge within the Project area. Registration of these rights commenced following the start of Magat Dam construction, and further registration is in progress. The cropping system to be introduced under the Project will increase evapotranspiration to an annual 44.9MCM, resulting in an annual US\$ 0.15 million reduction in the anticipated benefit of MRMP as assessed above. However, the reservoir effect of the proposed dam on the Matuno River would allow for a 1% increase in available discharge at Magat Dam, thus offsetting the above reduction.

(2) River maintenance flow

At present in the Philippines, fixed stipulations concerning maintenance flow do not exist. Nevertheless, NIA bases its

diversion dam design guidelines on a minimum flow with 90% of a 5-year return period discharge, and this has accordingly been considered as appropriate for river maintenance flow. However, in the case of the Project, the Magat Dam reservoir is situated immediately downstream of the Project area and flow regulation at this dam will ensure adequate discharge for areas below Magat Dam. Accordingly, setting of a maintenance flow for areas below Magat Dam is not considered necessary. Nevertheless, the Project has as its aim the ensurance of adequate discharge for currently irrigated areas both within the Project area and extending downstream to the Magat River reservoir. Also, discharge for laundry ($1.3\text{m}^3/\text{s}$) and increased seepage ($0.1\text{m}^3/\text{s}$) from damming-up should be included in considerations for maintenance flow requirement. Construction of the Matuno Dam will eliminate the problem of ensuring an adequate river maintenance flow.

(3) Sedimentation

Construction of a dam under the Project would suppress the rise in riverbed along the Magat River, thus reducing flooding.

TABLE VI-1

AVAILABILITY OF WATER RESOURCES (MATUNO)

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Shortage Remarks
	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	R.D	V.R	
1957	37.66	10.08	28.71	6.68	22.02	5.70	21.99	2.86	20.36	6.69	21.66	11.62	27.16	7.38	33.12	12.58	51.20	3.99	36.92	9.76	41.86	9.78	20.66	13.67	
1958	24.75	10.13	22.96	7.74	22.39	7.22	23.02	4.11	24.22	2.23	30.88	12.31	31.89	10.87	118.47	5.66	69.51	4.26	128.77	10.10	62.69	7.41	37.40	14.17	
1959	30.62	10.16	24.14	7.65	27.29	4.03	17.72	4.90	24.46	2.18	18.95	10.58	19.57	3.63	25.84	11.04	40.43	4.93	39.52	12.57	68.07	5.74	74.87	9.26	
1960	46.32	10.22	54.61	3.17	40.28	6.44	32.91	1.20	30.16	3.32	34.39	1.03	45.13	6.31	107.57	5.76	61.17	5.09	61.91	9.45	36.41	11.68	22.72	8.87	
1961	15.28	10.22	12.93	6.68	17.93	2.92	15.35	2.87	19.76	3.68	25.76	5.96	31.46	2.33	32.40	13.59	38.89	9.48	66.71	7.46	23.16	6.23	17.37	3.93	
1962	35.22	10.20	14.36	8.68	19.47	4.51	27.93	2.62	22.92	5.41	22.05	10.25	24.40	4.80	51.87	9.78	56.32	5.96	37.39	14.00	70.09	6.02	31.01	13.48	
1963	23.78	10.17	34.55	7.02	26.86	6.07	20.36	7.26	23.76	4.45	66.12	5.98	52.74	2.45	82.65	10.51	92.97	5.26	50.79	12.43	32.70	10.69	60.68	6.61	
1964	15.64	10.29	18.39	6.49	23.35	7.54	20.67	5.87	31.06	3.00	45.81	5.02	59.44	7.53	83.27	7.66	71.70	4.64	93.13	11.28	102.36	0.72	79.40	3.11	
1965	72.76	10.04	42.07	7.81	22.72	5.86	20.36	3.06	23.74	2.54	34.00	14.66	50.64	7.12	29.29	14.53	75.29	6.08	48.78	11.85	35.09	4.42	23.43	12.08	
1966	29.34	10.15	23.80	6.68	20.67	6.46	14.28	3.13	66.33	3.31	27.97	12.47	30.57	8.11	32.58	5.98	21.50	10.44	17.76	8.39	104.25	2.39	19.62	11.27	
1967	27.43	9.67	16.53	7.04	10.23	7.76	28.73	2.58	38.96	2.10	91.72	2.14	74.99	1.33	60.90	9.21	74.86	3.04	72.99	10.50	87.32	0.0	20.23	1.56	
1968	62.59	9.96	13.03	6.68	18.98	8.59	14.21	0.48	17.89	0.25	48.53	14.68	107.48	8.68	75.95	4.36	75.58	5.92	31.26	10.17	15.84	10.61	11.34	13.78	
1969	9.00	10.33	8.49	8.58	8.06	7.62	8.79	5.59	8.82	2.53	10.52	17.04	43.13	0.13	54.93	16.38	67.21	9.33	63.67	7.00	27.76	6.53	27.29	11.52	38.274
1970	12.99	9.96	9.26	7.80	8.44	4.58	8.91	3.91	8.51	3.66	42.68	7.71	30.81	6.40	60.02	9.85	33.00	8.10	106.60	4.66	78.10	1.82	42.52	2.59	
1971	26.41	9.83	27.84	6.31	32.60	6.88	20.95	6.84	33.71	2.82	33.60	11.85	47.73	2.95	60.93	16.00	50.20	6.45	132.43	11.67	78.67	4.00	62.10	6.22	
1972	43.51	9.67	22.04	5.41	16.93	7.59	14.23	8.72	20.42	5.43	26.91	14.42	113.97	0.13	85.72	16.41	108.60	7.18	34.09	14.28	32.60	5.31	22.95	14.41	
1973	14.37	10.33	13.27	6.68	11.37	8.59	9.46	6.31	14.95	6.75	20.97	12.63	26.81	14.26	31.37	10.96	53.85	11.63	159.25	7.41	83.42	6.04	52.76	15.00	
1974	30.44	10.24	20.88	6.38	12.26	8.38	12.73	5.29	20.56	2.82	49.36	13.17	69.71	8.73	78.34	15.29	29.02	13.41	48.81	6.16	52.16	3.37	32.05	8.85	
1975	43.30	10.33	22.89	6.44	16.93	6.05	18.04	3.49	11.65	3.53	12.04	16.67	14.26	13.83	43.46	10.25	66.83	10.12	23.83	9.35	25.46	5.54	31.79	5.53	27.775
1976	35.63	9.61	13.81	6.68	15.66	5.59	17.81	4.88	59.12	7.40	70.87	6.42	60.03	7.18	50.60	10.83	34.94	7.77	35.51	6.79	25.41	8.89	14.68	13.48	

R.D.: Matuno River Discharge (m³/sec.)
W.R.: Irrigation Water Requirement (m³/sec.)

TABLE VI-2

AVAILABILITY OF WATER RESOURCES (MAGAT)

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Shortage Remark
	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	R.D	W.R	
1957	55.95	10.90	31.19	9.57	31.05	6.74	31.25	4.09	28.35	7.76	30.30	12.62	39.27	8.51	48.33	13.30	78.38	6.12	57.97	10.62	62.83	9.69	41.67	14.51	
1958	35.05	10.99	32.50	8.69	31.59	8.15	34.03	5.26	35.00	3.52	45.15	13.26	46.66	11.75	187.21	6.94	108.15	5.43	203.43	10.94	96.71	8.40	55.44	14.99	
1959	44.55	11.02	34.36	8.60	39.75	5.17	24.20	6.00	35.39	3.46	25.84	11.54	27.54	4.87	35.62	12.60	60.96	5.97	58.70	13.29	105.59	6.82	116.62	10.34	
1960	73.22	11.08	44.70	4.39	60.91	9.30	50.70	2.54	46.53	4.74	65.55	2.37	84.45	7.40	223.63	6.95	143.33	6.22	140.58	10.32	55.98	12.47	33.23	14.69	
1961	22.22	11.18	17.06	9.57	27.38	4.14	20.28	4.10	29.50	4.90	42.74	7.04	74.76	3.61	74.20	14.26	87.85	10.43	133.62	8.44	50.96	7.28	28.57	5.22	
1962	22.32	11.06	18.49	9.57	30.65	5.62	40.32	3.87	41.89	6.56	42.88	11.22	154.77	5.95	193.49	10.65	174.59	7.08	58.87	14.69	118.37	9.75	47.10	14.35	
1963	35.16	11.03	41.29	8.01	38.88	7.09	28.33	8.20	33.96	5.63	115.03	7.10	99.15	3.73	150.32	11.34	172.22	6.38	90.13	13.21	59.36	11.54	96.04	7.78	
1964	32.10	11.15	26.99	9.39	33.11	8.45	28.91	6.90	47.48	4.24	69.89	6.27	95.65	6.68	133.56	8.65	120.37	5.79	148.88	12.05	200.19	2.08	149.07	4.44	
1965	115.37	10.90	75.32	8.75	33.48	6.88	29.64	4.28	35.64	3.81	53.68	15.49	82.61	8.15	44.41	15.15	100.24	7.15	79.32	12.61	61.23	5.57	52.27	12.99	
1966	42.57	11.01	32.71	9.57	28.80	7.45	18.74	4.34	18.27	4.53	65.96	13.39	72.08	9.12	77.27	7.86	50.42	11.31	28.33	9.36	180.36	3.66	117.80	12.24	
1967	64.61	10.55	38.88	8.03	23.76	8.66	68.36	3.83	92.91	3.39	186.20	3.42	121.70	2.68	120.89	10.11	155.30	4.25	122.22	11.31	150.16	1.40	45.61	1.40	
1968	94.69	10.42	27.65	9.57	28.25	9.44	26.14	1.87	25.79	1.64	73.52	15.52	169.25	9.62	149.54	5.32	175.25	7.01	73.74	11.05	35.80	11.47	23.12	14.62	
1969	17.69	11.19	9.02	9.46	8.48	8.53	9.98	6.84	14.59	3.81	15.90	17.74	65.84	1.53	83.23	16.90	103.95	10.27	104.56	8.03	40.07	9.48	39.55	12.46	10.345
1970	29.98	10.82	11.24	8.74	9.20	5.69	10.00	4.07	9.45	4.89	90.59	8.91	64.13	7.50	117.99	10.72	86.10	9.06	164.09	5.60	122.27	3.12	64.85	3.99	
1971	37.95	10.69	40.71	7.35	49.17	7.84	33.76	7.81	67.16	4.07	67.00	12.79	82.21	4.20	93.94	16.94	76.52	7.50	209.49	12.42	122.95	5.17	96.12	7.41	
1972	65.40	10.53	33.29	9.32	30.26	8.51	22.15	2.09	32.17	6.56	44.76	15.23	213.67	1.53	180.02	16.93	178.49	8.20	49.82	14.96	55.09	6.41	32.53	15.22	
1973	19.56	11.19	19.32	9.57	16.97	9.44	10.75	7.31	19.50	7.76	29.33	13.50	34.15	14.98	45.66	11.37	82.05	12.44	262.99	8.40	130.43	7.10	80.23	15.78	
1974	44.32	11.10	29.22	9.29	17.05	9.24	17.14	6.36	29.08	4.09	91.04	14.07	115.52	9.71	121.31	15.83	53.37	14.15	78.31	7.22	80.08	4.77	81.08	9.93	
1975	65.06	11.19	32.28	9.34	22.67	8.94	24.82	4.68	14.69	4.75	14.23	17.40	17.65	14.57	65.35	11.10	135.60	11.01	32.31	10.25	36.62	6.63	47.14	6.75	18.215
1976	52.65	10.47	17.57	9.57	20.76	7.01	24.23	7.45	90.99	9.42	109.77	7.47	92.50	8.24	76.81	11.65	91.80	8.77	52.60	9.72	36.25	9.82	19.06	14.35	28.555

R.D.: Magat River Discharge (m³/sec.)

W.R.: Irrigation Water Requirement (m³/sec.)

IRRIGATION WATER SHORTAGE

<u>Year</u>	<u>Month</u>	<u>R.D.</u> (m ³ /s)	<u>W.R.</u> (m ³ /s)	<u>Shortage</u> (m ³ /s)	<u>Shortage rate</u> (%)
(Case I)					
1968	DEC	11.34	13.78	2.44	<u>17.7</u>
1969	JAN	9.00	10.33	1.33	12.9
1969	FEB	8.49	8.58	0.09	1.1
1969	JUN	10.52	17.04	6.52	<u>38.3</u>
1975	JUN	12.04	16.67	4.63	<u>27.8</u>
(Case III)					
1969	FEB	9.02	9.48	0.46	<u>5.3</u>
1969	MAR	8.48	8.53	0.06	2.3
1969	JUN	15.90	17.74	1.84	<u>10.3</u>
1975	JUN	14.23	17.40	3.17	<u>18.2</u>

Note: Underlined is representative shortage in related crop season

R.D.: River Discharge

W.R.: Water Requirement