FARM INPUTS: LABOR, DRAFT ANIMAL AND MACHINERY REQUIREMENT (PRESENT)

Direct Seeded Paddy

Item	Irrigated Paddy						Rainfed Paddy					
	1st Crop			2nd Crop			1st Crop			2nd Crop		
	F 1/	H 2/	T 3/	F	H	T	F	H	T	F	H	T
1. Laborers (M.D/ha)	11.8	47.67	59.47	8.4	38.2	46.6	8.9	43.4	52.3	6.0	32.12	38.11
2. Draft Animals (Days/ha)	1.9	5.0	6.9	0.65	4.75	5.4	2.9	7.7	10/6	1.95	6.35	8.3
3. Machinery (Day/ha)	-	2,30	2.30	-	2.37	2.37	-	2.11	2.11	-	2.31	2.31
4. Farm Inputs												
(1) Seeds (kg)			180			180			175			175
(2) Fertilizer (kg)												
Urea			50.7			45.8			57.3			46.4
16-20-0			14.4			13.0			30.0			.25.5
21-0-0			9.5			8.6			2.3			2.1
14-14-14			72.6			65.5			43.2			40.8
(Average N-P-K in kg)			37-13-10			36-13-10			37-13-6			33-11-6
(3) Agro-chemicals												
Pesticide												
Liquid (ℓ)			1.3			1.17			0.81			0.7
Granule (kg)												
Herbicide												
Liquid (ℓ)			0.67			0.6			0.46			0.4
Granule (kg)			0.92			0.83			1.9			1.38

1/: Family Labor Force

2/: Hired Labor Force

3/: Total Labor Force

FARM INPUTS: LABOR, DRAFT ANIMAL AND MACHINERY REQUIREMENT (PRESENT)

Transplanted

Item	Irrigated Paddy						Rainfed Paddy					
	1st Crop			2nd Crop			1st Crop			2nd Crop		
	F	H	T	F	H	T	F	H	T	F	H	T
1. Laborers (M.D/ha)	10.9	55.2	66.1	8.1	44.4	52.5	7.8	61.4	0.2	6.1	47.3	53.4
2. Draft Animals (Days/ha)	1.6	4.1	5.7	1.35	3.85	5.2	2.55	8.75	11.3	2.3	7	9.3
3. Machinery (Day/ha)	-	3.08	3.08	-	3.08	3.08	-	2.17	2.17	-	2.17	2.17
4. Farm Inputs												
(1) Seeds (kg)			80			80			95			95
(2) Fertilizer (kg)												
Urea			45.8			43.5			36.1			30.6
16-20-0			5.3			8.9			14.4			12.2
21-0-0			-			-			-			-
14-14-14			85.2			91.5			79.6			64.5
(Average N-P-K in kg)			33-13-12			33-14-13			30-14-11			25-12-9
(3) Agro-chemicals												
Pesticide												
Liquid (ℓ)			0.54			0.6			1.59			1.31
Granule (kg)			8.9			9.86						
Herbicide												
Liquid (ℓ)			0.54			0.6			0.43			0.37
Granule (kg)			1.12			1.25			10.11			8.57

TABLE V-7
(2 of 3)

TABLE V-7
(3 of 3)

FARM INPUTS: LABOR, DRAFT ANIMAL AND MACHINERY REQUIREMENT (PRESENT)

Item	Sugarcane		Coconut
	Plant Cane	Ratoon Cane	
	T	T	T
1. Laborers (M.D/ha)	109.59	66.6	42
2. Draft Animals (Days/ha)	-	-	-
3. Machinery (Day/ha)	5.59	4.0	1
4. Farm Inputs			
(1) Seeds (kg)	51,700	1,800	-
(2) Fertilizer (kg)			
Urea (bag)	6.62	6.37	-
16-20-0	5.25	5.00	-
14-14-14	0.89	0.83	-
18-46-0	0.72	0.78	-
0-0-60	1.43	1.41	-
(Average N-P-K in kg)	204-79-49	196-73-48	-
(3) Agro-chemicals			
Pesticide	-	-	-
Herbicide			
Liquid (ℓ)	1.87	-	-
Granule (kg)	0.93	-	-

Source: Farm Survey by the Study Team

LABOR, DRAFT ANIMAL AND MACHINERY REQUIREMENT (PRESENT)
Direct Seeded Paddy

Item	Irrigated Paddy						Rainfed Paddy					
	1st Crop			2nd Crop			1st Crop			2nd Crop		
	F 1/	H 2/	T 3/	F	H	T	F	H	T	F	H	T
1. Labor Force (M.D/ha)	13.7	54.97	68.67	9.05	45.32	54.37	11.8	53.21	65.01	7.95	40.77	48.72
Land Preparation	1.9	5.77	7.67	0.65	5.52	6.17	2.9	8.21	11.11	1.95	7.07	9.02
Dike Repair	2	2	4	1.2	1.2	2.4	2.0	2.0	4.0	1.2	1.2	2.4
Seeding	1	1	2	0.8	0.8	1.6	1.0	1.0	2.0	0.8	0.8	1.6
Weeding	2	18	20.0	1.5	13.7	15.2	1.7	15.3	17.0	1.2	10.8	12.0
Fertilization	-	1	1.0	-	0.8	0.8	-	2.0	2.0	-	0.8	0.8
Spraying	1	1	2.0	0.8	0.8	1.6	1.0	1.0	2.0	0.8	0.8	1.6
Harvesting	-	16.5	16.5	-	14.9	14.9	-	15.5	15.5	-	13.2	13.2
Threshing	-	3.5	3.5	-	3.1	3.1	-	3.0	3.0	-	2.5	2.5
Winnowing	-	2.4	2.4	-	2.0	2.0	-	2.0	2.0	-	1.6	1.6
Drying	1.2	1.2	2.4	1.0	1.0	2.0	1.0	1.0	2.0	0.8	0.8	1.6
Hauling/Storage	2.6	2.6	5.2	1.5	1.5	3.0	2.2	2.2	4.4	1.2	1.2	2.4
Water Management	2	-	2.0	1.6	-	1.6	-	-	-	-	-	-
2. Draft Animals (Days/ha)	1.9	5.0	6.9	0.65	4.75	5.4	2.9	7.7	10.6	1.95	6.35	8.3
Plowing	0.6	3.1	3.7	0.6	3.1	3.7	0.9	4.7	5.6	0.9	4.7	5.6
Harrowing	0.3	0.9	1.2	0.3	0.9	1.2	0.5	1.5	2.0	0.3	0.9	1.2
Leveling	1.0	1.0	2.0	0.75	0.75	1.5	1.5	1.5	3.0	0.75	0.75	1.5
3. Machinery (Days/ha)	-	2.30	2.30	-	2.37	2.37	-	2.11	2.11	-	2.31	2.31
Plowing	-	0.08	0.08	-	0.08	0.08	-	0.01	0.01	-	0.01	0.01
Harrowing	-	0.69	0.69	-	0.69	0.69	-	0.5	0.5	-	0.71	0.71
Threshing	-	1.0	1.00	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0
Winnowing	-	0.53	0.53	-	0.6	0.6	-	0.6	0.6	-	0.59	0.59

1/: Family Labor Force
2/: Hired Labor Force
3/: Total Labor Force

TABLE V-8 (1 of 3)

LABOR, DRAFT ANIMAL AND MACHINERY REQUIREMENT (PRESENT)

Transplanted Paddy

Item	Irrigated Paddy						Rainfed Paddy					
	1st Crop			2nd Crop			1st Crop			2nd Crop		
	F	H	T	F	H	T	F	H	T	F	H	T
1. Labor Force (M.D/ha)	12.5	62.38	74.88	9.45	51.33	60.78	10.35	72.32	82.67	8.4	56.47	64.87
Nursery	1.8	3.5	5.3	1.3	2.7	4.0	1.3	2.7	4.0	0.9	1.9	2.8
Land Preparation	1.6	5.18	6.78	1.35	4.93	6.28	2.55	8.92	11.47	2.3	7.17	9.47
Dike Repair	1.5	1.5	3.0	0.8	0.8	1.6	1.0	1.0	2.0	1.2	1.2	2.4
Seeding/Transplanting	-	15.0	15.0	-	13.6	13.6	-	18.0	18.0	-	14.4	14.4
Weeding	1.4	12.6	14.0	1.1	10.1	11.2	1.7	15.3	17.0	1.2	10.8	12.0
Fertilization	-	1.0	1.0	-	0.8	0.8	-	1.0	1.0	-	0.8	0.8
Spraying	0.5	0.5	1.0	0.8	0.8	1.6	1.0	1.0	2.0	0.8	0.8	1.6
Harvesting	-	13.4	13.4	-	10.0	10.0	-	16.5	16.5	-	13.3	13.3
Threshing	-	3.5	3.5	-	3.1	3.1	-	3.0	3.0	-	2.5	2.5
Winnowing	-	2.4	2.4	-	2.0	2.0	-	2.0	2.0	-	1.6	1.6
Drying	1.2	1.2	2.4	1.0	1.0	2.0	1.0	1.0	2.0	0.8	0.8	1.6
Hauling/Storage	2.5	2.6	5.1	1.5	1.5	3.0	1.8	1.9	3.7	1.2	1.2	2.4
Water Management	2.0	-	2.0	1.6	-	1.6	-	-	-	-	-	-
2. Draft Animals (Days/ha)	1.6	4.1	5.7	1.35	3.85	5.2	2.55	8.75	11.3	2.3	7	9.3
Plowing	0.6	3.1	3.7	0.6	3.1	3.7	1.0	5.0	6.0	0.75	3,75	4.5
Harrowing	-	-	-	-	-	-	0.55	2.75	3.3	0.8	2.5	3.3
Leveling	1.0	1.0	2.0	0.75	0.75	1.5	1.0	1.0	2.0	0.75	0.75	1.5
3. Machinery (Days/ha)	-	3.08	3.08	-	3.08	3.08	-	2.17	2.17	-	2.17	2.17
Plowing	-	0.08	0.08	-	0.08	0.08	-	-	-	-	-	-
Harrowing	-	1.0	1.0	-	1.0	1.0	-	0.17	0.17	-	0.17	0.17
Threshing	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0
Winnowing	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0

TABLE V-8 (2 of 3)

TABLE V-8
(3 of 3)

LABOR, DRAFT ANIMAL AND MACHINERY REQUIREMENT (PRESENT)

Upland Crops

Item	Sugar Cane		Coconut
	Plant Cane	Ratoon Cane	
	T	T	T
1. Labor Force (M.D/ha)	109.59	66.6	42
Cane Point Preparation	15	1	
Land Preparation Burning	2.19	0.9	
Planting/Hauling	5.2	2	
Weeding Cultivation	2.0	0.9	
Fertilization	4	3	
Harvesting/Hauling	75.2	54.1	30
Transporting	6.0	4.7	
Processing	12		
2. Machinery	5.59	4.0	
Land Preparation	0.69	0.2	-
Weeding & Cultivation	0.4	0.4	-
Planting	0.1	-	-
Transporting	4.8	3.4	1

TABLE V-9

UNIT YIELD IN THE PROJECT AREA FROM THE RESULTS OF FARM SURVEY

Year	Irrigated				Rainfed			
	Wet Season		Dry Season		Wet Season		Dry Season	
	Area	Unit Yield	Area	Unit Yield	Area	Unit Yield	Area	Unit Yield
1981 CY	32.09	2,585	32.09	2,307	312.05	2,177	271.41	1,862
1982 CY	23.74	2.403	25.09	1,757	295.5	1,795	221.27	1,378
1983 CY	32.09	2,801	32.09	2,545	315.04	2,326	315.55	1.924
1084 CY	32.09	2,530			306.12	2,031		
Average	30.00	2,580	29.76	2,203	307.18	2,082	269.41	1,721

Cropped Ratio Total Arable Land	Irrigated	Dry Season
Area in Wet Season/Max. Area	0.93	0.97
Area in Dry Season/Max.Area	0.93	0.85

PADDY LAND AND REPRESENTATIVE YIELD BY LAND CLASS

Land Class	Area (Ha)	Ratio (%)	Irrigated			Rainfed		
			Barangay*	1st Cropping (kg)	2nd Cropping (kg)	Barangay*	1st Cropping (kg)	2nd Cropping (kg)
1R/1D	3,785	59.0	1 & 8			2.4.7 & 13	2,160	1,730
1R/3D	1,730	27.0		2,590	2,240	11 & 15	2,360	2,110
2R/1D	560	8.7				5	1,940	1,570
3R/2D	340	5.3				9	1,640	1,380
Total	6,415	100		2,590	2,240		2,170 1/	1,800 1/

Source: Agro-Economic Survey

* Note: Barangay 1 Agnaga, Municipality of Concepcion
2 Tamis-ac, - do -
4 Asue Fabriaga, Municipality of Sara
5 Radios, - do -
7 Zerrudo, - do -
8 Tentay, - do -
9 Ardimil, - do -
11 Dugman, Municipality of San Dionisio
13 Tipacla, Municipality of Ajuy
15 Puente Bunglas, - do -

1/: Weighted average

TABLE V-10

TABLE V-11

SUGARCANE PRODUCTION IN REGION VI

	1971	72	73	74	75	76	77	78	79	80	Average
Harvested Area (ha)	281,530	260,100	262,140	286,900	308,085	321,813	308,060	279,548	236,280	230,090	
Production of Sugar (+)	1,493,532	1,166,429	1,573,887	1,626,929	1,530,305	1,746,565	1,648,884	1,379,789	1,430,700	1,354,898	
Sugar Yield (t/ha)	5.31	4.48	6.00	5.68	4.97	5.43	5.35	4.94	6.06	5.89	
(piculs/ha)1/	87.8	74.1	99.2	93.9	82.2	89.8	88.5	81.7	100.2	97.4	89.5
Ton Cane2/	55.9	47.2	63.2	59.8	52.4	57.2	56.4	52.0	63.8	62.0	57.0

Source: "Regional Statistical and Agricultural Profile, Western Visaya". A Project of the Data Assessment and Review Team, Ministry of Agriculture

1/ : One Picul is 60.48kg

2/ : Ton cane is estimated at a ratio of 1.57; this means that 1.57 piculs of sugar is extracted from 1 ton of sugar cane. This is the average ratio of Victorias Mill District where sugar cane from the Project Area is milled.

SUGARCANE PRODUCTION BY CROPPING METHOD

Cropping Method	Cane Yield in Tons (TC)	Sugar Yield in Piculs (PS)	PS/TC
Plant cane	68.0	106.8	1.57
Ratoon Cane	51.5	80.9	1.57

Estimated from "Regional Statistical and Agricultural Profile" using the ratio between yields of plant cane and ratoon cane, which is 1.32:1.

CROP PRODUCTION COST AND RETURN AT PRESENT

Item		Paddy								Sugar cane		Coconut
		Direct Seeding				Transplanted						
		Irrigated		Rainfed		Irrigated		Rainfed		Plant	Ratoon	
		1st	2nd	1th	2nd	1st	2nd	1st	2nd	Cane	Cane	
1. Production Cost												
(1) Variable Cost Total	(₱)	3,930	3,560	3,390	3,030	3,920	3,700	3,430	2,870	11,750	8,160	270
	(%)	75	75	75	75	75	75	75	75	65	65	91
Labor	(₱)	1,620	1,350	1,360	1,070	1,760	1,500	1,630	1,310	1,540	920	180
	(%)	31	29	30	27	34	30	36	34	9	7	59
Land Preparation	(₱)	880	870	750	780	1,020	1,000	560	500	2,080	600	-
	(%)	17	13	17	19	20	20	12	13	12	5	-
Machinery	(₱)	-	-	-	-	-	-	-	-	4,360	3,240	100
	(%)	-	-	-	-	-	-	-	-	24	26	32
Inputs	(₱)	1,430	1,340	1,280	1,170	1,130	1,200	1,250	1,070	3,770	3,390	-
	(%)	27	28	28	29	22	24	27	28	21	27	-
(2) Fixed Cost	(₱)	1,300	1,170	1,120	1,000	1,290	1,220	1,130	950	1,340	4,410	30
	(%)	25	25	25	25	25	25	25	25	35	35	9
(3) Total Production Cost ((1)+(2))	(₱)	5,230	4,730	4,510	4,030	5,210	4,920	4,560	3,820	18,090	12,560	300
	(%)	100	100	100	100	100	100	100	100	100	100	100
2. Gross Income	(₱)	6,860	5,940	5,750	4,770	6,860	5,940	5,750	4,770	20400	15,480	640
3. Net Income (2 - 1)	(₱)	1,630	1,210	1,250	750	1,660	1,010	1,190	950	2,350	2,920	340

Note: Details may not add up to total because of rounding off.

TABLE V-13

DRAFT ANIMALS IN THE PROJECT AREA, 1983

Municipality	Number of Carabao	Available Draft Animal Force
Ajuy	2,142	1,714
Concepcion	1,625	1,300
San Dionisio	2,045	1,636
Sara	3,212	2,570
Total	9,024	7,220

Source: BAI, Iloilo City

1 - Available Draft Animal Force is calculated as 80% of the total number of carabao. The remaining 20% is regarded as calves.

Available draft animal force per year in the Project area is estimated to be about 1,646,160 days as follows:

240 days x 7,220 x 0.95 = 1,646,160 days

SUMMARY OF PRESENT LABOR FORCE REQUIREMENT BY CROP

(Unit: '00 man days)

Crop	1	2	3	4	5	6	7	8	9	10	11	12	Total
Labor													
A. Paddy	381	386	11	104	441	848	727	796	915	1096	379	341	6425
B. Sugarcane	49	49	50	50	8	6	2	2	1	1	44	45	307
C. Coconuts				20	22						20	22	84
D. Total Labor Requirement	430	435	61	174	471	854	729	798	916	1097	443	408	4816
E. Available Labor	2292	2292	2292	2292	2292	2292	2292	2292	2292	2292	2292	2292	27504
F. Balance	1862	1857	2231	2118	1821	1438	1563	1494	1376	1195	1849	1884	22688
G. Ratio (D/E)	18.7	19.0	2.6	7.6	20.6	37.3	31.8	34.8	40.0	47.8	19.3	17.8	24.8
Draft Animals													
A. Paddy	3	3	-	59	247	247	59	2	97	119	60	1	897
B. Available Labor	1372	1372	1372	1372	1372	1372	1372	1372	1372	1372	1372	1372	16464
C. Balance	1369	1369	1372	1313	1125	1125	1313	1370	1275	1253	1312	1371	15567
D. Ratio (A/B)%	0.2	0.2	-	4.3	18.0	18.0	4.3	0.2	7.1	8.7	4.4	0.1	5.5

Source: Agro-Economic Survey

SUPPORT FARM-GATE PRICE
(July 1984)

Crop	Buying Price/kg (₱)	Date of Effectivity
Palay	2.65	June 9/84
Corn	2.30	June 9/84
Sorghum	1.10	June 17/84
Soybean	3.95	June 17/84
Mango	3.70	Nov 1/84
Unshelled Peanut	3.90	June 17/81
Cassava Chips	0.65	June 17/84

SUPPORT MARKET PRICE
(July 1984)

Crop	Outlet	Selling Price/kg (₱)	Ceiling Price (₱)	Date of Effectivity
Rice	Retailers/Inst.	4.65		
	Consumers	4.85	4.85	June 9/84
White Corn	Retailers/Inst.	3,70		
	Consumers	3.85	3.85	June 9/84
Yellow Corn	End-users	3.90		June 9/84
Soybean Meal	End-users	6.50		June 9/84
Mung Beans		4.20		Aug 23/80
Sorghum		1.10		Aug 23/80
Soybean		4.20		Mar 12/82

TABLE V-18

DISPOSITION OF PADDY RICE IN 1983/84

	No. of Farmers	Area Planted (ha)	Total Production Cavans	Landlord			Harvester Only	Thresher	Sold/to be sold	Home Consumption	Seeds	Creditor
				Share	Lease	Total						
Irrigated	38	79.3	4,186	222	146	368 (9%)	284 (7%)	258 (6%)	2,274 (54%)	592 (14%)	211 (5%)	199 (5%)
Rainfed	510	1,125	45,744	4,372	3,336	7,708 (17%)	3,211 (7%)	2,895 (6%)	17,759 (39%)	8,844 (19%)	3,389 (7%)	1,930 (4%)
Total	548	1,204.3	49,930	4,594 (9%)	3,482 (7%)	8,076 (16%)	3,495 (7%)	3,154 (6%)	20,033 (40%)	9,436 (19%)	3,600 (7%)	2,129 (4%)

Source: Agro-Economic Survey

NUMBER OF WHOLESALERS/RETAILERS IN THE FOUR RELATED MUNICIPALITIES, 1983

	Wholesalers	Retailers	Wholesalers/ Retailers	Total
Ajuy	7	2	10	19
Concepcion	4	13	4	21
San Dionisio	5	7	4	16
Sara	26	2	13	41
Total	42	24	31	97

Source: Socioeconomic Profile, Iloilo Province

TABLE V-20

PALAY SELLING

	No. of Farmers	Feb	Mar	Apr	May	...	Sep	Oct	Nov	Dec	Where Sold: Bario	Where Sold: Poblacion	Where Sold: Other	Buyer: Merchant	Buyer: Other
Irrigated	38	2	15	2	-		2	12	4	1	24	8	6	36	1
Rainfed	510	60	133	18	6		21	145	63	3	324	101	32	411	49

Source: Agro-Economic Survey

PALAY MARKET, 1983/84

		No. of Farmers	Average Price ₱/cavan	Possible Destination	
				Negros	Others
Irrigated	1st Crop	19	61.05	17	2
	2nd Crop	19	70.00	17	2
Rainfed	1st Crop	258	64.00	208	17
	2nd Crop	252	72.35	203	17

Source: Agro-Economic Survey

Note: The average price of palay before June '84 was ₱1.7/kg with 1 cavan costing ₱85.

EXISTING POST HARVEST FACILITIES AND FARM MACHINERY

Municipalities	Total Millers	Type of Miller		Mills		Threshers		Driers	Warehouses		Tractors		Irrigation Pump Set
		Rice	Corn	Number	Capacity/hr	Manual	Engine		Unit	Capacity (Cavan)	4 wheels	2 wheels	
Ajuy	7	7	-	7	115	6	44	3	11	236,486	9	44	46
Concepcion	6	5	1	5	21	-	29	-	1	10,000	-	30	6
San Dionisio	12	12	-	12	63	-	34	2	1	31,852	2	21	1
Sara	16	16	-	24	116.8	1	116	8	6	385,311	22	85	25
Total	41	40	1	47	315.8	7	223	13	19	663,649	33	180	78

Source: Data on mills and warehouses is from NFA 1982.
Data on threshers and driers is from the agro-economic survey conducted by the JICA Team July 1984.

DEMAND AND SUPPLY OF VEGETABLES IN REGION VI

	Vegetable Requir't per Capita 1/ (kg/Year)	Population 2/ Projection	Vegetables		
			Supply 3/ ('000 ton)	Demand 4/ ('000 ton)	Surplus ('000ton)
1980	31.36	4,539,000	90	142	- 52
1981	32.35	4,637,000	89	150	- 61
1982	33.33	4,735,000	91	158	- 67
1983	34.32	4,834,000	73 5/	166	- 93
1984	35.30	4,933,000	97 6/	174	- 77
2000	58.01	6,164,000	167 6/	358	-191

Note:

1/: Projection of Food Requirement for the Philippines 1970-2000, UNFPA-NCSO Population Research Project, NEDA NCSO.

2/: N C S O

3/: Regional Statistical and Agricultural Profile, MA

4/: 1/ times 2/

5/: Due to drought

6/: Estimated from the average of 1980-82, starting from 1982 on the annual growth ratio of 4.78% (Projection Production of NCSO)

TABLE V-24

VEGETABLE DEMAND IN PROJECT RELATED MUNICIPALITIES AND VICINITY

	Vegetable Requir't per Capita 1/ (kg/Year)	Project Related Municipalities 3/ Population Proj'n 2/ ('000)	Demand (t)	Vicinity 4/ Population Proj'n ('000)	Demand (t)
1980	31.36	100	3,136	922	28,914
1984	35.30 3/	111	3,918	1,011	35,688
1987	38.26	120	4,591	1,080	41,321
2000	58.01	151	8,760	1,253	72,687

1/: Projection of Food Requirement for the Philippines, NEDA, NCSO

2/: N C S O

3/: Barangays of Ajuy, Concepcion, San Dionisio and Sara.

4/: Above 4 municipalities, municipalities of Iloilo Province within 60km from the Project area and Capiz Province.

WHOLESALE PRICE DIFFERENTIAL OF VEGETABLES BETWEEN MANILA AND ILOILO CITY

(Unit: ₱/kg)

Month	Tomato			Eggplant			Onion (Red)		
	1981	1982	1983	1981	1982	1983	1981	1982	1983
A. Manila									
Jan.	6.68	3.56	2.08	3.00	2.29	2.98	6.06	5.21	6.44
Feb.	1.72	2.58	1.94	2.06	2.73	1.27	7.90	3.55	6.26
Man.	0.40	0.79	1.84	1.20	1.11	1.52	3.68	2.17	3.72
Apr.	0.80	1.08	1.72	0.74	1.15	1.65	2.06	1.68	4.44
May	1.84	1.78	2.23	0.92	0.90	2.01	1.63	1.86	7.82
Jun.	2.68	3.15	3.59	1.99	0.93	2.48	1.85	3.11	9.51
Jul.	2.74	3.83	5.86	2.66	3.13	2.16	3.11	4.28	9.61
Aug.	2.36	3.08	3.94	1.99	2.51	2.26	3.17	4.52	9.41
Sep.	3.13	3.47	2.46	1.83	3.29	1.65	4.78	4.88	9.99
Oct.	5.36	2.10	4.02	1.65	2.87	2.29	3.78	5.42	14.49
Nov.	4.10	2.36	6.27	1.68	2.89	2.26	4.25	5.46	14.46
Dec.	3.06	1.63	5.43	2.80	1.77	2.54	5.05	5.32	14.10
Average	2.91	2.45	3.45	1.88	2.13	2.12	3.94	3.96	9.19
B. Iloilo City									
Jan.	4.79	3.28	2.34	1.90	1.87	1.84	6.13	5.98	5.71
Feb.	3.66	3.08	1.86	2.00	2.00	1.83	6.74	6.38	8.32
Mar.	3.78	2.74	1.24	2.00	1.81	1.47	6.61	4.75	6.84
Apr.	4.13	2.53	1.49	2.19	1.79	1.43	6.03	3.33	4.63
May	3.03	2.40	2.07	2.13	1.51	2.00	5.56	2.88	5.72
Jun.	3.54	3.86	2.40	1.88	1.69	2.16	5.41	3.78	8.41
Jul.	3.83	7.34	3.14	1.49	2.18	1.81	4.17	4.39	9.62
Aug.	5.78	8.08	4.71	1.41	2.02	2.09	4.00	4.88	10.81
Sep.	5.24	8.97	4.19	1.40	2.13	1.67	4.00	5.00	9.74
Oct.	4.98	-	4.98	1.40	2.49	1.60	3.59	5.36	9.39
Nov.	5.89	-	6.48	1.72	2.00	-	4.03	5.00	14.10
Dec.	5.93	-	8.66	1.80	2.06	-	5.14	4.84	17.06
Average	4.55	4.70	3.63	1.78	1.96	1.79	5.12	4.71	9.36
(Manila=100)	156	192	105	95	92	84	130	119	102

Source: BAEcon

RETAIL PRICE DIFFERENTIAL OF VEGETABLES BETWEEN MANILA AND ILOILO CITY

(Unit: ₱/kg)

Month	Tomato			Eggplant			Onion (Red)		
	1981	1982	1983	1981	1982	1983	1981	1982	1983
A. Manila									
Jan.	8.56	6.59	3.19	4.91	4.26	3.00	7.68	6.94	9.40
Feb.	2.52	4.94	3.28	3.25	4.16	2.97	10.41	5.56	9.93
Mar.	0.83	2.00	2.88	2.61	3.14	2.31	5.58	3.86	5.00
Apr.	1.40	2.13	3.41	1.57	2.33	3.61	3.10	3.00	6.19
May	2.68	2.57	3.91	1.85	1.78	4.00	2.79	2.94	10.12
Jun.	3.80	5.13	5.41	2.82	2.05	3.74	3.18	4.18	11.88
Jul.	3.82	5.57	8.19	4.94	4.38	3.56	4.16	5.41	12.06
Aug.	4.32	4.94	6.28	3.91	3.94	4.36	4.29	6.00	11.89
Sep.	5.03	5.88	4.61	4.25	5.36	3.40	4.69	6.17	12.90
Oct.	6.82	4.28	6.00	4.21	4.82	4.25	4.94	7.06	17.03
Nov.	6.88	4.88	9.25	3.94	4.76	4.00	5.41	7.06	18.19
Dec.	5.34	4.35	7.80	5.06	3.53	4.90	7.09	7.00	17.00
Average	4.34	4.59	5.35	3.61	3.71	3.68	5.28	5.43	11.80
B. Iloilo City									
Jan.	7.21	3.94	4.78	2.50	2.50	3.29	8.03	7.94	8.28
Feb.	5.80	3.67	4.43	2.53	2.50	3.20	10.27	7.91	10.75
Mar.	4.50	3.17	3.66	2.50	2.50	2.55	9.42	5.93	10.06
Apr.	5.44	3.31	4.19	2.91	2.06	2.80	7.03	4.00	6.84
May	4.97	3.00	5.09	2.75	2.00	2.80	6.67	3.59	8.89
Jun.	4.76	5.54	5.94	2.71	2.47	3.08	6.41	5.68	12.21
Jul.	5.40	12.56	7.03	1.96	2.75	3.20	5.86	6.71	13.94
Aug.	6.94	12.39	7.75	2.03	2.74	3.17	6.00	7.53	13.56
Sep.	5.97	11.85	7.03	2.00	2.80	2.47	6.00	8.00	12.24
Oct.	6.12	5.69	7.50	2.50	3.17	2.67	5.43	8.11	12.83
Nov.	7.00	5.06	9.62	2.50	3.50	3.11	5.61	8.03	18.35
Dec.	6.66	4.89	11.19	2.50	3.44	3.45	6.06	8.00	21.88
Average	5.90	6.26	6.51	2.45	2.70	2.98	6.92	6.78	12.47
(Manila-100)	136	136	122	68	73	81	131	125	106

Source: BAEcon

PERSONNEL OF MINISTRY OF AGRICULTURE AND FOOD IN THE PROJECT RELATED MUNICIPALITIES

(Unit: Personnel Number)

	Ajny	Concep-tion	San Dionicio	Sara	Total
Municipal Agricultural Officer	1	1	1	1	4
Agricultural Prod'n Technician	8	5	4	10	27
Cooperative Develop'nt Officer	-	-	1	1	2
Home Management Officer	-	-	1	1	2
Soil Specialist				1	1
Livestock Inspector	1	-	1	1	3
Economist of Baecon	-	-	-	1	1
Total	10	6	8	16	40

Source: MAF Provincial Office, Iloilo

COVERAGE OF AGRICULTURAL PRODUCTION TECHNICIANS

	Ajuy	Concep-cion	San Dionisio	Sara	Total
- Agricultural Prd'n Technician	8	5	4	10	27
- Target Supervised Area (ha)	2330	880	1050	3110	7370
- Average Supervised Area per Staff Member (ha/person)	291	175	263	311	273
- Supervised Farmers	930	490	870	1480	3770
- Average No. of Supervised Farmers per Staff Member	116	98	218	148	140

TABLE V-28

LOAN STATUS IN CROPPING SEASON 1983-84

	No. of Farmers	Area (ha)	Loans Granted (₱)	Repayment (₱)	Balance (₱)	Repayment Ratio (%)
Four Municipalities of Project Area	444	1,255.18 [1]	942,410.00 [2]	759,914.05	182,495.95	80.6

Source: Land Bank of the Philippines, Iloilo,
Philippine National Bank, Iloilo,
Cooperative Rural Bank, Iloilo,
Rural Bank of Sara

1/ Data on CRB is lacking

2/ Data on Rural Bank of Sara is lacking

CROP INSURANCE SITUATION, SARA, ILOILO PROVINCE FROM 1981 - 1984

Year	Hectarage Covered	Number of Farmers	Amount of Coverage (P)
1981	37	14	85,000.00
1982	451.45	110	511,925.00
1983	576.13	150	719,440.00
1984 1/	156.00	26	209,900.00
Total	1220.58	300	1,526,265.00

Source: PCIC, Iloilo City

1/ 1st Cropping only

TABLE V-30

FARM INDEBTEDNESS IN CROPPING SEASON 1983/84

		Banks			Merchant/Private Lenders		
	No. of Farmers	No. of Farmers	Granted (₱)	Interest (p.a) (%)	No. of Farmers	Granted (₱)	Interest Rate (P.m) (%)
Irrigated	38	4	25,800	14	25	57,700	10
Rainfed	510	36	113,410	14	360	823,770	22
Total	548	40 (7%)	139,210	-	385 (70%)	881,470	-

Source: Agro-Economic Survey conducted in 1984 July.

TABLE V-31

LIVESTOCK POPULATION IN THE FOUR RELATED MUNICIPALITIES, January 1983

Municipality	Carabao	Cattle	Hog	Goat	Duck	Chicken	Dog	Rabbit	Turkey
Ajuy	2,142	195	6,088	1,195	9,787	42,958	6,788	0	750
Concepcion	1,625	269	1,522	675	1,866	39,057	5,893	0	595
San Dionisio	2,045	124	1,999	676	3,506	44,303	4,578	0	0
Sara	3,212	541	2,394	729	11,167	59,323	7,360	0	0
Total	9,024	1,129	12,003	3,375	26,326	185,641	24,619	0	1,345

Source: BAI, Iloilo Province

LIVESTOCK AND POULTRY INVENTORY 1983-84

	No. of Farmers	Carabao			Cattle			Hogs			Chickens		
		FR	B	E	FR	B	E	FR	B	E	FR	B	E
Irrigated	19	6	13	16	-	-	-	9	16	25	15	174	252
Rainfed	258	131	219	296	2	3	6	78	121	142	204	1,736	3,236
Total	277	137	232	312	2	3	6	87	137	167	219	1,910	3,488

Source: Agro-economic survey conducted by the JICA Team 1984 July.
FR: Farmer's report
B : Number at the beginning
E : Number at the end

	Goats			Ducks			Geese		
	FR	B	E	FR	B	E	FR	B	E
Irrigated	2	7	7	2	7	10	-	-	-
Rainfed	19	64	80	38	321	453	4	17	28
Total	21	71	87	40	328	463	4	17	28

TABLE V-32

TABLE V-33

INLAND FISH CATCH BY MUNCIPALITY, PROVINCE OF ILOILO

Municipality	No. of Operators	Area (ha)		Total Area		Annual Production		Production Average (kg/ha)
		Gov't Leased	Privately Owned	(ha)	%	(M.T.)	%	
Ajuy	118	281	813	1,094	65.0	1,641	63.1	1,500
Concepcion	23	274	25	299	17.8	449	17.3	1,500
San Dionisio	15	143	142	291	17.2	510	19.6	1,758
Total	156	696	980	1,684	100	2,600	100	1,544

Source: Provincial Socio-Economic Profile, Iloilo Province

AVERAGE FARM BUDGET AT PRESENT

TABLE V-34

Items	1.5ha Farm	2.4ha Farm (Average Size)	3.5ha Farm
(Farm Land, unit: ha)			
(1) Operated Area - Paddy Field	--- 1.5 ---	--- 2.4 ---	--- 3.5 ---
(2) Planted Area of Paddy			
a. 1st Crop, Irrigated, DS *1	0.35	0.56	0.82
b. - do - TR *2	0.03	0.04	0.06
c. 1st Crop, Rainfed, DS	1.05	1.67	2.43
d. - do - TR	0.08	0.13	0.19
e. 2nd & 3rd Crop, Irrigated, DS	0.33	0.53	0.77
f. - do - TR	0.03	0.04	0.06
g. 2nd Crop, Rainfed, DS	0.54	0.87	1.27
h. - do - TR	0.03	0.06	0.09
Sub-total	2.44	3.90	5.69
(Farm account, unit: P)			
(3) Gross Production Value of Paddy			
a. 1st Crop, Irrigated, DS *1	2,402	3,844	5,628
b. - do - TR *2	206	275	412
c. 1st Crop, Rainfed, DS	6,039	9,604	13,975
d. - do - TR	460	748	1,093
e. 2nd & 3rd Crop, Irrigated, DS	1,959	3,146	4,571
f. - do - TR	178	237	356
g. 2nd Crop, Rainfed, DS	2,576	4,150	6,056
h. - do - TR	143	286	429
Sub-total	13,963	22,290	32,520
(4) Production Cost	11,072	17,678	25,791
(5) Net Production Value of Paddy			
a. 1st Crop, Irrigated, DS *1	578	924	1,353
b. - do - TR *2	50	66	99
c. 1st Crop, Rainfed, DS	1,308	2,081	3,028
d. - do - TR	96	155	227
e. 2nd & 3rd Crop, Irrigated, DS	399	640	930
f. - do - TR	30	41	61
g. 2nd Crop, Rainfed, DS	402	648	946
h. - do - TR	28	57	85
Sub-total	2,891	4,612	6,729
(6) Net Production Value of Livestock *3	541	541	541
(7) Total of Agriculture Income	3,432	5,153	7,270
(8) Non-farm Income *3	4,981	4,981	4,981
(9) Total of Farm Income	8,413	10,134	12,251
(10) Household Expenditure			
- Food expenditure for own farm *4	2,960	2,960	2,960
- Others expenditure	4,820	6,410	8,370
- Sub-total	7,780	9,370	11,330
(11) Disposable Income	633	764	921

Note: *1 ..... Direct Seeding
*2 ..... Transplant
*3 ..... Based on Farm Survey
*4 ..... Base on calculation is as follows:
- Annual consumption of paddy per capita = 186kg
- Family size = 6 persons
- Paddy price Without Project = 2.65P/kg
- Paddy price With Project = 2.78P/kg

FARMAR'S INTENT: WILLINGNESS TO CHANGE TO OTHER CROPS, 1983-84

	No. of Farms	Willing	Change to Other Crops						Reasons for Change					
			Rice-rice	Rice-corn	Rice-diversified crops	Sugar Cane	Coconut	Others	Easier Cultural Practices	Higher Yields	Higher Price	Sufficient Knowledge	Better Market Prospect	Others
Irrigated	19	-	-	-	-	-	-	-	-	-	-	-	-	-
Rainfed	258	12(5%)	5	4	1	-	1	1	1	1	4	4	2	-
TOTAL	277	12(4%)	5	4	1	-	1	1	1	1	4	4	2	-

Source: Agro-economic Survey

FARMER'S INTENT: UNWILLINGNESS TO CHANGE TO OTHER CROPS, 1983-84

	No. of Farms	Unwilling	Reasons						
			No Knowledge of Crop	Difficult Cultural Practices	Poor Yield	Low Price	Poor Market Prospect	High Price of Inputs	Others
Irrigated:	19	19(100%)	8	6	8	5	4	-	-
Rainfed	258	246(95%)	83	56	122	79	80	7	-
TOTAL	277	265(96%)	91	62	130	84	84	7	-

Source: Agro-economic Survey

OPINION SURVEY

	No. of Farms	Willing to join Irrigators Association/Farm Cooperative if Organized		Willing to apply improved agricultural technology		Willing to invest in the provision of non-farm facilities for irrigating farm	
		Yes	No	Yes	No	Yes	No
Irrigated	19	19	-	19	-	19	-
Sara Area	136	136	-	136	-	136	-
San Dionisio and Concepcion Area	66	65	-	65	-	65	-
Ajuy Area	56	56	-	56	-	56	-
Painted	258	258	-	258	-	258	-
Total	277	277	-	277	-	277	-

Note: Opinion Survey on Willingness to Join Irrigators' Association; to Apply Improved Agricultural Technology, and to Invest in the Provisions of Non-farm facilities for Irrigating Farm, 1983-48.

CHANGE OF LAND USE

Unit: Hectare

PROPOSED LAND USE	FARMLAND						OTHERS						TOTAL
	Paddy Field		Sugar-	Coconut	Grass-	Sub-	Bush &	Hills	Residen-	Rivers,	Roads	Sub-	
	Irrigated	Rainfed	Cane		land	total	Bamboo		tial Area	Creeks, others		total	
Service Area													
Diversified Crops			160	140	410	410							410
Paddy Field	1,510	4,490	200	50	100	6,350							6,350 2/
Right of Way 3/	80	240	20	10	10	360							360
Subtotal	1,590	4,730	380	200	220	7,120							7,120
Others													
Bush & Bamboo							40					45	45
Hills								185				185	185
Residential Area									245			245	245
Rivers, Creeks and others										650		650	650
Roads											75	75	75
Subtotal							45	185	245	650	75	1,200	1,200
TOTAL	1,590	4,730 1/	4/ 380	200	220	7,120	45	185	245	650	75	650	8,320
	6,320												

Note: 1/ 105ha of rainfed paddy and 55ha of sugar cane area along the transdiversion canal are included.
2/ 100ha of paddy and 5ha of right of way area along the transdiversion canal are included.
3/ Area for right of way are estimated at about 5% of gross area.

CROPPING AREA IN THE PROJECT AREA

(Unit: ha)

Item	Present				Without Project				With Project					
									Benefit Area			Enriched Area		
	1st Crop	2nd Crop	3rd Crop	CI	1st	2nd	3rd	CI	1st	2nd	3rd	1st	2nd	CI
1. Serruco C.I.S.[2]	700	530		176	700	360		151	320	320		360	360	200
Paddy														
Irrigated	400	375		194	700	360		151	320	320		360	360	200
Rainfed	300	155		152										
2. KABSAKA W.I.[3]														
Paddy Irrigated	132	30		123	132	80		161	85	85		40	40	200
3. Ordinary Service Area	6068	3265	130		6068	3265	130	156	5955	5955	808			214
Paddy	5488	3265	130	162	5548	3265	130	161	5545	5545	500			209
Irrigated	1058	965	130	203	1058	965	130	203	5545	5545	500[1]			
Rainfed	4430	2300	-	152	4430	2300	-	152						
Sugar Cane	380				380									
Coconut	200				200									
Diversified Crops									410	410	308			275
Tomato									205	410	103			
Corn									205					
Mung Beans											205			
4. Total	6900	3825	130	157	6900	3705	130	156	6360	6360	808	400	400	212
Paddy	6320	3825	130	163	6320	3705	130	161	5950	5950	500	400	400	208
Irrigated	1590	1370	130	194	1890	1405	130	181	5950	5950	500	400	400	208
Rainfed	4730	2455	-	152	4430	2300		152						
Sugar Cane	380				380									
Coconut	200				200									
Diversified Crops									410	410	308			275
Tomato									205	410	103			
Corn									205					
Mung Beans											205			

1/ 3rd crop practiced in 5 croppings biannually is expressed here as annual 3rd crop in a half scale.
2/ Serruco Communal Irrigation System
3/ Kabsaka Water Impoundings
4/ CI: Cropping Intensity

PROPOSED FARMING PRACTICES FOR PADDY

1.	Varieties	IR series: IR 36, 60, etc
2.	Growth Period	110 days
3.	Planting Method	
	- Sowing method	Direct seeding and transplanting
	- Seed amount	150kg of certified seed per hectare 44kg for transplanting
4.	Land Preparation	Plowing : Once Harrowing : Once by machine Leveling : Twice
5.	Fertilization	
	- Total application	1st Crop N: 87kg/Ha P: 30kg/Ha K: 30kg/Ha 2nd & 3rd Crop K: 95kg/Ha P: 30kg/Ha K: 30kg/Ha
	- Time of application	
	Basal fertilizer	During land preparation 2/3 of N and all of P and K broadcasted and incorporated
	Topdressing 2nd	1/3 of N topdressed 5-7 days before panicle initiation
6.	Pest and Disease Control	3ℓ/Ha
7.	Weeding	
	- Manual	Within one month after seeding or transplanting
	- Herbicide	1 week after seeding 2.0l/ha
8.	Harvesting	Manual harvesting by sickle

AVERAGE GRAIN YIELD BY SEEDING RATE
WET SEASON 1981, GUIMBAL, ILOILO

Method of Establishment	SEEDING RATES 60kg	90kg	120kg	150kg	180kg	Mean
Broadcast	5,280	5,678	6,189	6,370	6,295	5,962
Drilled	5,249	5,566	6,146	6,262	6,556	5,956

CVa = 7% CVb = 7.1%

Significant Levels:	LSD .05	.01
SV		
Method of Establishment	ns	ns
Seeding Rates	641.8	899.3
Method X Rates	ns	ns

Source: Report of B. S. CIA, P. C. Bernasor and S. K. Dedatta

GRAIN YIELD BY FERTILIZER LEVEL[1/]

Fertilizer			Grain yield (t/ha)				Grain yield (t/ha)					
N	P	K	Farm no. in San Fernando				Farm no. in Libmanan					
			1	2	3	Mean	1	2	3	4	Mean	Average two Area
0	0	0	3.6	2.4	2.7	2.9	2.8	2.4	2.6	3.1	2.7	2.8
29 [a]	30	30	4.3	3.6	3.0	3.7	3.9	3.6	3.1	4.5	3.8	3.7
29 (USG)	30	30	4.9	4.4	3.4	4.3	4.1	4.0	3.6	4.9	4.2	4.2
58 [a]	30	30	5.3	3.9	3.7	4.3	4.6	3.9	3.2	5.0	4.2	4.2
58 (USG)	30	30	5.6	5.6	4.1	5.1	4.7	4.0	4.0	4.9	4.4	4.7
87 [a]	30	30	5.4	5.4	4.0	5.0	4.7	4.6	3.5	5.4	4.5	4.7
87 (USG)	30	30	5.2	5.2	4.7	5.1	4.8	5.0	3.8	5.4	4.7	4.9

1/ Direct seeded flooded rice in the farmers' rainfed field in San Fernando, Camarines Sur. 1982 wet season.

a Prilled urea applied 2/3 broadcast and incorporated, 1/3 topdressed 5-7 days before panicle initiation.

USG = urea supergranule.

Source: Report of B.S. CIA, P.C. BERNASOR and S.K. DE DATTA

PROPOSED FARMING PRACTICES: TOMATO

1.	Variety	UPL TM1 BPI TM1
2.	Growth Period	100-120 days (30 days of Nursery Period)
3.	Planting Method	
	- Sowing Method	Transplanting
	- Seed Amount	1 kg/ha
	- Nursery Period	30 days
	- Planting Space	Between rows 75-100cm Between hills 30-40cm
	- Mulching	Grass mulch is required
4.	Land Preparation	Plowing : 1 time Harrowing : 1 times Furrowing : 1 time
5.	Fertilization	
	- Application Amount	N : 69-96kg P_2O_5 : 120-192kg K_2O : 60-96kg
	- Time of Application	All of N & P_2O_5 and half of K_2O are applied at planting time. The remaining half of K_2O is side-dressed one month after transplanting.
6.	Pest and Disease Control	
	- Amount	Pesticide : 6ℓ
	- Timing	Pesticide : Every two weeks after transplanting Funicide : Necessary occasion
7.	Weeding & Intertilling	Hand weeding by hoe Three times every three weeks after transplanting
8.	Harvesting	Manual

PROPOSED FARMING PRACTICES: CABBAGE

1.	Variety	F_1 KK Cross, F_1 K Y Cross Marion Market (Rainy Season Variety)
2.	Growth Period	58-65 days
3.	Planting Method	
	- Sowing	Drilling in a seedbed of a briable and fertile soil
	- Seed Amount	Early matured variety: 500g for ha, Late matured variety: 400g for ha.
	- Nursery Period	4-6 weeks
	- Planting Space	30-50cm between hills 75cm between rows
	- Soil Type	Sandy loam for early matured and clay for high yield; proper soil acidity is pH 5.5-6.5
4.	Land Preparation	Plowing Harrowing Furrowing
5.	Fertilization	
	- Application	N : 90-240kg/Ha P_2O_5 : 30-60kg/Ha K_2 : 30-60kg/Ha
	- Time of Application	Basal application of all of P_2O_5 and K_2O and half of N The remaining half of N is sidedressed one month after planting Organic fertilizer is also required
6.	Pest and Disease Control	
	- Amount	5ℓ
	- Timing	On occurence
7.	Weeding	Pre-emergence herbicide is useful at land preparation time. Hand weeding should be done prior to fertilizer application.
8.	Harvesting	Manual
9.	Irrigation	Once a week irrigation is required, especially after trans-planting and head developing time.

PROPOSED FARMING PRACTICES: ONION

1.	Variety	Bulb onion : Crystal Wax Certified Creole, Red Creole Green onion : Japanese Bunching Bieltsville Bunching
2.	Growth Period	120-130 Days
3.	Planting Method	
	- Sowing	Direct-seeding into rows
	- Seed Amount	3-10kg
	- Plant Density	Rows spaced 30-60cm and hills spaced 5-8cm
	- Soil Type	Sandy-loam, pH preference is 5.5 to 6.5
4.	Land Preparation	Ploughing Harrowing Furrowing
5.	Fertilization	
	- Application	N : 54-120kg/ha P_2O_5 : 103-240kg/ha K_2O : 54-120kg/ha Lime requirement in case of sandy loam pH reading 5.0 5.5 6.0 $CaCO_3$ 3.5 2.5 1.5
	- Application Time	Basal application of all of P_2O_5, K_2O and lime and half of N Remaining N is sidedressed to the side of the rows about 8cm away and for 10cm deep as bulbing begins
6.	Pest and Disease Control; Insecticide	2kg/ha/2 weeks x 7 times
7.	Weeding	Manual weeding should commence on the earliest date weeds are observed. Pre-and post-emergence herbicides, Treflan and TOK, respectively are useful.
8.	Harvesting	Pulling by hand when neck tissues begin to soften and tops are nearly ready to fall. The bulbs should be dried for a day.
9.	Irrigation	Weekly irrigation of 2.5-3.5cm in vegetative period

PROPOSED FARMING PRACTICES: MUNG BEANS

1.	Variety	CES series, MG50-10A MD15-2
2.	Growing Period	60-65 Days
3.	Planting Method	
	- Sowing	Drilling
	- Seed Amount	20-25 kg/ha
	- Planting Spacing	Between Rows 50cm Pland Demsity per Linear Meter 20-23
4.	Land Preparation	Plowing : 1 time Harrowing : 2 times Furrowing : 1 time
5.	Fertilization	
	- Application	Sandly to Sandy Loam soil N : 30kg P_2O_5 : 30kg K_2O : 30kg Loam to Clay N : 22.5kg P_2O_5 : 22.5kg K_2O : 22.5kg
	- Application Time	Basal application of all amounts
	- Lime Application	Necessary amount to raise soil acidity more than pH 6.5
	- Inoculation of Rhizobia	Available inoculant at BS or BPI is recommended
6.	Pest and Disease Control	
	- Amount	2ℓ/ha by spraying
	- Timing	On occurence
7.	Weeding	Hilling up by hoe four weeks after germination
8.	Harvesting	By hand

PROPOSED FARMING PRACTICES: CORN

1.	Variety	Phil DMR, IPB Var.1 Pioneer 6181
2.	Growth Period	100-110 days
3.	Planting Method	
	- Sowing	Direct planting
	- Seed Amount	15-18kg
	- Planting Spacing	Between rows: 75cm Between hills: 50cm, 2 plants/hill
4.	Land Preparation	Plowing : 1 Harrowing : 1 Furrowing : 1
5.	Fertilization	
	- Application	N : 60-100kg P_2O_5 : 30-45kg K_2O : 45-60kg (If necessary)
	- Application Time	Basal Fertilizer N: half of total P_2O_5: all Sidedressing N: half of total (4 to 5 weeks after germination)
6.	Pest and Disease Control	
	- Amount	Pesticide 3ℓ
	- Timing	on occurence
7.	Weeding	Hand weeding by hoe to make weed-free During the first four to five weeks
8.	Harvesting	Manual

Yield can be about 3.5t/ha

FARM INPUTS, LABOR FORCE, DRAFT ANIMAL AND MECHANICAL POWER REQUIREMENT

(WITH PROJECT)

Item	Irrigated Direct Seeding						Irrigated Transplanting					
	1st Crop			2nd Crop			1st Crop			2nd Crop		
	F	H	T	F	H	T	F	H	T	F	H	T
1. Labor (M·D/ha)	17.2	76.28	93.48	15.95	74.63	90.58	16.0	86.88	102.88	15.65	86.13	101.78
2. Draft Animals (day/ha)	1.6	4.1	5.7	1.35	3.85	5.2	1.6	4.1	5.7	1.35	3.85	5.2
3. Mechanical Power (day/ha)	-	2.61	2.61	-	2.68	2.68	-	3.08	3.08	-	3.08	3.08
4. Farm Inputs												
(1) Seed (kg)			150			150			80			80
(2) Fertilizer (kg)												
Urea			127			144			127			144
16-20-0												
21-0-0												
14-14-14			214			214			214			214
(Average N-P-K in kg)			87-30-30			94-30-30			87-30-30			94-30-30
(3) Agro-chemicals												
Pesticide												
Liquid ( )			3			3			3			3
Granule (kg)												
Herbicide												
Liquid ( )			2			2			2			2
Granule (kg)												

TABLE V-47
(1 of 3)

TABLE V-47
(2 of 3)

FARM INPUTS, LABOR FORCE, DRAFT ANIMALS AND MECHANICAL POWER REQUIREMENT

(WITH PROJECT)

Item	Corn			Tomato			Mung Beans		
	F	H	T	F	H	T	F	H	T
1. Labor (M·D/ha)	15	36.2	51.2	72	78.2	150.2	13	26.2	39.2
2. Draft Animals (day/ha)	-	2.0	2.0	-	2.0	2.0	-	2.0	2.0
3. Mechanical Power (day/ha)	-	1.2	1.2	-	1.2	1.2	-	1.2	1.2
4. Farm Inputs									
(1) Seed (kg)				17		1			20
(2) Fertilizer (kg)									
Urea				67		49			
0-0-60						100			
14-14-14			214						214
18-46-0						60			
(Average N-P-K in kg)									
(3) Agro-chemicals									
Pesticide									
Liquid ( )			3			6			2
Granule (kg)									
Herbicide									
Liquid ( )									
Granule (kg)									

TABLE V-47
(3 of 3)

FARM INPUTS, LABOR FORCE, DRAFT ANIMALS AND MECHANICAL POWER REQUIREMENT

(WITH PROJECT)

Item	Cabbage			Onion		
	F	H	T	F	H	T
1. Labor (M·D/ha)	38	78.2	116.2	47	87.2	134.2
2. Draft Animals (day/ha)	-	2.0	2.0	-	2.0	2.0
3. Mechanical Power (day/ha)	-	1.2	1.2	-	1.2	1.2
4. Farm Inputs						
(1) Seed (kg)			500			
(2) Fertilizer (kg)						
N_2O			120			
P_2O_5			45			
K_2O			45			
(3) Agro-chemicals ( )			5			

LABOR FORCE, DRAFT ANIMAL AND MECHANICAL POWER REQUIREMENT WITH PROJECT

Item	Direct Seeding						Transplanting					
	1st Crop			2nd Crop			1st Crop			2nd Crop		
	F 1/	H 2/	T 3/	F	H	T	F	H	T	F	H	T
1. Labor (man days/ha)	17.2	76.28	93.48	15.95	74.63	90.58	16.0	86.88	102.88	15.65	86.13	101.78
Nursery	-	-	-	-	-	-	1.8	3.5	5.3	1.3	2.7	4.0
Land Preparation	1.6	5.18	6.78	1.35	4.93	6.28	1.6	5.18	6.78	1.35	4.93	6.28
Dike Repair	2	2	4	1.2	1.2	2.4	1.5	1.5	3.0	0.8	0.8	1.6
Seeding/Transplanting	1	1	2	0.8	0.8	1.6	-	15.0	15.0	-	13.6	13.6
Weeding	2	18	20	1.5	13.7	15.2	1.4	12.6	14.0	1.1	10.1	11.2
Fertilization	-	1.8	1.8	-	1.8	1.8	-	1.8	1.8	-	1.8	1.8
Spraying	1.8	1.8	3.6	1.8	1.8	3.6	0.9	0.9	1.8	1.8	1.8	3.6
Harvesting	-	29.3	29.3	-	31.8	31.8	-	29.3	29.3	-	31.8	31.8
Threshing	-	6.2	6.2	-	6.9	6.9	-	6.2	6.2	-	6.9	6.9
Winnowing	-	4.3	4.3	-	4.5	4.5	-	4.3	4.3	-	4.5	4.5
Hauling/Storage	4.6	4.6	9.2	5	5	10.0	4.6	4.5	9.1	5.0	5.0	10.0
Drying	2.2	2.1	4.3	2.3	2.2	4.5	2.2	2.1	4.3	2.3	2.2	4.5
Water Management	2.0	-	2.0	2.0	-	2.0	2.0	-	2.0	2.0	-	2.0
2. Draft Animal (days/ha)	1.6	4.1	5.7	1.35	3.85	5.2	1.6	4.1	5.7	1.35	3.85	5.2
Plowing	0.6	3.1	3.7	0.6	3.1	3.7	0.6	3.1	3.7	0.6	3.1	3.7
Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
Leveling	1.0	1.0	2.0	0.75	0.75	1.5	1.0	1.0	2.0	0.75	0.75	1.5
3. Mechanical Power (days/ha)	-	2.61	2.61	-	2.68	2.68	-	3.08	3.08	-	3.08	3.08
Plowing	-	0.08	0.08	-	0.08	0.08	-	0.08	0.08	-	0.08	3.7
Harrowing	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0	-
Threshing	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0	6.9
Winnowing	-	0.53	0.53	-	0.6	0.6	-	1.0	1.0	-	1.0	4.5

Note: 1/ Family Labor Force
2/ Hired Labor Force
3/ Total Labor Force

LABOR FORCE, DRAFT ANIMAL AND MECHANICAL POWER REQUIREMENT WITH PROJECT

Item	Corn			Tomato			Mung Beans		
	F 1/	H 2/	T 3/	F	H	T	F	H	T
1. Labor (man days/ha)	15	36.2	51.2	72	78.2	150.2	13	26.2	39.2
Seedbed Preparation	-	-	-	2	2	5	-	-	-
Care of Seedlings	-	-	-	5	5	10	-	-	-
Land Preparation	-	3.2	3.2	-	3.2	3.2	-	3.2	3.2
Planting/Transplanting	3	4	7	3	12	15	4	-	4
Irrigation	2	-	2	4	-	4	2	-	2
Hilling-up	-	-	-	2	2	4	-	-	-
Cultivation/Weeding	3	3	6	5	5	10	3	3	6
Fertilization	2	1	3	2	2	4	1	1	2
Chemical Application	1	1	2	3	3	6	1	1	2
Harvesting	-	16	16	30	30	60	-	10	10
Husking & Hauling	2	4	6	13	7	30	1	4	5
Others	2	4	6	3	7	10	1	4	5
2. Mechanical Power	-	1.2	1.2	-	1.2	1.2	-	1.2	1.2
Plowing	-	0.2	0.2	-	0.2	0.2	-	0.2	0.2
Harrowing	-	1	1	-	1	1	-	1	1
Furrowing									
3. Draft Animal									
Furrowing	-	2	2	-	2	2	-	2	2

TABLE V-48
(3 of 3)

LABOR FORCE, DRAFT ANIMAL AND MECHANICAL POWER REQUIREMENT WITH PROJECT

	Cabbage			Onion		
	F	H	T	F	H	T
1. Labor (man days/ha)	38	78.2	116.2	47	87.2	134.2
Seedbed Preparation	2	2	4	-	-	-
Care of Seedlings	5	5	10	-	-	-
Land Preparation	-	3.2	3.2	-	3.2	3.2
Transplanting/Seeding	2	13	15	3	4	7
Care of Crops	15	25	40	20	40	60
Harvesting & Hauling	10	30	40	20	40	60
Irrigation	4	-	4	4	-	4
2. Mechanical Power	-	1.2	1.2	-	1.2	1.2
Plowing	-	0.2	0.2	-	0.2	0.2
Harrowing	-	1.0	1.0	-	1.0	1.0
Furrowing						
3. Draft Animal						
Furrowing	-	2.0	2.0	-	2.0	2.0

LABOR BALANCE WITH PROJECT

(Unit: '00 man days)

Crop Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
1. Paddy	1498	2260	423	290	426	1049	1140	145	1743	2445	1154	389	12962
2. Corn					13	21	12	1	29	29			105
3. Vegetables	13	396	26	1	112	50	51	2	186	37	101	103	1078
4. Mung Beans	3	23	12	42									80
5. Total Labor Requirement	1514	2680	460	332	541	1120	1203	148	1958	2511	1255	492	14224
6. Available Labor	3472	3472	3472	3472	3472	3472	3472	3472	3472	3472	3472	3472	41664
7. Balance	1958	792	3012	3140	2932	2352	2269	3324	1514	961	2217	2980	27440
8. Ratio (E/F)%	43.6	77.2	13.3	9.6	15.6	32.3	34.6	4.3	56.4	72.3	36.1	14.2	34.1

1/: Second year of 5 croppings biannually is excluded. The details are shown in the DATA BOOK.

DRAFT ANIMAL BALANCE WITH PROJECT

(Unit: '00 man·days)

Crop Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
1. Paddy		-	-	-	162	187	13	-	61	224	44	2	693
2. Corn					3	1							4
3. Vegetables	1	1			2	2				4	4		14
4. Mung Beans	1	3											4
5. Total Labor Requirement	3	4	-	-	167	190	13	0	61	228	48	2	715
6. Available Labor	1372	1372	1372	1372	1372	1372	1372	1372	1372	1372	1372	1372	16464
7. Balance	1369	1368	1372	1372	1205	1182	1359	1372	1311	1144	1324	1370	15747
8. Ratio (E/F)%	0.2	0.3	-	-	12.2	13.9	0.9	0	4.4	16.6	3.5	0.1	4.3

1/: Second year of 5 croppings biannually is excluded. The details are shown in the DATA BOOK.

PADDY UNIT YIELD OF NIA IRRIGATION SYSTEM IN REGION VI

System		Unit Yield (Unit: kg/ha) 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1. Aklan	Wet	2,400	2,850	3,795	4,415		4,100	4,350	4,450	3,900	4,150
	Dry	2,550	2,750	3,740	4,255		4,450	4,500	4,250	4,550	4,150
2. Panakuyan	Wet			3,120	3,430		4,100	4,000	3,400	3,200	3,350
	Dry			3,175	3,375		4,200	4,350	3,850	3,400	4,150
3. Manbusao	Wet			4,270			4,050	4,400	4,450	4,400	4,350
	Dry		2,550	4,275			4,300	4,400	4,150	4,400	4,150
4. Sibalon (Tigbanan)	Wet				3,940	4,300	3,300	3,300	4,300	4,850	4,500
	Dry					4,950	4,600	4,400	4,350	4,400	4,450
5. Barotac-Viejo	Wet				4,000	4,400	3,800	3,800	3,850	3,850	5,050
	Dry				None	4,900	4,950	4,350	4,250		3,500
6. Bago	Wet	3,100	3,000	3,565		3,950	4,050	4,850	4,700	4,200	4,450
	Dry	2,500	2,400	3,555		4,250	4,350	4,150	4,300	4,700	3,950
	3rd					4,000		4,100			
7. Pangiplan	Wet	3,200	3,450	3,625	4,200	4,250	3,600	3,700	4,800	4,450	5,000
	Dry	3,200	2,850	3,375	5,150	4,350	4,550	4,100	3,550	4,600	3,550
	3rd					3,950	3,750				
8. Jalaur	Wet	3,750	3,700	3,760		4,050		4,650	4,700	4,300	4,600
	Dry	3,500	3,500	3,710		4,100		4,000	3,950	4,350	4,000
9. Suague	Wet	3,650	3,700	3,735		4,300	4,300	4,750	4,850	4,750	4,400
	Dry	3,200	3,500	3,680		4,150	3,800	4,150	4,000	4,150	4,050
10. Agnan	Wet	2,600	2,700	4,290		3,950	3,900	3,850	4,250	4,350	4,450
	Dry	3,200	3,050	2,225		4,200	3,800	3,950	3,950	4,250	4,050
11. Sta. Barbara	Wet	2,900	2,850	4,800		4,000	4,100	3,850	4,850	4,700	4,150
	Dry	2,500	3,150	4,500		4,000	4,250	4,150	4,300	4,300	4,600
	3rd			575		4,000					
12. Sibalom-San Jose	Wet	2,300	2,150							4,400	5,000
	Dry	1,950	2,300							4,250	4,250
13. Sibalon - San Jose Ext'n	Wet			2,650	3,985		4,400	4,350	4,350	4,000	
	Dry				3,130		4,450	4,050	3,950	4,000	
14. Jalaur Extension	Wet									4,450	4,550
	Dry										4,050
Average	All season	2,906	2,968	3,521	4,213	4,213	4,137	4,356	4,242	4,275	4,265
	1st	2,988	3,050	3,761	3,995	4,150	3,973	4,154	4,412	4,271	4,461
	2nd	2,825	2,894	3,582	3,978	4,363	4,336	4,213	4,071	4,279	4,069
	3rd					3,983					

Source: NIA

INCREMENT OF UNIT YIELD OF IRRIGATION SYSTEM IN NIA REGION VI

Year	1st Crop		2nd Crop	
	Number of Samples	Yield (t/ha)	Number of samples	Yield (t/ha)
1st	13	3.222	10	2.833
2nd	12	3.376	13	3.395
3rd	9	3.852	9	3.815
4th	6	4.038	6	4.468
5th	10	4.127	11	4.214
6th	11	4.086	10	4.180
7th	12	4.263	12	4.042
8th	9	4.478	9	4.094
9th	8	4.381	9	4.367
10th	8	4.525	8	4.075

Source: NIA

CROP PRODUCTION IN THE BENEFIT AREA

Item	Present				W/O Project				W Project			
	Area (ha)		Yield	Product'n	Area		Yield	Product'n	Area		Yield	Product'n
	Direct Seed DS	Transplant TP	(t/ha)	(t)	DS	TP	(t/ha)	(t)	DS	TP	(t/ha)	(t)
1. Serruco Area	1145	85		2806	985	75		4390	820	540		6528
Paddy Irrigated	720	55		1876	985	75		4390	820	540		6528
1st	370	30	2.59	1036	650	50	3.7	2590	410	270	4.6	3128
2nd	350	25	2.24	840	335	25	5.0	1800	410	270	5.0	3400
Rainfed	425	30		930								
1st	280	20	2.17	651					-	-		
2nd	145	10	1.80	279					-	-		
2. KABSAKA Area												
Paddy Irrigated	150	12		409	196	16		1007	150	100		1200
1st	122	10	2.59	342	122	10	4.6	607	75	50	4.6	575
2nd	28	2	2.24	67	74	6	5.0	400	75	50	5.0	625
3. Ordinary Service Area												
Paddy	8260	623		18946	8260	623		20259	6950	4640		55732
Irrigated	2000	153		5193	2000	153		5700	6950	4640		55732
1st	985	73	2.59	2740	985	73	2.8	2962	3325	2220	4.6	25507
2nd	895	70	2.24	2162	895	70	2.5	2413	3325	2220	5.0	27725
3rd	120	10	2.24	291	120	10	2.5	325	300	200	5.0	2500
Rainfed	6260	470		13753	6260	470		14559				
1st	4120	310	2.17	9613	4120	310	2.3	10189	-	-		
2nd	2140	160	1.80	4140	2140	160	1.9	4370	-	-		
Sugar Cane	380			21633	380			21633	-			
Plant Cane	125		68.0	8500	125		68.0	8500	-			
Ratoon Cane	255		51.5	13133	255		51.5	13133	-			
Coconut	200		480(nuts)	9600	200		480 nuts	96,000	-			
Diversified Crops									615	513		
Tomato									205[1]	513[2]	10t/20t	12310
Corn									205		3.5	718
Mung Beans									205		1.0	205
4. Total of Paddy	9555	720		22161	9441	714		25656	7920	5280	4.81	63460
Irrigated	2870	220		7478	3181	244		11097	7920	5280		63460
1st	1477	113	2.59	4118	1757	133	3.3	6159	3810	2540	4.6	29210
2nd	1273	97	2.24	3069	1304	101	3.3	4613	3810	2540	5.0	31750
3rd	120	10	2.24	291	120	10	2.5	325	300	200	5.0	2500
Rainfed	6685	500		14683	6260	470		14559				
1st	4400	330	2.17	10264	4120	310	2.3	10189	-			
2nd	2285	170	1.80	4419	2140	160	1.9	4370	-			

1): Tomato Yield 10t/ha
2): Tomato Yield 20t/ha

CROP PRODUCTION COST AND RETURN WITHOUT PROJECT

Item		Paddy								Sugarcane		Coconut
		Direct Seeding				Transplanting				Plant Cane	Ratoon Cane	
		Irrigated		Rainfed		Irrigated		Rainfed				
		1st	2nd	1st	2nd	1st	2nd	1st	2nd			
1. Production Cost												
(1) Variable Cost Total	(₱)	4330	3910	3560	3180	4310	4070	3600	3020	11750	8160	270
	(%)	75	75	75	75	75	75	75	75	65	65	91
Labor	(₱)	1790	1490	1430	1130	1940	1650	1710	1370	1540	920	180
	(%)	31	29	30	27	34	30	36	34	8	7	59
Land Preparation	(₱)	970	950	780	820	1120	1100	580	520	2080	600	-
	(%)	17	18	17	19	20	20	12	13	12	5	
Mechanical Power	(₱)	-	-	-	-	-	-	-	-	4360	3240	100
	(%)									24	26	32
Input Materials	(₱)	1570	1470	1340	1230	1250	1320	1310	1130	3770	3390	-
	(%)	27	28	28	29	22	24	27	28	21	27	
(2) Fixed Cost	(₱)	1430	1290	1170	1050	1420	1340	1190	1000	6340	4410	30
	(%)	25	25	25	25	25	25	25	25	35	35	9
(3) Total Production Cost ((1) + (2))	(₱)	5760	5200	4730	4230	5730	5420	4780	4010	18090	12560	300
	(%)	100	100	100	100	100	100	100	100	100	100	100
2. Gross Income	(₱)	7750	6530	6040	5010	7550	6530	6040	5010	20440	15480	640
3. Net Income (2-1)	(₱)	1790	1330	1310	780	1820	1120	1250	1000	2350	2920	340

Note: Details may not add up to total because of rounding off.

TABLE V-55

CROP PRODUCTION COST AND RETURN WITH PROJECT

Item		Irrigated Paddy				Corn	Tomato	Mung Beans
		Direct seeding		Trans-planting				
		1st	2nd	1st	2nd			
1. Production Cost								
(1) Variable Cost Total	(₱)	6480	6640	6210	6400	3810	5790	3250
	(%)	74	74	74	74	71	62	64
Labor	(₱)	2610	2710	2750	2870	500	1130	345
	(%)	30	30	33	33	9	12	7
Land Preparation	(₱)	1020	1000	1020	1000	1300	1300	1300
	(%)	12	11	12	12	24	14	26
Mechanical Power	(₱)							
	(%)							
Input Materials	(₱)	2850	2930	2450	2530	2020	3370	1610
	(%)	33	33	29	29	37	36	32
(2) Fixed Cost	(₱)	2270	2320	2180	2240	1590	3590	1845
	(%)	26	26	26	26	29	38	36
(3) Total Production Cost ((1) + (2))	(₱)	8750	8960	8390	8640	5400	9380	
	(%)	100	100	100	100	100	100	
2. Gross Income	(₱)	12790	13900	12780	13900	11690	40000	8000
3. Net Income (2 - 1)	(₱)	4040	4940	4400	5260	6290	30620	2910

AVERAGE FARM BUDGET WITHOUT PROJECT AND WITH PROJECT

Items	1.5ha Farm		2.4ha Farm (Average Size)		3.5ha Farm	
	W.O.P.	W.P.	W.O.P.	W.P.	W.O.P.	W.P.
(Farm Land, unit: ha)						
(1) Operated Area - Paddy Field	--- 1.5 ---		--- 2.4 ---		--- 3.5 ---	
(2) Planted Area of Paddy						
a. 1st Crop, Irrigated, DS *1	0.42	0.90	0.67	1.44	0.98	2.10
b. - do - TR *2	0.03	0.60	0.05	0.96	0.07	1.40
c. 1st Crop, Rainfed, DS	1.00	-	1.59	-	2.31	-
d. - do - TR	0.08	-	0.12	-	0.18	-
e. 2nd & 3rd Crop, Irrigated, DS	0.34	0.97	0.54	1.55	0.80	2.26
f. - do - TR	0.02	0.65	0.04	1.03	0.06	1.51
g. 2nd Crop, Rainfed, DS	0.51	-	0.82	-	1.20	-
h. - do - TR	0.04	-	0.06	-	0.09	-
Sub-total	2.44	3.12	3.89	4.98	5.69	7.27
(Farm account, unit: P)						
(3) Gross Production Value of Paddy						
a. 1st Crop, Irrigated, DS *1	3,228	11,509	5,149	18,415	7,531	26,855
b. - do - TR *2	231	7,673	384	12,276	538	17,903
c. 1st Crop, Rainfed, DS	6,095	-	9,691	-	14,079	-
d. - do - TR	488	-	731	-	1,097	-
e. 2nd & 3rd Crop, Irrigated, DS	2,162	13,483	3,434	21,545	5,088	31,414
f. - do - TR	127	9,035	254	14,317	382	20,989
g. 2nd Crop, Rainfed, DS	2,568	-	4,129	-	6,042	-
h. - do - TR	201	-	302	-	453	-
Sub-total	15,100	41,700	24,074	66,553	35,210	97,161
(4) Production Cost	11,943	27,222	19,042	43,451	27,854	63,430
(5) Net Production Value of Paddy						
a. 1st Crop, Irrigated, DS *1	774	3,673	1,235	5,819	1,807	8,486
b. - do - TR *2	56	2,640	93	4,223	130	6,159
c. 1st Crop, Rainfed, DS	1,323	-	2,104	-	3,056	-
d. - do - TR	101	-	152	-	228	-
e. 2nd & 3rd Crop, Irrigated, DS	441	4,786	700	7,648	1,038	11,152
f. - do - TR	22	3,415	44	5,412	65	7,934
g. 2nd Crop, Rainfed, DS	400	-	644	-	942	-
h. - do - TR	40	-	60	-	90	-
Sub-total	3,157	14,478	5,032	23,102	7,356	33,731
(6) Net Production Value of Livestock *3	541	541	541	541	541	541
(7) Total of Agriculture Income	3,698	15,019	5,573	23,643	7,897	34,272
(8) Non-farm Income *3	4,981	4,981	4,981	4,981	4,981	4,981
(9) Total of Farm Income	8,679	20,000	10,554	28,624	12,878	39,253
(10) Household Expenditure						
- Food expenditure for own farm *4	2,960	3,100	2,960	3,100	2,960	3,100
- Others expenditure	5,100	15,640	6,810	23,720	8,930	33,680
- Sub-total	8,060	18,740	9,770	26,820	11,890	36,780
(11) Disposable Income	619	1,260	784	1,804	988	2,473

Note: *1 ..... Direct Seeding
*2 ..... Transplant
*3 ..... Based on Farm Survey
*4 ..... Base on calculation is as follows:
- Annual consumption of paddy per capita = 186kg
- Family size = 6 persons
- Paddy price Without Project = 2.65P/kg
- Paddy price With Project = 2.78P/kg

SUMMARY OF CROP BUDGET WITH AND WITHOUT PROJECT

Unit: Peso

		Production Cost	Gross Income	Net Income	Incremental Benefit	
					From Irrigated Condition without Project	From Rainfed Condition without Project
Without Project						
Paddy Direct Seeded						
Irrigated	1st	5760	7750	1790		
	2nd	5200	6530	1330		
Rainfed	1st	4730	6040	1310		
	2nd	4230	5010	780		
Paddy Transplanted						
Irrigated	1st	5730	7750	1820		
	2nd	5420	6530	1120		
Rainfed	1st	4780	6040	1250		
	2nd	4010	5010	1000		
Sugarcane						
Plant Cane		18090	20440	2350		
Ratoon Cane		12560	15480	2920		
Coconut		300	640	340		
With Project						
Paddy Direct Seeded						
	1st	8750	12790	4040	2240	2730
	2nd	8960	13900	4290	3610	4150
Paddy Transplanted						
	1st	8390	12790	4400	2580	3150
	2nd	8640	13900	5260	4150	4270
Tomato		9380	40000	30620		
Corn		5400	11690	6290		
Mung Beans		5100	8000	2910		

COMPARISON OF DRYING COST

	Drying Yard	Drying Machine	
		Flat Type	Rotation Type
Capacity	14.6/2 days 1/	0.7t/7hrs	1.5t/5hrs
Life (years)	20	4	4
Fixed Cost (₱/year)	20340	8427	37640
Valuable Cost (₱/year)	8800-13200	8201	18515
Total Drying Quantity/year	420	70	300
Cost/kg (₱/kg)	0.069-0.08	0.238	0.187

1/ Size of drying yard is 12 x 24 m^2 and the actual drying area is 11 x 23 m^2.

FIG. V - 1

PRESENT CROPPING PATTERN

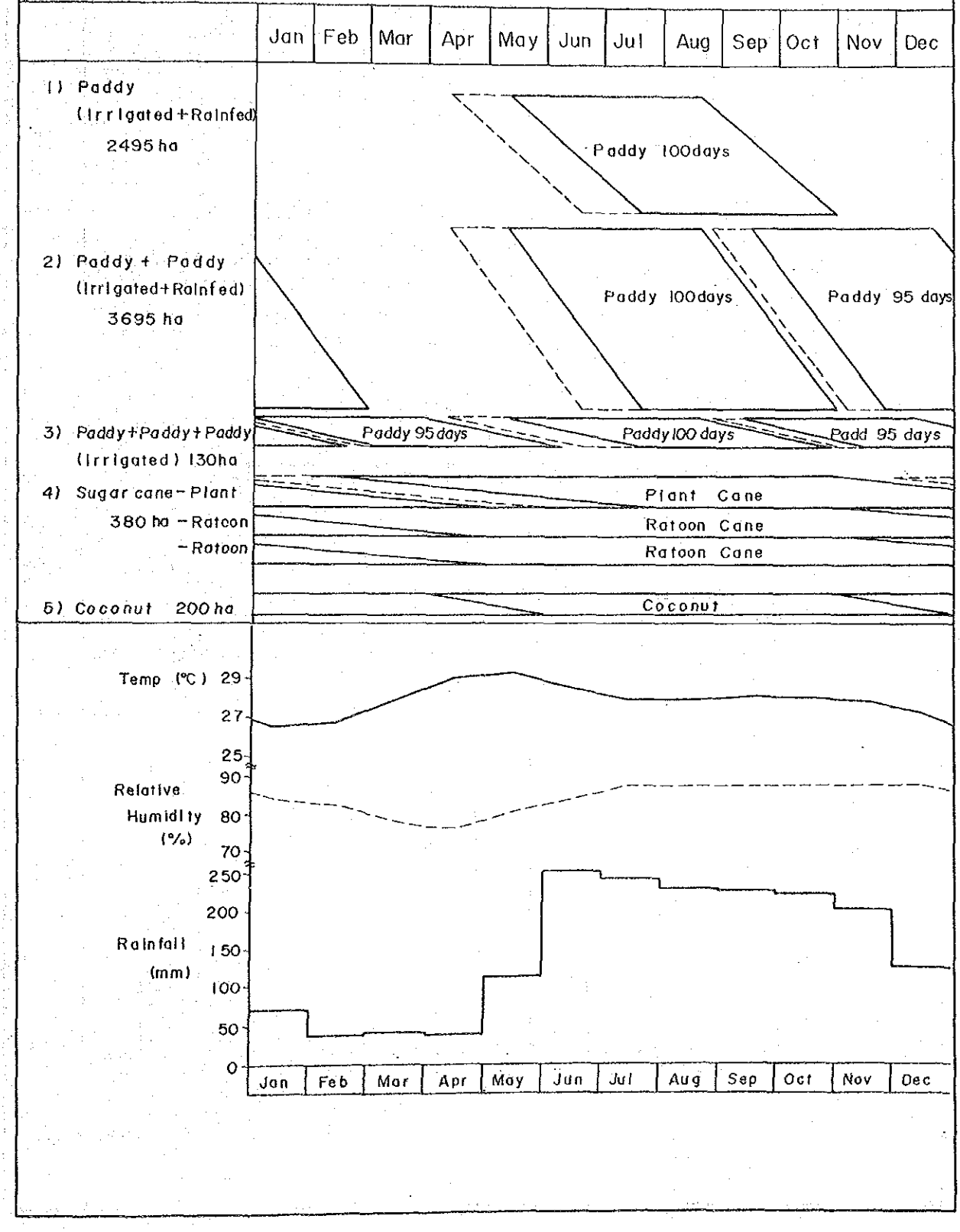
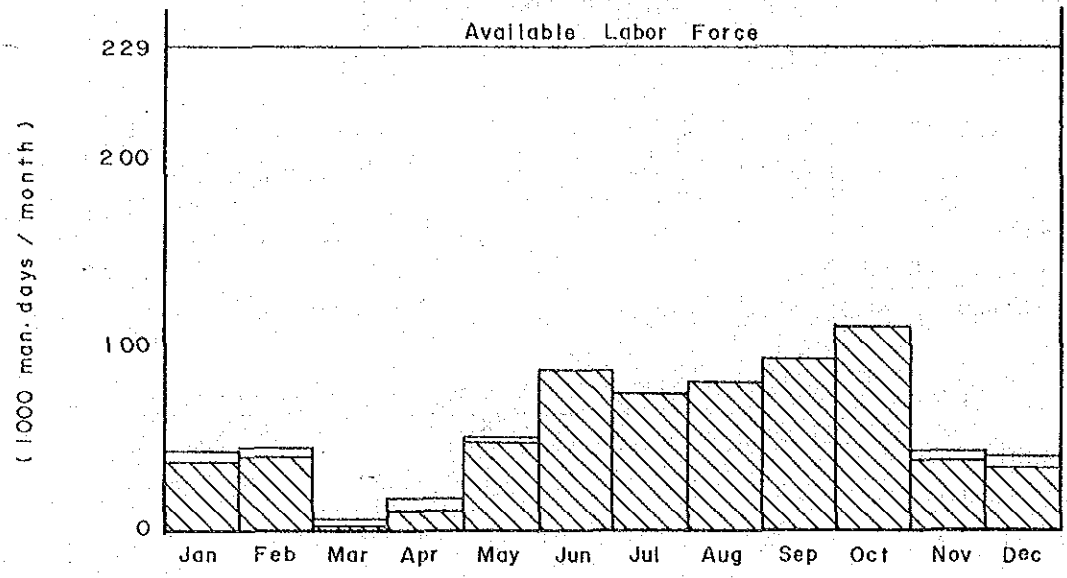
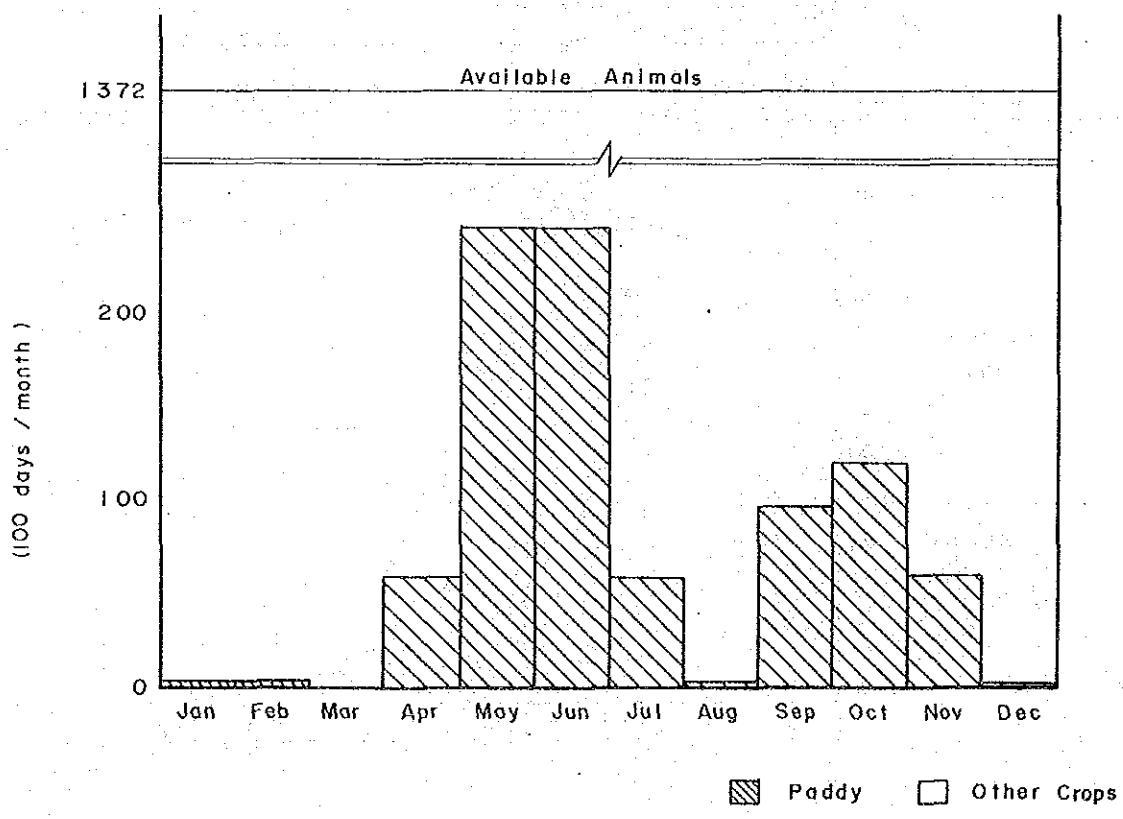


FIG. V-2
FIG. V-3

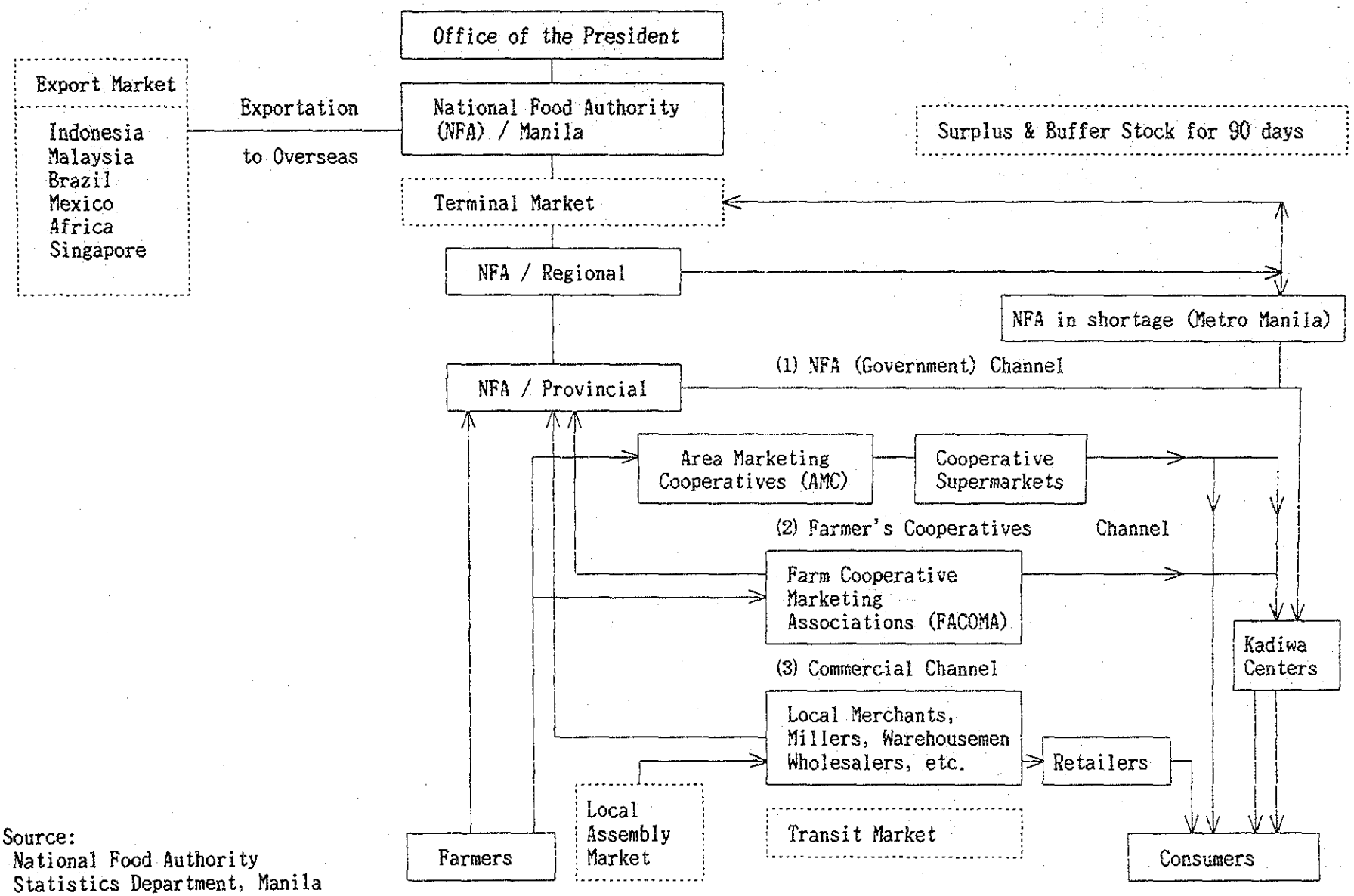
PRESENT LABOR BALANCE



PRESENT DRAFT ANIMAL BALANCE



RICE MARKETING FLOW CHART



Source:
National Food Authority
Statistics Department, Manila

FIG. V - 4

FIG V-5

PROPOSED CROPPING PATTERN

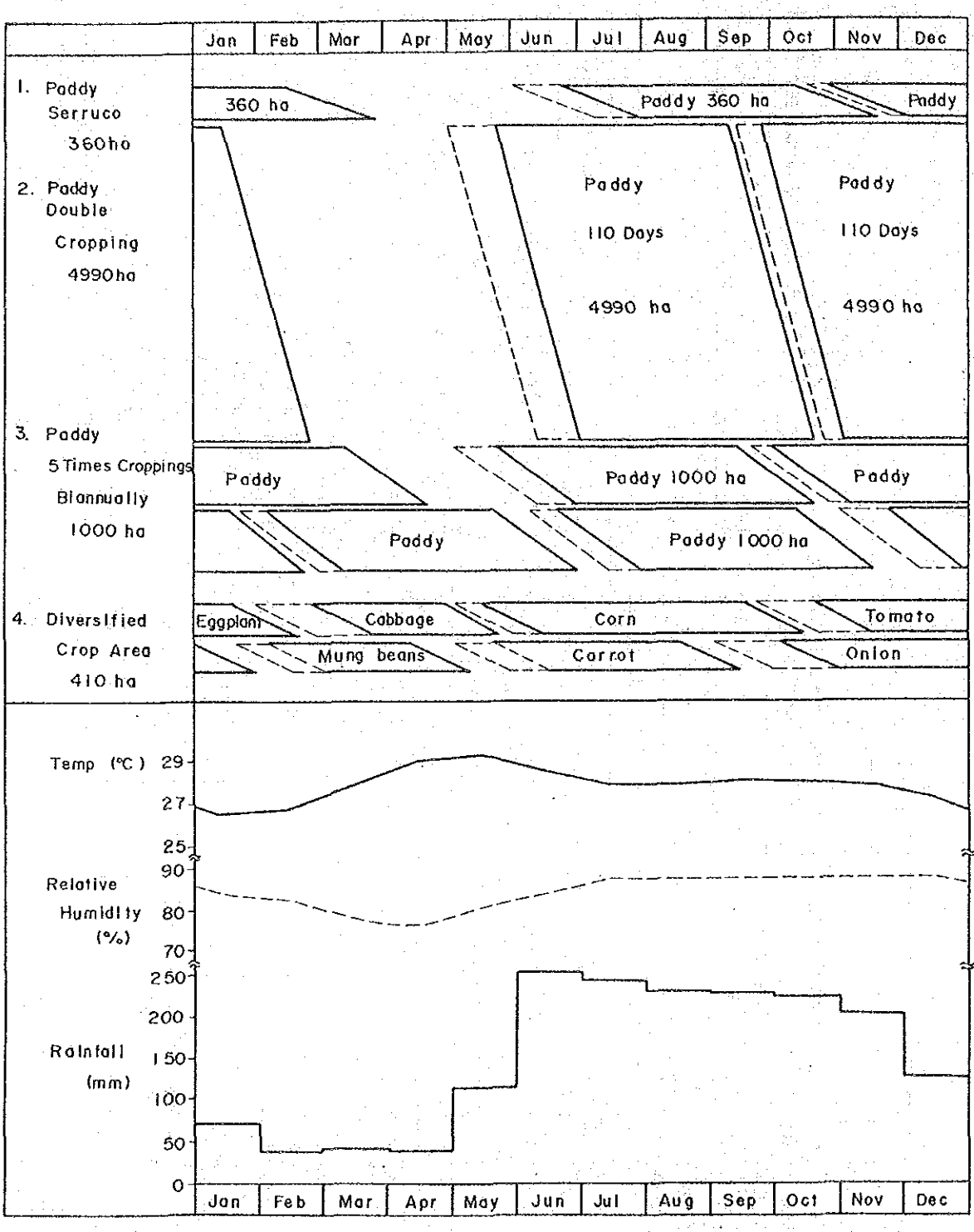


FIG V - 6

PROPOSED CROPPING PATTERN OF DIVERSIFIED CROPS

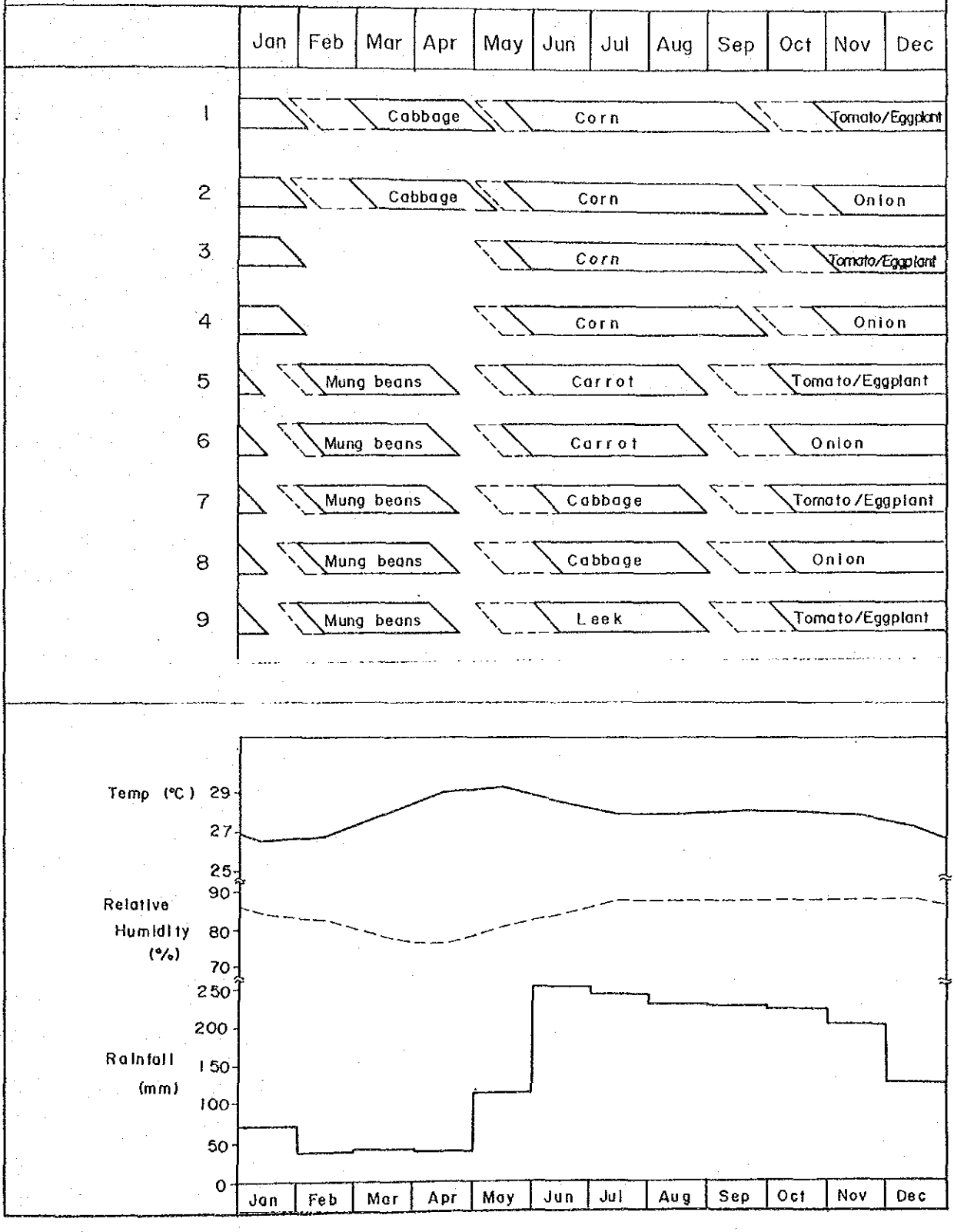


FIG. V - 7

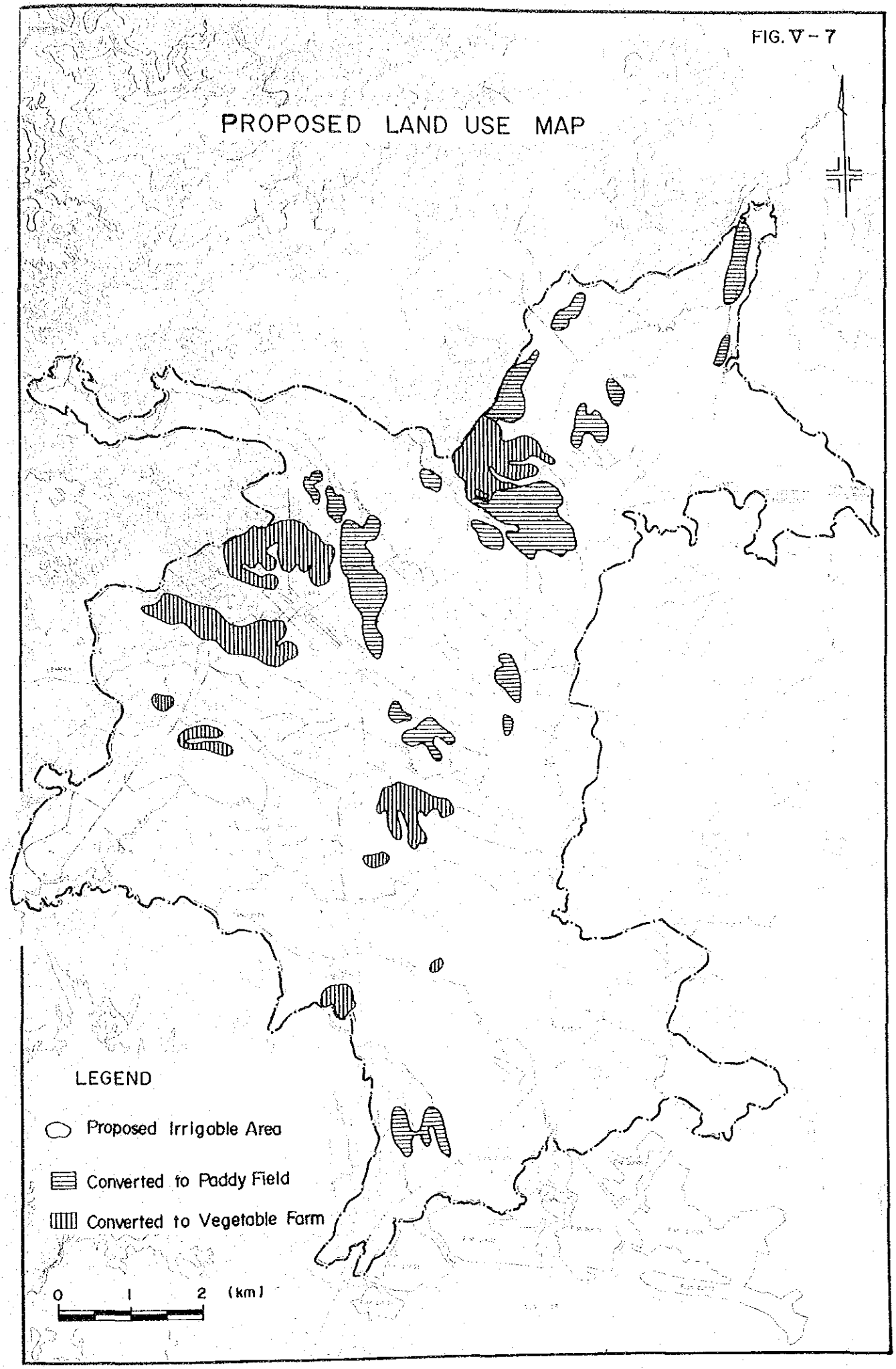
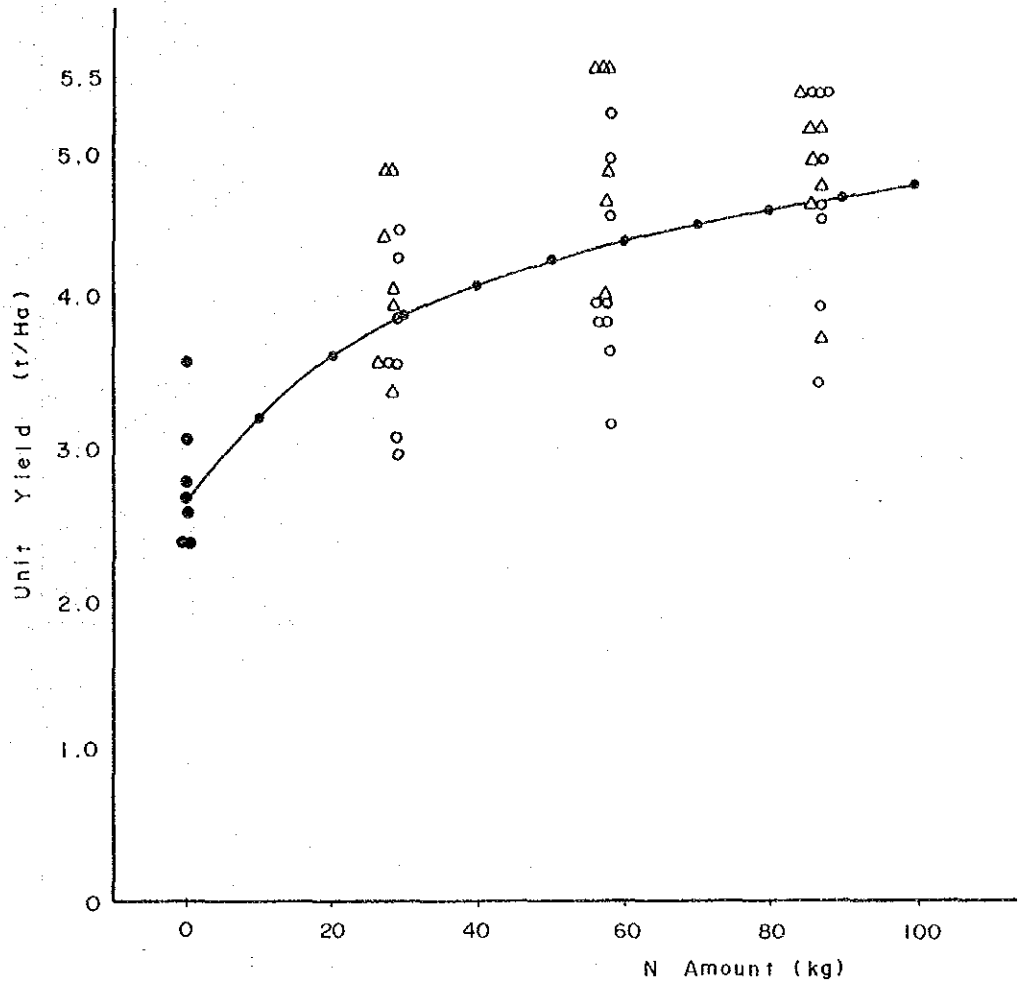

PROPOSED LAND USE MAP
LEGEND
Proposed Irrigable Area
Converted to Paddy Field
Converted to Vegetable Farm
0
1
2
(km)

FIG. V-8

GRAIN YIELD BY FERTILIZER LEVEL



Note : ○ Prilled Urea

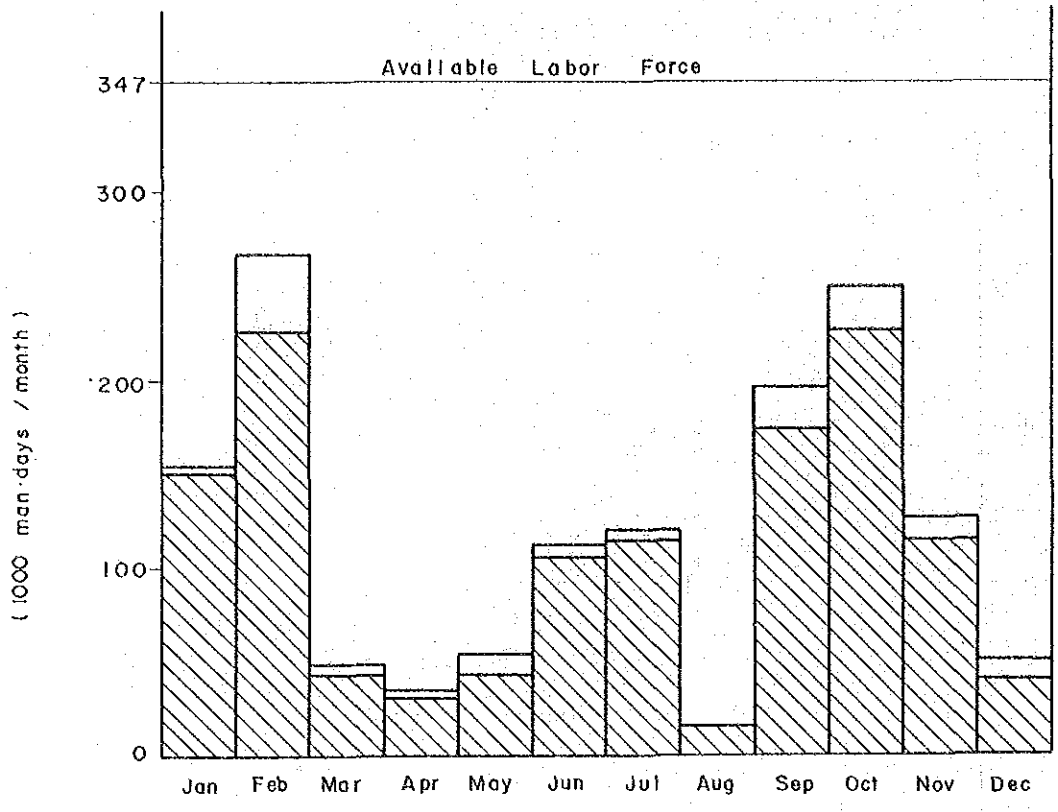
△ Urea Supergranule

● Controlled

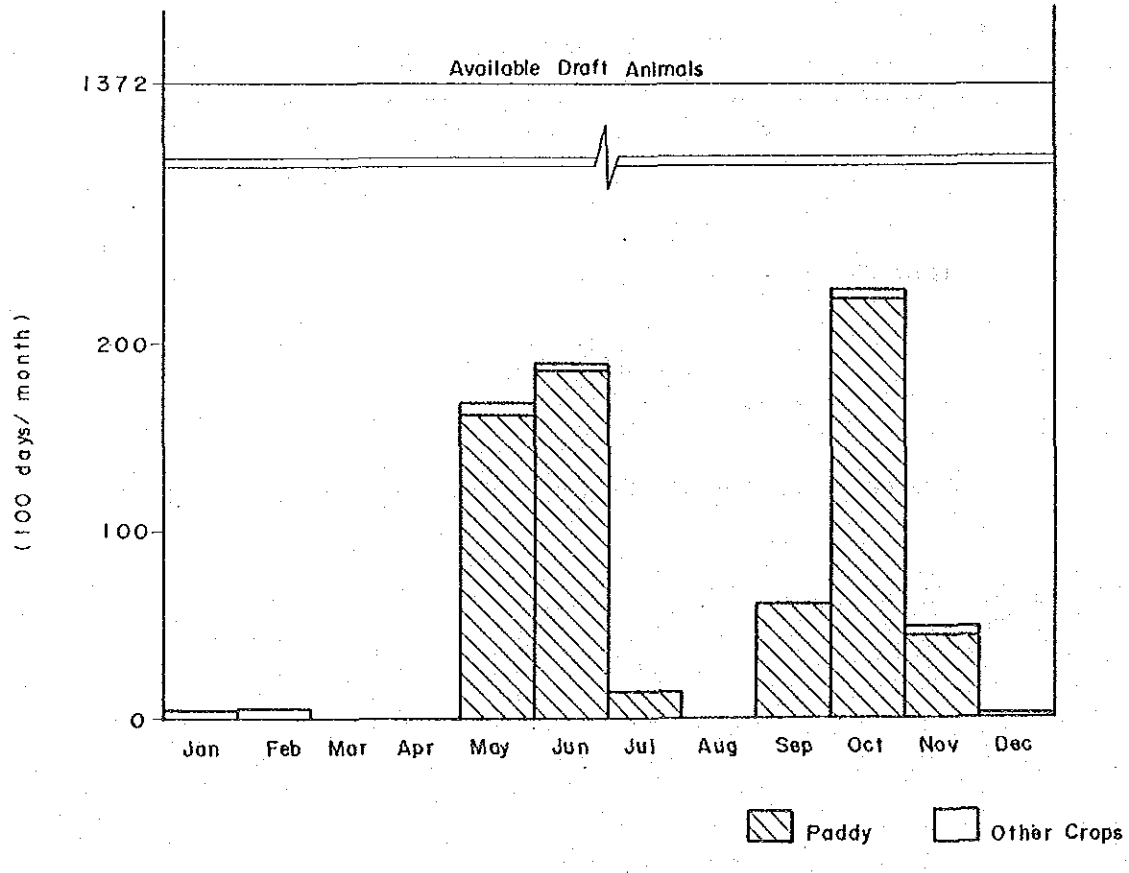
Source : Report of B.S.CIA, P.C. BERNASOR and S.K. DE DATTA

FIG. V-9
FIG. V-10

LABOR BALANCE WITH PROJECT



DRAFT ANIMAL BALANCE WITH PROJECT



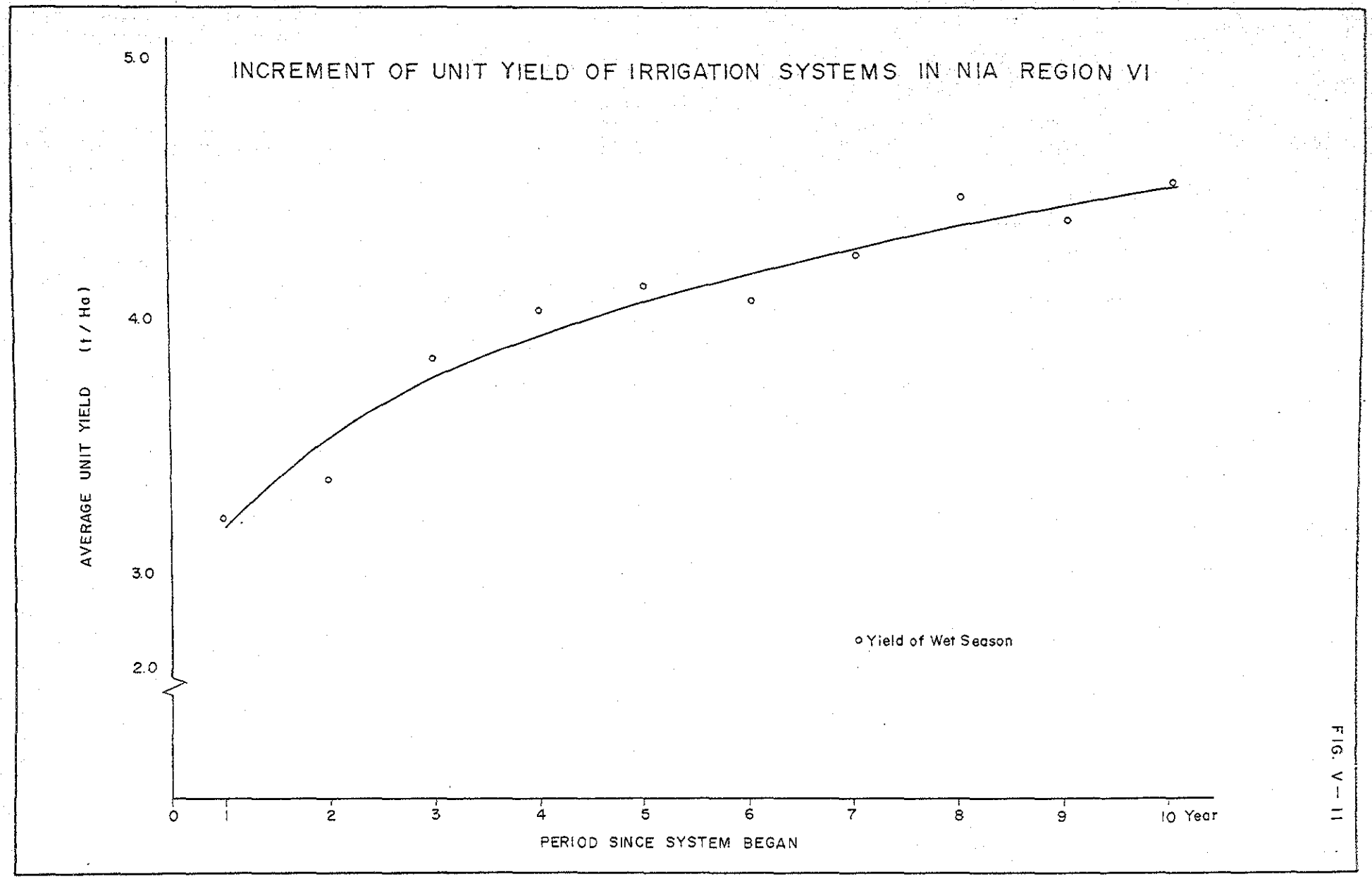
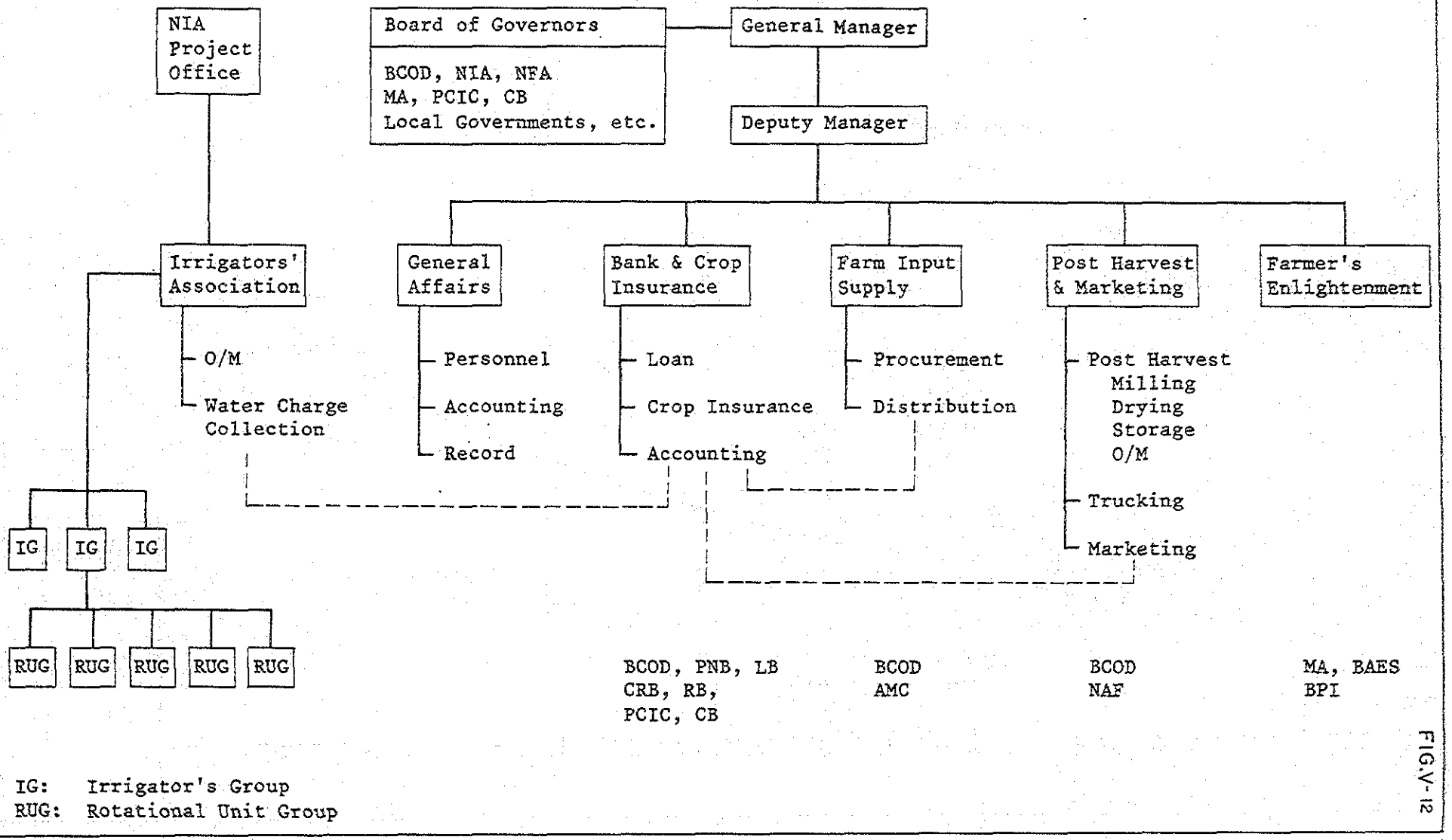

INCREMENT OF UNIT YIELD OF IRRIGATION SYSTEMS IN NIA REGION VI
AVERAGE UNIT YIELD (t / Ha)
5.0
4.0
3.0
2.0
0
1
2
3
4
5
6
7
8
9
10 Year
PERIOD SINCE SYSTEM BEGAN
o Yield of Wet Season

FIG. V – 11

FARMERS COOPERATIVE ORGANIZATION CHART



IG: Irrigator's Group
RUG: Rotational Unit Group

FIG.V-12

APPENDIX VI

WATER RESOURCES DEVELOPMENT

APPENDIX VI

WATER RESOURCES DEVELOPMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX VI

WATER RESOURCES DEVELOPMENT

1. GENERAL

The components which require water resources development under the present Project are irrigation, Integrated Community Center, hydropower generation and domestic water supply. Of the above, irrigation is the main component under the Project, while the remainder are considered as supplementary components. Accordingly, hydropower, Integrated Community Center and rural water supply are planned for inclusion within the irrigation scheme.

The Project area and relevant rivers which have potential for water resources development are illustrated in FIG. VI-1. Basic policy for water resources development under the present Project is maximum utilization of water resources in the Asue Basin itself (the term Asue Basin in this report includes the Gubaton River basin) and water resources development in the Catipayan River basin to compensate potential insufficiencies in water supply inside the Asue Basin.

Utilization of water resources inside the irrigation area itself will facilitate effective implementation of Project components and may also allow for staged development of the Project.

2. IRRIGATION WATER DEVELOPMENT

2.1 Irrigation Water Requirement

2.1.1 General

The basic factors determining irrigation water requirement are evapotranspiration and percolation, while the formulas generally employed to estimate required amounts are as follows:

- Consumptive Use of Crop
  Evapotranspiration + Percolation + Water Requirement for Land Soaking and Land Preparation
- Field Water Requirement
  Consumptive Use of Crop - Effective Rainfall
- Diversion Water Requirement
  Field Water Requirement + Field Losses + Conveyance Losses + Operation Losses

Although crops introduced under the Project include upland crops such as vegetables and corn, rice was conservatively adopted for all areas in the water resources development study considering that the proposed upland crop areas are limited to only 10% of the total proposed area. This will also allow for future change to rice cultivation in the Projects proposed upland crop area. Furthermore, for the 1000ha of the Bakabak diversion dam system area, triple paddy cropping was conservatively adopted in spite of the proposed biannual five paddy croppings.

2.1.2 Consumptive Use of Crops

(1) Reference Crop Evapotranspiration: ETo

On the basis of meteorological data at Iloilo City for a 20-year period from 1964-83, monthly reference crop evapotranspiration was calculated by the Modified Penman Method and the results are tabulated in TABLE VI-1. As discussed in APPENDIX II METEOROLOGY AND HYDROLOGY, for the period from 1964-83, observed pan-evaporation data in Iloilo City is available for 1964, while in the Project area, data is available from 1979. For the purpose of evaluation of adoptability of calculated Iloilo ETo, FIG. VI-2 shows the relation between Iloilo ETo and observed pan-evaporation both at Iloilo City and the Project area.

The Project area's observed pan-evaporation has an extremely small value in March-June 1983 and in January-March 1984. After excluding these unreliable values, monthly average pan-evaporation in the Project area is 118.0mm, while the same period's monthly average Iloilo ETo is 141.2mm resulting in a ratio of 0.84. Since the pan evaporation in the Project area is surrounded by paddy fields, ratio of ETo to pan evaporation was assumed at 0.95 and thus reference crop evapotranspiration in the Project area was estimated by multiplying 0.80 to Iloilo ETo.

(2) Crop Coefficient: Kc

Crop evapotranspiration: ETcrop is defined as ETo x Kc, while Kc indicates the crop factor which varies according to the stage of crop maturation. Again no experimental results with regards to the crop factor were available in the Project area at the time of

study. Therefore, experimental results from Canili and recommended figures from ESCAP in the Southeast Asian region were adopted.

Crop factors for rice adopted in Project calculations are presented below.

CROP FACTOR

Growing Stage	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Kc	0.86	0.85	0.88	0.95	0.99	1.00	0.98	0.92	0.85

(3) Deep Percolation

Deep percolation in paddy during both wet and dry seasons is assumed at 1.5mm/day for the entire Project area as discussed in APPENDIX VII IRRIGATION AND DRAINAGE.

(4) Land Soaking Capacity

Water requirement for land soaking is defined as follows:

- Land Soaking Capacity
  = Topsoil saturation depth x porosity x dryness

Land soaking capacities for dry and wet paddies are assumed as follows:

	Dry	Wet
- Topsoil saturation depth	250mm	250mm
- Porosity	50%	50%
- Dryness	60%	70%
- Land soaking capacity	75.0mm	87.5mm

(6) Consumptive Use of Crops

On the basis of the value assumed above, a 10-day total consumptive use of crops has been calculated for a 20-year period from 1964-83 under the principal irrigation method for 200% paddy cultivation shown in FIG. VI-3. For the water resources development study, 13 cases of consumptive use of crop have been calculated adopting different commencement dates of first paddy cultivation from March 1st to July 1st for every 10-day period. The calculated total consumptive use of 1st and 2nd paddy for 1964-83 are tabulated in TABLE VI-2.

Average total consumptive use of crops for each crop period is shown in the following table.

20-YEAR AVERAGE CONSUMPTIVE USE FOR DOUBLE CROPPING

Unit: mm

Commencement date of 1st Paddy	Consumptive Use		
	1st Paddy	2nd Paddy	Total
March 11	687	530	1217
March 21	669	528	1197
April 1	649	527	1176
April 11	634	526	1160
April 21	620	528	1148
May 1	609	531	1140
May 11	601	536	1137
May 21	595	542	1137
June 1	591	550	1141
June 11	590	560	1150
June 21	590	573	1163
July 1	590	588	1178

In the case of triple paddy cropping, April 21 was assumed as the commencement date for 1st cropping as shown in FIG. VI-3. Calculated consumptive use of crop for triple cropping is tabulated in TABLE VI-3 and summarized in the following table.

20-YEAR AVERAGE CONSUMPTIVE USE FOR TRIPLE CROPPING

Unit: mm

Commencement date of 1st Paddy	Consumptive Use			
	1st Paddy	2nd Paddy	3rd Paddy	Total
April 21	577	483	514	1574

2.1.3 Field Water Requirement

In the study, standards for effective rainfall and flooding depth were determined as follows:

- Effective Rainfall

  Daily rainfall less than 5mm is not effective
  Daily rainfall equal to or more than 5mm is fully effective

- Flooding depth

  Flooding depth was determined and is presented in the following table.

FLOODING DEPTH

Unit: mm

Crop Growing Stage	Minimum Flooding Depth	Maximum Flooding Depth
Land Preparation	0	150
Early Planting	0	0
Crop Maintenance	20	100
Drainage	0	0

A 10-day total field water requirement for a 20-year period from 1964-83 was calculated for the same cases with the calculation of consumptive use and the diversion water requirement obtained is discussed below.

2.1.4 Diversion Water Requirement

Irrigation efficiency for the calculation of diversion water requirement is assumed as tabulated below.

IRRIGATION EFFICIENCY

Losses	Field	Conveyance	Operation	Overall
Wet Season	0.70	0.90	0.90	0.57
Dry Season	0.75	0.90	0.90	0.61

Considering the above efficiencies in relation to field water requirement, a 10-day total diversion water requirement of each crop for double and triple cropping for a 20-year period from 1964-83 was calculated and is tabulated in TABLE VI-4 and VI-5. The average value is presented in the table below.

As shown in the table, the minimum value with the commencement date of 1st Paddy cultivation on May 1st was adopted for annual diversion water requirement. Optimum cropping calendar for water resources development is determined based on the required Catipayan reservoir capacity as discussed later and the optimum case coincided to the same date as the minimum annual diversion water requirement.

20-YEAR AVERAGE DIVERSION WATER REQUIREMENT FOR DOUBLE CROPPING

Unit: mm

Commencement date of 1st Paddy	Diversion Water Requirement		
	1st Paddy	2nd Paddy	Total
March 11	711	336	1047
March 21	641	340	981
April 1	575	354	929
April 11	512	375	887
April 21	463	393	856
May 1	424	422	846
May 11	390	462	852
May 21	370	601	971
June 1	355	565	920
June 11	350	625	975
June 21	351	684	1035
July 1	363	744	1107

20-YEAR AVERAGE DIVERSION WATER REQUIREMENT FOR TRIPLE CROPPING

Unit: mm

Commencement date of 1st Paddy	Diversion Water Requirement			
	1st Paddy	2nd Paddy	3rd Paddy	Total
April 21	460	356	701	1517

2.2 Asue Basin Water Source Development Study

2.1.1 General

For the irrigation water development plan, possible water resources development alternatives inside the Asue Basin were first examined. The alternative plans which are studied in this section were established considering no introduction of water from the Catipayan River Basin. The plans thus differ from the Asue Basin development scheme under the Project which was developed on the premise of basic considerations to utilize water resources of the Catipayan Basin. The plan which embraces the introduction of water from the Catipayan River was studied in section 2.3 hereafter.

Major rivers in the Asue Basin are the Asue, Serruco and Gubaton rivers. In this section, a plan with a diversion dam at an appropriate site on the Asue River was studied, as well as a plan with a storage dam on the Serruco River. The study results which are presented hereinafter revealed that the development scheme with water resources within the Asue basin is not appropriate since only 25 to 40% of the area can be irrigated. This creates discrepancies in living standards in the rural area and accordingly, despite the fact that the scheme requires less construction cost and presents higher benefit/cost ratio, the same is unsuitable. In addition, by the said alternative plans, incorporation of hydropower and domestic water supply is impossible.

2.2.2 Asue River Diversion Dam Plan

(1) Catchment and Irrigable Area

As discussed in APPENDIX II METEOROLOGY AND HYDROLOGY, the Asue River has a total catchment area of 140km^2 at the mouth of the river. However, the confluence of tributaries is mostly concentrated in the mid to downstream portion, and hence the catchment area in the upstream portion is limited.

In order to find an appropriate diversion dam site on the Asue River, the relation between catchment and topographically determined irrigable area along the Asue River was studied as presented in FIG. VI-4. As shown in the figure, the catchment area increases significantly after the confluence with Dahis Creek and

the Serruco River. Catchment downstream of the confluence points of Dahis, Padios and the Serruco River is 54.4km^2, 70.3km^2 and 116.0km^2, respectively, while the topographically determined irrigable area at each point is 1,470ha, 1,040ha and 1,000ha.

(2) Irrigation System and Irrigable Area

Based on the relation between the catchment and irrigable area discussed above, the upstream portion from the confluence of the Dahis Creek appears to have insufficient water supply. The irrigation system under this alternative plan accordingly focused on the construction of a diversion dam between the confluences of the Dahis and Serruco rivers as presented in FIG. VI-5. In addition to the diversion dam on the Asue River, diversion dams on the Serruco and Gubaton rivers are also considered in this plan.

As discussed in 2.3.3, Optimum Cropping Calendar, the optimum commencement for 200% paddy cultivation for the Serruco area is June 1st. This date is applicable for the diversion dam scheme in the entire area without a storage dam scheme.

In the case of a June 1st cultivation commencement date and utilization of the water resources of the Serruco River, double cropping (200% paddy) for 360ha is attainable on the basis of a 5-year return period drought. The catchment area of the Serruco River at the diversion dam is 22.9km^2. Accordingly the irrigable area determined from the water resources availability per unit catchment area is 15.7ha/km^2.

The unit discharge of the Serruco River, as analysed in APPENDIX II under METEOROLOGY AND HYDROLOGY, was estimated on the basis of 1.25 times the unit discharge of the Asue River at the Gauging station in Barangay Aguirre. Irrigable area by water availability per unit catchment area at the Asue gauging station is thus estimated at 12.6ha/km^2.

Based on the above irrigable area per unit catchment area irrigable area at each point along the Asue, Serruco and Gubaton rivers was calculated as shown in the table on the following page.

The said table also shows the topographically determined irrigable area.

IRRIGABLE AREA BY WATER AVAILABILITY AND TOPOGRAPHY

Site	River	Catchment (km^2)	Catchment/ Runoff Coefficient	Irrigable Area (ha)	
				By Water Availability	By Topography
Serruco D.D.	Serruco	22.9	22.9/1.25	360	2,000
Gubaton D.D.	Gubaton	18.8	18.8/1.25	296	1,600
Asue D.D.	Asue	13.7	13.7/1.00	173	6,170
Dahis Confluence Downstream	Asue	54.4	10.0/1.00 44.4/1.37	892	1,470
Padios Confluence Downstream	Asue	70.3	10.0/1.00 60.3/1.37	1,167	1,040
Serruco Confluence	Asue	116.0	10.0/1.00 22.9/1.25 83.1/1.37	1,921	1,000

As shown in the above table, the optimum diversion dam site on the Asue River is just downstream of the Padios Creek confluence which has an irrigable area of 1,040ha. In the case of the Dahis River confluence and the Serruco River confluence, irrigable area is only 892ha and 1,000ha, respectively.

On the basis of the results discussed above, a plan to construct a diversion dam just downstream of Padios Creek was proposed as a development scheme within the Asue Basin.

(3) Evaluation

The above plan was evaluated on the basis of benefit/cost ratio (B/C) and net present value (B-C). Construction cost for the same was roughly estimated at ₱83.1 million as shown on the following page.

Unit: ₱ million

Item	Amount
Dimension Dam	
- Gubaton	19.5
- Padios	19.5
- Irrigation Canal	
- Gubaton system (Main 2.6km)	5.8
- Padios system (Main 6.8km)	15.2
- On-Farm Development	
- Serruco system (360ha)	0.4
- Gubaton (300ha)	0.4
- Padios system (1,040ha)	1.3
- Preparatory Works, Administration and Engineering, Others	21.0
Total	83.1

Anticipated benefit under this plan was calculated from the irrigable area of each diversion dam system and assuming a projected yield of 2.0t/ha for wet season and 2.8t/ha for dry season and an economic value of ₱2,985/t. An annual benefit of ₱24.4 million was thereby determined.

Adopting the present worth of an annuity factor of 9.915 assuming a discount rate of 10% and a project life of 50 years, present worth of annual benefit was estimated at ₱241.9 million.

Benefit/cost ratio and net present value were finally calculated as follows:

B/C = 241.9/83.1 = 2.91

B-C = 241.9-83.1 = ₱158.8 million

In the same manner, B/C and B-C for the proposed Asue/Catipayan scheme (final plan) were obtained as:

B/C = 1,004/627.5 = 1.60

B-C = 1,004/627.5 = ₱376.5 million

Although the B/C of the inner Asue basin development plan is higher than the proposed scheme, in the case of this plan only 1,700ha of the Project's entire irrigable area of 6,760ha is benefited. This means that development of the Asue Basin water

resources is applicable to only one quarter of the Project area, and consequently the same will create discrepancies in the living standards of the area. In addition, the net present value of the benefit of this case is less than half of the proposed Asue/Catipayan scheme.

As a result, a development plan using the water resources inside the Asue Basin was concluded to be inappropriate for the proposed Project.

2.2.3 Serruco Reservoir Plan

(1) Irrigation System

An alternative plan which proposes a storage dam on the Serruco River was studied and the rough plan for the same is presented in FIG. VI-6. In this plan, to effectively utilize the water resources of the Asue River, a diversion dam just downstream of the confluence of the Dahis Creek on the Asue River was proposed in addition to the Serruco dam (Refer to 2.2.2, Asue River Diversion Dam Plan). A diversion dam on the Gubaton River is also proposed under this plan.

Water released from the Serruco storage dam to the Serruco River will be diverted at the existing Serruco diversion dam, and the Serruco area will be irrigated through the right and left main canals. In case water in the Gubaton and Asue rivers is insufficient to cover the service area, water will be supplemented from the Serruco storage dam through the Serruco diversion dam and the Serruco right main canal to the Gubaton area and through the newly proposed by-pass canal to the Dahis area.

The main features of the irrigation system under this plan are:

Gubaton system
- Gubaton diversion dam catchment area: 18.8km^2
- Irrigable area: 950ha

Serruco system
- Serruco storage dam catchment area: 20.4km^2
- Serruco diversion dam catchment area: 22.9km^2
- Irrigable area: 360ha

Dahis system
- Dahis diversion dam catchment area: 54.4km^2
- Irrigable area: 1,470ha

(2) Water Balance Study

Water balance study for the above irrigation system was carried out and the results are presented in TABLE VI-6. The required effective storage capacity of the Serruco storage dam was calculated at 7.6 MCM to supply irrigation water to 2,780ha for 200% paddy cultivation.

(3) Evaluation

Benefit cost ratio (B/C) and net present value (B-C) were calculated in the same manner as presented above.

Unit: ₱ million

Item	Amount
Serruco Dam	170.0
Diversion Dam	
- Gubaton	19.5
- Dahis	18.0
Irrigation Canal	
- Serruco-Dahis short cut (l=1.1km)	8.0
- Gubaton system (Main 4.9km)	10.9
- Dahis system (Main 10.5km)	23.5
On-Farm Development	
- Serruco system (360ha)	0.4
- Gubaton system (950ha)	1.1
- Padios system (1,470ha)	1.8
- Preparatory Works, Administration and Engineering, Others	86.0
Total	339.0

Benefit ₱39.8 million/year:present worth ₱394.6 million

Benefit cost ratio and net incremental benefit were accordingly calculated as follows:

B/C = 394.6/339.2 = 1.16

B-C = 394.6 - 339.2 = ₱55.4 million

The above results show that the Serruco storage dam scheme is not advantageous due to the low benefit and cost ratio and also the limited irrigable area of 2,780ha.

Another constraint for this scheme is that the Serruco River Basin is geologically composed predominantly of diorite and the weathered zone of the same is developed to a significant depth. This means that despite extensive grouting during dam construction, seepage in the reservoir area may not be eliminated.

2.3 Asue/Catipayan River Water Source Development Study

2.3.1 Basic Considerations

The studies for water resources development inside the Asue Basin revealed that irrigation development using only the water resources of the Asue Basin is insufficient for development of the Project area. Accordingly, in addition to the Asue Basin, another possible water resource, the Catipayan River, was studied for potential to supplement insufficiencies in irrigation water supply.

Again in this case, leading natural flow of the Catipayan River to the Asue Basin was found to be insufficient for the conceived development scale as discussed in APPENDIX XIII as STAGE DEVELOPMENT. Subsequently premising the construction of a dam on the Catipayan River, alternative and optimization studies were undertaken.

2.3.2 Irrigation System

Irrigation system i.e. layout of diversion dams and alignment of the main canal route under the present Project is proposed as shown in FIG. VI-7. The system was formulated in due consideration of optimum effective utilization of the water resources in the Asue Basin.

Main features of the proposed irrigation system are presented on the following page.

MAIN FEATURES OF THE PROPOSED IRRIGATION SYSTEM

Diversion Dam	River	Catchment Area (km^2)	Main Canal	Command Area (ha)
Serruco	Serruco	22.9	Right M.C.	175
			Left M.C.	185
			sub-total	(360)
Gubaton	Gubaton	18.8	Gubaton M.C.	520
Asue	Asue	13.7	Asue M.C.	2,250
			Eastern M.C.	2,400
			sub-total	(4,650)
Bakabak	Asue	116.0	Right M.C.	610
			Left M.C.	390
			sub-total	(1,000)
Trans-diversion Canal	Catipayan	-	Trans-diversion Canal	190
KABSAKA Area	-	-	-	40
Total area				6,760

The proposed irrigation system has been formulated to supplement water shortages as much as possible. The water supply system of each diversion dam system is briefly described below.

- Serruco area: 360ha

  This area is considered as enriched area under the Project, and the same was planned with an independent diversion dam system utilizing the existing diversion dam.

  This area of 360ha was determined on the basis of 200% paddy cultivation with a 5-year return period drought, and no supplementation of water shortage from the other systems is considered. However, surplus water in the Serruco River can be supplied to the Gubaton and Asue South areas through the Serruco right main canal.

- Gubaton area: 520ha

  Irrigation water is mainly supplied from the proposed Gubaton diversion dam through the Gubaton main canal. In case of water shortage, supplementation will be made from the Serruco diversion dam through the Serruco right main canal and diversion canal (1) and from the Asue diversion dam through the Asue main canal and diversion canal (1).

If surplus water is available at the Gubaton diversion dam, the same will be supplied to the Asue South area through the diversion canal (2).

- Asue South area: 426 ha

  The area is located at the southern tip of the Asue main canal and will be irrigated through the lateral canal D-L1 which branches off from the Asue main canal. Although the area is under the Asue main canal, surplus water in the Gubaton and Serruco rivers will be preferentially supplied to this area in order to effectively utilize water resources in the Asue Basin.

- Asue Main and Eastern area: 4,224ha

  The area will be irrigated by the Asue diversion dam through the Asue and Eastern main canals. Water shortage will be compensated by supply from the proposed Catipayan reservoir through the trans-diversion canal.

- Bakabak area: 1,000ha

  The area will be irrigated by the Bakabak diversion dam. The Bakabak diversion dam will be constructed immediately downstream of the confluence of the Serruco River, and return flow from the upstream area will be utilized for this area.

- Asue Upstream/Catipayan area: 190ha

  The area will be directly irrigated through the proposed trans-diversion canal.

- KABSAKA area: 40 ha

  This area is considered as an enriched area under the Project, and no supplementation of irrigation water is planned.

2.3.3 Optimum Cropping Calendar

Water supply for the Serruco area fully relies on the natural flow of the Serruco River as discussed previously. Water deficits in the main irrigation area, on the other hand, will be supplemented by the proposed Catipayan reservoir. Effective utilization of water in these areas must accordingly be analized seperately. In this section, optimum timing for commencement of paddy cultivation was evaluated for the Main area and the remaining Serruco area.

(1) Serruco Area

As discussed previously, the Serruco area is considered as an independent diversion dam system under the Project. Water balance study was made for the 20-year period from 1964-83 for 200% paddy

cultivation with varying commencement dates for 1st paddy cultivation.

Irrigable area for 1st and 2nd cropping with a 5-year return period drought was obtained for different cases and illustrated in FIG. VI-8. As shown in the figure, the maximum irrigable area is for 1st paddy cultivation commencement on June 1st. In this case, 5-year return period irrigable area is 360ha for both 1st and 2nd crops, and this fact shows that the 360ha area for the Serruco system is appropriate.

As a result, June 1st was selected as the commencement date for the Serruco area cropping calendar.

(2) Main Area

For the main area i.e. the irrigation area under the Project except 1,400ha of Bakabak, Serruco and KABSAKA area, optimum timing of 1st paddy cultivation commencement was evaluated on the basis of the required storage capacity of the proposed Catipayan dam.

Required storage of the Catipayan dam was calculated by water balance study for the 20-year period from 1964-83 with a 10-year return period drought and varying commencement dates for 1st paddy cultivation. The results are presented in FIG. VI-9. As shown in the figure, the design years i.e. a year with the closest required storage capacity to the probable excessive value of a 10-year return period varies according to variation in the cropping calendar. Although the required storage capacity of the Catipayan reservoir was obtained, the calculations are not detailed and do not include rainfall/evaporation of the reservoir area. Calculations are presented in 2.3.4 Water Balance Study and Reservoir Operation.

The minimum storage capacity was obtained for the 1st crop cultivation commencement date on May 1st with the design year of 1968. As a result, May 1st was determined as the commencement date of the cropping calendar for the main area.

(3) Bakabak Area

Triple cropping of paddy starting on April 21st was conservatively assumed for water resources evaluation. Although

detailed discussions are presented later, the area of 1000ha can be irrigated on the 10-year return period drought basis without increasing required storage capacity of the proposed Catipayan reservoir.

2.3.4 Water Balance Study and Reservoir Operation

(1) Calculation Rule

On the basis of the determined cropping calendar, water balance study was carried out on a 10-day basis for the 20-year period from 1964-83. The calculation rule is presented in FIG. VI-10.

(2) Return Flow

At the proposed Bakabak diversion dam, return flow from the Serruco area and a portion of the Asue area can be used. The area where drainage will be led to the Asue River upstream of the proposed Bakabak diversion dam was obtained at 3,738ha. The utilizable return flow rate is assumed at 25% in this study on the basis of discussions presented below.

For the dry season, average field water requirement is assumed at 5mm/day and percolation rate at 1.5mm/day, with a total requirement of 6.5mm/day for paddy. Considering the irrigation efficiency in dry season of 0.61 against the above total requirement of 6.5mm/day, the diversion water requirement will be 10.7mm/day (6.5/0.61).

Overall loss in the field was estimated at 4.2mm/day (10.7-6.5), and when percolation is considered as part of field loss, the loss is 5.7mm/day (4.2+1.5). The value of 5.7mm/day corresponds to 54% of the diversion water requirement of 10.7mm/day (5.7/10.7). If actual loss is assumed conservatively at 50% of 5.7mm/day, the remaining 2.8mm/day will return to rivers as surface flow and seepage water.

Considering the above characteristics of water in the paddy field, and also referring to experimental results in Southeast Asia, the return flow rate in the paddy field was assumed at 25% in

the study. However, the results of water balance study discussed later revealed that even in the standard year 1967-68 for the Catipayan reservoir capacity determination, a maximum return flow of only 13.0% in the Asue area was actually used at Bakabak diversion dam in the last 10-day period of May 1968.

(3) Design Year for Reservoir Capacity

As discussed previously in section 2.3.3, Optimum Cropping Calendar, the design year for Catipayan reservoir capacity was designated as 1968 on the basis of a 10-year return period drought. And the Catipayan reservoir capacity was determined to just satisfy the irrigation supply for the service area.

(4) River Maintenance Flow

River maintenance flow was not considered in the calculation in order to maximize utilization of available river water. Detailed discussions on river maintenance flow are presented in APPENDIX XV as ENVIRONMENTAL IMPACT.

(5) Water Balance Result

Water balance calculation was carried out for the 20-year period of 1964-83 for 10-day intervals. Water balance of each diversion dam system for every 10-day period from September 1967 to August 1968 is presented in TABLE VI-7 and FIG. VI-11 and summarized in the following table. The detailed results for a 20-year period are presented in the DATA BOOK.

SUMMARY OF WATER BALANCE STUDY

Unit: MCM

Month	Year	Asue Diversion Dam System			Catipayan Trans-diversion		
		River Discharge	Water Requirement[1/]	Surplus/ Deficit	River Discharge	Water Requirement	Surplus/ Deficit
Sep.	1967	1.500	3.857	-2.356	5.348	2.987	2.361
Oct.		1.686	5.260	-3.575	9.476	3.811	5.665
Nov.		1.820	3.047	-1.227	8.068	1.364	6.704
Dec.		0.966	9.795	-8.829	2.533	9.265	-6.732
Jan.	1968	0.470	4.431	-3.961	1.579	4.157	-2.578
Feb.		0.321	0.036	0.285	1.155	0.002	1.153
Mar.		0.300	0	0.300	0.957	0	0.957
Apr.		0.247	0	0.247	0.719	0	0.719

con't

Unit: MCM

Month Year	Asue Diversion Dam System			Catipayan Trans-diversion		
	River Discharge	Water Requirement 1/	Surplus/ Deficit	River Discharge	Water Requirement	Surplus/ Deficit
May	0.216	9.759	-9.543	0.716	9.932	-9.216
Jun.	0.466	8.159	-7.693	3.596	8.030	-4.434
Jul.	1.192	2.471	-1.279	8.050	1.390	6.660
Aug.	2.204	0.215	1.990	13.548	0.010	13.538

1/ includes supplementation water to the Gubaton system

From the water balance study, the irrigation water source for each diversion dam system was obtained and summarized as in the following table.

SOURCE OF IRRIGATION WATER
(Sep. 1967 - Aug. 1968)

Unit: MCM & %

Diversion Dam System	Total Diversion Water Requirement Without Rainfall 1/	Rainfall	River				
			Serruco	Gubaton	Asue	Catipayan	R.F 2/
Serruco System (360ha)	7.786 MCM 100.0%	3.672 47.2	4.114 52.8	-	-	-	-
Gubaton System (520ha)	10.852 MCM 100.0%	5.305 48.9	0.760 7.0	4.301 39.6	-	0.486 4.5	-
Asue System (4,650ha)	97.055 MCM 100.0%	47.439 48.9	0.951 1.0	2.287 2.4	12.771 13.2	33.607 34.5	-
Bakabank System (1,000ha)	27.923 MCM 100.0%	9.900 35.5	-	-	17.047 61.1	-	0.976 3.4
Trans-diversion Direct Turnout (190ha)	3.966 MCM 100.0%	1.938 48.9	-	-	-	2.028 51.1	-
Total (6,720ha) 3/	147.582 100.0	68.254 46.2	5.825 3.9	6.588 4.5	29.818 20.2	36.121 24.5	0.976 0.7

1/ including irrigation loss (actual effective rainfall/irrigation efficiency)

2/ Return flow

3/ Not including KABSAKA area

Maximum irrigation water discharge for the major canals on the basis of 10-day water balance was obtained as tabulated below.

10-DAY BASE MAXIMUM IRRIGATION WATER

Unit: m^3/sec

Canal	Head of Canal	Tail of Canal
Asue Main	3.01	0.82
Serruco Right Main	0.52	0.38
Diversion Canal (1)	0.99	0.50
Diversion Canal (2)	0.43	0.43
D-L1	0.51	0.51
Gubaton Main	0.95	-
Trans-diversion Canal	6.00	5.90

(6) Reservoir Operation

On the basis of required water supply volume from the Catipayan reservoir, the gross storage capacity of 27.9 MCM including the design sediment volume of 6.7 MCM was obtained as the required Catipayan reservoir capacity for the irrigation scheme. Gross storage capacity of the Catipayan reservoir under the Project however, was determined at 28.2 MCM including the domestic water supply scheme as discussed in 4. RURAL WATER SUPPLY.

Reservior operation for the 20-year period from 1964-83 for every 10-day period is presented in FIG. VI-12, while detailed results of reservoir operation for the scheme not including domestic water and hydropower release are presented in the DATA BOOK. Major values of reservoir operation are presented below.

20-year average value (MCM)

- Catipayan river discharge (inflow): 72.288
- Rainfall-evaporation in reservoir : 1.034
- Irrigation release : 29.116 (39,7% of inflow)
- Spillover : 44.205 (60.3% of inflow)
- Irrigation water deficit : 0.800 (2.3% of demand)

3. HYDROPOWER GENERATION

3.1 Basic Considerations

As discussed in APPENDIX IX RURAL DEVELOPMENT, hydropower development under the Project is basically considered as a supplementary component, and thus it will be subject to the irrigation water diversion plan. Accordingly, the hydropower component has been planned so as not to interfere with the the given storage capacity of the irrigation diversion plan.

Water which will be used in hydropower generation will therefore be subject to irrigation water requirement. However, in cases where there is surplus water in the reservoir the same will be effectively utilized for hydropower generation.

3.2 Reservoir Operation

In order to effectively utilize reservoir capacity, the optimum restricted water level i.e. the water level above which reservoir water can be used for hydropower generation, was determined after trial simulation as presented in the table below.

Restricted Water Level (Capacity)

Unit : MCM

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25.5	25.0	25.4	26.0	23.5	11.6	17.9	11.7	26.2	18.7	28.2	27.0

Reservoir operation with water release for hydropower generation under the conditions of the above restricted water level is presented in FIG. VI-12 and the detailed results are presented in the DATA BOOK. In this case, a gross storage capacity of 28.2 MCM was adopted considering the water release for Sara Waterworks which is discussed later. Major values of reservoir operation are presented below:

20-year average value (MCM)

- Catipayan river discharge (inflow): 72.288
- Rainfall-evaporation in reservoir : 0.935

- Irrigation release : 29.116 (39,8% of inflow)
- Hydropower release : 20.170 (17.5% of inflow)
- Domestic water deficit : 0.240 (0.3% of inflow)
- Spillover : 24.079 (32.9% of inflow)

As shown above, hydropower release with restricted water level allows effective utilization of water which would spilover in the case of irrigation release alone.

4. RURAL WATER SUPPLY

4.1 Integrated Community Center

4.1.1 General

As discussed in APPENDIX IX, RURAL DEVELOPMENT, water for domestic use will be supplied to the pond of the Integrated Community Center and potable water for the rural area will be supplied by the shallow wells of the same. Accordingly for domestic use, irrigation water, if available, will be utilized under the plan. The target population for water supply via each main canal is presented below.

COMMAND POPULATION FOR WATER SUPPLY UNDER I.C.C.

Unit: Person

Diversion Dam System	Command Population		
	Main Canals		Total
Asue D.D.	Asue: 9,200	Eastern: 9,800	19,000
Balcabak D.D.	Right: 2,500	Left: 1,600	4,100
Gubaton D.D.			2,100
Serruco D.D.	Right: 700	Left: 800	1,500
Trans-diversion Canal			700
Total			27,400

The design water supply capacity for the multipurpose pond in the Integrated Community Center was assumed at 100ℓ/day/person as discussed in APPENDIX IX under RURAL DEVELOPMENT. The same value includes potable water supply from shallow wells, considering that the ground water taken from shallow wells must be recharged through the multipurpose pond.

4.1.2 Water Balance

Water balance study for domestic water supply was carried out. As a result even in a critical case, such as that for the main canal in 1918, a supply of 0.053m^3/sec is available in the river at the diversion dam site versus the requirement of 0.044m^3/sec and no supplemental water supply from the Catipayan reservoir is required.

4.2 Water Supply to the Sara Waterworks

4.2.1 General

As discussed in APPENDIX IX, RURAL DEVELOPMENT, the Project includes the water supply scheme for the existing Sara Waterworks. Main features of water supply to Sara Waterworks are presented below.

- Barangays covered : 18 barangays
- Population : 20,300 persons
- Water supply capacity : 100ℓ/day/person
- Supplemented water from the proposed Catipayan reservoir : 0.0165m^3/sec

Under the Project, water will be supplied to the existing pipeline of the Sara Waterworks from the proposed Canal Route Power Station penstock. Accordingly, required water will be supplied from the Catipayan reservoir through the trans-diversion canal and tunnel. In the event that water is released for hydropower generation only, the water can be used for supply to the waterworks. In the case of release for irrigation purposes only, on the other hand, required water for Sara Waterworks will be added requiring additional storage capacity in the Catipayan reservoir.

4.2.2 Reservoir Operation

Reservoir operation considering water supply to the Sara Waterworks is discussed in section 3, HYDROPOWER GENERATION. Additional capacity required for this scheme was calculated at 0.3 MCM with the same standard year as the irrigation scheme. This means that except in the standard year for the irrigation scheme, 1968, water release for waterworks will not deplete the reservoir. The required gross storage capacity of the Catipayan reservoir under the Project has thus been determined at 28.2 MCM.

CALCULATED ILOILO ETo

Unit: mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Out	Nov	Dec	Total
1964	151.7	132.1	211.2	195.4	142.8	114.8	116.6	139.5	97.6	91.6	91.9	103.8	1589.0
65	106.7	121.9	154.2	143.0	149.9	100.3	104.9	122.7	97.7	140.7	124.2	121.7	1488.0
66	149.6	152.5	216.5	218.4	121.7	134.2	97.2	121.4	129.2	113.8	108.1	116.7	1679.3
67	121.8	123.7	186.9	204.4	189.8	140.5	126.1	107.6	134.2	121.7	125.4	145.1	1727.2
68	124.6	141.2	190.5	206.0	163.9	133.6	137.7	124.5	115.1	136.3	130.1	119.7	1723.2
69	148.9	154.1	195.1	223.2	177.5	129.1	107.0	122.8	100.7	123.0	114.1	99.0	1694.6
70	129.2	124.0	153.9	181.9	157.3	97.5	103.9	110.7	99.5	98.4	86.7	104.7	1447.7
71	134.9	112.1	157.5	174.8	107.8	100.9	110.5	129.0	99.2	134.5	106.1	114.4	1481.7
72	119.0	154.0	156.8	193.0	47.9	122.0	117.8	99.2	91.9	116.6	110.3	113.4	1541.6
73	148.0	136.0	222.2	217.8	193.7	114.4	116.2	102.4	81.0	94.2	101.9	86.4	1614.2
74	128.8	114.4	158.8	180.2	171.8	119.9	117.5	115.1	108.1	88.9	97.4	89.9	1490.8
75	124.3	137.3	169.5	152.7	141.0	107.8	113.8	108.2	100.9	100.7	122.3	101.7	1480.3
76	132.6	141.5	178.8	158.8	127.2	113.0	116.5	121.5	108.7	125.2	102.2	109.5	1535.5
77	114.7	110.5	156.9	205.4	165.9	146.4	98.7	113.8	104.0	121.7	90.5	130.9	1559.3
78	193.9	152.0	251.0	197.2	188.0	126.5	122.4	135.4	117.8	124.3	116.0	127.1	1851.5
79	142.8	205.4	207.6	202.2	167.2	137.1	85.1	138.1	142.3	147.1	131.2	119.8	1826.1
80	122.0	147.4	182.9	209.1	171.8	122.6	139.5	137.6	122.5	121.0	124.3	110.2	1711.0
81	125.1	89.2	219.4	224.6	172.4	128.4	126.9	145.0	123.7	125.0	116.6	128.1	1723.3
82	116.6	124.1	154.0	165.8	156.9	134.9	124.8	134.1	149.4	125.7	123.8	131.5	1641.5
83	142.1	150.9	189.1	208.5	187.8	135.0	129.5	131.8	118.3	127.7	105.2	99.2	1725.1
Ave.	133.9	136.2	185.6	193.1	160.1	123.0	115.6	123.0	112.1	118.9	111.4	113.6	1626.5
Ave. x 0.85	107.1	109.0	148.5	154.5	128.1	98.4	92.5	98.4	89.7	95.1	89.1	90.9	1301.3

CONSUMPTIVE USE OF CROP FOR 200% PADDY

Upper column : 1st Crop (mm)
Lower column : 2nd Crop (mm)

Year	Commencement date of 1st Paddy Cultivation											
	Mar.11	Mar.21	Apr.1	Apr.11	Apr.21	May 1	May 11	May 21	Jun. 1	Jun.11	Jun.21	Jul.1
1964	674.0	654.6	637.0	625.1	615.0	606.5	598.4	590.1	582.2	576.1	570.6	565.1
	494.9	487.0	481.2	481.3	487.1	497.4	510.7	524.7	540.1	556.9	576.7	600.3
65	618.6	609.8	601.9	594.9	586.3	576.9	570.3	568.3	572.6	580.6	588.9	595.9
	543.3	544.4	546.2	548.5	549.9	548.6	545.2	541.2	539.1	541.0	545.5	551.7
66	672.9	650.3	622.1	605.5	497.4	596.3	597.1	595.3	591.5	588.8	588.4	590.2
	535.7	534.2	531.8	530.6	531.4	535.2	543.1	553.8	567.9	584.5	604.1	606.5
67	733.9	714.2	690.0	668.2	649.1	634.1	624.1	616.7	610.9	607.2	604.5	603.8
	550.8	556.9	562.8	565.8	566.0	564.9	564.2	564.9	567.4	573.1	581.4	591.9
68	718.1	700.9	680.5	663.2	648.1	636.3	628.1	622.5	619.7	619.1	618.7	618.4
	557.2	557.5	557.6	557.5	557.4	556.9	557.1	558.4	562.2	569.6	580.1	593.6
69	720.9	696.1	668.7	646.3	626.3	609.3	595.8	585.5	579.5	578.7	580.0	582.4
	525.2	522.4	519.2	519.1	522.4	528.5	537.4	547.3	559.7	573.3	589.5	608.6
70	646.7	631.1	612.4	596.1	580.8	567.9	558.9	553.0	550.3	549.2	547.4	544.8
	485.1	482.1	480.5	481.7	485.2	490.7	498.0	506.6	517.4	529.1	541.9	555.2
71	613.4	600.3	587.2	579.4	575.0	573.6	574.0	575.9	580.6	586.1	590.8	593.1
	532.2	528.6	526.8	528.6	532.5	536.3	538.5	539.1	540.0	543.5	550.2	559.6
72	673.1	655.8	633.4	613.5	596.1	582.2	571.9	564.4	559.5	557.6	556.5	555.9
	502.0	504.9	509.0	513.3	517.6	521.2	526.0	532.8	543.7	556.1	568.4	580.0
73	725.5	698.8	668.8	641.5	614.0	588.8	568.5	553.3	543.2	537.9	533.7	530.5
	472.3	471.1	470.2	472.5	479.2	489.8	503.8	517.8	532.8	549.1	569.6	595.6
74	681.0	667.3	650.5	634.5	618.9	604.8	593.1	582.9	573.8	566.6	559.9	554.6
	491.5	487.2	482.0	478.5	478.3	482.0	489.6	498.7	508.4	517.6	528.2	541.6
75	630.6	618.4	605.9	595.3	585.2	576.3	569.6	564.5	560.8	559.0	558.5	559.6
	506.5	508.3	508.8	508.9	510.4	513.9	520.7	529.1	538.7	548.2	558.1	569.8
76	631.8	619.2	607.6	599.9	594.1	590.2	587.9	586.9	587.5	588.7	589.2	588.2
	526.3	522.9	520.3	520.1	521.7	524.3	528.3	533.8	542.7	554.7	569.3	585.4
77	703.9	683.0	658.2	638.0	621.0	606.7	594.4	583.2	574.2	570.0	568.1	567.4
	511.0	510.5	512.9	517.4	521.2	523.1	522.9	522.6	524.9	531.8	541.5	552.2
78	725.3	702.5	682.2	666.6	650.9	636.4	624.9	616.7	612.5	611.4	610.9	610.4
	547.3	545.1	544.0	547.8	556.6	569.7	585.4	600.2	615.3	631.8	652.8	678.7
79	696.8	671.6	648.9	635.1	626.0	620.3	617.3	615.2	616.0	621.3	629.8	640.4
	591.0	589.3	584.5	579.9	576.2	574.0	577.0	586.1	602.7	622.3	642.9	663.0
80	717.7	702.9	684.8	669.1	655.1	644.0	636.4	631.1	628.1	626.0	623.6	620.8
	553.2	549.4	544.5	540.2	537.3	536.0	537.7	542.5	550.5	560.8	572.8	587.1
81	731.3	709.1	686.6	669.8	655.9	645.2	637.6	631.6	628.0	626.4	625.2	623.8
	557.1	552.9	549.7	548.2	547.8	547.6	546.1	543.2	539.7	542.1	551.8	569.1
82	675.8	667.2	657.5	650.4	645.6	643.4	642.7	641.8	640.2	638.3	636.9	636.5
	573.3	574.1	571.4	566.9	561.1	555.6	552.0	551.3	552.8	556.4	561.1	566.6
83	734.0	716.4	696.0	677.8	660.5	645.2	633.3	624.5	619.1	616.3	613.3	609.6
	541.2	534.6	527.5	523.5	522.6	524.5	529.6	537.1	548.3	562.0	578.7	597.8
Total	13731.6	13369.5	12980.2	12670.2	12401.3	12184.4	12024.3	11903.4	11830.2	11805.3	11794.9	11791.4
	10599.1	10563.4	10530.9	10530.3	10561.9	10620.2	10713.3	10831.2	10994.3	11203.9	11464.6	11774.3
Ave.	686.6	668.5	649.0	633.5	620.1	609.2	601.2	595.2	591.5	590.3	589.7	589.6
	530.0	528.2	526.5	526.5	528.1	531.0	535.7	541.6	549.7	560.2	573.2	588.7
Annual	1216.5	1196.6	1175.6	1160.0	1148.2	1140.2	1136.9	1136.7	1141.2	1150.5	1163.0	1178.3

CONSUMPTIVE USE OF CROP FOR 300% PADDY

Unit: mm

	CROP			
	1st	2nd	3rd	Annual
1964	570.5	439.1	510.8	1520.4
65	544.2	505.3	504.0	1553.5
66	552.4	486.1	536.4	1574.9
67	605.6	517.7	552.7	1676.0
68	604.1	513.7	522.7	1640.5
69	584.0	477.8	505.1	1566.9
70	540.3	440.6	486.9	1467.8
71	531.9	485.4	500.2	1517.5
72	558.7	471.1	506.1	1535.2
73	576.5	433.6	488.8	1498.9
74	576.9	440.0	463.9	1480.8
75	544.8	468.4	489.1	1502.3
76	551.1	477.9	506.7	1535.7
77	579.5	472.4	517.7	1569.6
78	605.1	499.1	574.0	1678.2
79	577.3	535.2	551.7	1664.2
80	608.5	498.3	507.9	1614.7
81	608.1	503.0	528.1	1639.2
82	596.9	521.5	522.1	1640.5
83	615.2	482.6	500.6	1598.4
Total	11530.9	9668.8	10275.5	31475.2
Average	576.5	483.4	513.8	1573.7

TABLE VI-4

DIVERSION WATER REQUIREMENT FOR 200% PADDY

Upper column: 1st Crop (mm)
Lower column: 2nd Crop (mm)

Year	Commencement Date of 1st Paddy Cultivation											
	Mar.11	Mar.21	Apr.1	Apr.11	Apr.21	May 1	May 11	May 21	Jun. 1	Jun.11	Jun.21	Jul.1
1964	615.6	566.1	496.1	417.8	379.9	373.6	376.3	365.0	352.9	347.9	356.9	350.7
	273.2	259.2	273.3	278.6	332.9	365.8	433.1	530.6	599.9	676.6	751.6	823.1
65	593.2	549.1	529.9	487.4	426.9	377.0	307.7	273.9	282.4	264.1	248.6	303.1
	295.4	346.5	374.5	406.8	457.3	486.5	528.6	573.6	632.0	677.9	704.7	718.5
66	642.9	564.8	481.2	413.1	344.1	312.3	296.5	306.4	322.6	317.9	307.7	335.6
	294.4	305.6	297.1	317.7	317.3	332.8	2=408.7	459.7	563.0	663.1	747.5	832.7
67	761.9	686.0	616.2	558.7	495.0	443.8	404.3	374.5	333.8	341.5	326.1	333.3
	335.9	358.3	419.1	467.2	499.5	527.1	513.9	496.7	515.0	540.9	595.1	663.3
68	832.0	738.5	642.7	568.3	506.7	458.6	434.4	403.5	341.3	356.8	338.3	358.7
	341.6	352.0	377.5	440.2	462.5	534.8	642.2	715.1	783.5	851.2	871.6	914.4
69	752.1	671.9	614.6	540.2	475.7	379.3	349.4	330.6	306.3	287.8	294.1	343.7
	380.1	411.9	418.6	466.1	491.0	529.5	576.5	617.1	683.1	734.1	774.9	822.2
70	650.7	629.8	556.3	448.9	378.6	337.9	326.2	322.2	302.9	280.0	275.4	309.3
	303.3	294.2	237.7	257.3	262.6	272.5	327.5	354.6	414.6	462.1	520.8	573.6
71	478.3	424.9	330.8	270.8	211.8	226.8	228.6	250.4	289.4	304.5	334.1	353.3
	338.5	321.5	304.3	307.9	294.7	301.9	340.3	364.5	436.5	516.5	554.6	618.2
72	761.4	739.0	711.0	717.5	692.6	638.9	574.6	494.2	443.4	442.5	437.7	438.5
	321.4	305.9	310.4	330.4	366.4	396.4	399.8	407.2	424.0	464.1	500.9	589.6
73	934.6	836.2	737.9	647.5	566.3	498.7	426.2	385.9	308.7	286.9	268.5	233.0
	142.4	132.9	131.7	164.8	245.7	332.8	425.5	515.5	584.9	681.4	778.5	850.7
74	751.4	672.0	602.0	541.1	484.2	445.3	395.7	389.4	386.2	398.2	380.8	373.6
	337.0	375.8	304.3	286.5	246.3	241.7	253.8	266.0	339.6	410.9	497.9	567.5
75	563.4	465.6	403.4	371.9	355.6	378.7	354.3	336.1	359.5	330.5	357.3	320.8
	274.2	229.2	193.4	180.2	224.5	254.4	294.0	321.9	369.4	444.3	515.2	599.3
76	634.9	599.1	567.7	499.5	439.0	409.3	399.5	409.8	411.2	378.8	398.2	412.1
	334.9	335.1	409.6	440.0	426.9	414.9	403.1	414.6	508.9	558.9	615.9	700.1
77	710.9	648.2	548.3	529.4	484.1	424.1	350.9	338.2	311.4	307.5	360.5	354.8
	382.8	407.4	477.8	515.3	521.6	530.5	497.8	470.4	462.3	473.7	483.8	502.2
78	828.7	694.5	636.7	560.3	537.7	491.7	439.5	416.9	385.1	357.2	354.7	332.8
	267.6	274.2	310.7	321.5	379.9	453.5	549.0	652.1	782.3	869.0	941.1	1019.8
79	585.5	534.5	471.3	431.7	429.2	362.9	334.8	341.5	351.6	408.9	437.5	506.7
	515.1	542.5	565.4	590.4	604.2	641.5	673.6	723.6	801.6	845.4	918.8	941.6
80	713.5	635.3	570.7	491.9	438.6	358.3	313.1	289.2	270.4	294.0	299.9	319.3
	261.5	257.4	247.5	256.5	265.9	293.0	357.5	419.2	508.1	595.9	663.8	724.9
81	862.4	763.4	673.9	631.1	623.9	659.1	687.5	691.2	664.8	597.4	550.3	495.0
	486.0	484.7	487.7	470.1	448.6	474.7	496.2	543.2	591.1	642.1	712.1	792.8
82	639.4	594.6	563.4	503.4	464.4	436.5	401.5	360.9	411.0	438.5	462.4	516.4
	527.1	586.4	688.1	767.6	793.4	799.8	794.6	788.0	799.6	835.4	848.7	847.2
83	900.6	800.5	702.1	611.6	528.4	459.1	392.6	320.0	273.4	248.1	235.8	273.4
	310.0	289.8	252.1	230.4	225.6	263.2	323.3	404.3	490.3	573.6	676.3	770.1
Total	14213.4	12814.0	11492.2	10242.1	9262.7	8471.9	7793.6	7399.8	7108.3	6989.0	7024.8	7264.1
	6722.4	6810.5	7080.8	7495.5	7866.8	8447.3	9239.0	10037.9	10507.4	12517.1	13673.8	14871.8
Ave.	710.7	640.7	574.6	512.1	463.1	423.6	389.7	370.0	355.4	349.5	351.2	363.2
	336.1	340.5	354.0	374.8	393.3	422.4	462.0	601.2	564.5	625.9	683.7	743.6
Annual	1046.8	981.2	928.7	886.9	856.5	846.0	851.6	971.2	919.9	975.3	1034.9	1106.8

DIVERSION WATER REQUIREMENT FOR 300% PADDY

Unit: mm

	CROP			
	1st	2nd	3rd	Annual
1964	377.1	253.4	768.6	1399.1
65	429.1	399.9	693.9	1522.9
66	339.9	316.1	789.9	1445.9
67	494.0	408.4	691.8	1594.2
68	506.5	399.5	866.8	1772.8
69	478.0	448.8	753.3	1680.1
70	383.2	255.2	526.9	1165.3
71	222.8	296.9	515.1	1034.8
72	671.9	322.4	602.8	1597.1
73	569.7	152.2	732.4	1454.3
74	488.5	286.0	579.8	1354.3
75	355.6	177.0	582.0	1114.6
76	433.4	439.3	741.3	1614.0
77	477.1	482.8	547.7	1507.6
78	537.8	302.8	936.4	1777.0
79	430.5	563.0	737.9	1731.4
80	440.0	247.6	628.2	1315.8
81	571.7	447.4	798.2	1817.3
82	463.9	705.4	774.9	1944.2
83	529.8	224.8	745.1	1499.7
Total	9200.5	7128.9	14013.0	30342.4
Average	460.0	356.4	700.7	1517.1

WATER BALANCE FOR SERRUCO DAM SCHEME

1977	Serruco D.D. System			Gubaton D.D. System			Dahis D.D. System			Serruco Reservoir		
	Serruco Discng.	Water Reqmt.	Surpls/ Deficit	Gubaton Discng.	Water Reqmt.	Surpls/ Deficit	Dahis Discng.	Water Reqmt.	Surpls/ Deficit	Serruco Discng.	Water Reqmt.	Dam Capacity
Jan. 1	0.9115	0.0000	0.9115	0.8400	0.0000	0.9517	1.5426	0.0000	1.5426	0.9115	0.0000	0.0000
2	0.7539	0.0453	0.7087	0.6948	0.1194	0.6679	1.2755	0.1848	1.0912	0.7087	0.0000	0.0000
3	0.9036	0.0112	0.8924	0.8328	0.0296	0.9159	1.6683	0.0458	1.4036	0.8924	0.0000	0.0000
T	2.5691	0.0565	2.5126	2.3676	0.1490	2.5334	4.3478	0.2306	4.1172	2.5126	0.0000	0.0000
Feb. 1	0.6305	0.0208	0.6097	0.5810	0.0549	0.6034	1.0669	0.0849	0.9821	0.6097	0.0000	0.0000
2	0.6403	0.0399	0.6004	0.5900	0.1051	0.5634	1.0836	0.1626	0.9210	0.6004	0.0000	0.0000
3	0.4977	0.0104	0.4873	0.4587	0.0274	0.4823	0.8424	0.0424	0.7999	0.4873	0.0000	0.0000
T	1.7685	0.0710	1.6975	1.6298	0.1874	1.6591	2.9929	0.2899	2.7029	1.6975	0.0000	0.0000
Mar. 1	0.4998	0.0139	0.4859	0.4606	0.0366	0.4852	0.8458	0.0567	0.7891	0.4859	0.0000	0.0000
2	0.3672	0.0000	0.3672	0.3384	0.0000	0.3834	0.6214	0.0000	0.6214	0.3672	0.0000	0.0000
3	0.2975	0.0000	0.2975	0.2741	0.0000	0.3106	0.5034	0.0000	0.5034	0.2975	0.0000	0.0000
T	1.1644	0.0139	1.1506	1.0731	0.0366	1.1792	1.9706	0.0567	1.9140	1.1506	0.0000	0.0000
Apr. 1	0.2385	0.0000	0.2385	0.2198	0.0000	0.2490	0.4036	0.0000	0.4036	0.2385	0.0000	0.0000
2	0.2278	0.0000	0.2278	0.2100	0.0000	0.2379	0.3858	0.0000	0.3858	0.2278	0.0000	0.0000
3	0.2074	0.0000	0.2074	0.1911	0.0000	0.2165	0.3509	0.0000	0.3509	0.2074	0.0000	0.0000
T	0.6737	0.0000	0.6737	0.6208	0.0000	0.7034	1.1401	0.0000	1.1401	0.6737	0.0000	0.0000
May 1	0.1979	0.0000	0.1979	0.1823	0.0000	0.2066	0.3349	0.0000	0.3349	0.1979	0.0000	0.0000
2	0.2830	0.0000	0.2830	0.2608	0.0000	0.2955	0.4790	0.0000	0.4790	0.2830	0.0000	0.0000
3	0.3051	0.0000	0.3051	0.2812	0.0000	0.3186	0.5163	0.0000	0.5163	0.3051	0.0000	0.0000
T	0.7860	0.0000	0.7860	0.7243	0.0000	0.8206	1.3301	0.0000	1.3301	0.7860	0.0000	0.0000
Jun. 1	0.3610	0.1054	0.2556	0.3327	0.2782	0.0907	0.6109	0.4305	0.1804	0.2556	0.0000	0.0000
2	1.2102	0.0000	1.2102	1.1153	0.0000	1.4926	2.0480	0.0000	2.0480	1.2102	0.0000	0.0000
3	0.7481	0.0927	0.6555	0.6895	0.2446	0.5366	1.2662	0.3785	0.8877	0.6555	0.0000	0.0000
T	2.3193	0.1981	2.1212	2.1374	0.5228	1.8908	3.9251	0.8090	3.1161	2.1212	0.0000	0.0000
Jul. 1	0.7852	0.1879	0.5773	0.7052	0.4957	0.3032	1.2949	0.7671	0.5278	0.5773	0.0000	0.0000
2	1.0810	0.0439	1.0371	0.9962	0.1159	0.9127	1.8294	0.1794	1.6500	1.0371	0.0000	0.0000
3	0.8783	0.2404	0.6378	0.8094	0.6345	0.2825	1.4863	0.9817	0.5046	0.6378	0.0000	0.0000
T	2.7244	0.4722	2.2522	2.5107	1.2461	1.5985	4.6107	1.9282	2.6824	2.2522	0.0000	0.0000
Aug. 1	2.0071	0.0811	1.9260	1.8497	0.7141	1.8816	3.3968	0.3312	3.0655	1.9260	0.0000	0.0000
2	0.8350	0.1079	0.7271	0.7695	0.2848	0.5870	1.4131	0.4407	0.9724	0.7271	0.0000	0.0000
3	0.7497	0.1880	0.5616	0.6909	0.4962	0.2965	1.2687	0.7678	0.5009	0.5616	0.0000	0.0000
T	3.5918	0.3771	3.2147	3.3101	0.9951	2.7551	6.0786	1.5398	4.5388	3.2147	0.0000	0.0000
Sep. 1	0.9465	0.0000	0.9465	0.8722	0.0000	0.9882	1.6017	0.0000	1.6017	0.9465	0.0000	0.0000
2	0.8335	0.0000	0.8335	0.7681	0.0000	0.8702	1.4105	0.0000	1.4105	0.8335	0.0000	0.0000
3	0.6741	0.0166	0.6575	0.6212	0.0439	0.6596	1.1408	0.0679	1.0729	0.6575	0.0000	0.0000
T	2.4540	0.0166	2.4374	2.2615	0.0439	2.5184	4.1531	0.0679	4.0851	2.4374	0.0000	0.0000
Oct. 1	0.7511	0.0208	0.7303	0.6922	0.0549	0.7294	1.2712	0.0849	1.1863	0.7303	0.0000	0.0000
2	0.8726	0.0450	0.8277	0.8042	0.1187	0.7924	1.4760	0.1837	1.2931	0.8277	0.0000	0.0000
3	0.7288	0.2223	0.5065	0.6716	0.5866	0.1702	1.2334	0.9076	0.3258	0.5065	0.0000	0.0000
T	2.3526	0.2881	2.0645	2.1681	0.7601	1.6920	3.9814	1.1762	2.8052	2.0645	0.0000	0.0000
Nov. 1	0.5490	0.2365	0.3125	0.5059	0.6242	-0.0509	0.9291	0.9658	-0.0367	0.3125	0.0876	0.0000
2	0.4679	0.2967	0.1711	0.4312	0.7830	-0.2945	0.7918	1.2116	-0.4198	0.1711	0.7144	-0.5432
3	0.4865	0.1983	0.2882	0.4483	0.5233	-0.0019	0.8233	0.8098	0.0000	0.2882	0.0019	-0.2569
T	1.5034	0.7316	0.7718	1.3854	1.9305	-0.3473	2.5442	2.9872	-0.4565	0.7718	0.8039	-0.8001
Dec. 1	0.4064	0.2295	0.1769	0.3745	0.6056	-0.1813	0.6877	0.9370	-0.2493	0.1769	0.4306	-0.5106
2	0.3303	0.2140	0.1163	0.3044	0.5417	-0.2198	0.5589	0.8738	-0.3148	0.1163	0.5347	-0.7289
3	0.3551	0.1166	0.2385	0.3272	0.3078	0.0389	0.6009	0.4762	0.1247	0.2385	0.0000	-0.6905
T	1.0917	0.5601	0.5316	1.0061	1.4780	-0.3622	1.8476	2.2870	-0.4394	0.5316	0.9652	-2.1300
1977	22.9989	2.7851	20.2137	21.1950	7.3496	16.6491	38.9222	11.3726	27.5361	20.2137	1.7691	-2.9302

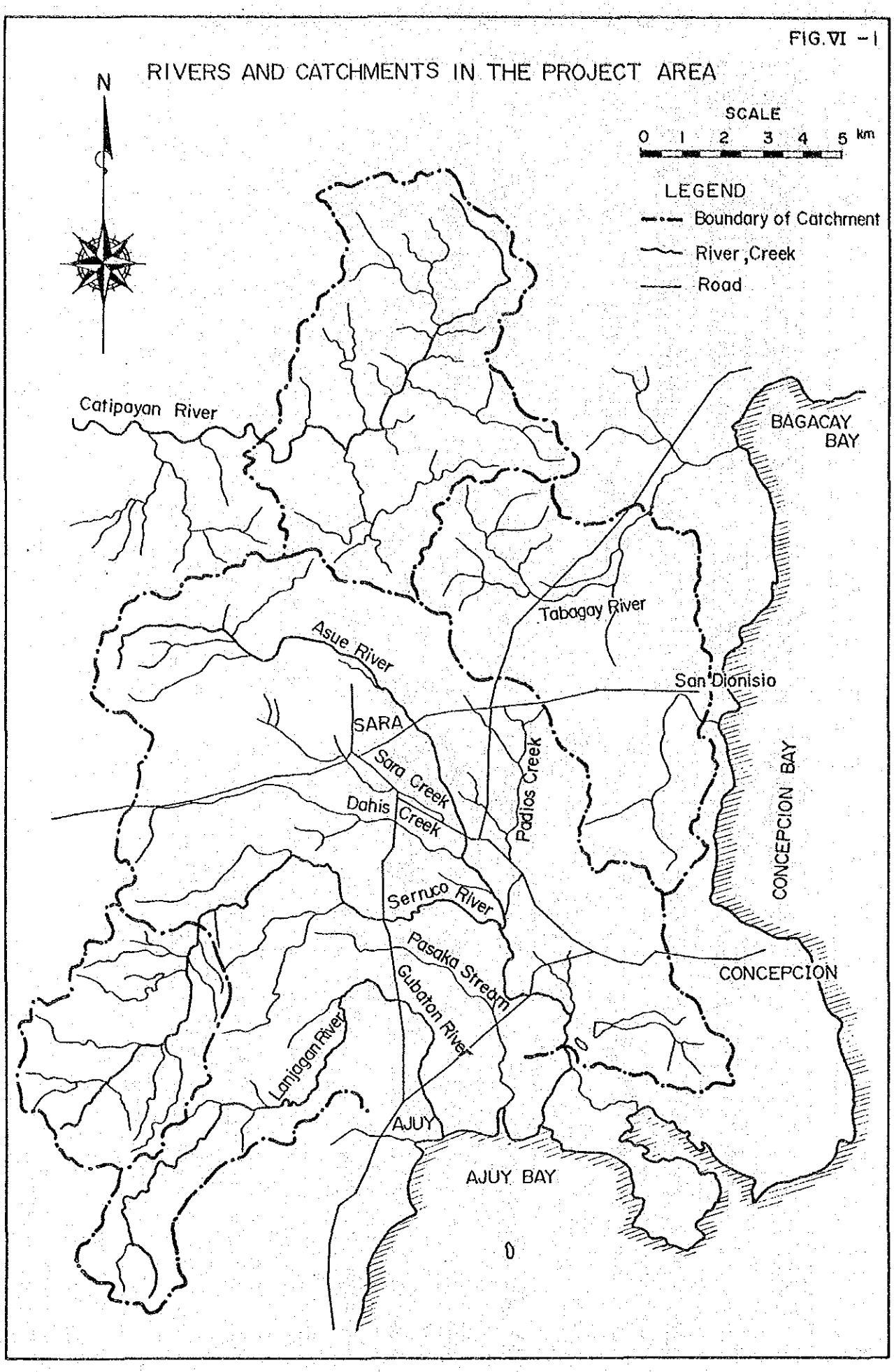
1978	Serruco D.D. System			Gubaton D.D. System			Dahis D.D. System			Serruco Reservoir		
	Serruco Discng.	Water Reqmt.	Surpls/ Deficit	Gubaton Discng.	Water Reqmt.	Surpls/ Deficit	Dahis Discng.	Water Reqmt.	Surpls/ Deficit	Serruco Discng.	Water Reqmt.	Dam Capacity
Jan. 1	0.2745	0.3063	0.0000	0.2530	0.8084	-0.5536	0.4645	1.2509	-0.7863	-0.0318	1.3400	-2.0623
2	0.2060	0.3366	-0.1053	0.1899	0.8883	-0.6984	0.3487	1.3745	-1.0259	-0.1306	1.7243	-3.9172
3	0.2060	0.3481	-0.1169	0.1899	0.9187	-0.7288	0.3486	1.4215	-1.0729	-0.1421	1.8017	-5.8610
T	0.6865	0.9911	-0.2222	0.6327	2.6153	-1.9809	1.1618	4.0469	-2.8851	-0.3046	4.8660	-11.8405
Feb. 1	0.1786	0.2370	-0.0366	0.1646	0.6255	-0.4610	0.3022	0.9679	-0.6657	-0.0585	1.1767	-7.0462
2	0.1707	0.1511	0.0196	0.1573	0.3988	-0.2206	0.2888	0.6171	-0.3282	0.0196	0.5488	-7.5754
3	0.1314	0.0587	0.0727	0.1211	0.1549	-0.0177	0.2223	0.2396	-0.0173	0.0727	0.0350	-7.5378
T	0.4806	0.4468	0.0556	0.4429	1.1792	-0.6992	0.8133	1.8246	-1.0113	0.0338	1.7105	-22.1594
Mar. 1	0.1568	0.0198	0.1370	0.1445	0.0523	0.1114	0.2653	0.0809	0.1844	0.1370	0.0000	-7.4008
2	0.1481	0.0000	0.1481	0.1365	0.0000	0.1546	0.2506	0.0000	0.2506	0.1481	0.0000	-7.2527
3	0.1532	0.0000	0.1532	0.1412	0.0000	0.1599	0.2592	0.0000	0.2592	0.1532	0.0000	-7.0995
T	0.4580	0.0198	0.4382	0.4221	0.0523	0.4260	0.7752	0.0809	0.6943	0.4382	0.0000	-21.7530
Apr. 1	0.1305	0.0000	0.1305	0.1202	0.0000	0.1362	0.2208	0.0000	0.2208	0.1305	0.0000	-6.9691
2	0.1224	0.0000	0.1224	0.1128	0.0000	0.1278	0.2072	0.0000	0.2072	0.1224	0.0000	-6.8467
3	0.9218	0.0000	0.9218	0.8495	0.0000	0.9625	1.5600	0.0000	1.5600	0.9218	0.0000	-5.9249
T	1.1746	0.0000	1.1746	1.0825	0.0000	1.2265	1.9879	0.0000	1.9879	1.1746	0.0000	-19.7406
May 1	0.2278	0.0000	0.2278	0.2099	0.0000	0.2378	0.3855	0.0000	0.3855	0.2278	0.0000	-5.6971
2	0.2397	0.0000	0.2397	0.2209	0.0000	0.2503	0.4057	0.0000	0.4057	0.2397	0.0000	-5.4574
3	0.2509	0.0000	0.2509	0.2312	0.0000	0.2620	0.4246	0.0000	0.4246	0.2509	0.0000	-5.2065
T	0.7184	0.0000	0.7184	0.6620	0.0000	0.7501	1.2158	0.0000	1.2158	0.7184	0.0000	-16.3610
Jun. 1	0.1552	0.1229	0.0323	0.1431	0.3244	-0.1623	0.2627	0.5019	-0.2392	0.0323	0.4015	-5.5757
2	0.2252	0.1463	0.0789	0.2075	0.3860	-0.1569	0.3811	0.5973	-0.2162	0.0789	0.3671	-5.8639
3	0.3613	0.1676	0.1937	0.3329	0.4424	-0.0957	0.6114	0.6845	-0.0731	0.1937	0.1382	-5.8085
T	0.7417	0.4368	0.3049	0.6835	1.1527	-0.3783	1.2552	1.7837	-0.5285	0.3049	0.9068	-17.2480
Jul. 1	0.2562	0.3869	-0.0993	0.2361	1.0211	-0.7850	0.4336	1.5800	-1.1464	-0.1307	1.9313	-7.8705
2	0.3819	0.1937	0.1982	0.3511	0.5111	-0.1019	0.6632	0.7909	-0.1277	0.1982	0.2294	-7.9019
3	0.3517	0.1670	0.1847	0.3241	0.4406	-0.0734	0.6557	0.6817	-0.0865	0.1847	0.1599	-7.8771
T	0.9898	0.7476	0.2836	0.9214	1.9728	-0.9603	1.6920	3.0526	-1.3606	0.2522	2.3209	-23.6495
Aug. 1	0.6285	0.0766	0.5519	0.5792	0.2020	0.4541	1.0636	0.3126	0.7509	0.5519	0.0000	-7.3252
2	1.4185	0.0545	1.3651	1.3082	0.1437	1.3384	2.4023	0.2224	2.1800	1.3651	0.0000	-5.9601
3	1.8779	0.0000	1.8779	1.7306	0.0000	1.9608	3.1781	0.0000	3.1781	1.8779	0.0000	-4.0822
T	3.9249	0.1310	3.7949	3.6180	0.3458	3.7533	6.6440	0.5350	6.1090	3.7949	0.0000	-17.3676
Sep. 1	0.8323	0.0000	0.8323	0.7670	0.0000	0.8690	1.4085	0.0000	1.4085	0.8323	0.0000	-3.2500
2	0.8729	0.0160	0.8569	0.8045	0.0423	0.8691	1.4773	0.0655	1.4118	0.8569	0.0000	-2.3931
3	1.8602	0.0942	1.8560	1.7143	0.0110	1.9313	3.1481	0.0170	3.1311	1.8560	0.0000	-0.5370
T	3.5654	0.0202	3.5452	3.2858	0.0533	3.6694	6.0339	0.0825	5.9514	3.5452	0.0000	-6.1800
Oct. 1	1.4248	0.0098	1.4149	1.3130	0.0260	1.4616	2.4112	0.0402	2.3710	1.4149	0.0000	0.0000
2	1.6481	0.0951	1.5530	1.5189	0.2509	1.4698	2.7882	0.3882	2.4010	1.5530	0.0000	0.0000
3	1.1116	0.2244	0.8872	1.0244	0.5725	0.5684	1.8812	0.9164	0.9648	0.8872	0.0000	0.0000
T	4.1845	0.3293	3.8551	3.8563	0.8491	3.5000	7.0816	1.3448	5.7368	3.8551	0.0000	0.0000
Nov. 1	1.1245	0.1496	0.9750	1.0363	0.3947	0.7794	1.9031	0.6108	1.2923	0.9750	0.0000	0.0000
2	0.9187	0.4233	0.4954	0.8467	0.8533	0.0000	1.3859	1.3200	0.0659	0.4954	0.0000	0.0000
3	0.7021	0.2586	0.4435	0.6470	0.6824	0.0000	1.1892	1.0560	0.1322	0.4435	0.0000	0.0000
T	2.6455	0.8315	1.9141	2.4380	1.9302	0.7794	4.4772	2.9868	1.4904	1.9141	0.0000	0.0000
Dec. 1	0.7006	0.1695	0.5311	0.6457	0.4473	0.2843	1.1857	0.6921	0.4936	0.5311	0.0000	0.0000
2	1.0833	0.0680	1.0153	0.9983	0.1794	0.9517	1.8333	0.2776	1.5557	1.0153	0.0000	0.0000
3	0.6919	0.0698	0.6220	0.6376	0.1843	0.5381	1.1709	0.2852	0.8857	0.6220	0.0000	0.0000
T	2.4758	0.3073	2.1685	2.2816	0.8110	1.7741	4.1899	1.2548	2.9351	2.1685	0.0000	0.0000
1978	22.9568	4.1615	18.0309	20.3268	10.9817	11.8600	37.3278	16.9927	20.3351	17.8953	9.8042%	-156.3000

WATER BALANCE FOR PROPOSED ASUE/CATIPAYAN SCHEME

1967	Serruco D.D. System			Gubaton D.D. System			AsueSouth Subsystem			Asue D.D. System			CatipayanT.D.System		
	Serruco Dischg.	Water Reqmt.	Surpls/ Deficit	Gubaton Dischg.	Water Reqmt.	Surpls/ Deficit	Asuesth. Dischg.	Water Reqmt.	Surpls/ Deficit	Asue Dischg.	Water Reqmt.	Surpls/ Deficit	Catipyn. Dischg.	Water Reqmt.	Surpls/ Deficit
Jan. 1	0.8546	0.0467	0.8079	0.7016	0.0820	0.6195	1.4274	0.0672	1.3602	0.4090	0.6664	-0.2574	2.1365	0.2874	1.8491
2	0.8831	0.0000	0.8831	0.7250	0.0112	0.7137	1.5968	0.0092	1.5876	0.4226	0.0912	0.3314	2.5788	0.0041	2.5747
3	0.9112	0.0156	0.8956	0.7480	0.0337	0.7143	1.6100	0.0276	1.5824	0.4361	0.2737	0.1623	1.9428	0.0123	1.9305
T	2.6488	0.0622	2.5866	2.1746	0.1270	2.0476	4.6342	0.1040	4.5302	1.2677	1.0314	0.2363	6.6581	0.3038	6.3543
Feb. 1	0.5399	0.0966	0.4433	0.4432	0.0041	0.4392	0.8825	0.0033	0.8792	0.2584	0.0329	0.2255	0.7472	0.0015	0.7457
2	0.5082	0.0265	0.4817	0.4172	0.0000	0.4172	0.8988	0.0000	0.8988	0.2432	0.0000	0.2432	1.1594	0.0000	1.1594
3	0.3462	0.0507	0.2955	0.2842	0.0000	0.2842	0.5798	0.0000	0.5798	0.1657	0.0000	0.1657	0.5740	0.0000	0.5740
T	1.3943	0.1738	1.2205	1.1446	0.0041	1.1406	2.3611	0.0033	2.3578	0.6673	0.0329	0.6344	2.4806	0.0015	2.4791
Mar. 1	0.3545	0.0123	0.3423	0.2910	0.0000	0.2910	0.6333	0.0000	0.6333	0.1697	0.0000	0.1697	0.7192	0.0000	0.7192
2	0.2789	0.0000	0.2789	0.2290	0.0000	0.2290	0.5079	0.0000	0.5079	0.1335	0.0000	0.1335	0.6328	0.0000	0.6328
3	0.2651	0.0000	0.2651	0.2176	0.0000	0.2176	0.4827	0.0000	0.4827	0.1269	0.0000	0.1269	0.5408	0.0000	0.5408
T	0.8985	0.0123	0.8862	0.7376	0.0000	0.7376	1.6239	0.0000	1.6239	0.4300	0.0000	0.4300	1.8928	0.0000	1.8928
Apr. 1	0.2285	0.0000	0.2285	0.1876	0.0000	0.1876	0.4160	0.0000	0.4160	0.1093	0.0000	0.1093	0.4252	0.0000	0.4252
2	0.2169	0.0000	0.2169	0.1781	0.0000	0.1781	0.3950	0.0000	0.3950	0.1038	0.0000	0.1038	0.3744	0.0000	0.3744
3	0.2071	0.0000	0.2071	0.1700	0.0000	0.1700	0.3770	0.0000	0.3770	0.0991	0.0000	0.0991	0.3392	0.0000	0.3392
T	0.6524	0.0000	0.6524	0.5356	0.0000	0.5356	1.1881	0.0000	1.1881	0.3123	0.0000	0.3123	1.1388	0.0000	1.1388
May 1	0.1974	0.0000	0.1974	0.1620	0.2546	0.0000	0.1048	0.2086	-0.1038	0.0945	2.1723	-2.0778	0.3139	2.1709	-1.8569
2	0.1883	0.0000	0.1883	0.1546	0.3475	-0.0046	0.0000	0.2847	-0.2847	0.0901	3.1121	-3.0220	0.3204	3.1490	-2.8286
3	0.3761	0.0000	0.3761	0.3087	0.2943	0.0144	0.3905	0.2411	0.1494	0.1800	2.3907	-2.2107	1.2710	2.3183	-1.0473
T	0.7617	0.0000	0.7617	0.6253	0.8965	0.0098	0.4953	0.7344	-0.2391	0.3646	7.6751	-7.3106	1.9053	7.6381	-5.7328
Jun. 1	1.1617	0.1166	1.0451	0.9537	0.4515	0.5022	1.5474	0.3699	1.1775	0.5560	3.6677	-3.1117	3.4061	3.2766	0.1294
2	0.7013	0.1796	0.5218	0.5758	0.3900	0.1858	0.7075	0.3195	0.3880	0.3357	3.1681	-2.8325	2.2720	2.9750	-0.7029
3	0.5304	0.1538	0.3766	0.4354	0.2316	0.2038	0.5804	0.1897	0.3907	0.2538	1.8811	-1.6273	1.4809	1.7119	-0.2310
T	2.3934	0.4499	1.9435	1.9649	1.0731	0.8918	2.9353	0.8791	1.9562	1.1455	8.7169	-7.5714	7.1590	7.9635	-0.8045
Jul. 1	1.4847	0.1304	1.3543	1.2189	0.1125	1.1064	2.4606	0.0922	2.3685	0.7106	0.9138	-0.2032	5.1715	0.2444	4.9271
2	1.0298	0.1982	0.8317	0.8454	0.1243	0.7211	1.5527	0.1019	1.4509	0.4929	1.0101	-0.5172	2.4904	0.5626	1.9278
3	0.9537	0.1686	0.7851	0.7930	0.0000	0.7930	1.5681	0.0000	1.5681	0.4564	0.0000	0.4564	2.3325	0.0000	2.3325
T	3.4682	0.4972	2.9710	2.8473	0.2368	2.6104	5.5815	0.1940	5.3874	1.6599	1.9239	-0.2640	9.9944	0.8070	9.1874
Aug. 1	1.3384	0.1019	1.2365	1.0988	0.0000	1.0988	2.3352	0.0000	2.3352	0.6406	0.0000	0.6406	3.5260	0.0000	3.5260
2	1.4156	0.0625	1.3531	1.1621	0.0000	1.1621	2.5152	0.0000	2.5152	0.6775	0.0000	0.6775	4.3820	0.0000	4.3820
3	1.7370	0.0000	1.7370	1.4260	0.0203	1.4057	3.1427	0.0167	3.1260	0.8313	0.1653	0.6660	4.4724	0.0074	4.4650
T	4.4910	0.1644	4.3266	3.6869	0.0203	3.6666	7.9931	0.0167	7.9764	2.1494	0.1653	1.9841	12.3804	0.0074	12.3729
Sep. 1	1.2904	0.0000	1.2904	1.0594	0.0197	1.0397	2.3301	0.0161	2.3140	0.6176	0.1598	0.4578	2.7478	0.0072	2.7406
2	1.0249	0.0000	1.0249	0.8414	0.1366	0.7048	1.7297	0.1119	1.6177	0.4905	1.1100	-0.6195	1.6946	0.6694	1.0252
3	0.8197	0.0471	0.7726	0.6729	0.3184	0.3545	1.1271	0.2609	0.8663	0.3923	2.5867	-2.1944	0.9056	2.3108	-1.4052
T	3.1350	0.0471	3.0879	2.5737	0.4748	2.0990	5.1869	0.3889	4.7980	1.5004	3.8565	-2.3561	5.3480	2.9874	2.3607
Oct. 1	1.0033	0.0139	0.9894	0.8237	0.1683	0.6553	1.6447	0.1379	1.5068	0.4802	1.3674	-0.8872	2.5028	0.9487	1.5540
2	1.0831	0.0139	1.0692	0.8892	0.2760	0.6132	1.6824	0.2261	1.4564	0.5184	2.2416	-1.7233	2.9407	1.8241	1.1166
3	1.4358	0.0662	1.3697	1.1788	0.2033	0.9755	2.3451	0.1665	2.1786	0.6872	1.6512	-0.9640	4.0329	1.0383	2.9946
T	3.5222	0.0939	3.4283	2.8916	0.6476	2.2440	5.6723	0.5305	5.1418	1.6857	5.2602	-3.5745	9.4764	3.8111	5.6653
Nov. 1	1.4035	0.0559	1.3476	1.1522	0.1294	1.0228	2.3704	0.1060	2.2644	0.6717	1.0515	-0.3797	3.6105	0.4270	3.1835
2	1.4296	0.2661	1.1635	1.1737	0.1158	1.0579	2.2214	0.0949	2.1265	0.6842	0.9407	-0.2564	3.3842	0.2987	3.0855
3	0.9693	0.3452	0.6241	0.7958	0.1298	0.6660	1.2901	0.1063	1.1837	0.4639	1.0543	-0.5904	1.0731	0.6378	0.4353
T	3.8025	0.6673	3.1352	3.1217	0.3750	2.7467	5.8819	0.3072	5.5746	1.8199	3.0465	-1.2266	8.0677	1.3636	6.7041
Dec. 1	0.7919	0.2888	0.4931	0.6419	0.3669	0.2750	0.7681	0.3006	0.4674	0.3742	2.9806	-2.6064	0.8677	2.7405	-1.8728
2	0.6633	0.2784	0.3849	0.5445	0.3723	0.1722	0.5571	0.3050	0.2521	0.3174	3.0244	-2.7069	0.9226	2.8430	-1.9204
3	0.5739	0.3202	0.2537	0.4711	0.4541	0.0170	0.2707	0.3720	-0.1013	0.2747	3.7900	-3.5154	0.7422	3.6812	-2.9390
T	2.0191	0.8874	1.1317	1.6576	1.1934	0.4642	1.5959	0.9776	0.6183	0.9663	9.7950	-8.8287	2.5325	9.2647	-6.7322
Year	29.1871	3.0554	26.1317	23.9615	5.0485	19.1939	45.0494	4.1359	40.9135	13.9690	41.5037	-27.5347	69.0339	34.1481	34.8859

1968	Serruco D.D. System			Gubaton D.D. System			AsueSouth Subsystem			Asue D.D. System			CatipayanT.D.System		
	Serruco Dischg.	Water Reqmt.	Surpls/ Deficit	Gubaton Dischg.	Water Reqmt.	Surpls/ Deficit	AsueSth. Dischg.	Water Reqmt.	Surpls/ Deficit	Asue Dischg.	Water Reqmt.	Surpls/ Deficit	Catipyn. Dischg.	Water Reqmt.	Surpls/ Deficit
Jan. 1	0.4048	0.2695	0.1353	0.3323	0.2769	0.0554	0.1907	0.2269	-0.0361	0.1937	2.2855	-2.0918	0.5812	2.1930	-1.6118
2	0.3028	0.2737	0.0291	0.2486	0.1767	0.0719	0.1010	0.1448	-0.0438	0.1449	1.4794	-1.3344	0.5076	1.3990	-0.8914
3	0.2750	0.2750	-0.0000	0.2258	0.0820	0.1437	0.1437	0.0672	0.0765	0.1316	0.6664	-0.5348	0.4904	0.5649	-0.0744
T	0.9826	0.8183	0.1644	0.8067	0.5357	0.2710	0.4354	0.4388	-0.0034	0.4703	4.4313	-3.9610	1.5792	4.1568	-2.5775
Feb. 1	0.2391	0.2247	0.0144	0.1963	0.0044	0.1919	0.2063	0.0036	0.2027	0.1144	0.0361	0.0783	0.3957	0.0016	0.3941
2	0.2286	0.1433	0.0854	0.1877	0.0000	0.1877	0.2730	0.0000	0.2730	0.1094	0.0000	0.1094	0.3548	0.0000	0.3548
3	0.2027	0.0480	0.1547	0.1664	0.0000	0.1664	0.3211	0.0000	0.3211	0.0970	0.0000	0.0970	0.4042	0.0000	0.4042
T	0.6704	0.4159	0.2545	0.5504	0.0044	0.5459	0.8004	0.0036	0.7968	0.3209	0.0361	0.2848	1.1548	0.0016	1.1532
Mar. 1	0.2123	0.0160	0.1963	0.1743	0.0000	0.1743	0.3706	0.0000	0.3706	0.1016	0.0000	0.1016	0.3374	0.0000	0.3374
2	0.2027	0.0000	0.2027	0.1664	0.0000	0.1664	0.3691	0.0000	0.3691	0.0970	0.0000	0.0970	0.3096	0.0000	0.3096
3	0.2119	0.0000	0.2119	0.1739	0.0000	0.1739	0.3858	0.0000	0.3858	0.1014	0.0000	0.1014	0.3096	0.0000	0.3096
T	0.6269	0.0160	0.6109	0.5146	0.0000	0.5146	1.1255	0.0000	1.1255	0.3000	0.0000	0.3000	0.9566	0.0000	0.9566
Apr. 1	0.1819	0.0000	0.1819	0.1493	0.0000	0.1493	0.3312	0.0000	0.3312	0.0870	0.0000	0.0870	0.2537	0.0000	0.2537
2	0.1717	0.0000	0.1717	0.1410	0.0000	0.1410	0.3127	0.0000	0.3127	0.0822	0.0000	0.0822	0.2364	0.0000	0.2364
3	0.1618	0.0000	0.1618	0.1329	0.0000	0.1329	0.2947	0.0000	0.2947	0.0775	0.0000	0.0775	0.2290	0.0000	0.2290
T	0.5154	0.0000	0.5154	0.4231	0.0000	0.4231	0.9386	0.0000	0.9386	0.2467	0.0000	0.2467	0.7190	0.0000	0.7190
May 1	0.1529	0.0000	0.1529	0.1255	0.2475	0.0000	0.0308	0.2028	-0.1720	0.0732	2.1827	-2.1096	0.2219	2.2000	-1.9781
2	0.1463	0.0000	0.1463	0.1201	0.3241	-0.0577	0.0000	0.2655	-0.2655	0.0700	2.9556	-2.8856	0.2579	3.0040	-2.7461
3	0.1520	0.0000	0.1520	0.1248	0.4926	-0.2159	0.0000	0.4035	-0.4035	0.0727	4.6204	-4.5476	0.2357	4.7276	-4.4919
T	0.4511	0.0000	0.4511	0.3704	1.0642	-0.2735	0.0309	0.8718	-0.8410	0.2159	9.7587	-9.5428	0.7155	9.9316	-9.2161
Jun. 1	0.3484	0.0500	0.2985	0.2961	0.1552	0.1308	0.4293	0.1272	0.3021	0.1668	1.2610	-1.0942	1.5098	1.1509	0.3589
2	0.2961	0.2580	0.0380	0.2430	0.4935	-0.2125	0.0000	0.4043	-0.4043	0.1417	4.6257	-4.4840	0.9764	4.6643	-3.6879
3	0.3291	0.1640	0.1650	0.2701	0.2723	0.0000	0.1628	0.2231	-0.0603	0.1575	2.2725	-2.1151	1.1096	2.2146	-1.1050
T	0.9736	0.4720	0.5015	0.7993	0.9211	-0.0816	0.3921	0.7546	-0.1625	0.4659	8.1592	-7.6933	3.5958	8.0298	-4.4340
Jul. 1	0.9116	0.0772	0.8344	0.7484	0.0664	0.6820	1.5164	0.0544	1.4619	0.4363	0.5397	-0.1034	3.7718	0.1277	3.6441
2	0.7869	0.2098	0.5771	0.6460	0.1084	0.5376	1.1148	0.0888	1.0260	0.3766	0.8805	-0.5038	2.5114	0.5435	1.9679
3	0.7926	0.2822	0.5104	0.6507	0.1294	0.5213	1.0316	0.1060	0.9256	0.3793	1.0512	-0.6719	1.7672	0.7191	1.0481
T	2.4911	0.5692	1.9219	2.0451	0.3042	1.7408	3.6627	0.2492	3.4135	1.1922	2.4714	-1.2791	8.0503	1.3903	6.6600
Aug. 1	0.6790	0.1024	0.5766	0.5574	0.0000	0.5574	1.1340	0.0000	1.1340	0.3250	0.0000	0.3250	1.8258	0.0000	1.8258
2	2.4510	0.0241	2.4269	2.0122	0.0000	2.0122	4.4391	0.0000	4.4391	1.1731	0.0000	1.1731	8.7792	0.0000	8.7792
3	1.4755	0.0000	1.4755	1.2113	0.0264	1.1849	2.6603	0.0216	2.6387	0.7062	0.2147	0.4915	2.9425	0.0097	2.9328
T	4.6055	0.1265	4.4789	3.7809	0.0264	3.7545	8.2334	0.0216	8.2118	2.2042	0.2147	1.9895	13.5475	0.0097	13.5378
Sep. 1	0.9178	0.0000	0.9178	0.7535	0.0237	0.7298	1.6476	0.0194	1.6282	0.4393	0.1922	0.2470	1.1058	0.0086	1.0972
2	1.0910	0.0000	1.0910	0.8957	0.1091	0.7866	1.8777	0.0893	1.7884	0.5222	0.8859	-0.3637	2.6170	0.4035	2.2135
3	0.7974	0.0177	0.7796	0.6546	0.2668	0.3878	1.1673	0.2187	0.9486	0.3816	2.1680	-1.7864	1.4335	1.8839	-0.4504
T	2.8062	0.0177	2.7884	2.3038	0.3996	1.9042	4.6926	0.3274	4.3652	1.3430	3.2461	-1.9031	5.1563	2.2961	2.8602
Oct. 1	0.7883	0.0135	0.7748	0.6471	0.2222	0.4249	1.1997	0.1821	1.0176	0.3773	1.8052	-1.4279	1.4127	1.5091	-0.0964
2	2.7291	0.0059	2.7232	2.2405	0.1167	2.1238	4.8469	0.0956	4.7513	1.3062	0.9483	0.3579	8.5161	0.0427	8.4734
3	1.5233	0.1995	1.3238	1.2505	0.3805	0.8700	2.1939	0.3117	1.8821	0.7290	3.0910	-2.3619	3.2691	2.5010	0.7681
T	5.0407	0.2189	4.8218	4.1382	0.7195	3.4187	8.2405	0.5894	7.6511	2.4125	5.8445	-3.4320	13.1980	4.0528	9.1452
Nov. 1	0.9574	0.2648	0.6927	0.7860	0.4253	0.3608	1.0534	0.3484	0.7050	0.4582	3.4544	-2.9962	0.9980	3.1516	-2.1536
2	1.1825	0.1905	0.9920	0.9708	0.1078	0.8629	1.8549	0.0883	1.7666	0.5659	0.8760	-0.3101	2.5751	0.3495	2.2256
3	1.6104	0.2012	1.4093	1.3221	0.0000	1.3221	2.7314	0.0000	2.7314	0.7708	0.0000	0.7708	4.7062	0.0000	4.7062
T	3.7503	0.6564	3.0939	3.0789	0.5331	2.5459	5.6397	0.4367	5.2030	1.7949	4.3304	-2.5355	8.2792	3.5011	4.7782
Dec. 1	0.9237	0.1964	0.7273	0.7583	0.0000	0.7583	1.4857	0.0000	1.4857	0.4421	0.0000	0.4421	1.1394	0.0000	1.1394
2	0.7313	0.2531	0.4783	0.6004	0.2597	0.3407	0.8189	0.2128	0.6062	0.3500	2.1097	-1.7597	0.8189	1.8546	-1.0357
3	0.6094	0.2811	0.3282	0.5003	0.3977	0.1025	0.4308	0.3258	0.1050	0.2916	3.2307	-2.9391	0.7598	3.0844	-2.3247
T	2.2644	0.7306	1.5338	1.8590	0.6574	1.2016	2.7354	0.5386	2.1968	1.0839	5.3405	-4.2567	2.7180	4.9390	-2.2210
Year	25.1782	4.0416	21.1366	20.6703	5.1657	15.9652	37.1272	4.2319	32.8953	12.0504	43.9329	-31.7825	59.6703	38.3088	21.3615

FIG.VI - 1


RIVERS AND CATCHMENTS IN THE PROJECT AREA
N
SCALE
0 1 2 3 4 5 km
LEGEND
Boundary of Catchment
River ,Creek
Road
Catipayan River
BAGACAY BAY
Tabogay River
Asue River
San Dionisio
SARA
Sara Creek
Dahis Creek
Padios Creek
CONCEPCION BAY
Sernuco River
Pasaka Stream
Gubaton River
Lanjagan River
CONCEPCION
AJUY
AJUY BAY

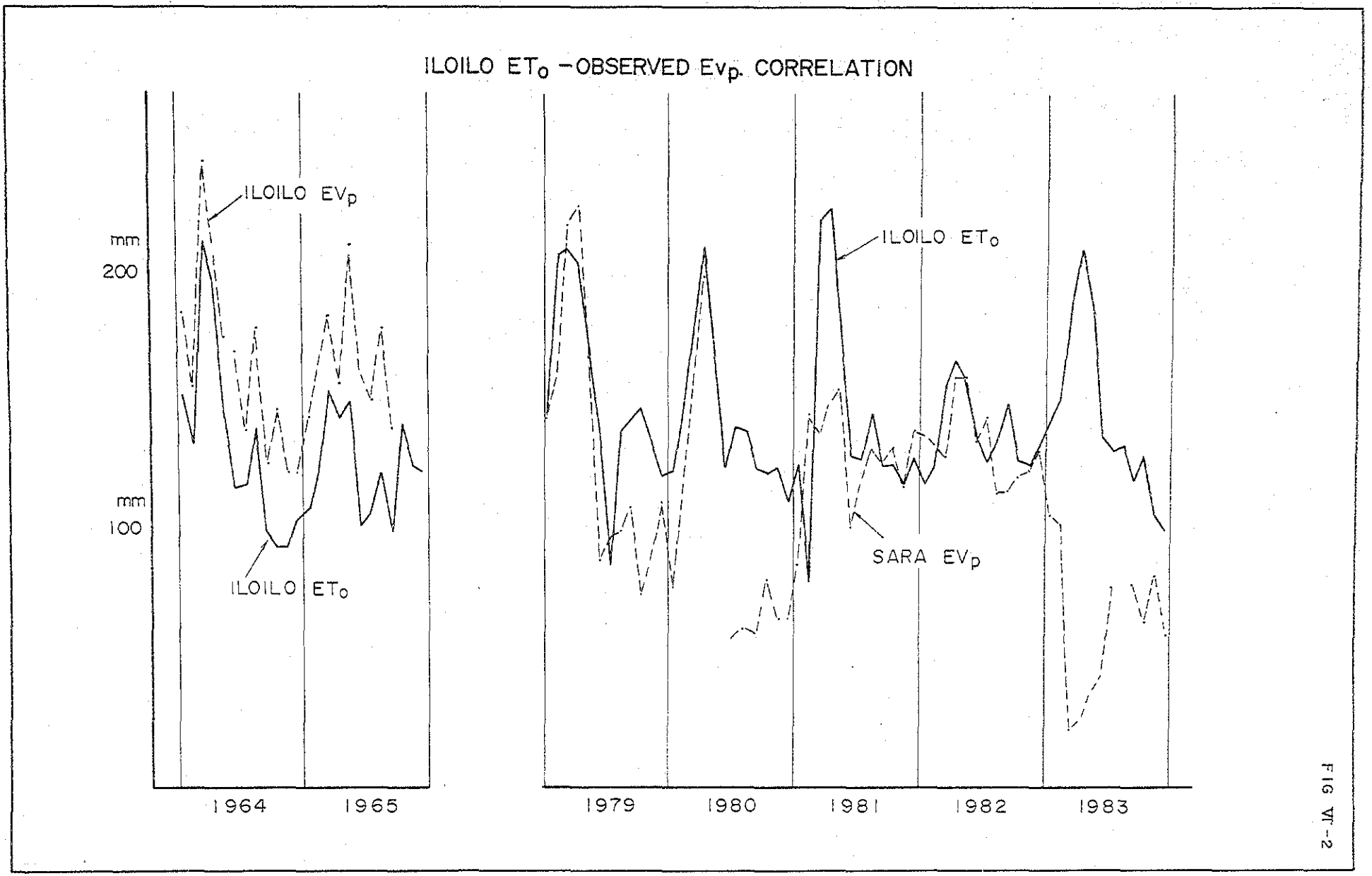
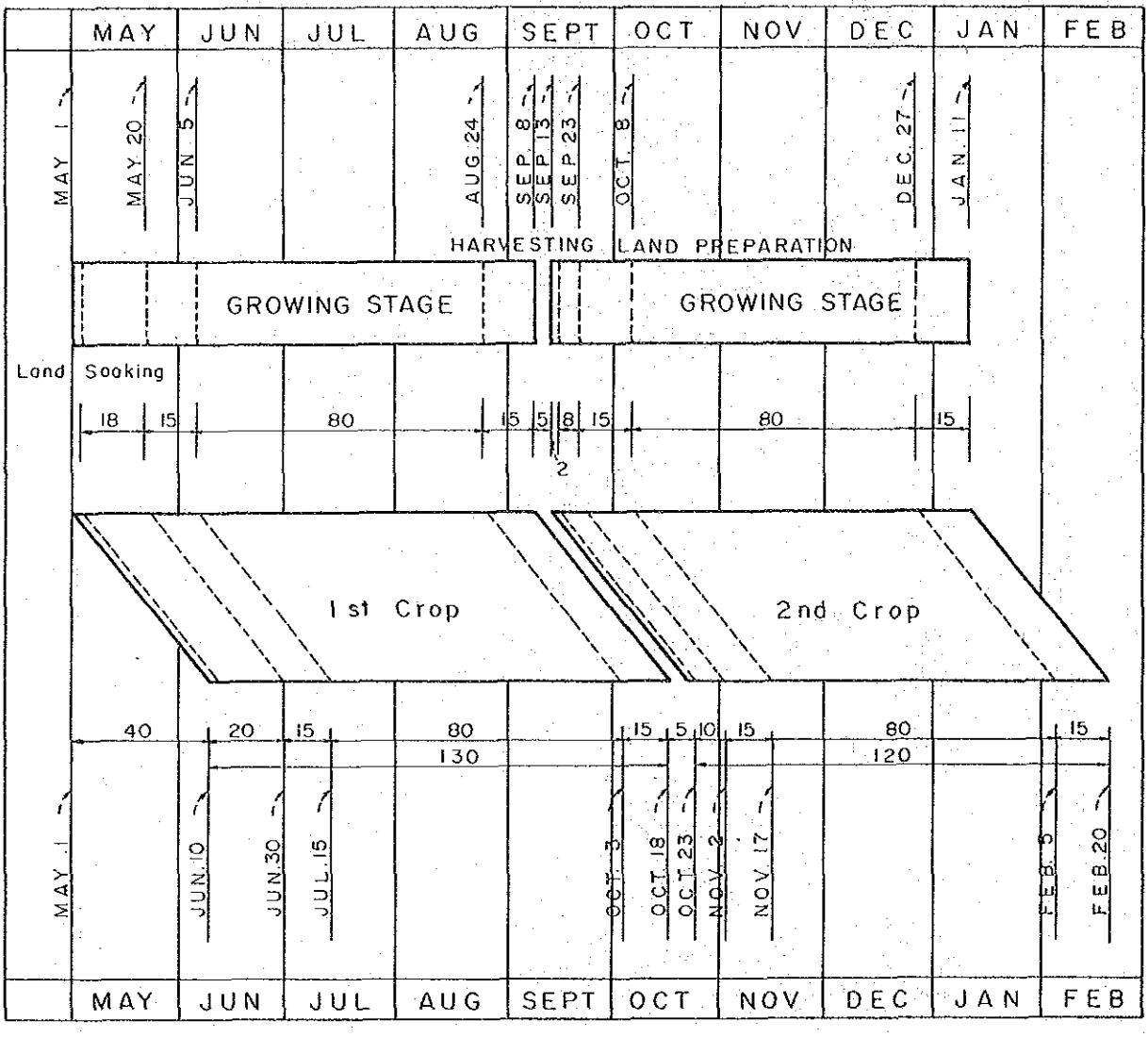

ILOILO ETo – OBSERVED Evp. CORRELATION
ILOILO EVp
mm
200
mm
100
ILOILO ETo
1964
1965
ILOILO ETo
SARA EVp
1979
1980
1981
1982
1983

FIG VI-2

FIG. VI-3

TYPICAL CROPPING CALENDAR
FOR IRRIGATION WATER REQUIREMENT



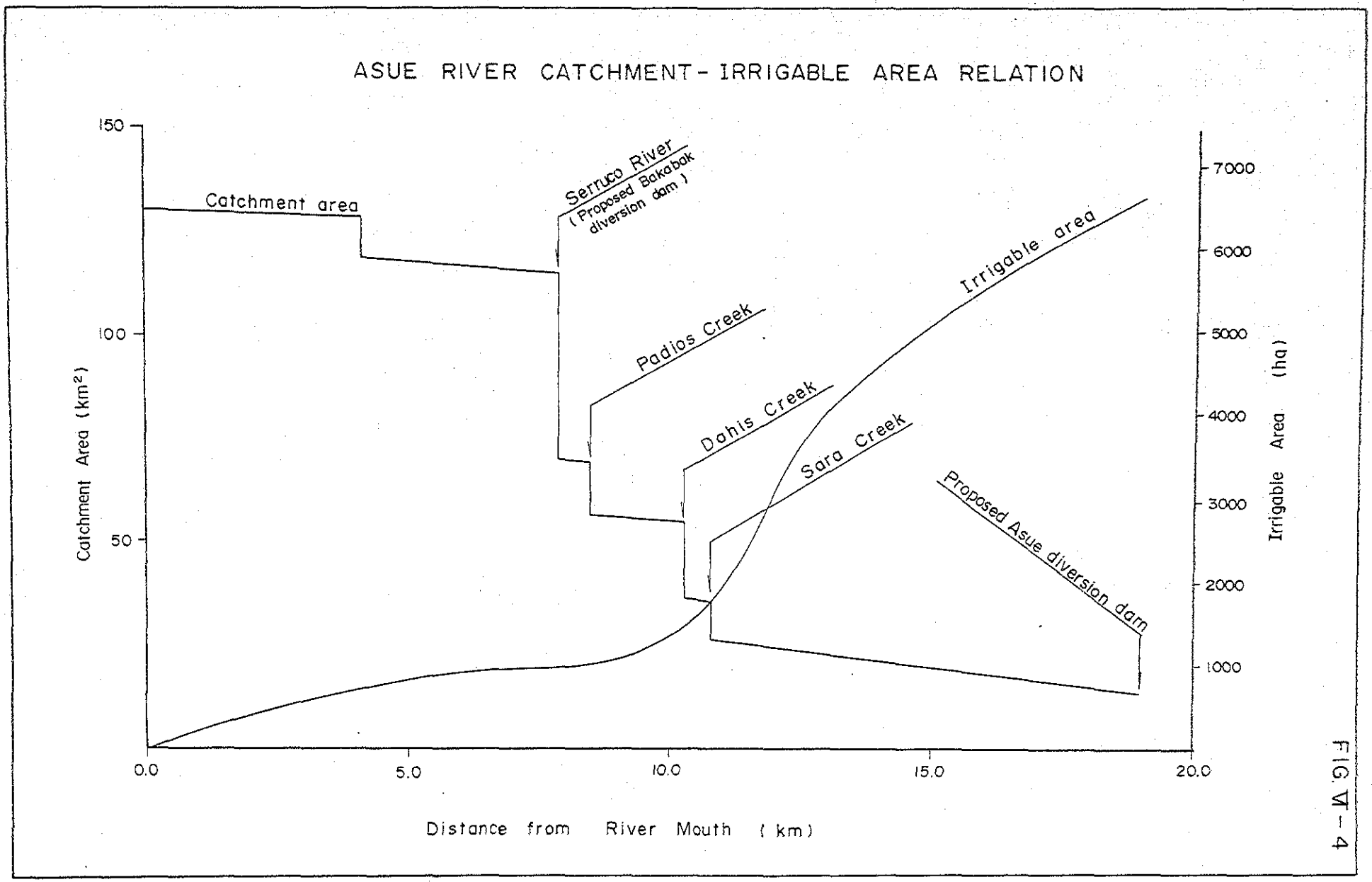

ASUE RIVER CATCHMENT - IRRIGABLE AREA RELATION
150
100
50
Catchment Area (km²)
Catchment area
Serruco River
(Proposed Bakabak
diversion dam)
Padios Creek
Dahis Creek
Sara Creek
Proposed Asue diversion dam
Irrigable area
7000
6000
5000
4000
3000
2000
1000
Irrigable Area (ha)
0.0
5.0
10.0
15.0
20.0
Distance from River Mouth (km)

FIG. VI - 4

FIG. VI - 5

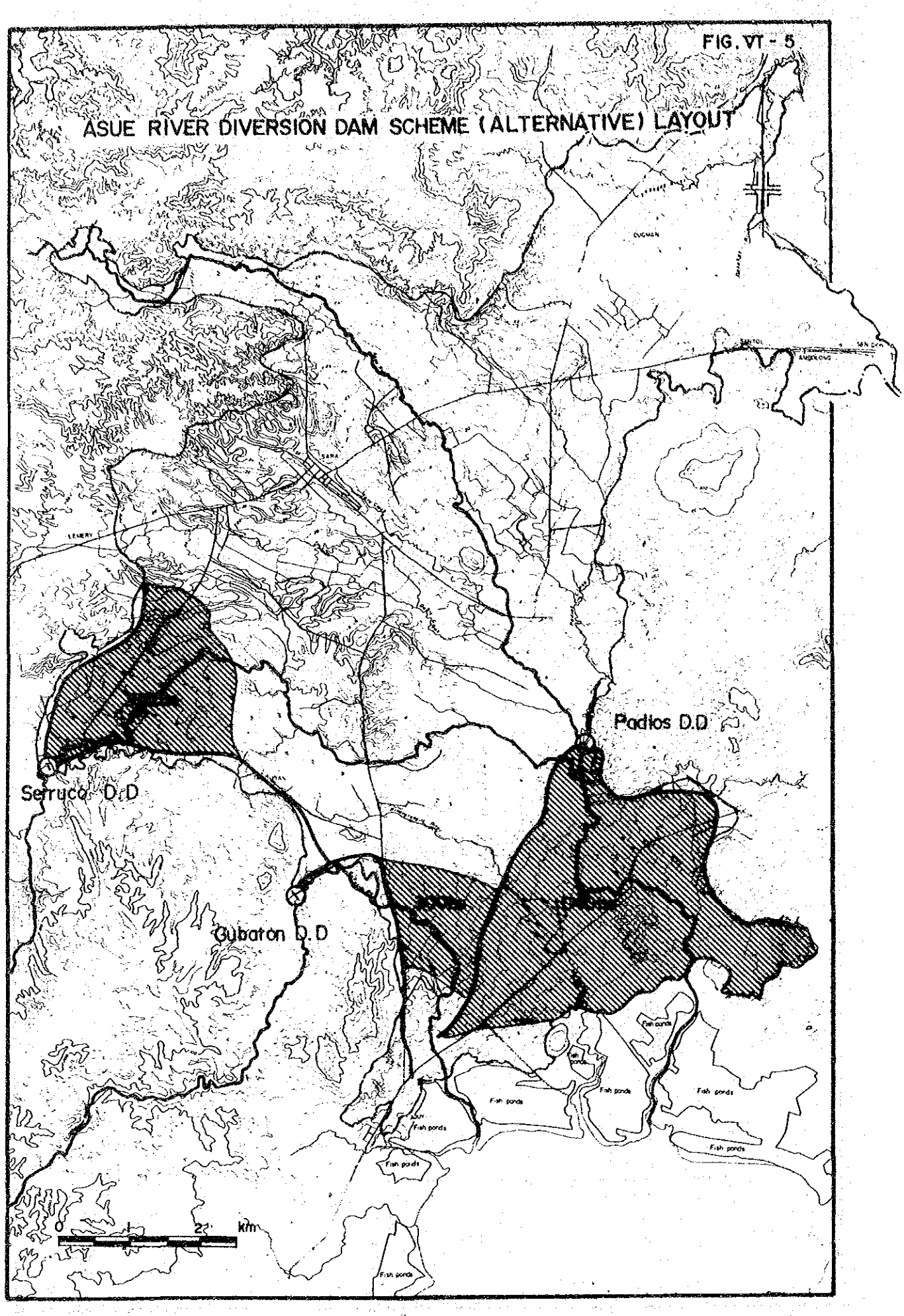
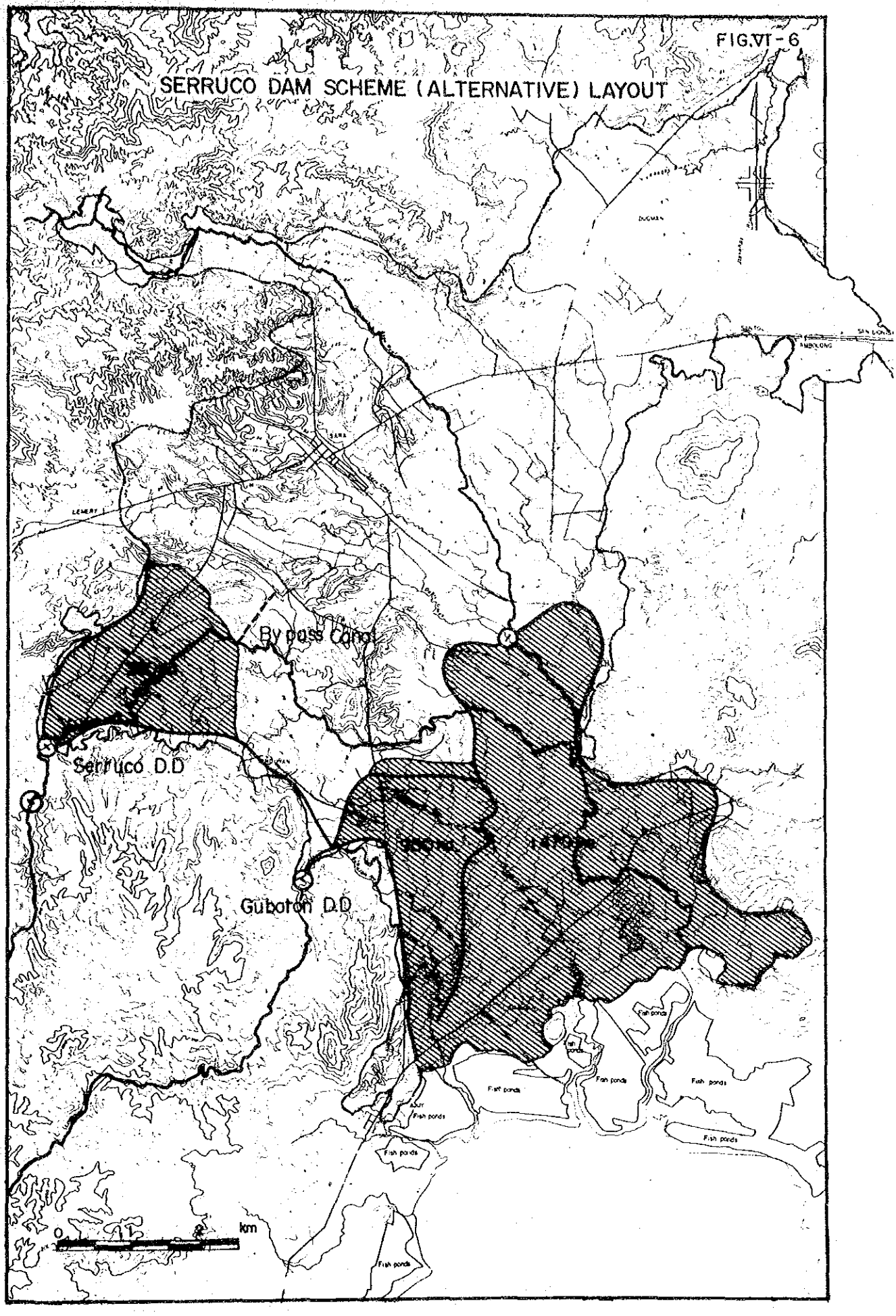

ASUE RIVER DIVERSION DAM SCHEME (ALTERNATIVE) LAYOUT
Padios D.D
Serruco D.D
Gubaton D.D
Fish ponds
0
1
2
km

FIG.VI - 6


SERRUCO DAM SCHEME (ALTERNATIVE) LAYOUT
By pass Canal
Serruco D.D
Guboton D.D
Fish ponds
km