TABLES

FOR

APPENDIX III

TABLE III.3-1 REDUCTION RATES BY FLOOD

1. Dept of Water	Less than 0.5 m deep				0.5 - 0.9 m deep				More than 0.9 m deep			
2. Growing Stage of Paddy	Stage - I				Stage - II				Stage - III			
3. Inundated Days	1-2	3-4	5-6	7-	1-2	3-4	5-6	7-	1-2	3-4	5-6	7-
4. Crop Damage (%)												
Lowland Paddy	10	20	30	50	70	80	85	90	30	80	90	90
Upland Paddy	20	34	47	60	31	40	50	60	44	60	72	82
Sweet Potato	11	30	50	50	27	40	75	88	38	63	95	100
Chinese Cabbage	42	50	70	83	58	70	83	97	47	75	100	100
Leafy Vegetable	19	33	46	59	20	44	48	95	44	58	71	84
Root Crops	32	46	59	62	43	57	100	100	73	87	100	100
Fruit Vegetable	22	30	42	56	31	38	51	100	40	50	63	100
Pulse	23	41	54	67	30	41	60	73	40	50	68	81
Average Upland Crops	27	42	54	67	35	48	67	54	51	67	81	91

Source : Criteria for the Engineering on River and Sabo Project, Ministry of Construction of Japan.

TALBE III.3-2 DAMAGE RATE BY GROWING STAGE/WATER DEPTH/ DURATION FOR SUGAR CANE

Unit : %

Growing Stage	Depth (m)	Duration (day)			
		1-2	3-4	5-6	7
Growing	0 - 0.5	0	0	0	3
	0.5 - 1.0	0	0	3	6
	1.0	0	3	6	9
Ripening	0 - 0.5	0	0	5	15
	0.5 - 1.0	0	5	15	20
	1.0	5	15	20	25

TABLE III.3-3(1) ECONOMIC PRICES FOR PADDY

		1984		1989		1994	
		Export	Import	Export	Import	Export	Import
1. World market price /1	$ MT	291	291	391	391	419	419
2. Less quality discount /2		52	52	52	52	52	52
3. Import cost to Manila		-	40	-	40	-	40
4. Export/Import/Value/Price		239	279	339	379	367	407
	₱ MT	4,302	5,022	6,102	6,822	6,606	7,326
5. Transshipment		90	90	90	90	90	90
6. Port charges /3		38	38	38	38	38	38
7. NFA administration charge /3		60	60	60	60	60	60
8. Transport & handling /3 /4		137	137	137	137	137	137
9. Economic Price Rice, Wholesale		3,977	5,347	5,777	7,147	6,287	7,651
10. Economic Price Paddy at Mill /5		2,396	3,259	3,530	4,393	3,851	4,310
11. Less Cost of Procurement, Transport and Handling Wholesale/Farmgate /6		80	80	80	80	80	80
12. Economic Price Paddy at Farmgate		2,316	3,339	3,450	4,473	3,771	4,390

/1 World Bank short run projection for Tahi, 5 % broken FOB Bangkok.
Jan., 1984 Commodity Price Projection in 1984 constant dollars.

/2 18 % Applicable to Phillipine coarse rice vareities.

/3 Charges deducted to calculate export parity price, but added for import parity.

/4 Charged based on average distance of 130 km at ₱ 1.05/km/ton, inclusive of handling and insurance.

/5 Yeild of rice 63 % - based on average of private mills and NFA facilities, covering 95 % . Milling cost are ₱ 190 per MT.

/6 Average distance 32 kms at ₱ 2.50/km/ton inclusive of handling.

TABLE III.3-3(2) ECONOMIC PRICE FOR SUGAR CANE, 1984

A.	Export/Value/Price, Iloilo	(₱/Picul)	216.7
B.	Liens		6.4
C.	Millers' Share		73.6
D.	Economic Price of Sugar cane at Mill gate	- Picul - (₱/Picul)	136.7
E.	Economic Price of Sugar cane at Farm gate	(₱/TC)	205.05

Source: 1. Socio Economic Profile 1982, Province of Capiz
2. Annual Report 1983, PHILSUCOM

Note:

F. Average Field of Sugar cane (Picul)	77 ps/ha
G. Average ps/TC	1.5
H. Average Field of Sugar cane	52 t/ha
I. Gross Income (E x H)	10,663 ₱/ha
J. Average Production Cost	7,750 ₱/ha
K. Net Income (I - J)	2,910 ₱/ha

TABLE III.3-3(3) ESTIMATED ECONOMIC PRICES OF FERTILIZERS

		1984				1989				1994			
1. Import price		Urea	Kcl	DAP	NP	Urea	Kcl	DAP	NP	Urea	Kcl	DAP	NP
C & F Manila	$ MT	170	120	270	180	273	147	496	290	400	153	538	327
	P MT	3,060	2,160	4,860	3,240	4,914	2,646	8,928	5,220	7,200	2,754	9,684	5,886
2. Insurance (2%)		61	44	97	64	98	53	179	104	144	55	194	118
3. Landing charge		130	130	130	130	130	130	130	130	130	130	130	130
4. Bagging			130				130				130		
5. Landed Cost		3,251	2,464	5,089	3,434	5,147	2,959	9,237	5,454	7,474	3,069	10,008	6,134
6. Transshipment		195	195	195	195	195	195	195	195	195	195	195	195
7. Operating Expenses		156	156	156	156	156	156	156	156	156	156	156	156
8. Industry Margin (2%)		72	56	109	76	110	66	192	116	157	68	207	130
9. Ex-Warehouse Cost		3,674	2,871	5,547	3,861	5,608	3,376	9,780	5,921	7,982	3,488	10,566	6,615
10. Handling		26	26	26	26	26	26	26	26	26	26	26	26
11. Transport to Dealer		60	60	60	60	60	60	60	60	60	60	60	60
12. Mark-up		100	100	100	100	100	100	100	100	100	100	100	100
13. Transport to Farmgate /1		22	22	22	22	22	22	22	22	22	22	22	22
14. Economic Price at Farmgate		3,882	3,079	5,755	4,069	5,816	3,584	9,988	6,129	8,190	3,696	10,774	6,823
15. Economic Price per 50 kg bag		194.15	153.95	287.75	203.45	290.80	179.20	499.40	306.45	409.50	184.80	538.70	341.15

Note : Average distance 10 km at P 2.2/km/ton

TABLE III.3-3(4) ECONOMIC COSTS OF PRODUCTION PER HECTARE FOR PADDY WITHOUT PROJECT (Irrigated Paddy 1st)

Cost	M/D /1	M/D /2	M/D /3	1984 Unit Price	1984 Amount	1989 Unit Price	1989 Amount	1994 Unit Price	1994 Amount
1. Labour									
Nursery Work	4			P 10	P 40	P 10	P 40	P 10	P 40
Land Preparation	10			10	100	10	100	10	100
& Clearing Field		2		25	50	25	50	25	50
			2	400	800	400	800	400	800
Basic Fertilizer	4			15	60	15	60	15	60
Pulling & Transplanting	40			10	400	10	400	10	400
Weeding	30			10	300	10	300	10	300
Top Dressing	2			15	30	15	30	15	30
Spraying	2			15	30	15	30	15	30
Harvesting	30			10	300	10	300	10	300
Threshing	10			10	100	10	100	10	100
			1	400	400	400	400	400	400
Drying	10			10	100	10	100	10	100
Sub-Total					2,710		2,710		2,710
2. Membership Fee					397.5		397.5		397.5
3. Materials									
Seeds	3 cavans			195	590	260	780	330	660
Fertilizers	N 2 bags (Urea)			194.15	390	290.80	580	409.50	820
	P 3 bags (16-20)			203.45	610	306.49	920	341.15	1,020
Agro-chemicals	Herbi, 1 quarts			150	150	158	160	165	170
	Insect, 3 quarts			170	510	179	540	187	560
Others					400		430		440
Sub-Total					2,650		3,410		3,670
Grand Total					5,758		6,518		6,778

Note : /1 Labour, /2 Animal, /3 Machine

TABLE III.3-3(5) ECONOMIC COSTS OF PRODUCTION PER HECTARE FOR PADDY WITHOUT PROJECT (Irrigated Paddy 2nd)

Cost		M/D /1	M/D /2	M/D /3	1984 Unit Price	1984 Amount	1989 Unit Price	1989 Amount	1994 Unit Price	1994 Amount
1. Labour										
Nursery Work										
Land Preparation		10			P 10	P 100	P 10	P 100	P 10	P 100
& Clearing of Field			2		25	50	25	50	25	50
				2	400	800	400	800	400	800
Basic Fertilization		4			15	60	15	60	15	60
Direct Seeding		5			10	50	10	50	10	50
Weeding		40			10	400	10	400	10	400
Top Dressing		2			15	30	15	30	15	30
Spraying		2			15	30	15	30	15	30
Harvesting		30			10	300	10	300	10	300
Threshing		10			10	100	10	100	10	100
				1	400	400	400	400	400	400
Drying		10			10	100	10	100	10	100
Sub-Total						2,420		2,420		2,420
2. Membership Fee						397.5		397.5		397.5
3. Materials										
Seeds		3 cavans			195	590	260	780	330	660
Fertilizers		N - 2 bags (Urea)			194.15	390	290.80	580	409.50	820
		P - 3 bags (16-20)			203.45	610	306.49	920	341.15	1,020
Agro-chemicals	Herbi,	1 quarts			150	150	158	160	165	170
	Insect,	3 quarts			170	510	179	540	187	560
Others						400		430		440
Sub-Total						2,650		3,410		3,670
Grand Total						5,468		6,228		6,488

Note : /1 Labour, /2 Animal /3 Machine

TABLE III.3-3(6) ECONOMIC COSTS OF PRODUCTION PER HECTARE FOR PADDY WITHOUT PROJECT (Rainfed Paddy 1st)

Cost		1984 M/D /1	1984 M/D /1	1984 M/D /3	1984 Unit Price	1984 Amount	1989 Unit Price	1989 Amount	1994 Unit Price	1994 Amount
1. Labour										
Nursery Work		4			P 10	P 40	P 10	P 40	P 10	P 40
Land Preparation		10			10	100	10	100	10	100
Clearing of Field			2		25	50	25	50	25	50
				2	400	800	400	800	400	800
Basic Fertilization		4			15	60	15	60	15	60
Pulling & Transplantig		40			10	400	10	400	10	400
Weeding		30			10	300	10	300	10	300
Top Dressing		2			15	30	15	30	15	30
Spraying		2			15	30	15	30	15	30
Harvesting		30			10	300	10	300	10	300
Threshing		10			10	100	10	100	10	100
				1	400	400	400	400	400	400
Drying		10			10	100	10	100	10	100
Sub-Total						2,710		2,710		2,710
2. Membership Fee										
3. Materials										
Seeds		3 cavans			195	590	260	780	330	660
Fertilizers		N - 2 bags (Urea)			194.15	390	290.80	580	409.50	820
		P - 3 bags (16-20)			203.45	610	306.49	920	341.15	1,020
Agro-Chemicals	Herbi,	1 quarts			150	150	158	160	165	170
	Insect,	3 quarts			170	510	179	540	187	560
Others						340		370		380
Sub-Total						2,590		2,350		3,610
Grand Total						5,300		6,060		6,320

Note : /1 Labour, /2 Animal, /3 Machine

TABLE III.3-3(7) ECONOMIC COSTS OF PRODUCTION PER HECTARE FOR PADDY WITHOUT PROJECT (Rainfed Paddy 2nd)

Cost	M/D /1	M/D /2	M/D /3	1984 Unit Price	1984 Amount	1989 Unit Price	1989 Amount	1994 Unit Price	1994 Amount
1. Labour									
Nursery Work									
Land Preparation &	10			P 10	100	P 10	P 100	P 10	P 100
Clearing of Field		2		25	50	25	50	25	50
			2	400	800	400	800	400	800
Basic Fertilization	4			15	60	15	60	15	60
Direct Seeding	5			10	50	10	50	10	50
Weeding	40			10	400	10	400	10	400
Top-dressing	2			15	30	15	30	15	30
Spraying	2			15	30	15	30	15	30
Harvesting	30			10	300	10	300	10	300
Threshing	10			10	100	10	100	10	100
			1	400	400	400	400	400	400
Drying	10			10	100	10	100	10	100
Sub-Total					2,420		2,420		2,420
2. Materials									
Seeds	3 cavans			195	590	260	780	330	660
Fertilizers	N - 2 bags (Urea)			194.15	390	290.80	580	409.50	820
	P - 3 bags (16-20)			203.45	610	306.49	920	341.15	1,020
Agro-Chemicals	Herbi, 1 quarts			150	150	158	160	165	170
	Insect, 3 quarts			170	510	179	540	187	560
Others					340		370		380
Sub-Total					2,590		3,350		3,610
Grand Total					5,010		5,770		6,030

Note : /1 Labour
/2 Animal
/3 Machines

TABLE III.3-3(8) ECONOMIC COSTS OF PRODUCTION PER HECTARE FOR MUNGO

Cost	M/D /1	M/D /2	1984 Unit Price (P)	1984 Amount (P)	1989 Unit Price (P)	1989 Amount (P)	1994 Unit Price (P)	1994 Amount (P)
1. Labour								
Land Preparation								
- 1st Plowing		7	25	175	25	175	25	175
- 2nd Plowing		6	25	150	25	150	25	150
- Harrowing (2x)		6	25	150	25	150	25	150
- Furrowing		3	25	75	25	75	25	75
Planting	5		10	50	10	50	10	50
Cultivation (2x)		12	25	300	25	300	25	300
Weeding	15		15	225	15	225	15	225
Harvesting	30		10	300	10	300	10	300
Threshing and Cleaning	5		10	50	10	50	10	50
Drying and Storing	5		10	50	10	50	10	50
Sub-Total				1,525		1,525		1,525
2. Materials								
- Seeds	15 kg		9/kg	135	9.0	135	9.0	135
- Fertilizer	NP 2 bags		203.45/bag		306.45	613	341.15	683
- Agro-chemicals				340		360		370
Sub-Total				475		1,108		1,188
Total Cost				2,000		2,633		2,713

Source : Farm Survey 1984

TABLE III.3-3(9) ECONOMIC COSTS OF PRODUCTION PER HECTARE FOR VEGETABLES

	M/D [1]	1984 Unit Price (₱)	1984 Amount (₱)	1989 Unit Price (₱)	1989 Amount (₱)	1994 Unit Price (₱)	1994 Amount (₱)
1. Labour							
Land Preparation							
Nursery Works	3	10	30	10	30	10	30
1st Plowing	2	10	40	10	40	10	40
1st Harrowing	4	10	40	10	40	10	40
2nd Plowing	4	10	40	10	40	10	40
2nd Harrowing	4	10	40	10	40	10	40
Transplanting	30	10	300	10	300	10	300
Fertilizer Application	5	10	50	10	50	10	50
Weeding, Top Dressing, Thining	50	3	250	3	250	3	250
Final Top Dressing	10	10	100	10	100	10	100
Insecticide Fungicide (7x)	70	5	350	5	350	5	350
Harvesting			400		400		400
Grading			100		100		100
Sub-Total			1,740		1,740		1,740
2. Materials							
Seeds Zoogram at ₱70/100 grms			140	70	140	70	140
Fertilizer, 5 bags 14-14-14		222	1,110	280	1,400	390	1,950
Insecticides 4 qts		150	600	158	630	165	660
Fungicides 3 ctns		170	510	179	540	187	560
Sticker 3 btls		10/btl	30	10	30	10	30
Others			240		270		320
Sub-Total			2,630		3,010		3,660
Total Cost			4,370		4,750		5,400

Source : Farm Survey 1984

TABLE III.3-3 (10) ECONOMIC COST OF PRODUCTION PER HECTARE FOR SUGAR CANE

Cost	M/D /1	M/D /2	M/D /3	Unit Price	Amount	
					Plant Cane	Ratoon
1. Labour & Machines						
Plowing				₱400	₱400	
Harrowing				400	400	
Furrowing				400	400	
Planting	25			10	250	
Weeding	30			10	300	300
Fertilization	3			15	45	45
Spraying	3			15	45	45
Drainage	2			15	30	30
Harvesting		₱10/TC x 52			520	520
Hauling		₱25/TC x 52			1,300	1,300
Others					180	180
Sub-total					3,870	2,240
2. Materials						
Seeds	37,500			0.003	110	
Fertilizers N-		9 bags (Urea)		194	1,746	1,746
P-		4 bags (DAP)		288	1,152	1,152
Agro Chemicals Insect		3 quarts		150	450	450
Fungi		5 quarts		170	850	850
Others					352	352
Sub-total					4,660	4,550
Grand Total					8,530	6,970

Note: Average Production Cost per ha of Sugar Cane
= 1/2 (Plant Cane + Ratoon) = 7,750

/1 Labour

/2 Animal

/3 Machines

Source: Pilar Sugar Central 1984

TABLE III.3-4(1) ESTIMATED DAMAGEABLE VALUE PER HECTARE OF PADDY

Name of Area : Cuartero

Name of Crop : Irrigated Paddy

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A. Crop Calendar						1 st						2 nd
B. Planted Area (%)	100	75	25	25	75	100	100	75	25	25	75	100
C. Accumulated Cost (%)	72	84	98	16	38	54	74	85	98	17	40	57
D. Flood Frequency (%)	9	0	0	3	6	12	6	9	6	26	12	12

Item	1st Paddy			2nd Paddy		
	1984	1989	1994	1984	1989	1994
E. Yield (ton/ha)	3.2	3.4	3.6	3.2	3.4	3.6
F. Price (P/ton)	3,339	4,473	4,390	3,339	4,473	4,390
G. Production Cost (P/ha)	5,758	6,518	6,776	5,468	6,228	6,488
H. Net Income (P/ha)	4,927	8,690	9,028	5,217	8,980	9,316
I. Damageable Cost (P/ha)	4,558	5,318	5,576	4,268	5,028	5,288
J. Damageable Value (P/ha) /1	2,462	3,799	3,957	2,674	4,184	4,353

NOTE, /1 : Calculated as follows,

- 1st Paddy $J = \sum_{Apr}^{Sep} B \times D \times (I \times C + H)$
- 2nd Paddy $J = \sum_{Oct}^{Mar} B \times D \times (I \times C + H)$

TABLE III.3-4(2) ESTIMATED DAMAGEABLE VALUE PER HECTARE OF PADDY

Name of Area : Cuartero

Name of Crop : Rainfed Paddy

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A. Crop Calendar						1 st						2 nd
B. Planted Area (%)	100	75	25	25	75	100	100	75	25	25	75	100
C. Accumulated Cost (%)	80	93	98	18	41	59	81	93	98	20	43	63
D. Flood Frequency (%)	9	0	0	3	6	12	6	9	6	26	12	12

Item	1st Paddy			2nd Paddy		
	1984	1989	1994	1984	1989	1994
E. Yield (ton/ha)	2.8	2.9	3.0	2.8	2.9	3.0
F. Price (P/ton)	3,339	4,473	4,390	3,339	4,473	4,390
G. Production Cost (P/ha)	5,300	6,060	6,320	5,010	5,770	6,030
H. Net Income (P/ha)	4,049	6,912	6,850	4,339	7,202	7,140
I. Damageable Cost (P/ha)	4,160	4,920	5,180	3,870	4,630	4,890
J. Damageable Value (P/ha) /1	2,177	3,243	3,280	2,355	3,552	3,581

NOTE, /1 Calculated as follow,

- 1st Paddy $J = \sum_{Apr}^{Sep} B \times D \times (I \times C + H)$
- 2nd Paddy $J = \sum_{Oct}^{Mar} B \times D \times (I \times C + H)$

TABLE III.3-4(3) ESTIMATED DAMAGEABLE VALUE PER HECTARE OF PADDY

Name of Area : Sigma

Name of Crop : Irrigated Paddy

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A. Crop Calendar	2nd						1st					
B. Planted Area (%)	100	100	75	25	25	75	100	100	75	25	25	75
C. Accumulated Cost (%)	57	72	84	98	16	38	54	74	85	98	17	40
D. Flood Frequency (%)	9	0	0	3	6	12	6	9	6	26	12	12

Item	1st Paddy			2nd Paddy		
	1984	1989	1994	1984	1989	1994
E. Yield (ton/ha)	3.2	3.4	3.6	3.2	3.4	3.6
F. Price (₱/ton)	3,339	4,473	4,390	3,339	4,473	4,390
G. Production Cost (₱/ha)	5,758	6,518	6,776	5,468	6,228	6,488
H. Net Income (₱/ha)	4,927	8,690	9,028	5,217	8,980	9,316
I. Damageable Cost (₱/ha)	4,558	5,318	5,576	4,268	5,028	5,288
J. Damageable Value (₱/ha) /1	2,881	4,435	4,620	1,560	2,455	2,554

NOTE, /1 : Calculated as follow,

- 1st Paddy $J = \sum_{May}^{Oct} B \times D \times (I \times C + H)$
- 2nd Paddy $J = \sum_{Nov}^{Apr} B \times D \times (I \times C + H)$

TABLE III.3-4(4) ESTIMATED DAMAGEABLE VALUE PER HECTARE OF PADDY

Name of Area : Sigma

Name of Crop : Rainfed Paddy

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A. Crop Calendar	2nd						1st					
B. Planted Area (%)	100	100	75	25	25	75	100	100	75	25	25	75
C. Accumulated Cost (%)	63	80	93	98	18	41	59	81	93	98	20	43
D. Flood Frequency (%)	9	0	0	3	6	12	6	9	6	26	12	12

Item	1st Paddy			2nd Paddy		
	1984	1989	1994	1984	1989	1994
E. Yield (ton/ha)	2.8	2.9	3.0	2.8	2.9	3.0
F. Price (₱/ton)	3,339	4,473	4,390	3,339	4,473	4,390
G. Production Cost (₱/ha)	5,300	6,060	6,320	5,010	5,770	6,030
H. Net Income (₱/ha)	4,049	6,912	6,850	4,339	7,202	7,140
I. Damageable Cost (₱/ha)	4,160	4,920	5,180	3,870	4,630	4,890
J. Damageable Value (₱/ha) /1	2,532	3,770	3,813	1,365	2,070	2,085

NOTE, /1 : Calculated as follow,

- 1st Paddy $J = \sum_{May}^{Oct} B \times D \times (I \times C + H)$
- 2nd Paddy $J = \sum_{Nov}^{Apr} B \times D \times (I \times C + H)$

TABLE III.3-4(5) ESTIMATED DAMAGEABLE VALUE PER HECTARE OF PADDY

Name of Area : Panay
Name of Crop : Irrigated Paddy

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A. Crop Calendar		3rd							1st				2nd
B. Planted Area (%)	- 1st						25	75	100	100	75	25	
	- 2nd	100	75	25							25	75	100
	- 3rd		25	75	100	100	75	25					
C. Accumulated Cost (%)	- 1st						16	38	54	74	85	98	
	- 2nd	72	84	98							17	40	57
	- 3rd		17	40	57	72	84	98					
D. Flood Frequency (%)		9	0	0	3	6	12	6	9	6	26	12	12

Item	1st Paddy			2nd Paddy			3rd Paddy		
	1984	1989	1994	1984	1989	1994	1984	1989	1994
E. Yield (ton/ha)	3.2	3.4	3.6	3.2	3.4	3.6	3.2	3.4	3.6
F. Price (₱/ton)	3,339	4,473	4,390	3,339	4,473	4,390	3,339	4,473	4,390
G. Production Cost (₱/ha)	5,758	6,518	6,776	5,468	6,228	6,488	5,468	6,228	6,488
H. Net Income (₱/ha)	4,927	8,690	9,028	5,217	8,980	9,316	5,217	8,980	9,316
I. Damageable Cost (₱/ha)	4,558	5,318	5,576	4,268	5,028	5,288	4,268	5,028	5,288
J. Damageable Value (₱/ha) /1	3,630	5,559	5,791	2,674	4,184	4,354	1,660	2,508	2,613

NOTE, /1 : Calculated as follow,

- 1st Paddy $J = \sum_{Jun}^{Nov} B \times D \times (I \times C + H)$
- 2nd Paddy $J = \sum_{Oct}^{Mar} B \times D \times (I \times C + H)$
- 3rd Paddy $J = \sum_{Feb}^{Jul} B \times D \times (I \times C + H)$

TABLE III.3-4(6) ESTIMATED DAMAGEABLE VALUE PER HECTARE OF PADDY

Name of Area : Panay
Name of Crop : Rainfed Paddy

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A. Crop Calendar		3rd							1st				2nd
B. Planted Area (%)	- 1st						25	75	100	100	75	25	
	- 2nd	100	75	25							25	75	100
	- 3rd		25	75	100	100	75	25					
C. Accumulated Cost (%)	- 1st						18	41	59	81	93	98	
	- 2nd	80	93	98							20	43	63
	- 3rd		18	41	59	81	93	98					
D. Flood Frequency (%)		9	0	0	3	6	12	6	9	6	26	12	12

Item	1st Paddy			2nd Paddy			3rd Paddy		
	1984	1989	1994	1984	1989	1994	1984	1989	1994
E. Yield (ton/ha)	2.8	2.9	3.0	2.8	2.9	3.0	2.8	2.9	3.0
F. Price (₱/ton)	3,339	4,473	4,390	3,339	4,473	4,390	3,339	4,473	4,390
G. Production Cost (₱/ha)	5,300	6,060	6,320	5,010	5,770	6,030	5,010	5,770	6,030
H. Net Income (₱/ha)	4,049	6,912	6,850	4,339	7,202	7,140	4,339	7,202	7,140
I. Damageable Cost (₱/ha)	4,160	4,920	5,180	3,870	4,630	4,890	3,870	4,630	4,890
J. Damageable Value (₱/ha) /1	3,221	4,765	5,114	2,335	3,551	3,795	1,486	2,170	2,333

NOTE, /1 : Calculated as follow,

- 1st Paddy $J = \sum_{Jun}^{Nov} B \times D \times (I \times C + H)$
- 2nd Paddy $J = \sum_{Oct}^{Mar} B \times D \times (I \times C + H)$
- 3rd Paddy $J = \sum_{Feb}^{Jul} B \times D \times (I \times C + H)$

Table III-3.5 ESTIMATED DAMAGEABLE VALUE PER HECTARE OF SUGARCANE

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	D. Net Income Accrued by Planted Month (₱)
A. Monthly Rate of Area Planted/1 (%)		6	13	15	15	15	14	8	3	0.7	0.3	4	6	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
B. Monthly Accumulated Cost/2 (%)		6	16	20	29	38	47	62	70	77	92	95	100	
C. Damageable Cost by (Planted Month)														
Planted Month (₱)	- Jan.	28/3	74	93	135	177	219	288	326	358	428	442	465	175/4
	- Feb.	1,008	60	161	202	292	383	474	625	705	776	927	957	378
	- Mar.	1,104	1,163	70	186	233	337	442	546	721	814	895	1,070	437
	- Apr.	1,070	1,104	1,163	70	186	233	337	442	546	721	814	895	437
	- May	895	1,070	1,104	1,163	70	186	233	337	442	546	721	814	437
	- Jun.	760	835	998	1,031	1,085	65	174	217	315	412	510	673	407
	- Jul.	384	434	477	570	589	620	37	99	124	180	236	291	233
	- Aug.	109	144	163	179	214	221	233	14	37	47	67	88	87
	- Sep.	21	25	34	38	42	50	52	54	3	9	11	16	20
	- Oct.	7	9	11	14	16	18	21	22	23	1	4	5	9
	- Nov.	62	90	118	146	192	217	239	285	295	310	19	50	116
	- Dec.	74	93	135	177	219	288	326	358	428	442	465	28	175
E. Flood Frequency (%)		9	0	0	3	6	12	6	9	6	26	12	12	
F. Damageable Value (₱)		759/5	0	0	205	373	689	347	561	414	1,973	963	992	

G.	Yield (Sugarcane/ha)	52
H.	Price (₱/t)	205
I.	Production Cost (₱/ha)	7,750
J.	Net Income (₱/ha)	2,910
K.	Annual Damageable Value/6 (₱/ha)	7,278

Note, /1: Sugarcane is planted every month.

/2: Sugarcane takes 12 months of growth period for harvesting.

/3: C (Jan.) = A(Jan.) x B(1) x I

/4: D (Jan.) = J x A(Jan.)

/5: F (Jan.) = E(Jan.) x $\sum_{i=Jan.}^{Dec.}$ Di ÷ Ci(Jan) (i: Planted Month)

/6: K = $\sum_{Jan.}^{Dec.}$ F

TALBE III.3-6 ESTIMATED DAMAGEABLE VALUE PER HECTARE OF ROOT CROPS

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Crop Calendar													
Accumulated Cost (%)	50	50	50	50	50	50	50	50	50	50	50	50	
Flood Frequency (%)	9	0	0	3	6	12	6	9	6	26	12	12	
Damageable Value	510	0	0	170	310	690	340	510	340	1,490	650	650	5,770

Yield, t/ha	8.6	Net Income, P/ha	5,080
Price, P/t	760	Damageable Cost, P/ha	1,270
Production Cost, P/ha	1,460	Damageable Value, P/ha	5,770

TABLE III.3-7 ESTIMATED DAMAGEABLE VALUE PER HECTARE OF VEGETABLES (EGGPLANT)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Crop Calendar													
Accumulated Cost (%)					50	50				50	50	50	
Flood Frequency (%)	9	0	0	3	6	12	6	9	6	26	12	12	
Damageable Value (P)					1,550	3,090				6,700	3,090	3,090	17,520

Yield, t/ha	11.9	Net Income, P/ha	23,964
Price, P/t	2,381	Damageable Cost, P/ha	3,636
Production Cost, P/ha	4,370	Damageable Value, P/ha	17,520

TABLE III.3-8 ESTIMATED DAMAGEABLE VALUE OF LEGUME

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Crop Calendar													
Accumulated Cost (%)									50	50	50	50	
Flood Frequency (%)	9	0	0	3	6	12	6	9	6	26	12	12	
Damageable Value (P)									170	750	350	350	1,620

Yield, t/ha	0.5	Net Income, P/ha	2,255
Price, P/t	7,869	Damageable Cost, P/ha	1,260
Production Cost P/ha	1,680	Damageable Value, P	1,620

TABLE III.3-9 AVERAGE DAMAGEABLE VALUE PER HECTARE OF HOME YARD CROP

Kinds	Area (ha)	Damageable Value (P)
Root Crop	630	3,635,100
Vegetables	110	1,927,200
Legume	70	107,100
Total	810	5,675,700
Average Damageable Value (P/ha)		7,007

TABLE III.3-10 PROJECTION OF FUTURE DAMAGEABLE VALUE OF CROPS AND FISH POND

ITEM		1984	1989	1994	1999	2004	2009	2014	2019	2024	2029
1.IRRIGATED PADDY											
(1)SIGMA AREA											
1ST PADDY	(PESO/HA/CROP)	2881	4435	4620	4851	5082	5313	5544	5787	6018	6598
2ND PADDY	(PESO/HA/CROP)	1560	2455	2554	2681	2809	2937	3065	3200	3327	3657
SUB-TOTAL	(PESO/HA/YEAR)	4441	6890	7174	7532	7891	8250	8609	8987	9345	10255
(2)CUARTERO AREA											
1ST PADDY	(PESO/HA/CROP)	2462	3799	3957	4154	4353	4550	4748	4957	5154	5653
2ND PADDY	(PESO/HA/CROP)	2674	4184	4353	4571	4789	5007	5225	5453	5672	6231
SUB-TOTAL	(PESO/HA/YEAR)	5136	7983	8310	8725	9142	9557	9973	10410	10826	11884
(3)PANAY AREA											
1ST PADDY	(PESO/HA/CROP)	3630	5559	5791	6081	6370	6660	6950	7255	7545	8269
2ND PADDY	(PESO/HA/CROP)	2674	4184	4354	4571	4789	5007	5225	5454	5672	6231
3RD PADDY	(PESO/HA/CROP)	1660	2508	2613	2744	2874	3005	3136	3274	3404	3724
SUB-TOTAL	(PESO/HA/YEAR)	7964	12251	12758	13396	14033	14672	15311	15983	16621	18224
2.RAINFED PADDY											
(1)SIGMA AREA											
1ST PADDY	(PESO/HA/CROP)	2532	3770	3813	4042	4272	4502	4730	4972	5201	5691
2ND PADDY	(PESO/HA/CROP)	1365	2070	2085	2210	2335	2460	2585	2717	2842	3115
SUB-TOTAL	(PESO/HA/YEAR)	3897	5840	5898	6252	6607	6962	7315	7689	8043	8806
(2)CUARTERO AREA											
1ST PADDY	(PESO/HA/CROP)	2177	3243	3280	3477	3675	3872	4069	4277	4474	4896
2ND PADDY	(PESO/HA/CROP)	2355	3552	3581	3795	4010	4225	4440	4666	4881	5347
SUB-TOTAL	(PESO/HA/YEAR)	4532	6795	6861	7272	7685	8097	8509	8943	9355	10243
(3)PANAY AREA											
1ST PADDY	(PESO/HA/CROP)	3221	4765	4825	5114	5406	5696	5985	6291	6580	7195
2ND PADDY	(PESO/HA/CROP)	2355	3551	3581	3795	4010	4225	4440	4666	4881	5347
3RD PADDY	(PESO/HA/CROP)	1486	2170	2201	2333	2464	2596	2728	2868	3000	3275
SUB-TOTAL	(PESO/HA/YEAR)	7062	10486	10607	11242	11880	12517	13153	13825	14461	15817
3.VEGETABLES											
ROOT CROP	(PESO/HA/CROP)	5770	6232	6731	6774	7024	7378	7713	8048	8384	8785
EGGPLANT	(PESO/HA/CROP)	17520	18327	19172	23487	25074	26661	28248	29835	31263	33601
LEGUME	(PESO/HA/CROP)	1620	1750	1890	2041	2204	2381	2572	2777	3000	3240
SUB-TOTAL	(PESO/HA/YEAR)	7007	7478	8002	8635	9059	9565	10057	10551	11026	11676
4.SUGAR CANE	(PESO/HA/YEAR)	7278	7278	7278	7278	7278	7278	7278	7278	7278	7278
5.FISHPOND											
PRAWN	(PESO/HA/CROP)	9580	9776	9976	10180	10389	10601	10818	11040	11265	11496
MILKFISH	(PESO/HA/CROP)	9694	9889	10089	10292	10500	10711	10927	11148	11372	11601
REPAIRING	(PESO/HA)	528	539	550	561	572	584	596	608	620	633
SUB-TOTAL	(PESO/HA/YEAR)	19802	20204	20615	21033	21461	21896	22341	22796	23257	23730

NOTE,

-CORN DAMAGE IS 3.5% OF TOTAL PADDY DAMAGE VALUE.

-LIVESTOCK DAMAGE IS 6.5% OF TOTAL PADDY DAMAGE VALUE.

TABLE III.3-11 POPULATION AND NUMBER OF BUILDINGS

Municipality	Within Municipality			Within Flood Prone Area		
	A	B	C	A	B	C
Cuartero	18,511	3,344	117	8,260	1,491	113
Dao	23,904	4,325	161	19,648	3,553	159
Dumalag	22,188	4,070	198	11,810	2,167	196
Dumarao	29,931	5,381	205	7,389	1,329	180
Jamindan	25,652	4,299	174	4,905	822	96
Maayon	25,711	4,490	169	11,792	2,058	132
Mambusao	32,066	5,639	219	17,884	3,145	203
Panay	31,649	5,502	214	31,636	5,502	214
Panitan	27,431	4,874	107	19,238	3,417	102
Pontevedra	30,482	5,120	203	12,643	2,125	194
Sigma	20,038	3,807	98	10,562	2,008	88
Tapaz	35,129	6,377	239	8,599	1,561	136
Roxas City	80,953	13,943	527	48,043	8,269	493
Total	403,645	71,171	2,631	212,409	37,447	2,306

Notes, A : Population
B : Number of Residential Building
C : Number of Non-residential Building

Source : 1980 Population and Housing, NCSO

TABLE III.3-12 STANDARD DAMAGE RATES FOR BUILDINGS AND THEIR CONTENTS

Kind of Property	Flood below Floor Level	Flood above Floor Level				
		0 to 0.49 m	0.50 to 0.99 m	1.00 to 1.99 m	2.0 to 2.99 m	More than 3 m
A) Residential						
Building	0.03	0.053	0.073	0.109	0.534	0.571
Household Effects	-	0.086	0.191	0.331	0.499	0.690
B) Non-residential						
Depreciable Assets	-	0.180	0.314	0.419	0.539	0.630
Inventory Stock	-	0.127	0.276	0.379	0.479	0.562

Reference : Criteria for the Engineering of River and Sabo Project, Ministry of Construction of Japan.

TABLE III.3-13 REGISTERED VALUE OF RESIDENTIAL BUILDINGS

Structure Type /1	Cuartero		Panay		Sigma		Roxas City						Total Number	Average Registered Value (₱)	Adjustment Ratio /2	Average Registered Value in 1984 (₱)
							Adlawan		Bago		Luctogan					
	Registered No.	Value (₱)	Registered No.	Value (₱)	Registered No.	Value (₱)	Registered No.	Value (₱)	Registered No.	Value (₱)	Registered No.	Value (₱)				
I	3	62,3999	0	-	0	-	0	-	0	-	0	-	3	62,399	1.90	118,558
II	26	77,776	50	61,671	1	38,750	19	16,714	19	18,513	67	47,226	182	49,329	1.85	91,259
III	13	38,084	17	28,635	29	18,595	1	4,282	2	5,179	8	14,486	70	22,666	1.75	39,666
IV	2,080	4,775	2,678	3,679	1,318	3,575	170	5,561	139	4,706	177	6,524	6,562	4,153	1.60	6,645
Total/ Average	2,122	5,925	2,745	4,890	1,348	3,924	190	6,669	160	6,351	252	17,598	6,817	5,574	-	9,292

Source: Provincial Assessor and Roxas City Assessor

Remarks; /1 : Structure Type I - Reinforced Concrete

II - Semi-concrete

III - Strong Materials

IV - Light Materials

/2 : The adjustment ratio was decided to take the inflation and the depreciation during 1979 - 1984 into consideration, since original registered value was assessed in 1979.

TABLE III.3-14 ACTUAL MARKET VALUE OF RESIDENTIAL BUILDING

Structure Type	Number of Building	Registered Market Value (₱)	Actual Market Value Ratio	Average Actual Market Value (₱)
I	3	118,558	2.2	260,828
II	182	91,259	2.2	200,769
III	70	39,666	2.2	87,264
IV	6,562	6,645	2.2	14,619
T O T A L	6,817	9,292	-	20,443

TABLE III. 3-15 PROJECTION OF FUTURE DAMAGEABLE VALUE OF RESIDENTIAL BUILDINGS

Item	1984	1989	1994	1999	2004	2009	2014	2019	2024	2029
Population	550,674	604,263	656,884	706,400	751,038	788,725	828,967	857,892	894,299	932,251
Family Size	5.61	5.53	5.45	5.37	5.29	5.21	5.14	5.06	4.99	4.92
Number of Houses	98,159	109,269	120,529	131,545	141,973	151,386	160,110	169,543	179,218	189,481
No. of New Houses /1	-	11,111	11,259	11,016	10,428	9,414	8,724	9,434	9,674	10,264
No. of Rebuilt Houses /1	-	34,356	38,245	42,185	46,041	49,691	52,985	56,039	59,340	62,726
No. of Existing Houses	98,159	63,804	71,026	78,344	85,505	92,283	98,401	104,072	110,204	116,492
Average Building Value /2(₱)	17,000	10,710	12,127	13,786	15,936	19,073	23,622	29,941	38,703	50,214
Average New Bldg. Value (₱)	36,000	37,041	45,223	52,215	66,496	84,793	110,380	143,702	187,140	243,669
New Average Bldg. Value (₱)	17,000	19,250	21,882	25,296	30,274	37,495	47,525	61,433	79,705	103,691
Per Capita GRDP (US$ at 1972 construction)	242	249	304	351	447	570	742	966	1,258	1,638

Remarks : /1 Incremental Number for five years

/2 $Vn \times (1-5d) + \frac{1}{N} \sum_{i=1}^{5} Va \cdot R^i \times Ni \times (1-d \cdot i)$ where, Vn : New average building value, d : Depreciation rate, N : Number of newly constructed houses, Va : Average new building value, R : Annual growth ratio of new building value, Ni : Annual increment of newly constructed houses.

TABLE III.3-16 AVERAGE HOUSEHOLD EFFECTS

	Cuartero	Panitan	Sigma	Total/Average
Number of Sample	16	23	25	64
Average Household Effects (₱)	7,160	4,000	5,020	5,190
Averabe Present Value of House (₱)	38,218	7,026	7,260	14,916

Remark : Original data were based on sample survey in February, 1984.

TABLE III.3-17 REGISTERED VALUE OF NON-RESIDENTIAL BUILDINGS

Structure Type/1	Cuartero		Panay		Sigma		Roxas City						Total Number	Average Registered Market Value (₱)	Adjustment Ratio/2	Average Registered Market Value in 1984 (₱)
							Adlawan		Bago		Loctugan					
	No.	Average Value(₱)	No.	Average Value(₱)	No.	Average Value(₱)	No.	Average Value(₱)	No.	Average Value(₱)	No.	Average Value(₱)				
I	4	91,027	0	--	1	11,460	0	--	0	--	1	15,860	6	65,238	1.90	123,952
II	11	33,261	11	119,714	3	33,521	4	12,561	12	53,859	23	59,316	64	60,064	1.85	111,218
III	7	38,445	1	62,280	26	14,534	0	--	0	--	0	--	34	20,861	1.75	36,507
IV	7	14,950	24	31,958	8	3,565	4	4,286	5	5,398	9	6,507	57	17,594	1.60	28,150
Total Average	29	38,060	36	59,615	38	13,643	8	8,425	17	39,606	33	43,597	161	36,941	--	66,466

Source : Provincial Assessor and Roxas City Assessor

Remarks : /1 Structure type I - Reinforced Concrete
II - Semi-concrete
III - Strong Materials
IV - Light Materials

/2 The adjustment ratio was decided to take the inflation and the depreciation during 1979 - 1984 into consideration, since original registered value was assessed in 1979.

TABLE III.3-13 PRESENT MARKET VALUE OF NON-RESIDENTIAL BUILDING

Structure Type	Number of Building	Registered Market Value (₱)	Actual Market Value Ratio	Average Actual Market Value (₱)
I	6	123,952	2.2	272,694
II	64	111,118	2.2	244,460
III	34	36,507	2.2	80,315
IV	57	28,150	2.2	61,930
Total/Average	161	66,466	-	146,226

TABLE III. 3-19 RESULTS OF SAMPLE SURVEY OF ASSETS HOLDINGS
STOCKED BY NON-RESIDENTIAL BUILDINGS

Type of Building	Number of Sample	Average Market Value (₱)			Average Inventory Stock	Actual Number of Building	Total Market Value (₱1000)		
		Building	Equipment	Total			Building	Equipment	Inventory Stock
Commercial	14	10,541	3,443	13,984	8,067	987	10,404	3,398	7,962
Industrial	15	42,362	16,188	58,547	6,463	311	13,175	5,034	2,010
Educational	2	35,600	29,150	64,750	--	252	8,971	7,346	--
Medical	3	16,950	7,950	24,900	--	80	1,356	636	--
Religious & Others	3	48,490	14,220	62,710	--	586	28,415	8,333	--
Total	37	--	--	--	--	2,216	62,321	24,747	9,972
Average (₱)	--	28,392	11,237	39,629	7,237	--	28,125	11,167	4,500
Ratio	--	--	--	--	--	--	1.00	0.397	0.160
Actual Value	--	--	--	--	--	--	146,226	58,052	23,396

TABLE III. 3-20 ECONOMIC DAMAGEABLE VALUE OF BUILDINGS

Kind of Property		Market Value (₱)	Conversion Factor	Economic Damageable Value (₱)
A) Residential				
• Building		20,443	0.82	17,000
• Household Effect	5,190	5,390	0.90	5,000
Agricultural Tools	200			
B) Non-Residential				
• Building	146,226	204,278	0.82	165,000
Equipment	58,052			
• Inventory		23,396	0.90	21,000

TABLE III.3-21 PROJECTION OF FUTURE DAMAGEABLE VALUE OF BUILDINGS AND THEIR CONTENTS

Year	Residential Building	Household Effects	Non-residential Building	Inventory Stock
1984	17,000	5,000	165,000	21,000
1989	19,250	5,662	186,838	23,779
1994	21,882	6,436	212,384	27,031
1999	25,296	7,440	245,420	31,248
2004	30,274	8,904	293,836	37,397
2009	37,495	11,028	363,922	46,317
2014	47,525	13,978	461,272	58,707
2019	61,433	18,069	596,261	75,888
2024	79,705	23,443	773,607	98,459
2029	103,691	30,497	1,006,410	128,089

TABLE III. 3-22 INDIRECT DAMAGE RATIO IN PAST MAJIOR FLOOD IN MALAYSIA

Type of Damage	Pahang	Pahang	Pahang	Kelantan	Kemasin-Semerak	Kuantan
	Jan. 1971	Dec. 1971	Dec. 1972	Jan. 1967	1967	Jun. 1971
1. Direct Damage						
a. Crop	6,020/1	4,000	1,600	24,850	8,500	183
b. Livestock	200	40	10	6,390	-	412
c. Building	11,380	4,065	1,360	17,708	5,670	1,706
d. Fishpond	40	5	-	-	-	-
e. Infrastructure	4,200	1,270	620	9,287	2,214	146/2
Sub-Total	21,840	9,380	3,590	58,235	16,384	2,447
2. Indirect Damage						
a. Activities Interrupted	6,600	3,530	1,615	12,305	700	323
b. Rescue & Relief	1,200	600	300	8,350	980	240
Sub-Total	7,800	4,130	1,915	20,655	1,680	563
3. Ratio ($\frac{\text{Indirect}}{\text{Direct}}$) (%)	36	44	53	35	10	23
4. Total Damage (Price Level)	29,640 (1974)	13,510 (1974)	5,505 (1974)	78,890 (1976)	18,064 (1979)	3,010 (1979)

Remark : /1 Forest Damage is included.

/2 Public building damage is included.

Source : "National Water Resources Study, Malaysia", October 1982, JICA

TABLE III.3-23 ESTIMATED DAMAGEABLE VALUE OF MILKFISH

Item		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A. Cropping Pattern	-1st					N	T			R			
	-2nd						N	T			R		
	-3rd								N	T			R
B. Area Factor (%)	-1st					100	100	100	100	100	50		
	-2nd						100	100	100	100	100	50	
	-3rd	50							100	100	100	100	100
C. Stocking Rate (PC/ha)	-1st					2,640	1,320	1,320	1,320	1,320	660		
	-2nd						2,640	1,320	1,320	1,320	1,320	660	
	-3rd	660							2,640	1,320	1,320	1,320	1,320
D. Value at Each Stage (₱/PC)	-1st					0.18	1.5	1.5	1.5	3	3		
	-2nd						0.18	1.5	1.5	1.5	3	3	
	-3rd	3							0.18	1.5	1.5	1.5	3
E. Stocking Value (₱/ha)	-1st					475	1,980	1,980	1,980	2,960	1,980		
	-2nd						475	1,980	1,980	1,980	3,960	1,980	
	-3rd	1,980							475	1,980	1,980	1,980	3,960
Sub-total (₱/3ha)		1,980				475	2,455	3,960	4,435	7,920	7,920	3,960	3,960
F. Cost of Fry (₱/ha)	-1st					475							
	-2nd						475						
	-3rd								475				
G. Labor (₱/ha)	-1st					75	150	150	225	225	120		
	-2nd						75	150	150	225	225	120	
	-3rd	120							75	150	150	225	225
H. Accumulated Cost (₱/ha)	-1st					550	700	850	1,075	1,300	1,420		
	-2nd						550	700	850	1,075	1,300	1,420	
	-3rd	1,420							550	700	850	1,075	1,300
Sub-total (₱/3ha)		1,420				550	1,250	1,550	2,475	3,075	3,570	2,495	1,300
I. Accumulated Rate of Cost (%)		100				3.1	10.2	18.9	32.9	50.3	70.5	84.6	92.0
J. Flood Frequency (%)		9	0	0	3	6	12	6	9	6	26	12	12
K. Damageable Value (₱/ha)		1,112				399	847	455	756	566	2,760	1,874	1,426
L. Gross Income (₱/ha/Milkfish)		12,355											
M. Production Cost (₱/ha/Milkfish)		5,895											
N. Net Income (₱/ha/Crop)		6,460											
O. Annual Damageable Value (₱/ha) /1		9,694											

NOTE, /1: Calculated as follow, $O = \sum_{MAY}^{JAN} J\ (N + N \times I)$

TABLE III.3-24 ESTIMATED DAMAGEABLE VALUE OF PRAWN

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A.	Cropping Pattern		3rd				1st				2nd		
B.	Area Factor (%)	100	100	100	100	100	100	100	100	100	100	100	100
C.	Stocking Rate (pcs/ha)	2,400	3,000 (Fry)	2,800	2,600	2,400	3,000 (Fry)	2,800	2,600	2,400	3,000 (Fry)	2,800	2,600
D.	Stocking Value (₱/ha)	9,600	1,140	5,600	7,800	9,600	1,140	5,600	7,800	9,600	1,140	5,000	7,800
E.	Cost (₱/ha)												
	Fry	-	1,140	-	-	-	1,140	-	-	-	1,140	-	-
	Labour	75	90	60	60	75	90	60	60	75	90	60	60
	Total	75	1,230	60	60	75	1,230	60	60	75	1,230	60	60
F.	Accumulated Cost (₱/ha)	1,425	1,230	1,290	1,350	1,425	1,230	1,290	1,350	1,425	1,230	1,290	1,350
G.	Flood Frquency	0.09	0	0	0.03	0.06	0.12	0.06	0.09	0.06	0.26	0.12	0.12
H.	Damageable Value (₱/ha) ⁄1	864	0	0	286	576	1,129	568	857	576	2,445	1,136	1,143

I.	Gross Income (₱/ha/Crop)	9,600
J.	Production Cost (₱/ha/Crop)	1,425
K.	Net Income (₱/ha/Crop)	8,175
L.	Annual Damageable Value (₱/ha)	9,580

Remarks : ⁄1 = Damageable Value H = G (F+BxK)

TABLE III. 4-1 INUNDATED AREAS AND BUILDINGS BY RETURN PERIOD

Classification	Return Period (Years)						
	1.1	2	5	10	25	50	100
Areas (Unit: ha)							
Paddy	5,078	8,513	11,374	13,956	16,073	17,581	18,734
Sugar cane	813	1,684	2,388	2,922	3,238	3,500	3,756
Fishpond	228	228	1,034	1,036	1,039	1,055	1,137
Others	4,847	5,851	6,530	7,391	8,231	9,140	9,754
Total	10,966	16,276	21,326	25,305	28,581	31,276	33,390
Buildings (Unit: Nos)							
Residential	4,786	7,122	10,398	13,678	16,205	18,735	20,318
Non-residential	319	538	872	1,225	1,334	1,534	1,685
Total	5,105	7,660	11,270	14,903	18,539	20,269	22,003
Affected Population (1,000 persons)	28.7	42.7	63.5	82.1	97.1	112.3	121.3

Remarks: Paddy fields are estimated for the first crop season (Wet Season).

TABLE III.4-2(1) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 1984

(Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	2,460	5,585	9,473	13,457	16,905	19,706	21,798
Rainfed Paddy	0	2,602	5,446	8,855	11,525	14,161	16,213	17,787
Vegetable	0	369	805	1,337	1,823	2,267	2,622	2,889
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	5,516	11,938	19,849	27,106	33,800	39,157	43,205
2. Live Stock	0	358	775	1,290	1,761	2,197	2,545	2,808
3. Building Damage								
Residential Building	0	5,001	10,809	20,665	37,181	65,189	88,674	109,874
Household Effect	0	1,862	4,424	8,618	14,872	23,980	31,157	37,559
Other Building	0	4,682	17,464	36,473	68,592	100,938	124,088	147,559
Commercial Stock	0	506	1,892	3,915	7,564	11,405	14,005	16,707
Sub-Total	0	12,052	34,590	69,673	128,211	201,514	257,926	311,701
4. Infrastructure Damage	0	4,218	12,106	24,385	44,873	70,529	90,274	109,095
5. Fishpond Damage	0	0	1,622	6,531	12,574	23,980	33,980	46,337
6. Indirect Damage	0	3,321	9,154	18,259	32,179	49,803	63,582	76,972
Total Damage	0	25,467	70,187	139,989	246,706	381,825	487,464	590,119
Average Annual Flood Damage								104,521

TABLE III.4-2(2) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 1989

(Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	3,808	8,645	14,664	20,831	26,168	30,504	33,743
Rainfed Paddy	0	3,887	8,136	13,229	17,218	21,156	24,222	26,573
Vegetable	0	394	859	1,427	1,945	2,419	2,797	3,083
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	8,174	17,743	29,505	40,296	50,212	58,140	64,131
2. Live Stock	0	531	1,153	1,917	2,619	3,263	3,779	4,168
3. Building Damage								
Residential Building	0	6,301	13,619	26,037	46,848	82,139	111,730	138,442
Household Effect	0	2,346	5,574	10,859	18,739	30,215	39,258	47,325
Other Building	0	5,899	22,005	45,957	86,427	127,182	156,351	185,924
Commercial Stock	0	637	2,384	4,933	9,531	14,371	17,646	21,051
Sub-Total	0	15,185	43,583	87,787	161,545	253,907	324,986	392,743
4. Infrastructure Damage	0	5,314	15,254	30,725	56,541	88,867	113,745	137,460
5. Fishpond Damage	0	0	1,654	6,661	12,825	24,459	34,659	47,263
6. Indirect Damage	0	4,380	11,908	23,489	41,074	63,106	80,296	96,865
Total Damage	0	33,587	91,296	180,088	314,902	483,817	615,608	742,632
Average Annual Flood Damage								134,275

TABLE III.4-2(3) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 1994

(Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	3,965	9,003	15,270	21,692	27,250	31,766	35,138
Rainfed Paddy	0	3,929	8,223	13,371	17,402	21,383	24,481	26,858
Vegetable	0	421	919	1,527	2,082	2,589	2,994	3,300
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	8,401	18,248	30,353	41,479	51,690	59,858	66,027
2. Live Stock	0	546	1,186	1,972	2,696	3,359	3,890	4,291
3. Building Damage								
Residential Building	0	7,907	17,089	32,671	58,783	103,065	140,195	173,711
Household Effect	0	2,943	6,994	13,625	23,513	37,912	49,259	59,382
Other Building	0	7,402	27,611	57,665	108,445	159,583	196,183	233,291
Commercial Stock	0	800	2,991	6,190	11,959	18,032	22,142	26,414
Sub-Total	0	19,054	54,686	110,153	202,701	318,593	407,781	492,799
4. Infrastructure Damage	0	6,668	19,140	38,553	70,945	111,507	142,723	172,479
5. Fishpond Damage	0	0	1,688	6,798	13,089	24,963	35,373	48,236
6. Indirect Damage	0	5,200	14,242	28,174	49,636	76,517	97,443	117,575
Total Damage	0	39,871	109,192	216,006	380,548	586,632	747,070	901,410
Average Annual Flood Damage								161,505

TABLE III.4-2(4) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 1999

(Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	4,162	9,449	16,028	22,769	28,603	33,342	36,882
Rainfed Paddy	0	4,163	8,713	14,168	18,440	22,657	25,940	28,459
Vegetable	0	455	992	1,648	2,246	2,793	3,230	3,560
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	8,865	19,257	32,028	43,757	54,521	63,129	69,632
2. Live Stock	0	576	1,251	2,081	2,844	3,543	4,103	4,526
3. Building Damage								
Residential Building	0	9,973	21,553	41,206	74,139	129,988	176,817	219,089
Household Effect	0	3,712	8,821	17,185	29,655	47,816	62,127	74,894
Other Building	0	9,336	34,824	72,728	136,774	201,271	247,431	294,233
Commercial Stock	0	1,009	3,772	7,807	15,083	22,742	27,926	33,314
Sub-Total	0	24,031	68,972	138,927	255,652	401,818	514,304	621,531
4. Infrastructure Damage	0	8,411	24,140	48,624	89,478	140,636	180,006	217,536
5. Fishpond Damage	0	0	1,722	6,935	13,353	25,466	36,086	49,209
6. Indirect Damage	0	6,282	17,301	34,289	60,762	93,898	119,644	144,365
Total Damage	0	48,167	132,646	262,889	465,848	719,886	917,275	1,106,801
Average Annual Flood Damage								197,005

TABLE III.4-2(5) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 2004

(Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	4,361	9,902	16,795	23,859	29,972	34,938	38,647
Rainfed Paddy	0	4,399	9,209	14,973	19,488	23,946	27,416	30,077
Vegetable	0	477	1,041	1,729	2,358	2,932	3,390	3,736
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	9,324	20,254	33,683	46,007	57,318	66,361	73,193
2. Live Stock	0	606	1,316	2,189	2,990	3,725	4,313	4,757
3. Building Damage								
Residential Building	0	12,884	27,844	53,233	95,778	167,928	228,426	283,036
Household Effect	0	4,796	11,396	22,201	38,311	61,772	80,261	96,754
Other Building	0	12,061	44,988	93,956	176,695	260,017	319,651	380,112
Commercial Stock	0	1,303	4,873	10,086	19,486	29,381	36,077	43,037
Sub-Total	0	31,045	89,103	179,477	330,271	519,100	664,417	802,941
4. Infrastructure Damage	0	10,866	31,186	62,817	115,595	181,685	232,546	281,029
5. Fishpond Damage	0	0	1,758	7,079	13,630	25,994	36,834	50,229
6. Indirect Damage	0	7,776	21,542	42,787	76,274	118,173	150,670	181,822
Total Damage	0	59,618	165,162	328,034	584,768	905,996	1,155,143	1,393,974
Average Annual Flood Damage								246,387

TABLE III.4-2(6) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 2009

(Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	4,560	10,354	17,562	24,949	31,341	36,534	40,413
Rainfed Paddy	0	4,636	9,704	15,779	20,537	25,234	28,891	31,696
Vegetable	0	504	1,099	1,826	2,489	3,095	3,579	3,944
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	9,787	21,260	35,352	48,277	60,139	39,621	76,785
2. Live Stock	0	636	1,381	2,297	3,138	3,909	4,525	4,991
3. Building Damage								
Residential Building	0	17,015	36,773	70,302	126,490	221,775	301,672	373,793
Household Effect	0	6,334	15,050	29,320	50,596	81,580	105,997	127,779
Other Building	0	15,928	59,414	124,083	233,352	343,392	422,148	501,996
Commercial Stock	0	1,722	6,436	13,320	25,734	38,802	47,646	56,837
Sub-Total	0	41,000	117,675	237,027	436,173	685,550	877,464	1,060,406
4. Infrastructure Damage	0	14,350	41,186	82,959	152,660	239,942	307,112	371,142
5. Fishpond Damage	0	0	1,793	7,223	13,906	26,521	37,581	51,248
6. Indirect Damage	0	9,866	27,494	54,729	98,123	152,409	194,445	234,686
Total Damage	0	75,640	210,792	419,590	752,280	1,168,473	1,490,751	1,799,260
Average Annual Flood Damage	0							315,842

TABLE III.4-2(7) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 2014

Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	4,760	10,806	18,330	26,039	32,711	38,131	42,179
Rainfed Paddy	0	4,873	10,200	16,585	21,586	26,523	30,366	33,315
Vegetable	0	530	1,155	1,919	2,616	3,254	3,762	4,146
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	10,248	22,264	37,019	50,543	62,956	72,876	80,371
2. Live Stock	0	666	1,447	2,406	3,285	4,092	4,736	5,224
3. Building Damage								
Residential Building	0	22,807	49,290	94,232	169,546	297,265	404,357	501,028
Household Effect	0	8,490	20,173	39,300	67,818	109,349	142,078	171,273
Other Building	0	21,350	79,638	166,320	312,783	460,278	565,842	672,870
Commercial Stock	0	2,308	8,627	17,855	34,493	52,009	63,864	76,184
Sub-Total	0	54,957	157,730	317,708	584,642	918,903	1,176,142	1,421,356
4. Infrastructure Damage	0	19,234	55,205	111,198	204,624	321,616	411,649	497,474
5. Fishpond Damage	0	0	1,829	7,366	14,183	27,049	38,329	42,268
6. Indirect Damage	0	12,766	35,771	71,354	128,591	200,192	255,560	308,504
Total Damage	0	97,873	274,249	547,054	985,871	1,534,810	1,959,296	2,365,199
Average Annual Flood Damage								412,590

TABLE III.4-2(8) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 2019

(Unit: 1,000 pesos at 1984 price contant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	4,966	11,276	19,125	27,169	34,131	39,786	44,010
Rainfed Paddy	0	5,120	10,717	17,426	22,681	27,868	31,907	35,004
Vegetable	0	556	1,212	2,014	2,746	3,415	3,948	4,351
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	10,728	23,308	38,751	52,898	65,882	76,258	84,097
2. Live Stock	0	697	1,515	2,518	3,438	4,282	4,956	5,466
3. Building Damage								
Residential Building	0	31,219	67,472	128,991	232,084	406,914	553,509	685,837
Household Effect	0	11,622	27,614	53,796	92,833	149,684	194,484	234,449
Other Building	0	29,226	109,013	227,669	428,156	630,057	774,558	921,064
Commercial Stock	0	3,159	11,810	24,441	47,217	71,194	87,421	104,286
Sub-Total	0	75,228	215,910	434,898	800,293	1,257,850	1,609,974	1,945,637
4. Infrastructure Damage	0	26,330	75,568	152,214	280,102	440,247	563,490	680,973
5. Fishpond Damage	0	0	1,866	7.517	14,472	27,600	39,110	53,333
6. Indirect Damage	0	16,947	47,725	95,385	172,680	269,379	344,068	415,426
Total Damage	0	129,932	365,895	731,286	1,323,885	2,065,243	2,637,859	3,184,935
Average Annual Flood Damage								552,480

TABLE III.4-2(9) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 2024

(Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	5,166	11,728	19,893	28,259	35,500	41,382	45,775
Rainfed Paddy	0	5,357	11,213	18,232	23,729	29,157	33,382	36,623
Vegetable	0	581	1,267	2,105	2,870	3,569	4,127	4,548
Sugar Cane	0	85	102	184	301	467	616	731
Sub-Total	0	11,190	24,311	40,415	55,161	68,694	79,508	87,678
2. Live Stock	0	727	1,580	2,627	3,585	4,465	5,168	5,699
3. Building Damage								
Residential Building	0	42,813	92,528	176,892	318,270	558,024	759,057	940,526
Household Effect	0	15,939	37,869	73,774	127,308	205,270	266,707	321,513
Other Building	0	40,079	149,496	312,215	587,155	864,032	1,062,194	1,263,107
Commercial Stock	0	4,332	16,196	33,517	64,751	97,632	119,886	143,013
Sub-Total	0	103,165	296,090	596,400	1,097,486	1,724,959	2,207,846	2,668,160
4. Infrastructure Damage	0	36,107	103,631	208,740	384,120	603,735	772,746	933,856
5. Fishpond Damage	0	0	1,904	7,667	14,761	28,152	39,892	54,399
6. Indirect Damage	0	22,678	64,127	128,377	233,267	364,501	465,774	562,469
Total Damage	0	173,868	491,645	984,228	1,788,382	2,794,509	3,570,936	4,312,263
Average Annual Flood Damage								744,600

TABLE III.4-2(10) FLOOD DAMAGE BY RETURN PERIOD ON ECONOMIC CONDITION IN 2029

(Unit: 1,000 pesos at 1984 price constant)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	5,503	12,493	21,191	30,103	37,816	44,082	48,762
Rainfed Paddy	0	5,862	12,269	19,950	25,965	31,904	36,527	40,074
Vegetable	0	614	1,339	2,225	3,032	3,771	4,360	4,805
Sugar Cane	0	85	102	184	301	467	616	731
Sut-Total	0	12,064	26,204	43,550	59,402	73,959	85,586	94,372
2. Live Stock	0	784	1,703	2,830	3,861	4,807	5,563	6,134
3. Building Damage								
Residential Building	0	58,888	127,269	243,309	437,771	767,544	1,044,058	1,293,663
Household Effect	0	21,923	52,088	101,474	175,108	282,342	366,847	442,231
Other Building	0	55,128	205,626	429,442	807,612	1,188,448	1,461,014	1,737,362
Commercial Stock	0	5,959	22,277	46,102	89,063	134,290	164,899	196,710
Sub-Total	0	141,900	407,262	820,329	1,509,556	2,372,625	3,036,820	3,669,967
4. Infrastructure Damage	0	49,665	142,541	287,115	528,344	830,419	1,062,887	1,284,488
5. Fishpond Damage	0	0	1,943	7,824	15,063	28,728	40,708	55,511
6. Indirect Damage	0	30,662	86,948	174,247	317,434	496,580	634,734	766,571
Total Damage	0	235,076	666,604	1,335,898	2,433,663	3,807,120	4,866,300	5,877,046
Average Annual Flood Damage								1,011,647

TABLE III.4-3 FLOOD DAMAGE BY SUB-AREA ON ECONOMIC CONDITION IN 1984

River		Inundated Properties in Flood Prone Area								Affected Population	Average Annual Damage
		Land Use (ha)					Buildings (Nos)				
Name	Stretch No.	Paddy	Sugar-cane	Fishpond	Others	Total	Residential	Non-residential	Total	(1000)	(₱1000)
Panay	P1	4,388	337	1,136	4,801	10,662	6,807	430	7,237	40.8	31,784
	P2	750	150	0	188	1,088	1,083	93	1,176	6.5	3,652
	P3	658	267	0	292	1,217	702	3	705	4.2	2,236
	P4	56	31	0	27	114	32	0	32	0.2	130
	P5	1,782	433	0	630	2,845	1,315	4	1,319	7.9	5,424
	P6	77	40	0	50	167	617	94	711	3.7	4,607
	P7	436	175	0	273	884	107	17	124	0.6	952
	P8	1,168	331	0	354	1,853	998	132	1,130	6.0	16,136
	P9	638	401	0	314	1,353	882	186	1,068	5.3	1,791
	P10	986	454	1	400	1,841	961	86	1,047	5.8	2,027
Maayon	Y1	28	12	0	14	54	21	0	21	0.1	152
	Y2	580	256	0	249	1,085	643	67	710	3.9	4,585
	Y3	118	127	0	84	329	120	2	122	0.7	465
	Y4	996	23	0	137	1,156	449	0	449	2.7	2,626
Mambusao	M1	127	14	0	31	172	128	23	151	0.8	626
	M2	710	95	0	200	1,005	786	91	877	4.7	4,064
	M3	640	55	0	344	1,039	753	110	863	4.5	8,634
	M4	274	24	0	148	446	323	47	370	1.9	1,009
	M5	700	113	0	204	1,017	419	13	432	2.5	1,509
	M6	291	171	0	85	547	603	82	685	3.6	3,567
	M7	2,432	123	0	588	3,143	1,733	31	1,764	10.4	6,217
Badbaran	B1	103	29	0	56	188	136	0	136	0.8	240
	B2	796	104	0	285	1,185	600	174	774	3.6	2,077
Total		18,734	3,765	1,137	9,754	33,390	20,318	1,685	22,003	121.3	104,521/1

Note : /1 Details may not add up to total due to rounding.

Table III. 4-4(1) Flood Damage in Sub-Area P1 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	1,299	2,189	3,572	4,767	6,389	7,657	8,674
Rainfed Paddy	0	795	1,312	2,078	2,676	3,460	4,071	4,599
Vegetable	0	152	255	412	543	718	856	968
Sugar Cane	0	0	0	4	8	21	42	64
Sub-Total	0	2,246	3,756	6,066	7,994	10,588	12,626	14,305
2. Live Stock	0	146	244	394	519	688	820	929
3. Building Damage								
Residential Building	0	2,734	3,863	5,068	6,957	10,662	14,604	18,033
Household Effect	0	1,018	1,581	2,113	2,782	3,922	5,131	6,164
Other Building	0	2,559	6,242	8,945	12,835	16,509	20,437	24,218
Commercial Stock	0	276	676	960	1,415	1,865	2,306	2,742
Sub-Total	0	6,589	12,364	17,088	23,991	32,960	42,480	51,159
4. Infrastructure Damage	0	2,306	4,327	5,980	8,396	11,536	14,868	17,905
5. Fishpond Damage	0	0	1,622	6,531	12,574	23,980	33,980	46,337
6. Indirect Damage	0	1,693	3,347	5,409	8,021	11,962	15,716	19,595
Total Damage	0	12,981	25,661	41,469	61,497	91,716	120,491	150,233
Average Annual Flood Damage								31,784

Table III. 4-4(2) Flood Damage in Sub-Area P2 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	32	93	217	350	476	539	579
Rainfed Paddy	0	90	233	484	734	991	1,133	1,229
Vegetable	0	8	23	51	79	107	122	132
Sugar Cane	0	1	1	1	4	13	23	37
Sub-Total	0	131	352	753	1,168	1,587	1,818	1,977
2. Live Stock	0	8	22	49	75	103	118	128
3. Building Damage								
Residential Building	0	244	221	350	1,853	3,584	6,066	7,187
Household Effect	0	90	90	146	741	1,318	2,131	2,456
Other Building	0	228	357	619	3,419	5,550	8,488	9,652
Commercial Stock	0	24	38	66	377	627	958	1,092
Sub-Total	0	588	709	1,183	6,391	11,081	17,644	20,389
4. Infrastructure Damage	0	205	248	414	2,236	3,878	6,175	7,136
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	140	199	359	1,480	2,497	3,863	4,444
Total Damage	0	1,074	1,532	2,759	11,353	19,147	29,619	34,076
Average Annual Flood Damage								3,652

Table III. 4-4(3) Flood Damage in Sub-Area P3 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	30	78	160	224	303	339	364
Rainfed Paddy	0	90	236	492	705	966	1,087	1,171
Vegetable	0	8	22	47	67	92	104	112
Sugar Cane	0	10	11	19	36	61	89	115
Sub-Total	0	138	348	719	1,033	1,424	1,619	1,763
2. Live Stock	0	9	22	46	67	92	105	114
3. Building Damage								
Residential Building	0	153	174	389	737	1,489	2,076	2,441
Household Effect	0	57	71	162	295	547	729	834
Other Building	0	143	281	687	1,361	2,305	2,905	3,279
Commercial Stock	0	15	30	73	150	260	327	371
Sub-Total	0	370	558	1,314	2,544	4,603	6,039	6,927
4. Infrastructure Damage	0	129	195	459	890	1,611	2,113	2,424
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	97	168	381	680	1,159	1,481	1,684
Total Damage	0	744	1,292	2,921	5,215	8,890	11,359	12,914
Average Annual Flood Damage								2,236

Table III. 4-4(4) Flood Damage in Sub-Area P4 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	1	5	17	24	27	28	29
Rainfed Paddy	0	2	14	50	71	80	82	85
Vegetable	0	0	1	4	6	7	8	8
Sugar Cane	0	0	0	0	2	7	9	9
Sub-Total	0	3	20	71	103	121	127	131
2. Live Stock	0	0	1	4	6	7	8	8
3. Building Damage								
Residential Building	0	5	8	19	35	88	129	136
Household Effect	0	2	3	8	14	32	45	46
Other Building	0	5	13	34	65	137	180	183
Commercial Stock	0	0	1	3	7	15	20	20
Sub-Total	0	14	26	65	122	275	376	387
4. Infrastructure Damage	0	4	9	22	42	96	131	135
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	3	8	24	41	75	96	99
Total Damage	0	25	65	188	316	576	739	761
Average Annual Flood Damage								130

Table III. 4-4(5) Flood Damage in Sub-Area P5 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	202	499	930	1,188	1,388	1,482	1,565
Rainfed Paddy	0	260	666	1,253	1,609	1,887	2,016	2,127
Vegetable	0	33	85	159	204	239	255	269
Sugar Cane	0	2	3	12	32	83	111	130
Sub-Total	0	497	1,253	2,354	3,033	3,597	3,864	4,091
2. Live Stock	0	32	81	153	197	233	251	265
3. Building Damage								
Residential Building	0	290	385	850	1,652	3,297	4,315	4,963
Household Effect	0	107	157	354	661	1,212	1,516	1,696
Other Building	0	271	622	1,500	3,048	5,105	6,039	6,665
Commercial Stock	0	29	67	161	336	576	681	754
Sub-Total	0	699	1,232	2,867	5,699	10,192	12,553	14,080
4. Infrastructure Damage	0	244	431	1,003	1,994	3,567	4,393	4,928
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	221	449	956	1,638	2,638	3,159	3,504
Total Damage	0	1,694	3,447	7,334	12,562	20,228	24,221	26,870
Average Annual Flood Damage								5,424

Table III. 4-4(6) Flood Damage in Sub-Area P6 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	3	12	24	35	50	61	67
Rainfed Paddy	0	4	15	29	43	61	76	82
Vegetable	0	0	2	3	5	8	10	10
Sugar Cane	0	0	0	0	1	2	2	3
Sub-Total	0	7	30	57	85	121	150	163
2. Live Stock	0	0	1	3	5	7	9	10
3. Building Damage								
Residential Building	0	47	111	1,507	2,917	4,864	6,066	6,635
Household Effect	0	17	45	628	1,167	1,789	2,131	2,268
Other Building	0	44	180	2,659	5,382	7,532	8,489	8,910
Commercial Stock	0	4	19	285	593	851	958	1,008
Sub-Total	0	114	358	5,081	10,061	15,037	17,646	18,823
4. Infrastructure Damage	0	39	125	1,778	3,521	5,262	6,176	6,588
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	24	77	1,038	2,051	3,064	3,597	3,837
Total Damage	0	186	592	7,958	15,724	23,493	27,579	29,422
Average Annual Flood Damage								4,607

Table III. 4-4(7) Flood Damage in Sub-Area P7 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	17	67	127	186	259	313	342
Rainfed Paddy	0	22	83	157	229	319	391	420
Vegetable	0	2	11	20	30	42	51	55
Sugar Cane	0	0	0	1	4	24	36	40
Sub-Total	0	42	162	307	450	644	792	859
2. Live Stock	0	2	10	19	29	41	51	55
3. Building Damage								
Residential Building	0	125	103	116	218	521	873	1,101
Household Effect	0	46	42	48	87	191	306	376
Other Building	0	117	166	205	402	807	1,221	1,479
Commercial Stock	0	12	18	22	44	91	137	167
Sub-Total	0	302	330	393	753	1,612	2,540	3,126
4. Infrastructure Damage	0	105	115	137	263	564	889	1,094
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	67	92	128	224	429	640	770
Total Damage	0	521	710	986	1,720	3,291	4,913	5,905
Average Annual Flood Damage								952

Table III. 4-4(8) Flood Damage in Sub-Area P8 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	189	551	774	891	1,029	1,094	1,189
Rainfed Paddy	0	368	921	1,153	1,252	1,360	1,405	1,471
Vegetable	0	40	107	140	156	174	182	194
Sugar Cane	0	12	20	40	49	75	86	97
Sub-Total	0	609	1,599	2,107	2,348	2,638	2,767	2,951
2. Live Stock	0	39	103	136	152	171	179	191
3. Building Damage								
Residential Building	0	297	3,251	3,767	4,874	7,523	9,035	9,878
Household Effect	0	110	1,330	1,571	1,949	2,767	3,174	3,376
Other Building	0	278	5,253	6,649	8,992	11,649	12,643	13,266
Commercial Stock	0	30	569	713	991	1,316	1,427	1,502
Sub-Total	0	717	10,405	12,702	16,809	23,257	26,281	28,023
4. Infrastructure Damage	0	250	3,641	4,445	5,883	8,139	9,198	9,808
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	242	2,362	2,908	3,778	5,131	5,763	6,146
Total Damage	0	1,859	18,112	22,301	28,972	39,337	44,190	47,120
Average Annual Flood Damage								16,136

Table III. 4-4(9) Flood Damage in Sub-Area P9 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	4	22	58	122	289	462	634
Rainfed Paddy	0	10	43	67	89	157	218	278
Vegetable	0	1	4	9	15	32	49	66
Sugar Cane	0	1	1	1	2	5	11	13
Sub-Total	0	16	70	135	228	483	740	991
2. Live Stock	0	1	4	8	14	31	48	64
3. Building Damage								
Residential Building	0	109	135	214	584	2,198	3,946	6,858
Household Effect	0	40	55	89	233	808	1,386	2,344
Other Building	0	102	218	379	1,079	3,404	5,522	9,211
Commercial Stock	0	11	23	40	119	384	623	1,042
Sub-Total	0	265	433	724	2,017	6,797	11,479	19,458
4. Infrastructure Damage	0	92	151	253	705	2,378	4,017	6,810
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	56	98	168	444	1,453	2,442	4,098
Total Damage	0	431	758	1,289	3,411	11,144	18,728	31,422
Average Annual Flood Damage								1,791

Table III. 4-4(10) Flood Damage in Sub-Area P10 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	4	39	187	983	1,174	1,239	1,390
Rainfed Paddy	0	1	5	25	132	157	166	186
Vegetable	0	0	3	15	81	97	102	115
Sugar Cane	0	1	2	3	24	25	34	36
Sub-Total	0	6	49	230	1,220	1,453	1,541	1,727
2. Live Stock	0	0	3	14	79	94	100	112
3. Building Damage								
Residential Building	0	11	77	235	1,392	2,423	2,726	3,505
Household Effect	0	4	31	98	557	891	958	1,198
Other Building	0	10	125	416	2,569	3,751	3,815	4,707
Commercial Stock	0	1	13	44	283	423	430	533
Sub-Total	0	27	249	795	4,803	7,490	7,931	9,945
4. Infrastructure Damage	0	9	87	278	1,681	2,621	2,775	3,480
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	6	58	197	1,167	1,748	1,852	2,289
Total Damage	0	49	446	1,516	8,951	13,407	14,200	17,554
Average Annual Flood Damage								2,027

Table III. 4-4(11) Flood Damage in Sub-Area Y1 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	2	5	11	13	14	14	15
Rainfed Paddy	0	5	15	34	42	43	44	45
Vegetable	0	0	1	3	4	4	4	4
Sugar Cane	0	0	1	1	3	3	4	4
Sub-Total	0	7	22	49	62	64	66	68
2. Live Stock	0	0	1	3	4	4	4	4
3. Building Damage								
Residential Building	0	22	21	24	39	53	62	66
Household Effect	0	8	8	10	15	19	22	22
Other Building	0	21	34	43	72	82	88	89
Commercial Stock	0	2	3	4	8	9	9	10
Sub-Total	0	55	68	84	136	164	183	189
4. Infrastructure Damage	0	19	23	29	47	57	64	66
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	12	17	24	37	43	47	49
Total Damage	0	94	133	190	287	333	365	377
Average Annual Flood Damage								152

Table III. 4-4(12) Flood Damage in Sub-Area Y2 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	17	29	70	108	124	159	176
Rainfed Paddy	0	115	185	408	590	638	776	863
Vegetable	0	9	15	34	50	55	68	75
Sugar Cane	0	22	22	35	44	44	44	46
Sub-Total	0	163	251	547	792	861	1,047	1,160
2. Live Stock	0	10	16	35	51	56	68	75
3. Building Damage								
Residential Building	0	96	187	1,819	2,206	2,868	3,336	4,487
Household Effect	0	35	76	758	882	1,055	1,172	1,534
Other Building	0	90	302	3,210	4,071	4,441	4,668	6,026
Commercial Stock	0	9	32	344	448	501	526	682
Sub-Total	0	232	600	6,133	7,610	8,867	9,704	12,731
4. Infrastructure Damage	0	81	210	2,146	2,663	3,103	3,396	4,455
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	73	161	1,329	1,667	1,933	2,132	2,763
Total Damage	0	560	1,239	10,192	12,785	14,821	16,348	21,186
Average Annual Flood Damage								4,585

Table III. 4-4(13) Flood Damage in Sub-Area Y3 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	8	9	12	13	13	16	25
Rainfed Paddy	0	49	57	73	85	75	105	157
Vegetable	0	4	4	6	7	6	8	13
Sugar Cane	0	28	28	29	29	29	29	29
Sub-Total	0	89	98	120	134	123	158	224
2. Live Stock	0	5	6	7	8	8	10	14
3. Building Damage								
Residential Building	0	79	65	76	74	110	194	307
Household Effect	0	29	26	31	29	40	68	104
Other Building	0	74	105	134	137	170	271	412
Commercial Stock	0	8	11	14	15	19	30	46
Sub-Total	0	192	209	257	257	341	565	871
4. Infrastructure Damage	0	67	73	89	89	119	197	304
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	53	58	71	73	88	139	212
Total Damage	0	407	445	546	563	680	1,071	1,626
Average Annual Flood Damage								465

Table III. 4-4(14) Flood Damage in Sub-Area Y4 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	112	152	199	216	222	290	347
Rainfed Paddy	0	523	739	993	1,115	1,115	1,248	1,421
Vegetable	0	46	65	87	97	97	112	129
Sugar Cane	0	1	1	2	2	2	3	4
Sub-Total	0	682	957	1,281	1,430	1,436	1,653	1,901
2. Live Stock	0	44	62	83	92	93	107	123
3. Building Damage								
Residential Building	0	175	238	411	526	620	819	996
Household Effect	0	65	97	171	210	228	287	340
Other Building	0	163	385	725	971	960	1,146	1,338
Commercial Stock	0	17	41	77	107	108	129	151
Sub-Total	0	422	763	1,386	1,816	1,917	2,383	2,828
4. Infrastructure Damage	0	147	267	485	635	670	834	989
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	194	307	485	596	617	746	876
Total Damage	0	1,490	2,356	3,720	4,570	4,735	5,724	6,718
Average Annual Flood Damage								2,626

Table III. 4-4(15) Flood Damage in Sub-Area M1 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	7	45	95	131	167	184	193
Rainfed Paddy	0	2	19	41	55	69	76	80
Vegetable	0	0	4	10	13	17	19	19
Sugar Cane	0	0	0	0	C	1	3	4
Sub-Total	0	10	69	147	200	255	282	297
2. Live Stock	0	0	4	9	13	16	18	19
3. Building Damage								
Residential Building	0	7	25	168	287	524	705	849
Household Effect	0	2	10	70	114	192	247	290
Other Building	0	6	41	297	529	811	986	1,140
Commercial Stock	0	0	4	31	58	91	111	129
Sub-Total	0	17	81	568	989	1,620	2,050	2,408
4. Infrastructure Damage	0	6	28	198	346	567	717	843
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	5	27	138	232	368	460	535
Total Damage	0	39	212	1,061	1,782	2,828	3,529	4,104
Average Annual Flood Damage								626

Table III. 4-4(16) Flood Damage in Sub-Area M2 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period(Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	21	142	328	523	694	838	902
Rainfed Paddy	0	8	60	139	217	283	338	364
Vegetable	0	2	14	34	54	71	85	92
Sugar Cane	0	2	2	2	3	7	12	17
Sub-Total	0	33	219	504	797	1,055	1,274	1,376
2. Live Stock	0	2	14	32	51	68	82	89
3. Building Damage								
Residential Building	0	45	176	1,075	2,114	3,999	5,511	6,659
Household Effect	0	16	72	448	845	1,471	1,936	2,276
Other Building	0	42	285	1,898	3,901	6,192	7,712	8,943
Commercial Stock	0	4	30	203	430	699	870	1,012
Sub-Total	0	108	566	3,626	7,292	12,363	16,030	18,891
4. Infrastructure Damage	0	38	198	1,269	2,552	4,327	5,610	6,611
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	27	149	814	1,604	2,672	3,449	4,045
Total Damage	0	209	1,148	6,248	12,298	20,486	26,447	31,014
Average Annual Flood Damage								4,064

Table III. 4-4(17) Flood Damage in Sub-Area M3 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	6	32	117	256	432	600	655
Rainfed Paddy	0	2	12	45	98	167	232	253
Vegetable	0	0	3	11	25	43	60	66
Sugar Cane	0	0	0	0	0	1	2	2
Sub-Total	0	9	48	175	382	645	895	977
2. Live Stock	0	0	3	11	24	41	58	63
3. Building Damage								
Residential Building	0	315	885	2,345	4,339	7,389	9,598	10,765
Household Effect	0	117	362	978	1,735	2,718	3,372	3,680
Other Building	0	295	1,431	1,140	8,005	11,441	13,432	14,458
Commercial Stock	0	31	155	444	882	1,292	1,516	1,637
Sub-Total	0	761	2,835	7,909	14,964	22,841	27,919	30,541
4. Infrastructure Damage	0	266	992	2,768	5,237	7,994	9,771	10,689
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	155	581	1,629	3,091	4,728	5,796	6,340
Total Damage	0	1,193	4,461	12,493	23,700	36,250	44,442	48,613
Average Annual Flood Damage								8,634

Table III. 4-4(18) Flood Damage in Sub-Area M4 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	2	14	50	110	185	257	281
Rainfed Paddy	0	0	5	19	42	71	99	108
Vegetable	0	0	1	5	11	18	26	28
Sugar Cane	0	0	0	0	0	0	0	0
Sub-Total	0	3	20	75	163	276	383	419
2. Live Stock	0	0	1	4	10	17	24	27
3. Building Damage								
Residential Building	0	35	98	260	482	821	1,066	1,196
Household Effect	0	13	40	108	192	302	374	408
Other Building	0	32	159	460	889	1,271	1,492	1,606
Commercial Stock	0	3	17	49	98	143	168	181
Sub-Total	0	84	315	878	1,662	2,537	3,102	3,393
4. Infrastructure Damage	0	29	110	307	581	888	1,085	1,187
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	17	67	189	362	558	689	754
Total Damage	0	136	514	1,456	2,781	4,278	5,286	5,781
Average Annual Flood Damage								1,009

Table III. 4-4(19) Flood Damage in Sub-Area M5 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Dategories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	0	158	364	535	559	608	691
Rainfed Paddy	0	0	60	137	203	215	235	267
Vegetable	0	0	15	36	53	56	61	69
Sugar Cane	0	0	3	9	9	10	12	13
Sub-Total	0	0	236	546	800	840	916	1,040
2. Live Stock	0	0	15	35	52	54	59	67
3. Building Damage								
Residential Buidling	0	0	142	341	565	907	1,077	1,458
Household Effect	0	0	58	142	226	333	378	498
Other Building	0	0	230	603	1,042	1,405	1,507	1,958
Commercial Stock	0	0	24	64	114	158	170	221
Sub-Total	0	0	456	1,152	1,949	2,805	3,133	4,138
4. Infrastructure Damage	0	0	159	403	682	981	1,096	1,448
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	0	130	320	522	702	780	1,004
Total Damage	0	0	998	2,457	4,006	5,384	5,986	7,699
Average Annual Flood Damage								1,509

Table III. 4-4(20) Flood Damage in Sub-Area M6 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	0	11	158	278	304	306	317
Rainfed Paddy	0	0	4	61	106	117	118	122
Vegetable	0	0	1	15	28	30	30	32
Sugar Cane	0	0	2	17	38	39	40	42
Sub-Total	0	0	18	251	450	490	494	513
2. Live Stock	0	0	1	16	29	31	32	33
3. Building Damage								
Residential Building	0	0	64	577	2,635	5,410	5,789	6,376
Household Effect	0	0	26	240	1,054	1,990	2,034	2,179
Other Building	0	0	104	1,019	4,861	8,377	8,101	8,563
Commercial Stock	0	0	11	109	536	946	914	969
Sub-Total	0	0	206	1,948	9,087	16,724	16,839	18,090
4. Infrastructure Damage	0	0	72	681	3,180	5,853	5,893	6,331
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	0	44	434	1,912	3,465	3,488	3,745
Total Damage	0	0	341	3,332	14,658	26,565	26,748	28,713
Average Annual Flood Damage								3,567

Table III. 4-4(21) Flood Damage in Sub-Area M7 by Return Period on Economic Condition in 1984

(Unit: 1,000 Pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	495	1,404	1,950	2,432	2,664	3,037	3,157
Rainfed Paddy	0	218	615	845	1,040	1,151	1,296	1,341
Vegetable	0	52	147	204	253	278	316	328
Sugar Cane	0	0	0	2	3	5	8	8
Sub-Total	0	765	2,166	3,001	3,728	4,098	4,657	4,834
2. Live Stock	0	49	140	195	242	266	302	314
3. Building Damage								
Residential Building	0	146	463	866	1,781	2,643	4,984	7,121
Household Effect	0	54	189	361	712	972	1,751	2,434
Other Building	0	137	749	1,529	3,286	4,093	6,975	9,564
Commercial Stock	0	14	81	164	362	462	787	1,082
Sub-Total	0	353	1,484	2,921	6,143	8,173	14,499	20,204
4. Infrastructure Damage	0	123	519	1,022	2,150	2,860	5,074	7,071
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	193	646	1,070	1,839	2,309	3,680	4,863
Total Damage	0	1,485	4,957	8,210	14,103	17,708	28,213	37,287
Average Annual Flood Damage								6,217

Table III. 4-4(22) Flood Damage in Sub-Area B1 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	0	5	10	13	20	25	27
Rainfed Paddy	0	0	31	56	73	108	139	146
Vegetable	0	0	2	4	6	9	11	12
Sugar Cane	0	2	2	2	2	3	6	6
Sub-Total	0	2	40	72	94	140	181	191
2. Live Stock	0	0	2	4	6	9	11	12
3. Building Damage								
Residential Building	0	2	27	41	63	167	292	440
Household Effect	0	1	11	17	25	61	102	150
Other Building	0	2	44	73	117	259	408	591
Commercial Stock	0	0	4	7	12	29	46	67
Sub-Total	0	7	88	141	220	518	850	1,250
4. Infrastructure Damage	0	2	30	49	77	181	297	437
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	1	24	40	59	127	201	283
Total Damage	0	13	186	308	457	976	1,542	2,175
Average Annual Flood Damage								240

Table III. 4-4(23) Flood Damage in Sub-Area M2 by Return Period on Economic Condition in 1984

(Unit: 1,000 pesos)

Categories	Return Period (Year)							
	1	1.1	2	5	10	25	50	100
1. Crop Damage								
Irrigated Paddy	0	7	20	39	56	121	155	175
Rainfed Paddy	0	36	112	212	315	668	858	969
Vegetable	0	3	9	18	27	57	73	83
Sugar Cane	0	3	3	3	4	5	9	10
Sub-Total	0	49	144	273	402	851	1,095	1,237
2. Live Stock	0	3	9	17	26	55	71	80
3. Building Damage								
Residential Building	0	55	79	135	839	3,021	5,396	8,406
Household Effect	0	20	32	56	335	1,111	1,896	2,873
Other Building	0	52	128	238	1,548	4,677	7,552	11,289
Commercial Stock	0	5	13	25	170	528	852	1,278
Sub-Total	0	134	254	456	2,894	9,339	15,698	23,848
4. Infrastructure Damage	0	46	88	159	1,012	3,268	5,494	8,346
5. Fishpond Damage	0	0	0	0	0	0	0	0
6. Indirect Damage	0	34	74	136	650	2,027	3,353	5,026
Total Damage	0	268	571	1,042	4,985	15,541	25,713	38,539
Average Annual Flood Damage								2,077

FIGURES

FOR

APPENDIX III

FIGURE III.1-1 FLOW CHART OF FLOOD DAMAGE ANALYSIS

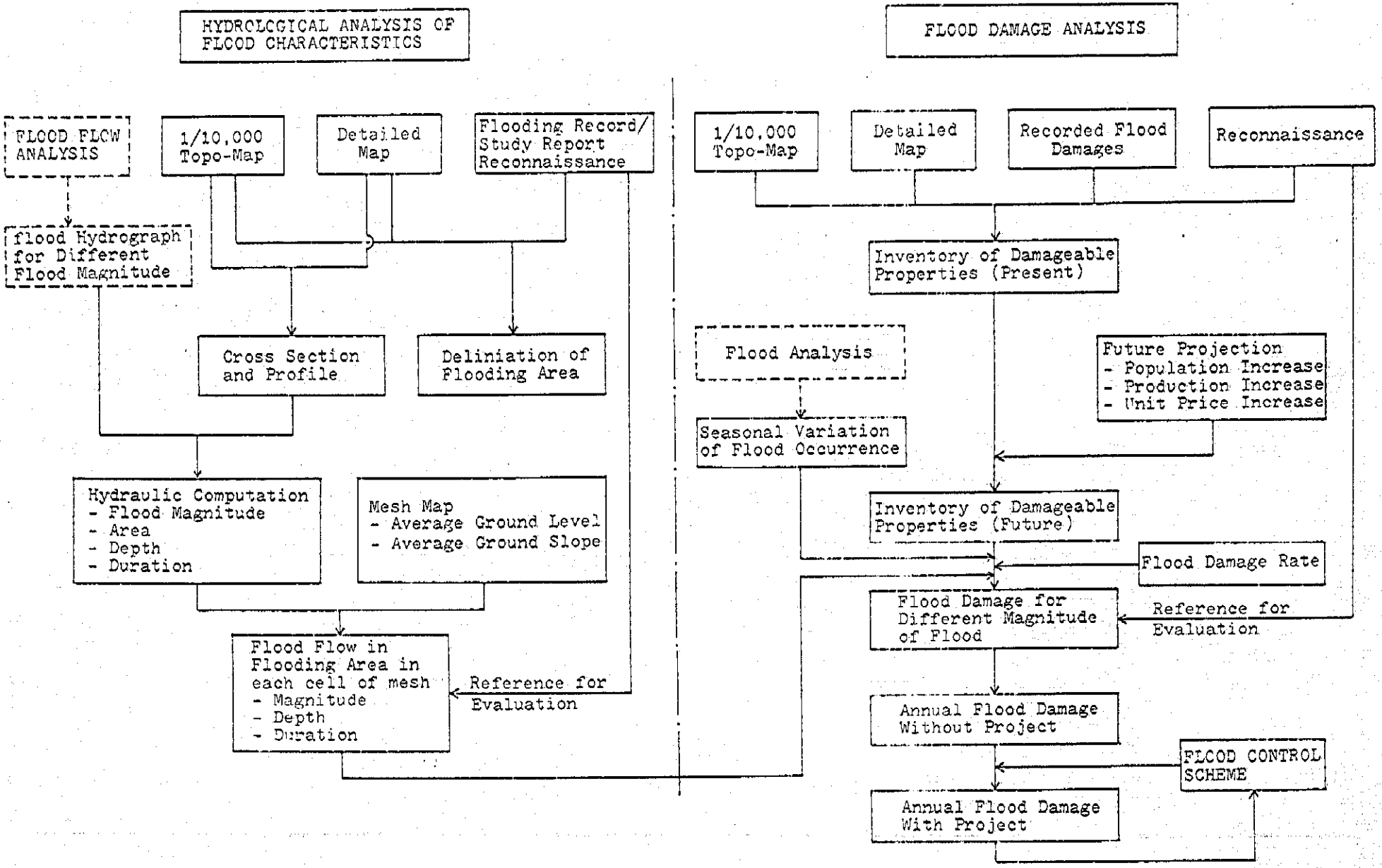
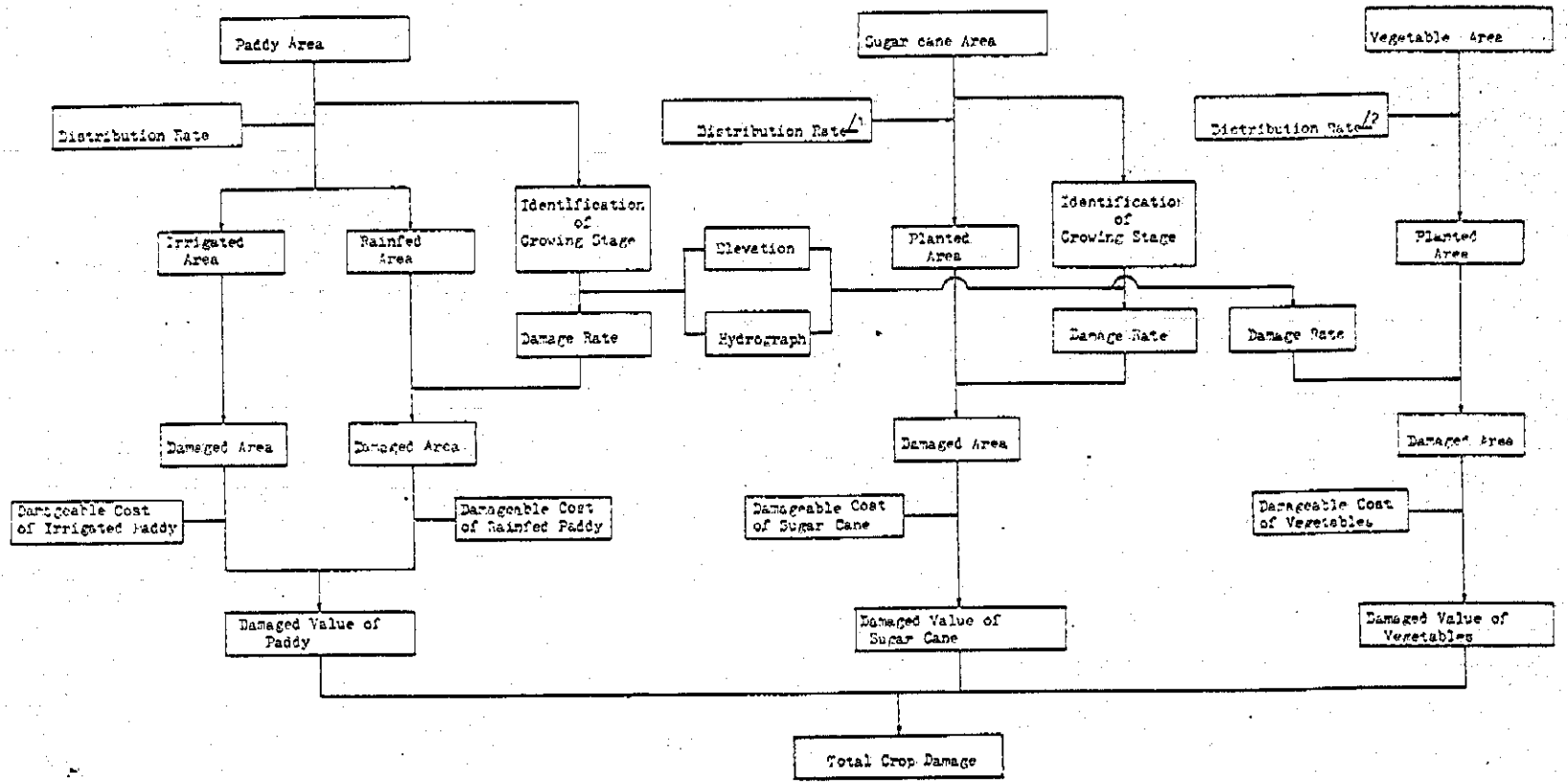


FIGURE III.3-1 FLOW CHART OF CROP DAMAGE ANALYSIS



Remarks : /1 = Distribution rate of monthly planted area.
/2 = Distribution rate of crop area by kind of vegetables.

FIGURE III.3-2 FLOW CHART OF BUILDING DAMAGE ANALYSIS

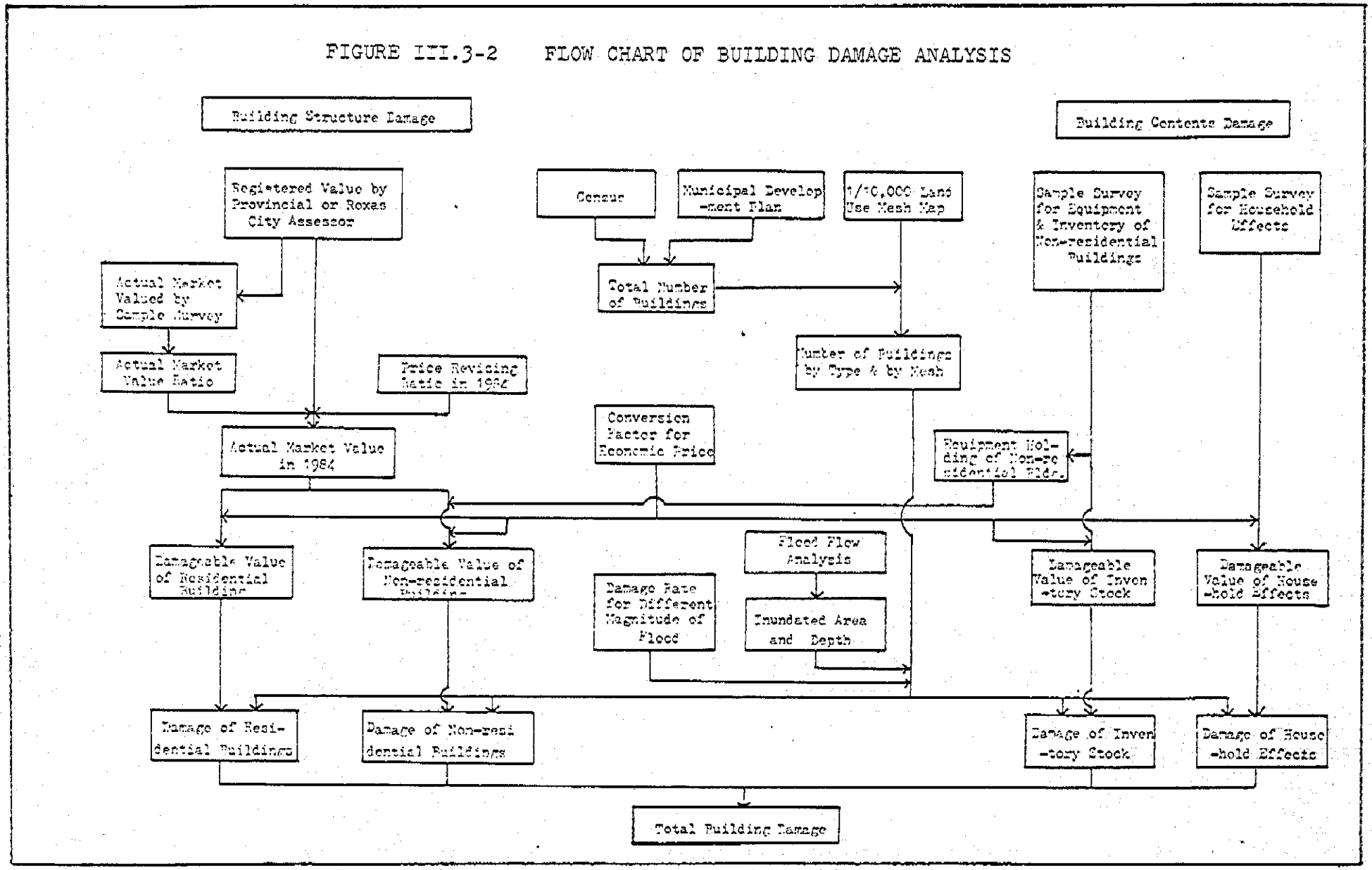
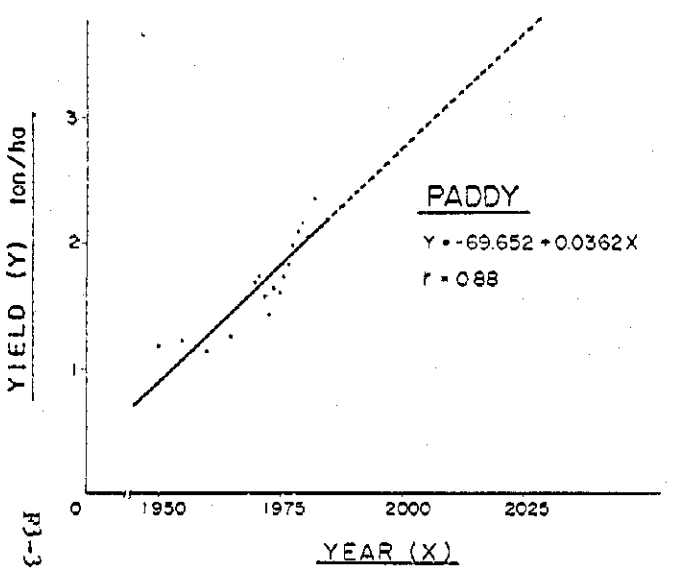
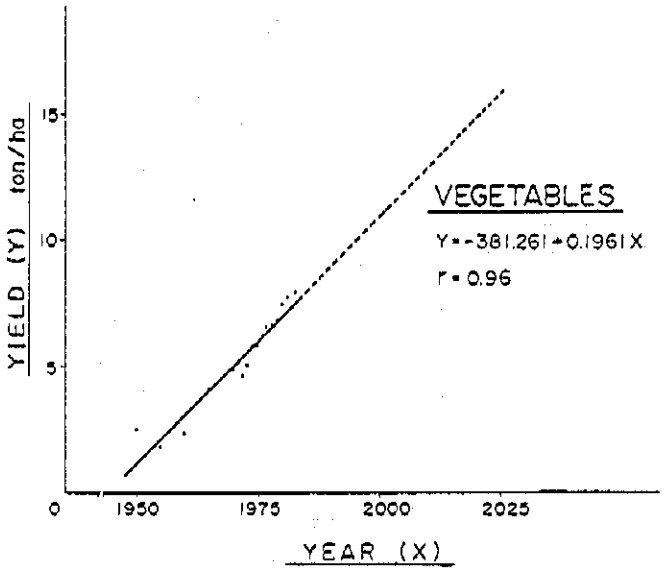
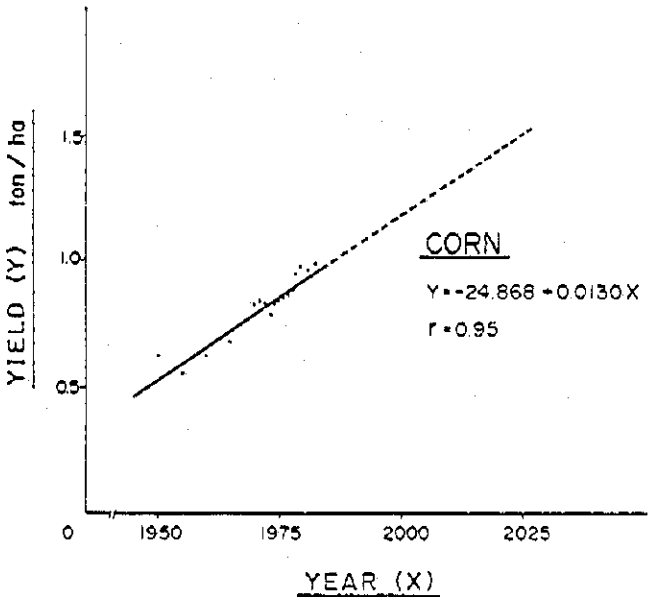
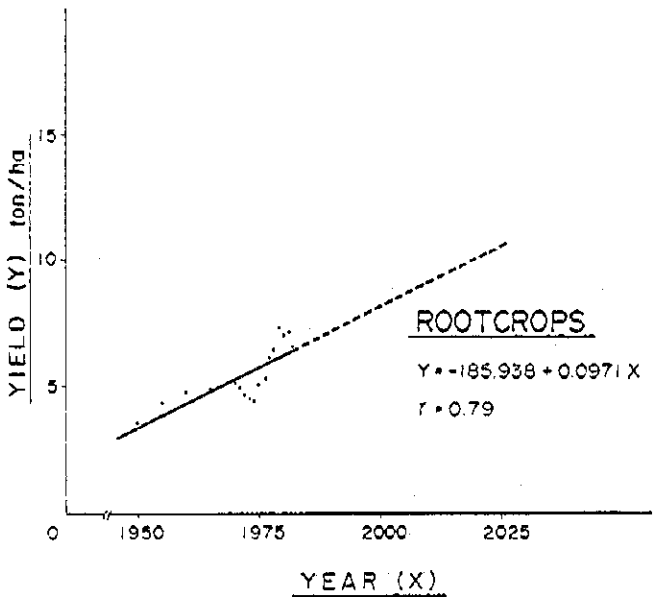


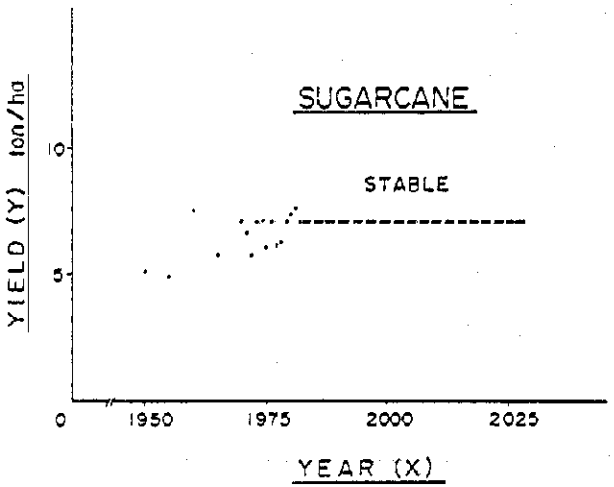
Fig. Ⅲ. 3-3 YIELD PROJECTIONS FOR MAJOR CROPS











(Data Source)

Philippine Statistical Yearbook (1983)

APPENDIX IV

FLOOD CONTROL PLAN

FOR

FINAL REPORT

ON

THE PANAY RIVER BASIN-WIDE

FLOOD CONTROL STUDY

APPENDIX IV FLOOD CONTROL STUDY

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1. Introduction

The Panay river basin covers an area of approximately 2,181 km^2. It has a river length of about 152 km. The basin is located on the northeastern part of Panay Island in the Western Visayas Region and spreads over almost the entire province of Capiz with only a small portions lying within the provinces of Iloilo and Aklan. The basin is bounded on the south by the province of Iloilo and on the west by the Panay highlands which separate it from the province of Antique. The north-western boundary is the Aklan province and on the north is Sapian Bay.

The climate of the basin falls under the 3rd type climate of Philippines which is characterized to have no pronounced seasons but it is relatively wet from May to October and dry from November to April. At Roxas, the average monthly rainfall in the dry period is about 50 mm and that in the wet period is about 250 mm. Annual average rainfall in the basin is 2,550 mm. But its areal distribution is remarkably varied from as high as 3,500 mm in the west mountain area to about 2,000 mm in the south-eastern area.

The average annual total run-off of the Panay river at the bifurcation point of the Pontevedra river is 2,880 x 10^6 m^3, annual average discharge is 91.4 m^3/sec and 95 % dependable flow is 16.0 m^3/sec.

The Panay river basin consists of Antique range on the west, Panay central plain on the center and northeastern Panay highland on the east. Antique range is composed of north-south trending mountains with sharp ridges and deeply dissected valleys. It slopes gradually eastward and forms a wide belt of foothills that merges the western side of Panay central plain.

The upstream area of the Panay and the Mambusao rivers is composed of moderately hard consolidated conglomerate, sandstone and siltstone of Oligocene-Miocene age. On the contrary, the upstream area of the Badbaran and Maayon river is composed of andestic volcanic

breccia of Upper Miocene-Pliocene age and andesite of Oligocene age. Along the main river channels, wide flat cultivated lands composed of quaternary alluvial and deluvial deposits are developed.

The 12 muncipalities and a city are located within the Panay river basin. Estimated basin population is 465,000 as of 1980 which is anticipated to increase to 825,000 in 2020 with average growth rate of 1.3 % which is somewhat lower than the growth rate of the whole Philippines in the same period of 1.7 %.

Gross regional domestic product of the basin at 1972 constant prices is ₱917 x 10^6 in 1982 which is anticipated to increase to ₱5,946 x 10^6 in 2020 with average growth rate of 2.5 %. The per capital GRDP of the basin in the period increase from ₱1,766 to ₱ ,931 with average growth rate of 2.2 %.

The land use in the basin is mainly for food production. Major land uses of the total basin area of 2,182 km^2 is sugarcane of 48,530 ha (21 %), paddy of 40,960 ha (19 %) and fishpond of 10,560 ha (5 %). The remaining 55 % is occupied by shrub, orchard, pasture, grassland, marsh/swamp and others. The present land use in inundation area is shown in Fig. IV.1-1 and in Table IV.1-1.

Rice is the main crop in the basin followed by sugarcane, total annual production of paddy in the basin is about 215,000 ton. Present average yields of paddy are about 3.1 tons per ha per crop for irrigated paddy and 2.6 tons for rainfed paddy. In most of irrigated and rainfed areas, double cropping of paddy is made. The typical size of paddy farm is 1.5-2.0 ha with 7 to 8 family size.

Total annual production of sugar in the basin is about 60,000 ton on an average.

Water resources development in the basin is still lagging despite the presence of abundant water resources. There are neither existing nor ongoing major dam project at present, however, a proposed damsite has been identified for multipurpose dam project on the upper Ranay river. The present existing irrigation system serves an area of about 9,747 ha. Both the extension and proposed irrigation systems for the

basin will serve about 11,100 ha.

The Panay river basin has a flood prone area of over 300 km^2. Within the area, lands along the Panay river from the Panay/Maayon junction to the Panay/Badbaran junction and along the Mambusao river downstream from the town of Mambusao are the most frequently inundated.

The existing flood control facilities are limited to isolated bank protection works in various parts of eroded river banks. A total of 1,540 m long revetments was constructed at Poblacion Sigma and Poblacion Jamindan along the Mambusao river and at Banga-an, Panitan and Angub, Cuartero along the Panay river. Revetment works along the Panay river located at Bitoon and Cuartero have been completed laterly. These structures protect public road and lands on the right bank which were often eroded by flood flows. There are several proposed flood control projects in the basin. Most of them are just the extension of the existing revetments.

In this Appendix IV, the following items are to be described hereinafter.

(a) Present river condition
(b) Preparatory investigation
(c) Flood flow analysis and estimation of flood damage on present river condition (summary)
(d) Basic concept for flood control plan
(e) Selection of proposed protection area
(f) Combination plan of river improvement and floodway
(g) Combination plans of river improvement and dam
(h) Combination plans of inclusive structural measures
(i) Non-structural measures
(j) Flood forecasting and warning system
(k) Formulation of flood control plan
(l) Technical consideration
(m) Program of flood control plan

The data collected and the results of flood flow analysis are to be referred to Appendix I "Meteorological and Hydrological Condition".

2. Present River Condition

2.1 River Feature and River Characteristic

The Panay river with a catchment area of 2181 km^2 and river length of 152 km originates in the Nacuron mountain range near the Capiz-Aklan boundary. The river flows in a northeastern direction, joining the tributaries of the Badbaran, Mambusao and Maayon rivers. At Pasiang, the Panay bifurcates into two, the lower Panay and Pontevedra rivers. The lower Panay flows in a northwestern direction through Panay and Roxas City and drains into Capiz Bay, while the Pontevedra river flows in an eastern direction through Pontevedra and finally drains into Tinagongdagat Inlet. The bifurcation point of the lower Panay is silted up and the Pontevedra river is now the main channel.

Higher mountains are located in the eastern and western edges of the basin holding relatively flat basin in-between.

The Panay river is a natural river without any major artificial river channel improvement work or artificial dikes, except some revetment works provided in various parts of eroded river banks.

The Upper Panay river located upstream from the Badbaran junction flows down in the mountain area with relatively steep slope of 1/1,100. In the Central plain after the junction, the slope of the river become gentle about 1/3,000 and the river forms a frequent meandering belt dissecting low rolling hills and occasionally make sharp bends skirting isolated hills of hard volcanic rocks and limestone. In the middle reaches, it joins the main tributaries, the Badbaran and Mambusao rivers. The Badbaran river flowing down from the Northeastern Highland is relatively steep stream until it joins to the main river with average slope of 1/2,600. On the contrary, the Mambusao river originated from the Antique Range become gentle with a slope of 1/4,000 from the point about 20 km upstream from the junction with the Main Panay flows down with many meandering.

Meandering belt in the middle reaches of the Panay river is remarkable. From the confluence the Maayon river toward upstream to the confluence of the Badbaran, amplitude of meandering attains to 300 - 500 m with intervals of 200 to 300 m. Especially, in the reach between the confluence of the Maayon and the confluence of the Mambusao, flow capacity of the river is small, about 500 m^3/sec, due to gentle bed slope caused by meandering. Formation of frequent meandering appears to be partially caused by deviation of river flow reflected by shallow lying undurated surface of bedrocks. In the reach between the confluence of Maayon and the branch point of the Pontevedra, meandering is relatively few. The flow capacity in the reach is relatively big, 700 - 900 m^3/sec, due mainly to the higher elevation of both banks.

The bed slope of the Pontevedra river is very gentle beside its river mouth is clogged with deposited sand and elevation of bank is low. Therefore the flow capacity of the reach is small, less than 500 m^3/sec.

The river characteristic of the existing Panay river such as flow capacity, river width, river depth and bed slope are shown in Fig. IV.2-1 to 2. From the figures, it can be seen that in the most part of the river, the flow capacity is much less than 2-year runoff. The meanderings in 1947 and those in 1983 are shown together in Fig. IV.2-3 . The change of the river course in about 40 years is unexpectedly little.

2.2 Features of Rainfall

The basin mean annual rainfall is 2,550 mm based on the isohyetal map shown in Fig. IV.2-4 . But the distribution of rainfall in the basin has a clear inclination, that is an annual mean rainfall inclines from high in the west toward low in the east. In other words, annual rainfall is as high as 3,500 mm at the west-end area but it decreases gradually to east and shows less than 2,000 mm in the south-easthern area of the basin.

In regard to monthly variability of rainfall, there is not much difference between dry season and wet season. But, it can be said as follows.

(a) From February to April, it is comparatively dry. The monthly rainfall in these periods is generallybelow 100 mm.

(b) From June to November, it is comparatively wet. The monthly rainfall in these periods is generally more than 200 mm.

(c) May, December and January are the transitional period. The monthly rainfall is generallybetween 100 mm and 200 mm.

In regard to the point heavy rainfall, the following are the summary of records.

(a) The 35 years records at Roxas City show the 3 days heavy rainfall from No. 1 to 5 in magnitude as 396.8 mm (355.1 mm in 2 days and 310.7 mm in 1 day), 372.9 mm, 332.5 mm, 305.5 mm and 272.6 mm. Roxas city is the only station in the basin which has the records of more than 10 years.

(b) The recorded extream rainfalls of 3 days in the Panay island are much heavier than those in the basin such as 673.1 mm at Culasi in June 1966, 665.5 mm at Culasi in Nov. 1973, 665.4 mm at Valderama in July 1956 and 625.1 mm at Barbaza in July 1969.

(c) The maximum hourly rainfall at Roxas City is recorded at 93.1 mm (and the second, 75.7 mm) in 8 years records of 1972-1979.

It is noticed that the daily rainfall is not always so much as the hourly rainfall is heavy in the day. For example, the maximum hourly rainfall during November 1973 flood is only 29.8 mm but the daily total of the day is much more than the daily total of other days which has heavier hourly rainfall.

In regard to the basin heavy rainfall, it is remarkable that the point-heavy-rainfall generally does not coincide with the basin heavy

rainfall except at the time of typhoon.

During the period of typhoon, the rainfall in the Panay island is generally pretty high and it seems that the rainfall distribution covers whole the Panay island or at least the Panay river basin as far as checking the limited rainfall records at the time of typhoon.

The maximum flood in the basin in these more than 30 years happened in November 1973 when the typhoon "Openg" passed by the northern part of Panay island, that is, the Panay river basin.

2.3 Flood Flow Characteristic in the Basin

Heavy rainfalls occur very often at points or in certain limited areas, not being affected by typhoon. But during the period of typhoons, the heavy rainfall covers whole the Panay island or at least the Panay river basin. Therefore all big floods were caused by typhoon. According to the past records, typhoons attacked the Panay island 19 times during the periods of 36 years from 1948 to 1983. This means that typhoon attacks the island nearly once in two years.

As seen in the basin map, the Upper Panay and three major tributaries, Mambusao, Badbaran and Maayon, all originate from the eastern or western mountains and flow out to the central plain concentrically, then all flows gathered in the area flows down the main Panay river and Pontevedra river to the sea. Therefore at the time of flood, though there are some time differences among the tributaries and Upper Panay to have their flood flow to reach the center of the central plain near the Mambusao junction, the time difference is not big enough, so that all the outflow from the tributary basins some what concentrate in the central plain. In other words, most part of each flood wave are accumulated each other resulting in big peakflow and long inundation period. Since the carrying capacity of downstream reach of the Panay river from the Mambusao junction is as small as 500 m^3/sec which is less than 1 year-flood, all bigger flood flow out of the river over-topping the river banks and inundate the central plain. Additionally, there are some narrow points of flood

plain. Therefore the flood water overflown from the river channel makes a chain of retarding basins, which causes the elongation of inundation period. In case of 1973 flood, flood duration in the central plain was longer than 10 days.

2.4 Existing Records of Past Big Floods

(1) General

Among the past big floods, the following are considered to be the first and the second biggest floods in the basin during the period at least after the end of the World War II.

(a) "Openg Flood" caused by the typhoon "Openg" in November 1973

(b) "Undang Flood" caused by the typhoon "Undang" in November 1984

The following are the general descriptions of these two floods.

(2) "Openg" Flood

(A) Flood Hydrograph of "Openg" Flood

The water stage hydrograph and discharge hydrograph of the "Openg" flood at the Cuartero gauging station is obtained based on the water stage and discharge records published officially by NWRC. The incomplete hydrographs at the Mambusao and Maayon gauging sites are also obtained. They are shown together in Fig. IV.2-5.

According to the figure, the peak daily mean discharge of "Openg" flood at Cuartero is about 2,100 m^3/sec and the flood volume is about 850 x 10^6 m^3. The flood volume is unreasonably too big compared with probable rainfall. The unreasonable estimate is considered to be due wrongly extended rating curve for the site. The modified discharge hydrograph is made by modifying the rating curve and be shown together in Fig. IV.2-5.

(B) Inundation Area of "Openg" Flood

According to the previous study of the "Nationwide Flood Control Plan", the additional investigation performed in June 1985, the inundation area of "Openg" flood is not so much different from that of "Undang" flood shown in Fig. IV.2-7, which is over 300 km^2 in total.

(C) Flood Damage of "Openg" Flood

The flood damage caused by "Openg" flood was assessed in the previous study "Nationwide Flood Control Plan" based on results of questionnaires survey. The result is as shown in Table IV.2-1 which shows the total flood damage of ₱57,400,000 at the price level of 1973 (equivalent to ₱204 x 10^6 at the estimated price level of 1980).

If the amount is updated to the price level of 1984 by applying ratio of price index of 1984 and 1980 of 1.67, the flood damage at the price level of 1984 is ₱341.0 million.

(D) Records of "Openg" Flood

There are some records of streamflow and rainfall at the time of "Openg" Flood. But, the available/reliable records in the basin are limitted to the followings.

(a) Water stage records at Cuartero G.S.

(b) Rainfall records at Roxas city

That is, the number of records for the analyses of rainfall as well as runoff is not sufficient though the analyses are possible if some assumptions are accepted.

(2) "Undang" Flood

(A) Flood Hydrograph of "Undang" Flood

The water stage hydrographs of "Undang" flood at 6 stream gaging stations are shown in Fig. IV 2-6. The comparatively reliable rating curves of water level and discharge at Panitan and Cuartero are prepared as shown in Appendix I.

(B) Inundation Area of "Undang" Flood

The inundation area was investigated at the time of additional investigation performed in June 1985. The area covers about 300 km^2 in total which is a little smaller than that of "Openg" flood though the difference is negligibly small on the map of small scale. The area is shown in Fig. IV.2-7. The results of additional investigation is described in Appendix XIII.

(C) Flood Damage of "Undang" Flood

The flood damage caused by "Undang" flood was estimated from the data collected at the time of additional investigation. Most of the data are obtained from the reports of "Undang" compiled by the government offices and agencies. It is estimated that the total damage is about ₱247.6 x 10^6. The breakdown and detail of the damage are shown in Appendix III and XIII. The summary of direct damage by "Undang" flood is shown in Table IV.2-2.

(D) Records of "Undang" Flood

There are comparatively sufficient and reliable records of not only the meteo-hydrology for the analyses of rainfall and runoff but also the damage. There are mainly four reasons why such data are collected.

(a) New gagings stations of rainfall as well as streamflow are established in 1984.

(b) JICA study team was stationed in Roxas city during "Undang" flood.

(c) The additional investigation was carried out for collecting the more detailed and reliable records.

(d) Philippine government made the investigation of the "Undang" disaster and complied the reports.

3. Preparatory Investigations

At the time of the previous study, Nationwide Flood Control Plan, flood flow analysis and estimation of probable flood damage were made by a well-prepared river system model with the aide of an electronic computer. However, the topographic information available for the analysis were only the topographic maps in the scale of 1:50,000 with contours interval of 20 m and river cross sections at more than 5 km intervals. This insufficiency of topographic information was the main restriction for making flood damage estimation with proper accuracy.

In order to make sufficient topographic information available for this Study, the following preparatory investigations were carried out by JICA (a separate team of this Study).

(A) Aerial photographing

Aerial photographing with a scale of 1:20,000 covering the whole Panay river basin (area ; 2,300 km^2) was carried out, but finally some portions, mostly mountain areas are failed to be taken due to adverse weather condition. The photographs are used effectively for preparation of topographic map, interpretation of land use and geological condition, identification of old river course and other purposes.

(B) Preparation of topographic map

Topographic map of flood plain area (area ; 700 km^2) have been prepared at a scale of 1:10,000 with contour interval of 2 m from above mentioned aerial photographs. The maps were effectively used for flood flow analysis and preparation of river improvement plans.

(C) River profile and cross section survey

The work covers the lower Panay river, Pontevedra river, Panay main upto the point about 10 km upstream from Badbaran junction, downstream portion of Maayon and Badbaran and Mambusao upto the point about 25 km upstream of Panay junctions. Interval of cross section is about 3 km - 5 km and

width is about 1 km. The results are used for preparation of river improvement plans.

The index of each in the scale of map 1/50,000 and 1/10,000 are respectively attached as Figs. IV.3-1 and IV.3-2. The index map of river cross sections is shown in Fig. IV.3-3 and the cross sections reduced from the originals are shown in Data Book II.

4. Flood Flow Analysis and Estimation of Flood Damage on Present River Condition

4.1 Flood Flow Analysis

(1) Method and Results of Analysis

The flood analysis is made to estimate the probable flood runoffs with different return period from the past rainfall records and to estimate the flood water level and possible inundation condition in the river basin. The description of analysis on the present river condition is done in Appendix I. In the study, the river system model was constructed and used for flood runoff calculation with the aid of an electronic computor. The major steps of the analysis are shown below.

(a) Construction of river system model

(b) Estimation of probable basin rainfalls with different return periods

(c) Estimation of probable flood runoff from each sub-basin with different return period

(d) Flood routing along river course

(e) Estimation of flood water level and duration in possible inundated area.

The river system model is diagrammatically shown in Fig. IV.4-1. The river basin have experienced a big flood in November 1973 by the typhoon "Openg" and in November 1984 by the typhoon "Undang". The records of "Undang" flood are used for the simulation of rainfall and streamflow in the present river condition.

As the results of flood flow analysis, distribution of flood flow for the each probable flood under the present river condition was clarified as shown in Fig. IV.4-2. Based on the clarified water level at each base points, the inundation condition in the basin is assessed and used for estimation of the flood damage. Inundation conditions for 5 year, 25 year and 100 year-flood are shown in Figs. IV.4-3 to IV.4-5.

(2) Verification of Analysis by "Undang" Flood

Most of rainfall stations in the Panay River basin were newly installed in and after 1976, and before this, only point rainfall data at the Roxas city were available. Since there have been no pronounced floods during the period of 1976 to present, except for November 1984 flood, this Study took up the November 1984 flood for verification of the probable rainfall analysis and the runoff analysis. This flood has caused an extensive inundation as shown in Fig. IV.2-7, which continued for almost a week. The flood is still fresh in mind of the local residents.

The Undang typhoon caused an extensive inundation in the Panay River basin in November 1984. For this flood, a great amount of information was gathered, which ranges as given below:

- Daily (inclusive partly of 6-hourly) rainfall records at 13 stations in the Panay River basin
- Water level records at 6 stream gaging stations in the Panay River
- Flood marks at 30 places along the Panay River and its tributaries
- Inundation water level and duration at about 200 places in the basin
- Discharge measurements at the Panitan station. A stage-discharge rating curve applicable to floods can be constructed from these measurements
- Course of the Undang typhoon and wind velocity and air pressure recorded at the Roxas city

The meteo-hydrological records of "Undang" flood mentioned above are used for the verification of the rainfall and runoff analyses.

(3) Probable Rainfall and Probable Flood

The probable rainfall in each basin is estimated by using the probable rainfall at a representative rainfall gaging station and a reduction rate by area.

Then the probable Flood analysis is carried out by using the probable basin rainfall and some constants obtained by the verification of analysis in the present river condition. The details are mentioned in Appendix I.

4.2 Estimation of Flood Damage

The flood damages are estimated in this Study for the 6 major items which are 1) crop damage, 2) livestock damage, 3) building damage, 4) fishpond damage, 5) infrastructure damage and 6) indirect damage. The two major items, crop damage and building damage are further sub-divided into the following categories:

Crop damage

- Irrigated paddy damage
- Rainfed paddy damage
- Vegetable damage
- Sugarcane damage

Building damage

- Residential building damage
- Household effect damage
- Non-residential building damage
- Inventory stock damage

The inundated areas and buildings by return period are estimated as shown in Table IV.4-1.

Then each items of flood damage is assumed to increase in future in accordance with the population increase, raise of per capita GDP or increase in agricultural products due to technical advance. Detailed procedure of estimating each items of flood damage is shown in Appendix III. The flow chart of flood damage analysis is shown in Fig. IV.4-6.

Flood plain is divided by meshes of $100^{m} \times 100^{m}$. Flood damage are assessed mesh by mesh and summed up by each subriver basins and tributary basins. Inundation characteristic of each mesh of land is identified based on the results of flood flow analysis.

Flood damage of each item for different probable floods and each year in future are assessed firstly, then the average annual flood damage in 1984 and future years can be assessed from them.

These values in 1984, 2009 and 2029 are shown in Tables IV.4-2 to IV.4-4.

After reviewing the results of estimated flood damage, major findings are as follows:

(a) In case of smaller flood (5 year-flood), deep inundations occur in the areas along the middle reaches of the main river downstream from Dumalag to the confluence with the tributary Maayon and in the area of vast paddy field located south of downstream reaches of the tributary Maayon and in the area of vast paddy field located south of downstream reaches of the tributary Mambusao. Reflecting such conditions, crop damages in the above areas are large even for smaller flood (5 year-flood).

(b) In case of bigger floods, the above deep inundation areas extends to as far as the Pontevedra town. Reflecting such condition, the crop damage in the Panitan - Panay area increase conspiciously for the bigger floods.

(c) The building damage is the biggest damage and crop damage follows it. Building damage increases sharply as flood magnitude increases.

(d) The building damages concentrate in limited number of big towns along the mainstream and major tributaries such as Dumarao, Dumalag, Cuartero, Maayon, Mambusao, Sigma, Panitan and Pontevedra. Most of them located in the middle reach area.

5. Basic Concept for Flood Control Plan

5.1 Basic Concept

5.1.1 General

Repeated damages from floods constitute the most important issue in the Panay river basin, as discussed in Chapter III. Planning for flood control, therefore, was of primary concern in this Study. Besides this issue, considerations were given on possibilities of irrigation development, municipal and industrial water supply and hydropower generation, for the purpose of formulating a comprehensive basin-wide development program.

In the report of "Nationwide Flood Control Plan and River Dredging Program (hereinafter called Nationwide Report)", the Panay river is taken up as one of 12 major rivers in the Philippines. And the flood control plans for the Panay river are formulated as follows.

(A) Basic Plan

A target plan for the future phase of flood control works with the objective scale against 100 year-flood. All the main river channels (Panay river except lower Panay, Badbaran river, Mambusao river, and Pontevedra river) in the flood prone area are improved by dredging and diking. A dam is constructed in Badbaran river.

(B) First Phase Plan

A reduced Basic plan for the appropriate scale of implementation with the objective scale against 25-year flood. The first phase plan is basically the same as the basic plan in regard to the structures and the reaches of improvement. The difference is the capacity of river channel, that is, for the flood scale of 100-year vs 25-year.

(C) First step Plan

A stepwise execution plan of the First phase plan with the same objective scale of flood as that of the First phase plan

but only the channel improvement for downstream stretches from the rivermouth to Panay/Mambusao confluence. That is, the channel improvement of upstream stretches from Panay/ Mambusao confluence and the construction of Badbaran dam remaines as the second or third step plan of the First phase plan.

A flood control project would be implemented through both structural and non-structural measures. This Study will chiefly contemplate the protection by structural measures, wherein non-structural measures will be discussed in combination of and as substitute of the structural measures.

In principle, if a flood control project by structural measures, is to be carried out, a high setting of target level of protection, say against a 100-year flood, would be desirable in view of the safety of facility and the long-term stability effects of the livelihood of the people concerned. However, a plan formulated with such concept would not necessarily be viable from economic standpoints, because the setting of the target protection level is largely dependent on the economic conditions of the study area. If a plan with a high protection level is not justifiable economically, an alternative plan needs to be formulated, which would comprise a provisional plan aiming at a slightly lower target level of protection in the first stage, followed by an ultimate plan with a higher target level which would protect the increased future potential damages in the area.

In the Panay river basin, a provisional plan (short-to medium-term) mentioned above will be proposed as the core of the flood control plan, since flood control measures with the high level of protection was presumed not liable to be justified. As the result, the Study proposes flood control measures that would best fit the present condition and requirement in the Panay river basin.

5.1.2 Background and Information for Flood Control Plan

In principle, a protective measure carrying a high target level of protection, say against a 100-year flood, is desirable in implementing a flood control project, in view of the long-term effects on stability of livelihood of people concerned. However, a plan formulated in such concept would not necessarily be viable in a preliminary stage, from economic standpoints, and the question of target protection level is largely dependent on the economic conditions of the study area. If a plan with a high protection level is not viable economically, an alternative plan needs to be formulated, which would comprise an urgent plan aiming at slightly lower target level of protection in the first stage, followed by at ultimate plan with a higher target level corresponding to increased potential damage in the study area.

In the Panay river basin, a provisional plan (short-to mid-term) mentioned above is proposed as the core of the flood control plan, since the flood control measures with the high protection level is not liable to be justified, as discussed in the nationwide Flood Control Study. As the result, the study proposes the flood control measures that best fit the current requirements in the Panay river basin.

The following are the descriptions of the socio-economic background and flood characteristics which will be available for understanding to study the provisional flood control plan.

(A) The economic and financial situation of the Philippines become worse especially since the middle of 1983 and the smooth recovery is hardly expected at least in the near future from the synthetic analysis of present situation.

The following are the examples of present situation as of the end 1984.

(a) The Philippines inflation rate is over 60% in October 1984, though the rate will go down gradually in 1985.

(b) The Philippines is the only country in Southeast Asia with negative growth rate of GNP possibly -5.5% for the whole of 1984 from ₱98.77 billion in 1983 to ₱93.35 billion in 1984.

(c) The fixed capital formation, consisting of government and private construction, declined by 28.94% in 1984.

(d) The capital stock also shows a negative growth in 1984.

(e) The government expenditures account likewise posted 9.7% drop in 1984.

(f) The imports declined by 20.7%. The main cause will be the government restriction for keeping overall import at a minimum.

(g) The foreign accumulated debt is over US$25 billion which is more than three fourth of GDP.

(h) The unemployment seems to be still on the increase, though no reliable data are available, no matter how many people are out of work at present.

(i) It is decided that the budget of MPWH (The government body for executing the construction project) is declined from ₱4.3 billion in 1984 to ₱3.3 billion in 1985.

Therefore, it is expected to be unrealistic to formulate a project of large scale which need too much budget and debt for the government.

(B) Though the financial difficulties are expected as mentioned above, the flood control in the Panay river basin is essential for reducing the damages caused by the habitual flood inundation in the flood prone area of over 300 km^2. Though the inhabitants in the area of habitual inundation are more or less accumstomed to such condition, it is still very serious problem for them and the present study for flood control embolden them for expecting the execution. For example, it was found after the 1984 November flood (the second or third biggest flood happened in these 30 years) that the number of student in schools and colleges is suddenly decreased, the number of criminal act such as theft and robbery is increased, the annual festivals and events of villages and towns are cancelled or scale-downed and the prices of flood, housebuilding materials, etc. are increased. That is, the indirect impact of flood shows the seriousness of flood damages.

Besides, it is informed by interviewing with the inhabitants that they hesitate to improve their land and the other properties in the habitual inundation area. That is, it can be said that the habitual floods actually restrain the development of the inundation area.

Additionally, it should be noted that the properties in the inundation area is comparatively big as this area yields the most crops in the basin and 6 municipal towns (Pontevedra, Panitan, Mambusao, Sigma, Dao and Cuartero) are located in the habitual inundation area.

(C) It is considered that the river improvement plan against relatively small scale flood will shows the more or less remarkable effect on reducing the damages even in case the flood of bigger than the objective scale occurs, as the flood water level will be lower than that in present condition and the flood duration becomes shorter. And the habitual inundation area will be much decreased.

(D) It is common knowledge for river improvement plan to be consistent in the basin. That is, the impact of improvement has to be studied from the synoptic and basin-wide points of view.

Especially it should be taken care that the channel improvement in the upper reach and tributaries will increase the flood discharge in the lower reach of main river. Therefore, it is suggested to make a plan of which improvement works start from the lower reach. Additionally the property of lower reach is relatively bigger than that of upper reach.

(E) The flood features for making the conception of flood control plan in the Panay river basin are described below.

(a) Though the scale is different, the inundation happens almost every year.

(b) The considerably serious inundation covering the municipal towns seem to happen every 3 or 4 years though the interval period is not constant.

(c) The further serious flood seems to come almost once 10 years, which affect not only the livelihood of inhabitants in the inundation area but also the economic development and social stability in the whole basin.

(d) The big floods causing the wide inundation area generally happen when the typhoon passes by the Panay river basin and the heavy rainfall coincides in the whole basin area.

(e) But the flood covering the limited area happens by the heavy rainfall in the partial area especially in the Mambusao river.

(f) At the time of big flood, the inundation area is extended due to the shortage of flow capacity in the downstream reaches of Panay river. The present channel has the capacity of somewhat less than 1-1.5 year flood though the capacity varies along the river. Especially the capacity of Pontevedra river is short due to the sedimentation at the river mouth which makes the opposite river bed slope.

(g) At the time of big flood, the inundation area is extended due to the narrow portion of flood plain. That is, the natural retarding basins are made in the upstream flood plain area of the bottle neck portions along the Panay river. It is roughly divided into four retarding basins caused by a bottle neck of flood flow capacity. The biggest retarding basin is the upstream area of Panay/Mambusao confluence covering the area of more than 50 km^2 at the maximum water stage. The downstream area of this Mambusao retarding basin is the area most frequently inundated. The second retarding basin is the upstream area from about 5 km upstream of Panitan (town) which covers the area of more than 20 km^2 but the retarding period is shorter and the frequency of inundation is fewer in comparison with the Mambusao basin. The third one has the bottle neck portion at the just upstream of Panay/Maayon confluence, which covers the area of more than 30 km^2 at the maximum water stage. The forth one is the upstream area of Cuartero, covering the area of more than 30 km^2 at the maximum water stage. But the retarding period of this basin is comparatively short (less than One day) except the case of the very big flood like November 1973 flood.

(h) The Panay river has three main tributaries. The flood water from these tributaries flows down and individually enter to the main Panay river.

On the other hand, the flood water from the upstream basin of main Panay river also flows down at the same time and gradually increase the discharge by gathering the flood-flow from the tributaries.

But as already mentioned above, the capacity of downstream reaches is limited as small as the capacity of less than 1.5 year flood at some stretches. And even if it is flooded, the flow-capacity in the flood plain is not so much increased due to the bottle neck points which restrain the smooth flow from upstream to downstream by making natural retarding basins in the upstream area of the points.

Though the lag time of flood peak discharge is generally more or less different between the tributaries and main Panay river, the storage function for discharge increase at the natural retarding basin makes the higher inundation water levels.

Therefore the flood peak water level generally does not coincide with the peak discharge in case of the big flood in the downstream reaches. And the recession period becomes much longer. This condition becomes more apparent in proportion to the magnitude of lfood. That is, the flood duration period is much increased due to the capacity shortage of river channel and flood plain in the downstream reaches especially from the Panay/Mambusao conference.

Additionally, it should be noted that the flood duration period becomes longer in the downstream stretches of Mambusao river and Maayon river due to the back water from the main Panay river.

(F) In the Panay river basin, the flat area is generally used for paddy, fishpond, and sugar cane farms and the undulated mountainous area is generally remained as shrub and grass-land. The major municipal towns except Tapaz and Jamindan are also all located in the flat plain. That is, it can be said that the land utilization level in the flat plain is pretty high.

In this condition, more than 60% of flat plain is located in the flood plain. Therefore, it is not recommendable to reduce the limited plain land by the river improvement with dikes which confine the wide productive area as there is no dikes at present in the Panay river basin. The safety level of flat plain in case of unexpected big flood becomes low as the destruction of high dikes causes the increase of damage.

The construction of dam in the upper reach is a desirable counter-measure for relieving from the above-mentioned matters. If the adequate damsite for cutting the flood peak is found, it is necessary to study the flood control by a dam (or dams) only and also by the combination of river channel improvement with dam.

Additionally, the dam and reservoir will be available for power generation if the storage capacity is sufficient. In the Panay island, there is no hydro-power station. The development of power together with the flood control will open an opportunity for the economic development of Panay river basin.

(G) In addition to the flood control by dredging, diking, and dam, the other conceivable plans are also to be studied as the alternative and/or supplemental plans. The soft countermeasures will contribute to reduce the damage or the earlier recovery from the damage as the supplement of flood control by the hard countermeasures.

5.1.3 Flow Chart for Formulation of Flood Control Plan

In this report entitled "Panay River Basin-wide Flood Control Plan" it is decided that the flood control plan is to be formulated by the following procedure.

(a) Establishment of flood control level

(b) Selection of criteria for protection areas

(c) Decision of conditions for cost and benefit

(d) Listing conceivable alternative plans

(e) Formulation of LP

- Selection of proposed protection area
- Formulation of LP plan based on the alternative plans including the combination with floodways, dams, and polders

(f) Formulation of MP and SP

(g) Formulation of non-structural measures

(h) Formulation of stage-wise development plans

(i) Scheduling and Project Evaluation

The plan formulation logic diagram of flood control plan is shown in Fig. IV.5-1.

The details at each procedure are described in the sections for the description of each plan.

5.1.4 Establishment of Flood Control Level

The objective term for flood control is to be established by three levels, that is, (A) Long-term, (B) Mid-term and (C) Short-term. The following are the criteria/description of each plan classified by the objective term.

(A) Long-term Plan (LP)

(a) A flood control measure of high protection level was assumed to be enacted in most of the currently inundated areas. The target flood control effect of this plan was set at the coverage ration 90%, i.e. 90% of the residents in the flood prone area would be relieved from the inundation damage, allowing for unavoidable local inundation for the remainders.

(b) As a supplemental target for flood control plan, the agricultural land areas are to be protected from the flool damage as much as possible. In the flood prone area, the agriculture, land by a rice crop, is a main industry in the Panay river basin and the desire to the protection of Panay field against flood is strong among the inhabitants.

(c) A 100-year probable flood was taken as the design flood, taking into the size of the river and the land use potential in the basin. This accords with the basic plan recommended in the Nationwide Flood Control Study.

(b) Mid-term Plan (MP)

(a) A Mid-term provisional plan was assumed to be introduced, if the long-term plan was not economically justified under the present conditions.

The protection level of this plan was defined by a flood of practically conceivable magnitude, say the recorded maximum flood. The coverage protection ratio for the residents to get flood damage reduction is expected to be 70 - 80% of the population in the flood prone areas. The flood of larger than the target flood in MP plan is to be mitigated though it is not completely protected.

(b) The recorded maximum flood in the current years in the basin was the November 1973 flood (corresponding to a 25-year recurrence period). This flood was taken as the design flood of practically conceivable magnitude. The design flood coincides with the objective flood in the First phase plan proposed in the Nationwide Flood Control Study.

The 1973 flood has a special persuasiveness to the local residents, as the flood is still remained in mind as the largest flood in current years.

(C) Short-term Plan (SP)

(a) A short-term provisional plan would be introduced, if the mid-term plan above was found to be difficult in view of the economy viability.

The protection level would have to below, as the objective floods would be the minor ones with repeated occurrence. Provision needs to be made, however, that the plan would reduce the expected damage even in the face of floods larger than the design flood.

(b) The protection areas by SP are the areas of which damage potential including the population are comparatively high even in case of minor floods. SP is expected to provide the benefit due to flood damage reduction to the inhabitants of more than 50% in the flood prone area.

(c) In the short-term provisional plan, the design flood was determined at the following 2 cases.

Minimum Compound Section

In case that a dike (even if its hight is low) is constructed, it is desirable to assume 10-year probable flood as the minimum level. Therefore, it is decided to set the target flood of SP in case of compound section to be 10-year flood. The 10-year flood is almost equivalent to "Undang" flood which is the second biggest and newest flood in the memory of the inhabitants.

Single Section

This case aim to make a minimum scale flood control works. As there is no dike, the flood water level will be lowered and the flood duration will become shorter by the dredging and excavation of the present river channel, through the flood

frequency will be still high even after the imrovement. The present bankful capacity is more or less 1 - 1.5 year flood. Therefore, this capacity is to be increased to 2 - 3 year flood level by enlarging the present channel. The remarkable meandering of present channel is to be reformed for lowering the flood water level. The improved channel will be available as the low water channel of the compound section which will be constructed in the future.

The flood control plan also can be classified by the effectiveness as shown below.

(A) Flood Protection Effect

The above flood control plans, i.e. LP, MP and SP, would realize the reduction of flood damages by decreasing the frequency of occurrence, though the protection levels are considerably different.

(B) Flood Damage Mitigation

The plan above would have some residual flood damages unavoidably when the flood is larger than the objective protection level. But in the long run, the plan would mitigate the flood damage even in the face of a larger flood, and thus realize a significant decrease in the annual average flood damage. In case of SP plan, the mitigation effect is especially remarkable as it aim to accommodate the 2 - 10 year flood. The Lp and Mp plans also have effect of mitigation for the unexpected large floods even if it can not completely confine the flood water.

5.1.5 Selection for Protective Areas

The inundation area maps of present river conditions, corresponding to 5- and 100-year probable floods, are given in Fig. IV.5-2. As seen in the figure, the inundation areas would not significantly change with the size of inflow floods. This indicates that reduction in the flood discharge would not directly result in relief of widespread areas from inundation damage. It would bring about, however, mitigation of inundation damage due to decreased inundation depths and duration.

The intensities of potential flood damage associated with 5- and 100-year floods are respectively shown in Figs. IV.5-3 and IV.5-4. As depicted on the figures, the flood damages would be equally inflicted along the river course. To be more specific, the potential flood damage would be largest in the areas along the stretch downstream of the Panitan town, while the intensity of flood damage would be highest is the major towns dispersed in the areas. Tables IV.5-1 and IV.5-2 present the maximum flood damages and affected population associated with the 100-year flood (as given in Fig. IV.5-3), for each river stretch in the sub-areas and for each major towns.

The objective areas for flood control plans of LP, MP and SP were determined, based on the flood damage potential under present condition shown in Tables IV.5-1 and IV.5-2 and the criteria set forth in the foregoing sub-section. The criteria given below were applied in selecting the areas:

Selection Criteria for Priority Areas

Proposed Structure	Area/Place to be selected	Selection Criteria
River improvement	River stretch (inundated area)	Priorities given by the damage potential of each stretch (Damage cost per stretch, per km, and per km^2). Manage on towns excluded, assuming they would be eliminated by polder dikes).
Poders (dyked enclosures)	Major town/ villages	Priorities given by the damage potential (₱), or by the damage per km^2 (₱/km^2)

As seen in Tables IV.5-1 and IV.5-2, the river stretch sections and towns classified as Level-1 are the most important protection areas and the next priority is given to a stretch of Level-2, then Level-3.

Based on the criteria for protective priority areas classified by three levels; Level 1, 2 and 3, as described in the preceding paragraph, some alternative plans of protective areas are made. Then, the following criteria (indices) are given for selecting one of protective area alternatives.

(a) Cost-Damage ratio; Damage Potential reducible by protection work/Cost of protection work

(b) % of Protection in terms of reduction in damage potential by structural measures

(c) % of Population released from flood hazard by structural measures

5.1.6 Conditions for Estimating Construction Cost and Benefit

The relative merit of alternative plans was evaluated through cost and economic comparisons. Polder dikes in item (d) will be contemplated as measures for the Mid- and Short-term plans, but not in the framework of the Long-term plan, because of their primary propose of giving priority protection to specifific areas. The following basic concepts and criteria were placed in the evaluation:

(a) Construction cost:

- Cost represents 1984 price

(b) Economic cost:

- 82% of local currency portion in estimated financial cost
- 100% of foreign currency portion

(c) Flood control benefit:

- Benefits accrued from reduction of flood damages, both present and future.
- Damage reduction to be estimated in accordance with procedures detailed in Appendix III.
- Future damage potential is to be increased at a predetermined rate but with the following conditions (See Appendix III).
  - full growth of future damage potential if high level flood protection against 25-year flood or large is provided.
  - growth rate is to be half if only low-level flood protection against 10-year flood or less is provided.

· growth rate is to be 1/4 if no flood protection measure is provided.

- Sensitivity analysis to be conducted on the case of no increase in future damage potential, if considered to be necessary.
- In case of protection by high dikes, some of the protected inland area would remain prone to inundation due to run-off of inland water. This residual damage would be assessed to be 5% of the calculated damage reduction.

Note; Increase of future damage potential considers the basin development which accrues the secondary benefits including the improvement of transportation (via levee road).

(d) Construction period;

- River improvement : 4 to 8 years according to the scale of the work
- River diversion : 5 years incl. preparatory works
- Dam : 5 years incl. preparatory works
- Polder : 3 years incl. preparatory works

(e) Discount rate : 8% per annum

5.1.7 Selection of Implementation Timing

The relative merits of the above Long-, Mid- and Short-term Plans would be compared through economic evaluations, in which the discount rate was selected to be 8% p.a. as a rate applicable to evaluation of standard flood control projects. The study set forth a criterion that the projects having the EIRR value of more than 8% would be worthy of implementation projects which fall outside of the criterion should be deferred until a future date, when the enlarged benefits justify the implementation. In selecting the short range plans, the implementation in the order of EIRR merits would be recommended.