

- continued -

Site No.	Name of River	Drainage Area (km ²)	River Course Length (km)	Flood Concentration Time (min.)	Runoff Coefficient	Average Basin Rainfall (mm/day)	Average Rainfall Intensity (mm/hour)	Peak Runoff Discharge (m ³ /sec)
Y-2	Right Tributary	4.8	5.13	24.	0.70	690.2	235.2	220.
Y-3	Yawa River	14.2	10.23	49.	0.70	659.0	199.9	552.
Y-4	Left Tributary	4.0	10.08	48.	0.70	694.7	211.4	164.
Y-5	Yawa River	19.0	11.68	56.	0.70	649.1	191.0	705.
Y-6	Right Tributary	19.0	8.05	38.	0.70	649.1	206.6	763.
Y-7	Yawa River	38.0	11.68	56.	0.70	622.4	183.1	1353.
Y-8	Yawa River	40.0	12.98	62.	0.70	620.2	177.6	1382.
Y-9	Budiao River	7.5	11.78	56.	0.70	678.4	199.2	290.
Y-10	Yawa River	47.5	12.98	62.	0.70	612.8	175.5	1621.
Y-11	Yawa River	58.5	15.53	82.	0.70	603.4	159.1	1810.
Y-12	Pawa Bubabod River	7.6	11.55	55.	0.70	678.1	200.0	296.
Y-13	Yawa River	66.1	15.53	82.	0.70	597.7	157.6	2026.
Y-14	Yawa River	74.4	17.28	96.	0.70	592.0	148.0	2142.
O-1	Buyuan (A) River	5.3	9.38	45.	0.70	463.8	143.3	148.
O-2	Buyuan (A) River	3.7	9.25	44.	0.70	469.7	145.6	105.
O-3	Unknown	3.2	10.25	49.	0.70	471.0	143.1	89.
O-4	Matanag River	5.6	10.13	48.	0.70	462.8	140.7	153.
O-5	Basud River	14.0	11.00	52.	0.70	444.7	132.7	361.
O-6	Bacacay River	23.3	14.38	76.	0.70	432.7	117.0	530.
O-7	Bulawan River	5.7	7.25	35.	0.70	462.5	149.9	166.

Site No.	Name of River	Drainage Area (km ²)	River Course Length (km)	Flood Concentration Time (min.)	Runoff Coefficient	Average Basin Rainfall (mm/day)	Average Rainfall Intensity (mm/hour)	Peak Runoff Discharge (m ³ /sec)
O-8	Bulawan River	7.3	9.00	43.	0.70	458.0	142.7	203.
O-9	Bulawan River	15.4	11.48	55.	0.70	442.6	130.8	392.
O-10	Tiagao River	5.7	4.25	22.	0.70	503.5	174.1	193.
O-11	Tiagao River	7.7	10.05	48.	0.70	497.5	151.5	227.
O-12	Tiagao River	13.4	10.05	48.	0.70	485.2	147.8	385.
O-13	Tagas River	8.3	13.64	65.	0.70	495.9	140.2	226.
O-14	Bonbon River	6.6	11.78	56.	0.70	500.6	147.0	189.
O-15	Sawang River	9.9	13.25	63.	0.70	492.1	140.2	270.
B-1	Amtic (B) River	8.1	7.13	34.	0.70	496.4	161.4	254.
B-2	Buang River	4.5	8.25	39.	0.70	507.9	160.9	141.
B-3	Quinali (B) River	12.6	8.25	39.	0.70	486.6	154.2	378.
B-4	Quinali (B) River	19.2	9.13	43.	0.70	476.2	148.0	552.
B-5	Quinali (B) River	30.8	12.80	61.	0.70	463.2	133.2	797.
B-6	Tabigyan River	4.7	7.75	37.	0.70	507.1	162.5	149.
B-7	Left Tributary	44.7	15.90	76.	0.70	451.8	122.2	1062.
B-8	Quinali (B) River	80.2	15.90	76.	0.70	431.9	116.8	1821.
B-9	Quinali (B) River	84.1	17.70	86.	0.70	430.2	111.8	1829.
B-10	Namotnga River	5.0	9.25	44.	0.70	506.0	156.8	152.
B-11	Quinali (B) River	89.1	17.70	86.	0.70	428.0	111.3	1928.
B-12	Quinali (B) River	93.9	22.20	107.	0.70	426.1	102.3	1867.

-continued -

Site No.	Name of River	Drainage Area (km ²)	River Course Length (km)	Flood Concentration Time (min.)	Runoff Coefficient	Average Basin Rainfall (mm/day)	Average Rainfall Intensity (mm/hour)	Peak Runoff Discharge (m ³ /sec)
B-13	Left Tributary	15.3	11.50	55.	0.70	482.0	142.3	423.
B-14	Quinali (B) River	109.2	22.20	107.	0.70	420.3	100.9	2142.
B-15	Quinali (B) River	123.1	27.40	148.	0.70	415.6	87.0	2081.
B-16	Left Tributary	8.8	9.50	53.	0.70	494.7	147.1	252.
B-17	Quinali (B) River	131.9	27.40	148.	0.70	412.9	86.4	2215.
B-18	Quinali (B) River	132.8	28.84	160.	0.70	412.6	83.4	2152.
B-19	Tuliv Creek	18.3	13.64	80.	0.70	477.5	126.9	451.
B-20	Quinali (B) River	151.1	28.84	160.	0.70	407.3	82.3	2418.
B-21	Quinali (B) River	157.8	31.14	178.	0.70	405.5	77.7	2383.

TABLE-5.5.1 RESULTS OF VARIETAL AND FERTILIZER RESPONSE TESTS
IN THE BICOL RICE AND CORN EXPERIMENT STATION (1979)

TEST-A:

Treatment					Yield (tons/ha)		
N (kg/ha)			K ₂ O (kg/ha)		IR-8	IR-36	IR-42
Basal	Panicle		Basal	Panicle			
	Initiation	(kg/ha)		Initiation			
0	0	0	0	0	3.2	2.0	3.7
100	40	0	0	0	5.0	4.2	4.9
100	40	60	0	0	5.9	5.2	6.2
100	40	0	60	0	5.5	4.6	5.8
100	40	60	60	0	7.5	6.4	7.7
100	40	60	60	30	7.7	6.5	7.9

Remark: Dry Season

TEST-B:

Variety	Growth Duration (days)	Basal N-level (kg/ha) and Yield (ton/ha)					
		0 (kgN/ha)	60	90	120	150	180
IR-9	134	4.1	5.8	6.4	6.3	5.6	4.8
IR-20	118	3.0	5.0	5.7	5.4	5.3	4.9
IR-32	140	3.4	4.4	4.2	4.1	4.4	2.9
IR-36	108	3.6	4.7	5.7	5.4	5.6	5.3
IR-38	126	4.7	5.8	6.1	5.3	5.9	5.3
IR-42	135	3.8	5.4	6.4	6.4	5.9	6.6

Remark: Spacing; 20 x 20 cm, 60 kg P₂O₅/ha, spacing; 20 x 20 cm, Dry Season, Some plants are affected by Tungro disease, 30 kgN/ha was applied as top-dressing

TEST-C:

Variety	Growth Duration (days)	Basal N-level (kg/ha) and Yield (tons/ha)					
		0 (kgN/ha)	30	60	90	120	150
IR-8	116	2.4	2.6	2.8	3.0	2.5	2.1
IR-20	116	3.0	4.2	3.8	3.8	3.7	2.7
IR-36	105	3.2	3.6	3.9	3.7	4.0	2.8
IR-42	131	3.4	4.1	4.3	3.8	3.7	4.0
IR-44	116	4.1	3.8	3.5	3.7	4.0	3.3
IR-46	116	3.1	3.2	3.4	3.5	3.5	3.8

Remarks: Wet season, 30 kg P₂O₅/ha, 30 kg K₂O/ha, 20 kgN/ha at panicle initiation stage, Spacing; 20 x 20 cm

TABLE-5.5.2 UNIT IRRIGATION DIVERSION REQUIREMENT (1/3)

Quinali (A) River Basin, Lower Area

(Unit: l/sec/ha)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average	Max.
1956	0.94	0.42	0.46	0.22	0.57	0.94	0	0.37	0	0.03	0.23	0	0.35	0.94
57	0.45	0.93	0.65	0.12	0.79	0.66	0.39	0	0.08	0	0.28	0.87	0.44	0.93
58	0.72	0.77	0.60	0.26	0.65	0.78	0.51	0.22	0	0	0.27	0.96	0.48	0.96
59	0.88	0.75	0.35	0.25	0.52	1.02	0.34	0.25	0.10	0	0.21	0.08	0.40	1.02
1960	0.77	0.80	0.66	0.22	0.61	0.70	0.36	0.25	0.05	0	0.27	0.39	0.42	0.80
61	1.32	1.25	0.70	0.26	0.53	0.73	0.25	0.28	0.20	0	0.33	0.82	0.56	1.32
62	0.87	0.79	0.57	0.25	0.42	0.40	0.11	0.29	0	0.04	0.26	0.93	0.41	0.83
63	1.33	0.96	0.87	0.27	0.66	0.37	0.81	0	0.11	0.02	0.33	0.65	0.53	1.33
64	0.69	0.90	0.72	0.15	0.76	0.62	0.92	0.55	0.09	0.01	0.28	0.23	0.49	0.92
1965	0.96	1.03	0.83	0.24	0.74	0.93	0.57	0.93	0.36	0.05	0.39	0.84	0.66	1.03
66	0.38	1.05	0.66	0.26	0.60	0.89	0.26	0.69	0.22	0	0.24	0.10	0.45	1.05
67	0.04	0.74	0.57	0.21	0.76	1.05	0.29	0.17	0	0.02	0.40	0.98	0.44	1.05
68	0.99	0.86	0.82	0.27	0.61	0.69	0.36	0.25	0.05	0	0.27	0.25	0.45	0.99
69	0.77	0.74	0.88	0.27	0.73	0.69	0.27	0.52	0	0.04	0.33	0.33	0.46	0.88
1970	0.52	0.35	0.63	0.23	0.77	1.05	0	0	0.07	0	0.20	0.56	0.37	1.05
71	0.47	0.80	0.39	0.22	0.35	0.71	0.06	0.74	0.30	0	0.35	0.08	0.37	0.80
72	1.25	0.79	0.39	0.26	0.68	0.50	0.05	0	0.05	0.01	0.30	0.67	0.41	1.25
73	1.24	1.12	0.80	0.27	0.77	1.05	0.59	0.34	0	0	0.21	0.10	0.54	1.24
74	1.05	0.55	0.77	0.25	0.68	0.12	0	0.79	0.49	0	0.24	0.31	0.44	1.05
1975	0.57	0.93	0.51	0.11	0.77	0.48	0.34	0.11	0	0	0.16	0.93	0.41	0.93
76	0.56	0.31	0.59	0.23	0.38	0.16	1.26	0	0.03	0.02	0.19	0.08	0.32	1.26
77	0.80	0.54	0.74	0.26	0.59	1.34	0	0.35	0	0.04	0.27	1.01	0.50	1.01
78	1.28	1.18	0.61	0.18	0.60	0.58	0.51	0.19	0.16	0	0.41	0.61	0.53	1.28
79	1.28	1.20	0.87	0.09	0.71	0.62	0.39	0.63	0	0.03	0.30	0.73	0.57	1.28
Average	0.84	0.82	0.65	0.22	0.64	0.71	0.36	0.33	0.1	0.01	0.28	0.52	0.48	

TABLE-5.5.3 UNIT IRRIGATION DIVERSION REQUIREMENT (2/3)

Quinali (A) River Basin, Upper Area

(Unit: l/sec/ha)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average	Max.
1956	0.34	0.81	0.72	0.29	0.70	1.27	0.38	0.73	0.09	0.05	0.30	0.24	0.58	1.34
57	0.85	1.32	0.91	0.19	0.94	0.98	0.78	0.33	0.28	0.02	0.35	1.13	0.67	1.32
58	1.11	1.16	0.87	0.34	0.78	1.10	0.90	0.58	0.19	0	0.35	1.22	0.72	1.22
59	1.27	1.13	0.61	0.32	0.65	1.34	0.72	0.61	0.30	0	0.28	0.34	0.63	1.34
1960	1.17	1.19	0.93	0.29	0.74	1.02	0.75	0.61	0.24	0.02	0.34	0.65	0.66	1.19
61	1.71	1.63	0.96	0.32	0.66	1.05	0.63	0.64	0.39	0.01	0.41	1.09	0.79	1.71
62	1.27	1.18	0.83	0.32	0.55	0.72	0.50	0.65	0.17	0.06	0.33	1.19	0.65	1.27
63	1.72	1.34	1.13	0.34	0.79	0.69	1.19	0.06	0.30	0.04	0.40	0.91	0.74	1.72
64	1.08	1.29	0.98	0.22	0.88	0.95	1.31	0.91	0.23	0.03	0.35	0.49	0.73	1.31
1965	1.35	1.41	1.09	0.32	0.87	1.25	0.96	1.29	0.55	0.06	0.46	1.10	0.89	1.41
66	0.78	1.43	0.92	0.33	0.74	1.21	0.65	1.05	0.41	0.02	0.31	0.36	0.68	1.43
67	0.43	1.12	0.84	0.29	0.89	1.38	0.67	0.53	0.08	0.04	0.47	1.24	0.67	1.38
68	1.38	1.24	1.08	0.34	0.74	1.01	0.75	0.61	0.24	0	0.34	0.51	0.69	1.38
69	1.17	1.12	1.14	0.34	0.85	1.01	0.65	0.88	0.20	0.06	0.40	0.60	0.70	1.17
1970	0.91	0.74	0.89	0.30	0.90	1.37	0.32	0.35	0.27	0	0.27	0.82	0.60	1.37
71	0.86	1.19	0.65	0.29	0.48	1.03	0.45	1.10	0.49	0	0.42	0.35	0.61	1.19
72	1.65	1.18	0.65	0.33	0.81	0.82	0.44	0.15	0.24	0.03	0.35	0.93	0.63	1.65
73	1.63	1.50	1.06	0.34	0.90	1.37	0.98	0.70	0.16	0	0.29	0.36	0.77	1.63
74	1.45	0.93	1.03	0.32	0.81	1.22	0.30	1.15	0.68	0	0.31	0.57	0.73	1.45
1975	0.96	1.32	0.78	0.19	0.90	0.79	0.73	0.47	0.10	0.03	0.23	1.19	0.64	1.32
76	0.95	0.70	0.85	0.30	0.51	0.48	1.65	0.25	0.22	0.04	0.25	0.35	0.55	1.65
77	1.19	0.93	1.00	0.33	0.72	1.66	0.26	0.71	0.16	0.06	0.34	1.28	0.72	1.66
78	1.67	1.57	0.87	0.25	0.74	0.90	0.90	0.55	0.35	0	0.48	0.87	0.76	1.67
79	1.67	1.58	1.13	0.16	0.85	0.95	0.77	0.99	0	0.05	0.37	0.99	0.79	1.67
Average	1.15	1.21	0.91	0.29	0.77	1.07	0.74	0.66	0.27	0.03	0.35	0.78	0.69	0.69

TABLE-5.5.4 UNIT IRRIGATION DIVERSION REQUIREMENT (3/3)

Quinali (B) Area

(Unit: l/sec/ha)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average	Max.
1956	0	0	0	0	0.40	1.08	0.61	0.15	0	0	0.24	0.04	0.21	1.08
57	0	0.50	0.20	0.11	0.64	0.88	0.70	0.18	0.11	0	0.23	0.31	0.33	0.88
58	0	0	0	0.17	0.49	0.92	0.53	0	0.14	0	0.22	0.39	0.24	0.92
59	0.04	0	0	0.22	0.50	0.87	0.42	0.65	0.24	0	0.22	0.06	0.27	0.87
1960	0.59	0.24	0.58	0.06	0.43	0.83	1.02	0.37	0	0	0.22	0.20	0.39	1.02
61	0.58	0.86	0.41	0.07	0.61	0.76	1.02	0.21	0.22	0	0.25	0.25	0.44	1.02
62	0.11	0.04	0.37	0.16	0.42	1.28	1.14	0.14	0	0.03	0.24	0.40	0.36	1.28
63	0.30	0	0.67	0.22	0.59	0.48	0.60	0	0.18	0.02	0.23	0.19	0.29	0.67
64	0	0	0.54	0	0.60	0.87	0.92	0.20	0	0	0.24	0.06	0.29	0.92
1965	0	0	0.04	0.15	0.51	0.84	0.05	0.07	0.17	0	0.24	0.10	0.18	0.84
66	0	0.32	0.25	0.16	0.61	1.32	0.05	0.80	0.27	0	0.24	0.04	0.34	1.32
67	0	0	0	0.10	0.78	1.13	0.85	0.20	0.23	0.02	0.22	0.24	0.31	1.13
68	0	0.28	0.39	0.22	0.88	1.39	0.42	0.28	0.02	0.03	0.26	0.57	0.40	1.39
69	0.23	0.99	0.60	0.12	0.73	1.14	0.60	0.49	0.04	0.04	0.25	0.07	0.44	1.14
1970	0.08	0	0.02	0.06	0.73	0.72	0.52	0.38	0.06	0	0.21	0.13	0.24	0.73
71	0	0	0	0.11	0.37	0.62	0	0.71	0.30	0	0.24	0.04	0.20	0.71
72	0	0.37	0	0.17	0.72	0.50	0.59	0	0.26	0.02	0.23	0.17	0.25	0.72
73	0.17	0.27	0.63	0.15	0.63	0.64	0	0	0	0	0.22	0.04	0.23	0.64
74	0.13	0	0.44	0.18	0.65	0.36	0.33	0.68	0.09	0	0.24	0.12	0.27	0.68
1975	0	0	0.78	0	0.67	0.58	0.20	0.24	0	0	0.28	0.04	0.23	0.78
76	0.74	0	0	0.06	0.41	0.43	0.37	0.10	0.21	0	0.23	0.04	0.22	0.74
77	0.14	0	0.34	0.10	0.43	0.86	0.09	0.27	0	0.01	0.21	0.45	0.24	0.86
78	0.75	0.16	0.16	0.11	0.50	0.32	0.35	0.01	0	0	0.25	0.13	0.23	0.75
79	0.47	0.38	0.88	0.07	0.59	0.50	0.44	0.62	0	0	0.24	0.27	0.37	0.88
Average	0.18	0.18	0.3	0.12	0.41	0.81	0.49	0.28	0.11	0.01	0.23	0.18	0.27	0.81

TABLE-5.5.5 IRRIGABLE AREA FOR THE NATIONAL IRRIGATION SYSTEM

(Unit: ha)

	Present		Future	
	Wet S.	Dry S.	Wet S.	Dry S.
Ogsong	300	300	600	600
Nasisi	1,350	1,350	900	900
Mahaba			700	450
Hibiga	350	350	500	500
Total	2,050	2,050	2,700	2,450

Source: Feasibility Report on the National Irrigation Systems Improvement Project, Package II, 1977

TABLE-5.5.6 IRRIGATION DIVERSION REQUIREMENT
FOR NATIONAL IRRIGATION SYSTEM

(Unit: m³/sec)

Month	Average Diversion Requirement (1956-1979)			
	Ogsong /1 Headworks	Nasisi /2 Headworks	Mahaba /3 Headworks	Hibiga /4 Headworks
Jan.	0.8	1.1	0.5	0.6
Feb.	0.7	1.1	0.5	0.6
Mar.	0.6	0.8	0.4	0.5
Apr.	0.2	0.3	0.1	0.1
May	0.5	0.7	0.6	0.4
June	0.6	0.9	0.8	0.5
July	0.5	0.7	0.5	0.4
Aug.	0.4	0.6	0.5	0.3
Sept.	0.2	0.3	0.2	0.1
Oct.	0	0	0.02	0
Nov.	0.21	0.3	0.2	0.2
Dec.	0.5	0.7	0.4	0.4

Note: Net irrigation area in future

/1 Ogsong : 600 ha

/2 Nasisi : 900 ha

/3 Mahaba : 700 ha (Wet), 450 ha (Dry)

/4 Hibiga : 500 ha

TABLE-5.5.7 CONVERSION RATIO FOR CALCULATION OF
EXPECTED RIVER RUNOFF

River (Headworks)	Drainage Area <u>1/</u> (km ²)	Gauging Station Used		Conversion Ratio <u>2/</u>
		Name	Drainage Area (km ²)	
Cabilogan HW	122	Bobongsuran	131	0.947
Ogsong River ^{3/}	28.2	Ogsong	11	2.564
Nasisi HW	39	Nasisi	39	1.0
Mahaba HW	6.4	Nasisi	39	0.254
Hibiga HW	5.7	Nasisi	39	0.233
Polangui River ^{4/}	25.8	Nasisi	39	0.731

Note: 1/ : Irrigation areas of the National Irrigation Systems are excluded from the drainage area. The return flow from irrigation area is not taken into account.

2/ : Refer to Fig. VII.4 in the Supporting Report II.

3/ : Confluence with the Nasisi River.

4/ : At the existing Quinali Headworks.

TABLE-5.5.8 MONTHLY MEAN DISCHARGE

(Unit: m³/sec)

Month	Headworks and River					
	Cabilogan	Ogsong	Nasisi	Mahaba	Hibiga	Polangui
Jan.	6.6	2.5	2.6	0.7	0.6	1.9
Feb.	4.8	2.0	1.8	0.5	0.4	1.3
Mar.	4.3	1.7	1.8	0.5	0.4	1.3
Apr.	4.7	1.6	1.8	0.5	0.4	1.3
May	4.3	2.1	1.7	0.4	0.4	1.2
June	5.5	2.6	1.8	0.5	0.4	1.3
July	7.3	2.5	1.7	0.4	0.4	1.2
Aug.	7.2	2.6	1.7	0.4	0.4	1.2
Sept.	7.6	3.5	1.7	0.4	0.4	1.2
Oct.	7.2	4.7	2.0	0.5	0.5	1.5
Nov.	7.3	5.3	2.7	0.7	0.6	2.0
Dec.	8.8	3.9	3.1	0.8	0.7	2.3

Note: Drainage area

Cabilogan : 122 km²
 Ogsong : 28 "
 Nasisi : 39 "
 Mahaba : 6.4 km²
 Hibiga : 5.7 "
 Polangui : 25.8 " , Irrigation area of National Irrigation System and drainage area upstream of Hibiga Headworks (5.7 km²) are excluded.

TABLE-5.5.9 MONTHLY MEAN AVAILABLE DISCHARGE

(Unit: m³/sec)

Month	South Quinali Headworks ^{/1}	Quinali Headworks
Jan.	8.3	2.3
Feb.	5.3	1.4
Mar.	5.2	1.5
Apr.	7.0	2.0
May	6.0	1.4
June	6.9	1.5
July	9.6	1.4
Aug.	9.6	1.5
Sept.	12.1	1.8
Oct.	14.0	2.4
Nov.	13.7	2.6
Dec.	13.0	3.2

Note: ^{/1} Drainage area : 199 km² (excluding existing irrigation area)

TABLE-5.5.10 MONTHLY MEAN DISCHARGE AT BANTAYAN HEADWORKS

(Unit: m³/sec)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
1956	-	-	-	3.5	3.5	3.2	5.7	5.7	8.7	6.4	6.7	12.9
57	9.0	5.1	4.1	5.2	3.1	4.4	5.2	6.9	5.6	4.4	5.4	2.4
58	3.9	3.4	3.0	1.9	1.1	1.2	4.0	4.7	3.5	7.1	9.0	2.4
59	2.0	3.1	3.1	2.0	1.5	0.6	1.8	2.8	2.4	3.6	3.6	6.8
1960	5.3	3.7	2.9	9.8	3.4	5.4	5.9	4.2	5.0	5.1	5.2	4.6
61	4.6	3.0	2.8	3.0	3.2	4.2	3.5	4.5	6.2	5.1	4.6	5.8
62	3.1	2.6	3.0	2.8	6.6	4.1	6.3	5.9	6.6	6.1	6.9	3.8
63	2.9	2.9	2.6	2.2	1.8	4.4	5.5	6.5	5.5	5.0	4.9	4.4
64	4.1	3.4	2.0	2.2	1.9	3.1	3.9	4.4	5.1	6.4	4.6	7.5
1965	5.1	4.6	2.6	2.6	2.4	2.6	9.0	6.6	7.8	5.4	5.6	4.3
66	5.9	2.4	2.8	2.8	2.7	2.2	4.6	2.7	2.1	2.3	4.1	5.1
67	6.0	3.4	3.9	2.9	2.4	2.9	5.1	5.1	5.6	4.8	5.9	2.8
69	2.4	2.3	2.2	2.6	2.7	3.7	4.7	1.9	4.0	3.6	2.9	-
1970	-	-	-	2.3	1.1	-	-	-	-	6.3	4.1	-
71	4.1	2.4	1.6	1.1	3.7	1.9	6.1	-	4.7	7.3	5.4	10.1
72	8.5	4.5	5.1	4.4	4.3	7.0	6.0	6.4	8.8	5.9	-	7.6
73	5.2	3.4	3.4	2.9	3.3	8.3	6.4	-	-	-	-	-
74	-	6.6	4.3	4.0	3.9	-	5.1	3.1	3.1	5.2	6.7	4.7
1975	6.4	-	3.1	2.6	2.7	4.3	7.8	7.9	-	3.9	2.4	20.9
76	7.3	1.6	3.1	1.8	6.2	5.0	4.9	9.1	8.2	4.9	9.6	11.7
77	4.6	6.4	6.4	13.2	5.4	6.6	12.9	7.4	12.4	5.2	13.7	2.6
78	5.0	5.4	2.9	3.6	4.5	6.4	-	-	-	14.5	2.9	9.7
79	-	-	-	-	-	-	-	-	-	-	-	-
Average	4.9	3.7	3.2	3.6	3.2	4.1	5.7	5.4	5.7	5.4	5.5	6.7

Note: Drainage area = 84 km²

TABLE-5.5.11 IRRIGATION DIVERSION REQUIREMENT

(Unit: m³/sec)

Month	Cabilogan Headworks	South Quinali Headworks	Quinali Headworks	Bantayan Headworks
Jan.	1.7	3.7	0.7	0.5
Feb.	1.7	3.6	0.7	0.4
Mar.	1.3	2.8	0.5	0.7
Apr.	0.4	1.0	0.2	0.3
May	1.1	2.8	0.5	1.4
June	1.5	3.1	0.6	1.9
July	1.0	1.6	0.4	1.1
Aug.	0.9	1.4	0.4	0.6
Sept.	0.4	0.4	0.2	0.3
Oct.	0.0	0.1	0.0	0.01
Nov.	0.5	1.2	0.2	0.6
Dec.	1.1	2.3	0.5	0.4

Note: Net irrigation area

- Cabilogan : 1,400 ha
- South Quinali : 4,350 ha
- Quinali : 600 ha
- Bantayan : 2,400 ha

TABLE-5.5.12 MAXIMUM IRRIGABLE AREA

Name of Scheme	Irrigable Area (ha)	
	Gross	Net
Quinali (A) River basin		
i) Cabilogan Scheme	1,600	1,400
ii) Agos Sta. Cruz - South Quinali Scheme	4,850	4,350
iii) Quinali Scheme	700	600
Quinali (B) River basin		
iv) Bantayan Scheme	2,700	2,400

TABLE-5.5.13 IRRIGATION WATER SHORTAGE

Scheme	Irrigation Water Shortage ^{1/}		
	Annual Max.	2-year Max.	23 years Total
	10 ⁶ m ³ (%)	10 ⁶ m ³ (%)	10 ⁶ m ³ (%)
i) Cabilogan	2.3 (18.2)	2.3 (5.2)	2.3 (0.1)
ii) Agos Sta. Cruz - South Quinali	20.0 (27.6)	24.7 (15.7)	98.3 (6.8)
iii) Quinali	1.7 (13.7)	1.7 (6.9)	
iv) Bantayan	3.9 (18.8)	6.9 (18.2)	12.0 (2.6)

Note: 1/ : Shortage in volume (10⁶ m³) or percentage to the irrigation diversion requirements,

TABLE-5.6.1 FLOOD DAMAGE TO HOUSES

(Unit: 1,000 Pesos)

River Basin	Return Period				
	2-Year	10-Year	20-Year	50-Year	100-Year
<u>Quinali (A) River basin</u>					
Houses	14,343	24,393	29,261	35,907	42,638
Establishments (0.10)	1,434	2,438	2,926	3,591	4,264
Total	15,777	26,821	32,187	39,498	46,902
<u>Quinali (B) River basin</u>					
Houses	986	2,024	2,463	4,785	5,514
Establishments (0.10)	99	202	246	479	551
Total	1,085	2,226	2,709	5,264	6,065
<u>Yawa River basin</u>					
Houses	1,647	5,899	10,691	16,722	20,038
Establishments (0.10)	165	590	1,069	1,672	2,004
Total	1,812	6,489	11,760	18,394	22,042

Remarks: Amount is estimated at 1982 price level

TABLE-5.6.2 FLOOD DAMAGE TO GOVERNMENT INFRASTRUCTURE

(Unit: 1,000 Pesos)

River Basin	1975	1976	1977	1978	1979	1980	1981
<u>Quinali (A)</u> <u>River Basin</u>							
Roads	2,984	463	3,915	1,108	1,203	-	3,156
Railways	1,492	-	-	-	462	255	1,695
River Facilities	1,071	-	212	533	1,156	3,653	8,406
Water works	-	-	-	-	-	-	697
Total	5,547	463	4,127	1,641	2,821	3,908	13,954
<u>Quinali (B)</u> <u>River Basin</u>							
Roads	296	179	622	326	676	-	396
Railways	-	-	-	-	-	-	-
River Facilities	106	-	-	217	-	115	170
Water works	-	-	-	-	-	-	562
Total	402	179	622	543	676	115	1,128
<u>Yawa</u> <u>River Basin</u>							
Roads	494	219	364	563	567	-	367
Railways	8,706	-	-	-	-	-	-
River Facilities	141	104	-	163	245	-	-
Water works	-	-	-	-	-	-	396
Total	9,341	323	364	726	812	-	763

Remarks: Amount is estimated at 1982 price level.

TABLE-5.6.3 ESTIMATED FLOOD DAMAGE TO INFRASTRUCTURE

(Unit: 1,000 Pesos)

River Basin	Return Period				
	2-Year	10-Year	20-Year	50-Year	100-Year
<u>Quinali (A) River basin</u>					
Houses	15,777	26,821	32,187	39,498	46,902
Government Infrastructure	13,954	16,745	17,861	18,140	19,536
Total	29,731	43,566	50,048	57,638	66,438
<u>Quinali (B) River basin</u>					
Houses	1,085	2,226	2,709	5,264	6,065
Government Infrastructure	1,128	1,354	1,444	1,466	1,579
Total	2,213	3,580	4,153	6,730	7,644
<u>Yawa River basin</u>					
Houses	1,647	5,889	10,691	16,722	20,038
Government Infrastructure	812	974	1,039	1,056	1,137
Total	2,459	6,863	11,730	17,778	21,175

Remarks: Amount is estimated at 1982 price level.

TABLE-5.6.4 FLOOD DAMAGE TO IRRIGATION FACILITIES

(Unit: 1,000 Pesos)

River Basin	Return Period				
	2-Year	10-Year	20-Year	50-Year	100-Year
Quinali (A) River Basin	622	746	796	809	871
Quinali (B) River Basin	108	130	138	140	151
Yawa River Basin	37	44	47	48	52

Remarks: Amount is estimated at 1982 price level.

TABLE-5.6.5 INUNDATION DEPTH AND PERIOD FOR
DIFFERENT RETURN PERIOD

<u>Return</u> <u>Period</u> (Year)	<u>Inundation Depth</u>			<u>Inundation Period</u>		
	<u>f₁</u> (cm)	<u>f₂</u> (cm)	<u>f₃</u> (cm)	<u>f₁</u> (days)	<u>f₂</u> (days)	<u>f₃</u> (days)
1) Quinali (A) River basin; without-flood control						
100	266	295	345	3	6	722
50	235	265	315	3	6	22
20	195	225	275	2-3	5-6	22-21
10	163	193	245	2-3	5-6	21-22
2	82	112	162	1-2	4-5	20-21
2) Quinali (A) River basin; with-flood control						
100	71	101	151	1	3	20
50	-	-	-	-	-	-
20	-	-	-	-	-	-
3) Quinali (B) River basin; without-flood control						
100	233	-	-	2-3	-	-
50	196	-	-	2-3	-	-
20	147	-	-	1-2	-	-
10	108	-	-	1-2	-	-
2	-	-	-	1	-	-
4) Quinali (B) River basin; with-flood control						
100	77	-	-	1	-	-
50	-	-	-	-	-	-
20	-	-	-	-	-	-

TABLE-5.6.6 EXTENT OF RICE FIELD IN THE QUINALI (A)
AND QUINALI (B) PROJECT AREAS CATEGORIZED BY
FLOOD HAZARD AND CROPPING PATTERN

(Unit: ha)

		Quinali (A)		Nasisi		Quinali (B)	
		Without Flood Control	With Flood Control	Without Flood Control	With Flood Control	Without Flood Control	With Flood Control
(1) Flooded Area							
Class f ₁	I/P	2,510	-	860	-	810	-
	R/P	2,530	-	-	-	70	-
Class f ₂	I/P	680	-	-	-	-	-
	R/P	550	-	-	-	-	-
Class f ₃	I/P	450	550	-	-	-	-
	R/P	-	520	-	-	-	-
(Sub-Total)		(6,720)	(1,070)	(860)	(-)	(880)	(-)
(2) Flood-free Area							
	I/P	-	2,570	1,820	2,670	560	1,370
	R/P	-	2,530	-	-	960	1,030
	C/F	180	180	10	10	-	-
(Sub-Total)		(180)	(5,280)	(1,830)	(2,680)	(1,520)	(2,400)
(3) River Bed							
		-	550	-	10	-	-
Total:		6,900	6,900	2,690	2,690	2,400	2,400

Remark; I/P: Irrigated rice field
R/P: Rainfed rice field
C/F: Coconut area

TABLE-5.6.7(1) ANNUAL FLOOD DAMAGE TO RICE CULTIVATION IN
THE QUINALI (A) RIVER BASIN (IRRIGATED DOUBLE CROPPING AREA)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
a) Ratio of Planted Area to Total Area	0.89	1.00	0.79	0.38	0.19	0.56	0.92	0.92	0.56	0.19	0.03	0.42
b) Distribution of Typhoon	0.01	0.02	0.01	0.04	0.07	0.05	0.08	0.04	0.08	0.20	0.24	0.16
c) Production Cost Already Spent (₹/ha)	2,228	2,658	3,135	3,438	1,012	1,915	2,375	2,769	3,035	3,285	505	1,413
d) Net Income (₹/ha)	2,680	2,680	2,680	2,680	2,350	2,350	2,350	2,350	2,350	2,350	2,680	2,680
1) Return Period of 10-year to 100-year												
e) Damage Rate of Rice (%)	28	44	54	42	12	24	40	49	51	40	10	13
f1 3,370 ha/1	40	58	68	53	22	36	54	63	64	50	20	23
f2 680 ha	50	77	99	100	32	46	67	89	100	100	30	33
f3 450 ha	63	237	125	207	31	151	701	467	628	458	14	204
f) Monthly Damage (₹10 ³)/2												
2) Return Period of 2-year												
e) Damage Rate of Rice (%)	19	24	25	21	12	18	22	24	24	20	10	13
f1 3,370 ha/1	40	58	68	53	22	36	54	63	64	50	20	23
f2 680 ha	50	77	99	100	32	46	67	89	100	100	30	33
f3 450 ha	50	165	80	141	31	126	490	309	409	313	14	204
f) Monthly Damage (₹10 ³)/2												
Total Flood Damage	3,286											
Total Flood Damage	2,332											

1 Including 860 ha of flooded rice field located in the Nasisi World Bank Scheme area

2 f = a x b x (c + d) x damage rate x flooded area

TABLE-5.6.7(2) ANNUAL FLOOD DAMAGE TO RICE CULTIVATION IN
THE QUINALI (A) RIVER BASIN (RAINFED
SINGLE CROPPING AREA)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
a) Ratio of Planted Area to Total Area	-	-	-	-	-	0.03	0.50	0.97	1.00	0.70	0.13	-
b) Distribution of Typhoon	0.01	0.02	0.01	0.04	0.07	0.05	0.08	0.04	0.08	0.20	0.24	0.16
c) Production Cost Already Spent (₱/ha)	-	-	-	-	-	478	1,165	1,497	1,711	1,984	2,115	-
d) Net Income (₱/ha)	-	-	-	-	-	1,910	1,910	1,910	1,910	1,910	1,910	-
1) Return Period of 10-year to 100-year												
e) Damage Rate of Rice (%)												
f1 2,530 ha	-	-	-	-	-	10	13	48	55	46	40	-
f2 550 ha	-	-	-	-	-	20	23	63	71	58	100	-
Monthly Damage (₱10 ³)	-	-	-	-	-	1	56	206	516	808	196	-
										Total Flood Damage		1,783
2) Return Period of 2-year												
e) Damage Rate of Rice (%)												
f1 2,530 ha	-	-	-	-	-	10	13	21	26	22	40	-
f2 550 ha	-	-	-	-	-	20	23	63	71	58	100	-
Monthly Damage (₱10 ³)	-	-	-	-	-	1	56	116	304	477	196	-
										Total Flood Damage		1,150

TABLE-5.6.8(1) ANNUAL FLOOD DAMAGE TO RICE CULTIVATION
IN THE QUINALI (B) RIVER BASIN (IRRIGATED
DOUBLE CROPPING AREA)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
a) Ratio of Planted Area to Total Area	1.00	0.97	0.50	0.10	0.45	0.90	1.00	0.75	0.25	-	0.30	0.87
b) Distribution of Typhoon	0.01	0.02	0.01	0.04	0.07	0.05	0.08	0.04	0.08	0.20	0.24	0.16
c) Production Cost Already Spent (₱/ha)	2,537	2,939	3,438	782	1,764	2,293	2,592	3,019	3,285	371	1,471	2,125
d) Net Income (₱/ha)	2,680	2,680	2,680	2,350	2,350	2,350	2,350	2,350	2,350	2,680	2,680	2,680
1) Return Period of 10-year to 100-year												
e) Damage Rate of Rice (%)	44	54	42	10	15	31	50	50	40	-	11	18
f) Monthly Damage (₱10 ³)	19	48	10	1	16	52	160	65	37	-	27	98
										Total Flood Damage		533
2) Return Period of 2-year												
e) Damage Rate of Rice (%)	25	25	21	10	15	20	25	24	20	-	11	17
f) Monthly Damage (₱10 ³)	11	22	5	1	16	34	80	31	18	-	27	92
										Total Flood Damage		337

TABLE-5.6.8(2) ANNUAL FLOOD DAMAGE TO RICE CULTIVATION
IN THE QUINALI (B) RIVER BASIN (RAINFED
SINGLE CROPPING AREA)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
a) Ratio of Planted Area to Total Area	-	-	-	-	0.03	0.50	0.97	1.00	0.70	0.13	-	-
b) Distribution of Typhoon	0.01	0.02	0.01	0.04	0.07	0.05	0.08	0.04	0.08	0.20	0.24	0.16
c) Production Cost Already Spent (₱/ha)	-	-	-	-	478	1,165	1,497	1,711	1,984	2,115	-	-
d) Net Income (₱/ha)	-	-	-	-	-1,910	1,910	1,910	1,910	1,910	1,910	-	-
1) Return Period of 10-year to 100-year												
e) Damage Rate of Rice (%)												
f) Monthly Damage (₱10 ³)					10	13	48	55	46	40	-	-
					0	1	9	6	7	3	-	-
										<u>Total Flood Damage</u>		<u>26</u>
2) Return Period of 2-year												
e) Damage Rate of Rice (%)												
f) Monthly Damage (₱10 ³)					10	13	21	26	22	40	-	-
					0	1	4	3	3	3	-	-
										<u>Total Flood Damage</u>		<u>14</u>

TABLE-5.6.9 MUD/DEBRIS FLOW DAMAGE
TO AGRICULTURE CAUSED BY
TYPHOON "DALING" IN 1981

Item		Quinali (A)	Yawa
I) Damage to Coconut			
1) Damage area	(ha)	45	23
2) Re-transplanting cost of coconut			
- Unit cost ^{/1}	(P10 ³ /ha)	3.18	3.18
- Total cost	(P10 ³)	<u>143</u>	<u>73</u>
3) Loss of net return (net income)			
- Loss of net return per hectare ^{/2}	(P10 ³ /ha)	17.7	17.7
- Total loss	(P10 ³)	<u>797</u>	<u>407</u>
II) Damage to Paddy Field			
1) Damage area		105	91
2) Rehabilitation cost per hectare ^{/3}	(P10 ³ /ha)	75	75
3) Total rehabilitation cost (P10 ³)		7,875	6,825
Total		8,815	7,305

/1: See TABLE-5.6.11.

/2: Loss of net return per hectare is estimated as below:

- Annual net return of coconut	: P2,950/ha
- Period of loss*	: 6 year
- Total loss per hectare	: P17,700/ha

* The period of loss is assumed at 6 years from re-transplanting to first production of coconut.

/3: Average depth of sediment : 0.5 m
Volume of sediment per hectare : 5,000 m³
Excavation cost per m³ : P15.0/m³
Rehabilitation cost per hectare: P75,000/ha

TABLE-5.6.10 RE-TRANSPLANTING COST PER
HECTARE FOR COCONUT

(Unit: P/ha)

Item	Establishing Period			Total
	1-year	2-year	3-year	
A) Materials/Equipment				
1) Seedling: 143 at P1.0/ seedling	143	-	-	143
2) Fertilizer - N: 11 kg/ha	75	75	75	225
K: 38 kg/ha	122	122	122	366
3) Pesticide	200	200	200	600
4) Tools	200	-	-	200
5) Covercrop seeds: 20 kg at P10.0/kg	200	-	-	200
6) Replanting - 10% of stand seedlings: 14 at P1.0/ seedling	14	-	-	14
B) Labour				
1) Clearing, ready to plant	1,000	-	-	1,000
2) Layouting, staking and holing: 0.5 x 0.5 m at P0.75/hole	107	-	-	107
3) Planting: 143 at P0.2/ seedling including basal application of fertilizer	29	-	-	29
4) Replanting: 14 at P0.2/ seedling including basal application of fertilizer	3	-	-	3
5) Fertilizer/chemical application:				
- 6 months after planting at P0.1/palm	14	-	-	14
- 143 palms at P0.5/palm		72	72	144
6) Ringweeding: 143 at P0.3/palm	-	43	43	86
7) Rolling of covercrops: 2 man- animal day at P25.0/day	-	-	50	50
Total	2,107	512	562	3,181

Source: Regional office of PCA

TABLE-5.7.1 FINANCIAL CONSTRUCTION COST
FOR QUINALI (A) RIVER BASIN

(Unit: 1,000 Pesos)

Description	Sabo Works	River Improvement Works	Irrigation Works	Total
1. Contract Cost				
(1) Direct Cost	55,582	413,838	53,141	522,561
(2) General	5,559	41,384	5,314	52,257
(3) Supervision & Miscellaneous	3,668	27,313	3,507	34,488
(4) Profit	6,481	48,253	6,196	60,930
(5) Contractor's Tax	2,139	15,924	2,045	20,108
Sub total	73,429	546,712	70,203	690,344
2. Right of Way/Site Acquisition	20	17,668	-	17,688
3. Resettlement	-	24,293	-	24,293
4. Engineering Cost	7,343	54,671	7,020	69,034
5. Project Management Cost	3,671	27,335	3,510	34,516
6. Contingency				
(1) Physical Contingency	11,014	109,343	14,040	134,397
(2) Price Escalation	72,025	531,319	26,056	629,400
Total	167,502	1,311,341	120,829	1,599,672

Remarks: Price escalation contingency is basis of disbursement schedule.

Sabo works includes the Quirangay River, the Tumpa River, the Maninila River, the Masarawag River, the Ogsong River and the Nasisi River.

Integration of irrigation is planned 6,350 ha of irriable area.

River improvement works includes the Quinali (A) River, the Nasisi River and the Tailsay River.

TABLE-5.7.2 FINANCIAL CONSTRUCTION COST
FOR YAWA RIVER BASIN

(Unit: 1,000 Pesos)

Description	Sabo Works	River Improvement Works	Irrigation Works	Total
1. Contract Cost				
(1) Direct Cost	55,011	22,612		77,623
(2) General	5,501	2,262		7,763
(3) Supervision & Miscellaneous	3,630	1,492		5,122
(4) Profit	6,414	2,636		9,050
(5) Contractor's Tax	2,117	871		2,988
Sub total	72,673	29,873		102,546
2. Right of Way/Site Acquisition	20	390		410
3. Resettlement	-	1,134		1,134
4. Engineering Cost	7,267	2,987		10,254
5. Project Management Cost	3,634	1,494		5,128
6. Contingency				
(1) Physical Contingency	10,901	5,974		16,875
(2) Price Escalation	43,857	15,932		59,789
Total	138,352	57,784		196,136

Remarks: Price escalation contingency is basis of disbursement schedule.

Sabo works include the Anuling River, the Budiao River and the Pawa-Burabod River.

TABLE-5.7.3 FINANCIAL CONSTRUCTION COST
FOR QUINALI (B) RIVER BASIN

(Unit: 1,000 Pesos)

Description	Sabo Works	River Improvement Works	Irrigation Works	Total
1. Contract Cost				
(1) Direct Cost	3,060	152,451	22,024	177,535
(2) General	306	15,246	2,203	17,755
(3) Supervision & Miscellaneous	202	10,061	1,453	11,716
(4) Profit	357	17,776	2,568	20,701
(5) Contractor's Tax	118	5,866	848	6,832
Sub total	4,043	201,400	29,096	234,539
2. Right of Way/Site Acquisition	1	3,605	-	3,606
3. Resettlement	-	878	-	878
4. Engineering Cost	404	20,140	2,910	23,454
5. Project Management Cost	202	10,070	1,455	11,727
6. Contingency				
(1) Physical Contingency	607	40,280	5,820	46,707
(2) Price Escalation	6,297	137,658	12,026	155,981
Total	11,554	414,031	51,307	476,892

Remarks: Price escalation contingency is basis of disbursement schedule.

Sabo rowks is planned only the Buang River.

Integration of irrigation is planned 2,400 ha.

River improvement works include the Quinali (B) River, San Francisco River and San Vicente River.

TABLE-5.7.4 FINANCIAL CONSTRUCTION COST FOR QUINALI (A) RIVER BASIN
(FOREIGN AND LOCAL CURRENCY PORTION)

(Unit: 1,000 Pesos)

Description	River						Total		
	Sabo Works		Improvement Works		Irrigation Works		Foreign	Local	
	Portion	Local Currency	Portion	Local Currency	Portion	Local Currency	Portion	Portion	
1. Contract Cost									
(1) Direct Cost	19,776	35,806	211,573	202,265	25,022	28,119	256,371	266,190	522,561
(2) General	1,978	3,581	21,157	20,227	2,502	2,812	25,637	26,620	52,257
(3) Supervision & Miscellaneous	1,305	2,363	13,964	13,349	1,651	1,856	16,920	17,568	34,488
(4) Profit	2,306	4,175	24,669	23,584	2,918	3,278	29,893	31,037	60,930
(5) Contractor's Tax	761	1,378	8,141	7,783	963	1,082	9,865	10,243	20,108
Sub total	26,126	47,303	279,504	267,208	33,056	37,147	338,686	351,658	690,344
2. Right of Way/Site Acquisition	-	20	-	17,668	-	-	-	17,688	17,688
3. Resettlement	-	-	-	24,293	-	-	-	24,293	24,293
4. Engineering Cost	-	7,343	27,950	26,721	-	7,020	27,950	41,084	69,034
5. Project Management Cost	-	3,671	-	27,335	-	3,510	-	34,516	34,516
6. Contingency									
(1) Physical Contingency	3,919	7,095	55,901	53,442	6,611	7,429	66,431	67,966	134,397
(2) Price Escalation	12,264	59,761	142,553	388,766	6,764	19,292	161,581	467,819	629,400
Total	42,309	125,193	505,908	805,433	46,431	74,398	594,648	1,005,024	1,599,672

TABLE-5.7.5 FINANCIAL CONSTRUCTION COST FOR YAWA RIVER BASIN
(FOREIGN AND LOCAL CURRENCY PORTION)

(Unit: 1,000 Pesos)

Description	River												Grand Total
	Sabo Works			Improvement Works			Irrigation Works			Total			
	Foreign Currency Portion	Local Currency Portion		Foreign Currency Portion	Local Currency Portion		Foreign Currency Portion	Local Currency Portion		Foreign Currency Portion	Local Currency Portion		
1. Contract Cost													
(1) Direct Cost	19,053	35,958	9,266	13,346	-	-	28,319	49,304					77,623
(2) General	1,905	3,596	927	1,335	-	-	2,832	4,931					7,763
(3) Supervision & Miscellaneous	1,257	2,373	611	881	-	-	1,868	3,254					5,122
(4) Profit	2,221	4,193	1,080	1,556	-	-	3,301	5,749					9,050
(5) Contractor's Tax	733	1,384	357	514	-	-	1,090	1,898					2,988
Sub total	25,169	47,504	12,241	17,632	-	-	37,410	65,136					102,546
2. Right of Way/Site Acquisition	-	20	-	390	-	-	-	410					410
3. Resettlement	-	-	-	1,134	-	-	-	1,134					1,134
4. Engineering Cost	-	7,267	1,224	1,763	-	-	1,224	9,030					10,254
5. Project Management Cost	-	3,634	-	1,494	-	-	-	5,128					5,128
6. Contingency													
(1) Physical Contingency	3,775	7,126	2,448	3,526	-	-	6,223	10,652					16,875
(2) Price Escalation	7,518	36,339	3,646	12,286	-	-	11,164	48,625					59,789
Total	36,462	101,890	19,559	38,225	-	-	56,021	140,115					196,136

TABLE-5.7.6 FINANCIAL CONSTRUCTION COST FOR QUINALI (B) RIVER BASIN
(FOREIGN AND LOCAL CURRENCY PORTION)

(Unit: 1,000 Pesos)

Description	River						Grand Total		
	Sabo Works		Improvement Works		Irrigation Works		Foreign Currency	Local Currency	
	Portion	Local Currency	Portion	Local Currency	Portion	Local Currency	Portion	Portion	
1. Contract Cost									
(1) Direct Cost	1,138	1,922	80,275	72,176	10,289	11,735	91,702	85,833	177,535
(2) General	114	192	8,028	7,218	1,029	1,174	9,171	8,584	17,755
(3) Supervision & Miscellaneous	75	127	5,298	4,763	679	774	6,052	5,664	11,716
(4) Profit	133	224	9,360	8,416	1,200	1,368	10,693	10,008	20,701
(5) Contractor's Tax	44	74	3,089	2,777	396	452	3,529	3,303	6,832
Sub total	1,504	2,539	106,050	95,350	13,593	15,503	121,147	113,392	234,539
2. Right of Way/Site Acquisition	-	1	-	3,605	-	-	-	3,606	3,606
3. Resettlement	-	-	-	878	-	-	-	878	878
4. Engineering Cost	-	404	10,605	9,535	-	2,910	10,605	12,849	23,454
5. Project Management Cost	-	202	-	10,070	-	1,455	-	11,727	11,727
6. Contingency									
(1) Physical Contingency	226	381	21,210	19,070	2,719	3,101	24,155	22,552	46,707
(2) Price Escalation	1,080	5,217	43,133	94,525	3,083	8,943	47,296	108,685	155,981
Total	2,810	8,744	180,998	233,033	19,395	31,912	203,203	273,689	476,892

TABLE-5.7.7 ECONOMIC COST
FOR QUINALI (A) RIVER BASIN

(Unit: 1,000 Pesos)

Description	Sabo Works	River Improvement Works	Irrigation Works	Total
1. Contract Cost				
(1) Direct Cost	50,361	360,786	46,795	457,942
(2) General	5,036	36,078	4,679	45,793
(3) Supervision & Miscellaneous	3,324	23,812	3,088	30,224
(4) Profit	-	-	-	-
(5) Contractor's Tax	-	-	-	-
Sub total	58,721	420,676	54,562	533,959
2. Right of Way/Site Acquisition	-	-	-	-
3. Resettlement	-	24,293	-	24,293
4. Engineering Cost	5,872	42,067	5,456	53,395
5. Project Management Cost	2,936	21,034	2,728	26,698
6. Contingency				
(1) Physical Contingency	8,808	84,136	10,912	103,856
(2) Price Escalation	-	-	-	-
Total	76,337	592,206	73,658	742,201

TABLE-5.7.8 ECONOMIC COST
FOR YAWA RIVER BASIN

(Unit: 1,000 Pesos)

Description	Sabo Works	River Improvement Works	Irrigation Works	Total
1. Contract Cost				
(1) Direct Cost	50,001	20,131	-	70,132
(2) General	5,000	2,014	-	7,014
(3) Supervision & Miscellaneous	3,300	1,328	-	4,628
(4) Profit	-	-	-	-
(5) Contractor's Tax	-	-	-	-
Sub total	58,301	23,473	-	81,774
2. Right of Way/Site Acquisition	-	-	-	-
3. Resettlement	-	1,134	-	1,134
4. Engineering Cost	5,830	2,347	-	8,177
5. Project Management Cost	2,915	1,173	-	4,088
6. Contingency				
(1) Physical Contingency	8,745	4,695	-	13,440
(2) Price Escalation	-	-	-	-
Total	75,791	32,822	-	108,613

TABLE-5.7.9 ECONOMIC COST
FOR QUINALI (B) RIVER BASIN

(Unit: 1,000 Pesos)

Description	Sabo Works	River Improvement Works	Irrigation Works	Total
1. Contract Cost				
(1) Direct Cost	2,774	132,635	19,434	154,843
(2) General	278	13,264	1,944	15,486
(3) Supervision & Miscellaneous	183	7,754	1,282	10,219
(4) Profit	-	-	-	-
(5) Contractor's Tax	-	-	-	-
Sub total	3,235	154,653	22,660	180,548
2. Right of Way/Site Acquisition	-	-	-	-
3. Resettlement	-	878	-	878
4. Engineering Cost	324	15,465	2,266	18,055
5. Project Management Cost	162	7,733	1,133	9,028
6. Contingency				
(1) Physical Contingency	485	30,930	4,532	35,947
(2) Price Escalation	-	-	-	-
Total	4,206	209,659	30,591	244,456

TABLE-5.7.10 ECONOMIC COST FOR QUINALI (A) RIVER BASIN
(FOREIGN AND LOCAL CURRENCY PORTION)

(Unit: 1,000 Pesos)

Description	River												Grand Total					
	Sabo Works				Improvement Works				Irrigation Works					Total				
	Foreign Currency Portion		Local Currency Portion		Foreign Currency Portion		Local Currency Portion		Foreign Currency Portion		Local Currency Portion			Foreign Currency Portion	Local Currency Portion			
1. Contract Cost																		
(1) Direct Cost	19,776	30,585	211,573	149,213	25,022	21,773	256,371	201,571	457,942									
(2) General	1,978	3,058	21,157	14,921	2,502	2,177	25,637	20,156	45,793									
(3) Supervision & Miscellaneous	1,305	2,019	13,964	9,848	1,651	1,437	16,920	13,304	30,224									
(4) Profit	-	-	-	-	-	-	-	-	-									
(5) Contractor's Tax	-	-	-	-	-	-	-	-	-									
Sub total	23,059	35,662	246,694	173,982	29,175	25,387	298,928	235,031	533,959									
2. Right of Way/Site Acquisition	-	-	-	-	-	-	-	-	-									
3. Resettlement	-	-	-	24,293	-	-	-	24,293	24,293									
4. Engineering Cost	-	5,872	24,669	17,398	-	5,456	24,669	28,726	53,395									
5. Project Management Cost	-	2,936	-	21,034	-	2,728	-	26,698	26,698									
6. Contingency																		
(1) Physical Contingency	3,459	5,349	49,339	34,797	5,835	5,077	58,633	45,223	103,856									
(2) Price Escalation	-	-	-	-	-	-	-	-	-									
Total	26,518	49,819	320,702	271,504	35,010	38,648	382,230	359,971	742,201									

TABLE-5.7.11 ECONOMIC COST FOR YAWA RIVER BASIN
(FOREIGN AND LOCAL CURRENCY PORTION)

(Unit: 1,000 Pesos)

Description	River												Grand Total					
	Sabo Works			Improvement Works			Irrigation Works			Total								
	Foreign Currency Portion	Local Currency Portion	Total	Foreign Currency Portion	Local Currency Portion	Total	Foreign Currency Portion	Local Currency Portion	Total	Foreign Currency Portion	Local Currency Portion	Total						
1. Contract Cost																		
(1) Direct Cost	19,053	30,948	49,001	9,266	10,865	19,131	-	-	-	28,319	41,813	70,132						
(2) General	1,905	3,095	4,900	927	1,087	2,014	-	-	-	2,832	4,182	7,014						
(3) Supervision & Miscellaneous	1,257	2,043	3,300	611	717	1,328	-	-	-	1,868	2,760	4,628						
(4) Profit	-	-	-	-	-	-	-	-	-	-	-	-						
(5) Contractor's Tax	-	-	-	-	-	-	-	-	-	-	-	-						
Sub total	22,215	36,086	58,301	10,804	12,669	23,473	-	-	-	33,019	43,755	81,774						
2. Right of Way/Site Acquisition	-	-	-	-	-	-	-	-	-	-	-	-						
3. Resettlement	-	-	-	-	1,134	1,134	-	-	-	-	1,134	1,134						
4. Engineering Cost	-	5,830	5,830	1,080	1,267	2,347	-	-	-	1,080	7,097	8,177						
5. Project Management Cost	-	2,915	2,915	-	1,173	1,173	-	-	-	-	4,088	4,088						
6. Contingency																		
(1) Physical Contingency	3,332	5,413	8,745	2,161	2,534	4,695	-	-	-	5,493	7,947	13,440						
(2) Price Escalation	-	-	-	-	-	-	-	-	-	-	-	-						
Total	25,547	50,244	75,791	14,045	18,777	32,822	-	-	-	39,592	69,021	108,613						

TABLE-5.7.12 ECONOMIC COST FOR QUINALI (B) RIVER BASIN
(FOREIGN AND LOCAL CURRENCY PORTION)

(Unit: 1,000 Pesos)

Description	River						Total		
	Sabo Works		Improvement Works		Irrigation Works		Foreign	Local	
	Foreign Currency Portion	Local Currency Portion	Foreign Currency Portion	Local Currency Portion	Foreign Currency Portion	Local Currency Portion	Currency Portion	Currency Portion	
1. Contract Cost									
(1) Direct Cost	1,138	1,636	80,275	52,360	10,289	9,145	91,702	63,141	154,843
(2) General	114	164	8,028	5,236	1,029	915	9,171	6,315	15,486
(3) Supervision & Miscellaneous	75	108	5,298	3,456	679	603	6,052	4,167	10,219
(4) Profit	-	-	-	-	-	-	-	-	-
(5) Contractor's Tax	-	-	-	-	-	-	-	-	-
Sub total	1,327	1,908	93,601	61,052	11,997	10,663	106,925	73,623	180,548
2. Right of Way/Site Acquisition	-	-	-	-	-	-	-	-	-
3. Resettlement	-	-	-	878	-	-	-	878	878
4. Engineering Cost	-	324	9,360	6,105	-	2,266	9,360	8,695	18,055
5. Project Management Cost	-	162	-	7,733	-	1,133	-	9,028	9,028
6. Contingency									
(1) Physical Contingency	199	286	18,720	12,210	2,399	2,133	21,318	14,629	35,947
(2) Price Escalation	-	-	-	-	-	-	-	-	-
Total	1,526	2,680	121,681	87,978	14,396	16,195	137,603	106,853	244,456

TABLE - 5.7.13 DISBURSEMENT SCHEDULE (FINANCIAL COST AND ECONOMIC COST)

(Unit: 1,000 Pesos)

	1st Year		2nd Year		3rd Year		4th Year		5th Year		6th Year		7th Year		8th Year		9th Year		10th Year		Total		
	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	
<u>Financial Construction Cost</u>																							
1. Quinali(A)																							
(1) Sabo			1,305	3,141	4,858	12,337	4,861	13,022	5,349	15,117	7,889	23,513	10,864	34,191	7,183	23,872						42,309	125,193
(2) River	24,248	28,329	25,699	31,588	44,117	56,679	67,002	91,780	68,686	98,410	72,939	106,364	74,195	103,319	51,405	120,118	36,648	88,584	40,969	80,262	505,908	805,433	
(3) Irrigation	5,967	8,702	12,714	19,538	13,470	21,800	14,280	24,358														46,431	74,398
Sub total 1	30,215	37,031	39,718	54,267	62,445	90,816	86,143	129,160	74,035	113,527	80,828	129,877	85,059	137,510	58,588	143,990	36,648	88,584	40,969	80,262	594,648	1,005,024	
2. Yawa																							
(1) Sabo	4,590	10,936	5,846	14,662	4,286	11,318	5,211	14,507	7,656	22,494	6,126	18,983	2,747	8,990								36,462	101,890
(2) River			4,466	8,033	4,738	8,972	5,025	10,023	5,330	11,197												19,559	38,225
Sub total 2	4,590	10,936	10,312	22,695	9,024	20,290	10,236	24,530	12,986	33,691	6,126	18,983	2,747	8,990								56,021	140,115
3. Quinali(B)																							
(1) Sabo																2,810	8,744					2,810	8,744
(2) River	14,605	15,402	15,479	17,161	24,617	28,713	26,118	32,075	27,724	35,869	29,439	40,162	20,854	30,004	22,162	33,647					180,998	233,033	
(3) Irrigation			6,093	9,487	6,457	10,592	6,845	11,833														19,395	31,912
Sub total 3	14,605	15,402	21,572	26,648	31,074	39,305	32,963	43,908	27,724	35,869	29,439	40,162	20,854	30,004	24,972	42,391					203,203	273,689	
<u>Economic Cost</u>																							
1. Quinali(A)																							
(1) Sabo			1,022	1,919	3,585	6,738	3,378	6,347	3,497	6,571	4,851	9,111	6,282	11,802	3,903	7,331						26,518	49,819
(2) River	20,204	16,587	20,204	16,587	32,710	26,657	46,824	38,603	45,219	36,985	45,219	35,690	43,294	30,951	28,222	31,927	18,922	21,203	19,884	16,314	320,702	271,504	
(3) Irrigation	4,973	5,488	10,013	11,054	10,013	11,054	10,011	11,052														35,010	38,648
Sub total 1	25,177	22,075	31,239	29,560	46,308	44,449	60,213	56,002	48,716	43,556	50,070	44,801	49,576	42,753	32,125	39,258	18,922	21,203	19,884	16,314	382,230	359,971	
2. Yawa																							
(1) Sabo	3,819	7,512	4,583	9,014	3,164	6,220	3,620	7,119	5,006	9,848	3,766	7,405	1,589	3,126								25,547	50,244
(2) River			3,511	4,692	3,513	4,698	3,512	4,695	3,509	4,692												14,045	18,777
Sub total 2	3,819	7,512	8,094	13,706	6,677	10,918	7,132	11,814	8,515	14,540	3,766	7,405	1,589	3,126								39,592	69,021
3. Quinali(B)																							
(1) Sabo																1,526	2,680					1,526	2,680
(2) River	12,169	8,797	12,169	8,800	18,252	13,197	18,252	13,197	18,252	13,196	18,252	13,196	12,168	8,798	12,167	8,797					121,681	87,978	
(3) Irrigation			4,799	5,397	4,799	5,400	4,798	5,398														14,396	16,195
Sub total 3	12,169	8,797	16,968	14,197	23,051	18,597	23,050	18,595	18,252	13,196	18,252	13,196	12,168	8,798	13,693	11,477					137,603	106,853	
Total	41,165	38,384	56,301	57,463	76,036	73,964	90,395	86,411	75,483	71,292	72,088	65,402	63,333	54,677	45,818	50,735	18,922	21,203	19,884	16,314	559,425	535,845	
<u>Sabo Project</u>																							
Financial cost	4,590	10,936	7,151	17,803	9,144	23,655	10,072	27,529	13,005	37,611	14,015	42,496	13,611	43,181	7,183	23,872					78,771	227,083	
Economic cost	3,819	7,512	5,605	10,933	6,749	12,958	6,998	13,466	8,503	16,419	8,617	16,516	7,871	14,928	3,903	7,331					52,065	100,063	

TABLE-5.8.1 ECONOMIC PRICE STRUCTURE
OF PADDY AND COPRA

Item	(Unit: P/ton)	
	Paddy	Copra
- F.O.B. Export price ^{/1}	2,860	3,590
- Port charge, loading and terminal warehouse costs	100	100
- Transportation cost	30	30
- Milling cost	140	-
- By-product sale	(100)	-
- Ex-mill gate price	2,690	-
- Paddy equivalent (63%)	1,695	-
- Procurement cost (5%)	85	170
- Economic farmgate price	1,610	3,290

/1: Based on the commodity price forecasts by IBRD in 1982, export price in 1990 at 1982 constant price is forecasted as shown below.

Item	(Unit: P/ton)		
	Actual (1980)	Estimated (1982)	Projected (1990)
<u>IBRD Forecast (1981 constant)</u>			
- Rice (F.O.B. Bangkok)	3,350	2,500	3,400
- Copra (C.I.F. N.W. Europe)	3,500	2,660	4,050
<u>F.O.B. Export Price (1982 constant)</u>			
- Rice	-	2,100	2,860
- Copra	-	2,360	3,590

Remarks: US\$ 1 = P8.0

TABLE-5.8.2 ECONOMIC PRICE STRUCTURE OF FERTILIZER

(Unit: P/ton)

Item	Urea	T.S.P.	Muriate of Potash
- Import price (C.I.F. Manila) ^{/1}	2,300	2,410	1,170
- Import expenses	260	260	260
- Import gate price	2,560	2,670	1,430
- Transportation cost to wholesale outlet	100	100	100
- Expenses at wholesale outlet	200	200	200
- Wholesale price	2,860	2,970	1,730
- Transportation cost to retail outlet	70	70	70
- Expenses at retail outlet	130	130	130
- Sales price to farmer	3,060	3,170	1,930
- Nutrient price ^{/2} (P/kg)	6.8	6.9	3.2

^{/1}: Based on the commodity price forecasts by IBRD in 1982, import price in 1990 at 1982 constant price is forecasted as shown below.

(Unit: P/ton)

Item	Actual 1980	Estimated 1982	Projected 1990
<u>IBRD Forecast (1981 constant)</u>			
- Urea (F.O.B. Europe)	1,710	1,420	2,120
- T.S.P (F.O.B. U.S.Gulf)	1,390	1,230	1,560
- M. Potash (F.O.B. Vancouver)	900	700	880
<u>C.I.F. Manila (1982 constant)</u>			
- Urea	-	1,540	2,300
- T.S.P.	-	1,900	2,410
- M. Potash	-	930	1,170

Remarks: US\$ 1 = P 8.0

^{/2}: Urea: 45%, T.S.P.: 46%, M. Potash: 60%

TABLE-5.8.3 AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFIT

(Unit: P10³)

Item	Flood Magnitude (Return Period)				
	1.01	2	10	20	50
<u>Quinali(A)</u>					
- Damage to Crop	0	3,482	5,069	5,069	5,069
- Damage to Houses	0	15,777	26,821	32,187	39,498
- Damage to Infrastructure	0	13,954	16,745	17,861	18,140
- Damage to Irrigation Facilities	0	622	746	796	809
- Indirect damage	0	2,093	2,512	2,679	2,721
<u>Total</u>	0	35,928	51,893	58,592	66,237
- Exceeding Probability	0.99	0.50	0.10	0.05	0.02
- Events per Year within Interval	0.49	0.40	0.05	0.03	
- Average Damage per Year within Interval		17,964	43,911	55,243	62,415
- Average Annual Flood Damage		8,802+17,564+	2,762+1,872 =		31,000
- Remaining Inundation Damage and Lost Benefit					-2,023 ¹
- Flood Damage Reduction Benefit					<u>28,977</u>
<u>Quinali(B)</u>					
- Damage to Crop	0	351	559	559	559
- Damage to Houses	0	1,085	2,226	2,709	5,264
- Damage to Infrastructure	0	1,128	1,354	1,444	1,466
- Damage to Irrigation Facilities	0	108	130	138	140
- Indirect Damage	0	169	203	217	220
<u>Total</u>	0	2,841	4,472	5,067	7,649
- Exceeding Probability	0.99	0.50	0.10	0.05	0.02
- Events per Year within Interval	0.49	0.40	0.05	0.03	
- Average Damage per Year within Interval		1,421	3,657	4,770	6,358
- Average Annual Flood Damage		696+ 1,463 +	239 +	191 =	2,598
- Remaining Inundation Damage					-81
- Flood Damage Reduction Benefit					<u>2,508</u>
<u>Yawa</u>					
- Damage to Houses	0	1,647	5,889	10,691	16,722
- Damage to Infrastructure	0	812	974	1,039	1,056
- Damage to Irrigation Facilities	0	37	44	47	48
- Indirect Damage	0	122	146	156	158
<u>Total</u>	0	2,618	7,053	11,933	17,984

(to be continued)

Item	Flood Magnitude (Return Period)				
	1.01	2	10	20	50
- Exceeding Probability	0.99	0.50	0.10	0.05	0.02
- Events per Year within Interval	0.49	0.40	0.05	0.03	
- Average Damage per Year within Interval	1,309	4,836	9,493	14,959	
- Average Annual Flood Damage	641 + 1,934 + 475 + 449 =				3,499
- Remaining Inundation Damage					-197
- Flood Damage Reduction Benefit					<u>3,302</u>

∟1: Annual production foregone (550 ha)

Irrigated field	Wet:	330 ha x B1,670/ha =	B551,100
	Dry:	330 ha x B1,860/ha =	B613,800
Rainfed field	Wet:	220 ha x B 680/ha =	B149,600
<u>Remaining inundation damage</u>			<u>B708,000</u>
Total			B2,022,500
			± B2,023,000

TABLE-5.8.4 LAND ENHANCEMENT BENEFIT

Project Area / Crop	Planted Area (ha)	Economic Net Return per Year (₹/ha)	Total Net Income (₹10 ³)
<u>(I) Quinali(A)</u>			
(1) With Irrigation Project			
- Irrigated Rice	5,280	7,740	40,867
- Irrigated Rice	1,070	5,030	5,382
Total	6,350		<u>46,249</u>
(2) Without Irrigation Project			
- Irrigated Rice	3,120	5,030	15,694
- Rainfed Rice	3,050	1,910	5,826
- Coconut	180	2,950	531
Total	6,350		<u>22,051</u>
(3) Increment Benefit (1) - (2)			<u>24,198</u>
<u>(II) Quinali(B)</u>			
(1) With Irrigation Project			
- Irrigated Rice	2,400	7,740	<u>18,576</u>
(2) Without Irrigation Project			
- Irrigated Rice	1,370	5,030	6,891
- Rainfed Rice	800	1,910	1,528
- Coconut	230	2,950	679
Total	2,400		<u>9,098</u>
(3) Increment Benefit (1) - (2)			<u>9,478</u>

TABLE-5.8.5(1) ECONOMIC NET RETURN PER HECTARE FOR PADDY
CULTIVATION UNDER PRESENT CONDITION

Item	Rainfed		Irrigated	
	Wet Season	Dry Season	Wet Season	Dry Season
I) Gross Income				
- Yield (ton/ha)	1.6	3.0		3.2
- Unit Price (P/ton)	1,610	1,610		1,610
- Gross income (P)	2,576	4,830		5,152
	Amount (P)	Amount (P)	Amount (P)	Amount (P)
II) Production Cost				
- Seed	57 kg	91	57 kg	91
- Fertilizer ^{/1} : N	27 kg	184	72 kg	490
: P	9 kg	62	25 kg	173
: K	5 kg	16	13 kg	42
- Chemicals	2 kg	160	3.6kg	288
- Labor	55 days	550	70 days	700
- Animal power ^{/2}	15 days	375	15 days	375
- Irrigation fee ^{/3}	-	-	-	161
- Harvesting ^{/3}	-	368	-	690
- Miscellaneous ^{/4}	-	90	-	150
- Total	1,896	1,896	3,160	3,292
III) Net Return per Hectare (I - II)	680	1,670		1,860

^{/1}: Nutrient ^{/2}: Wet season : 2 cavans/ha, Dry season : 3 cavans/ha
^{/3}: 1/7 of production
^{/4}: About 5% of production cost

TABLE-5.8.5(2) ECONOMIC NET RETURN PER HECTARE FOR PADDY CULTIVATION
UNDER FUTURE WITHOUT IRRIGATION PROJECT

Item	Rainfed		Irrigated	
	Wet Season	Dry Season	Wet Season	Dry Season
I) Gross Income				
- Yield (ton/ha)	2.5	3.5		3.8
- Unit price (P/ton)	1,610	1,610		1,610
- Gross income (P)	4,025	5,635		6,118
	Amount (P)	Q'ty	Amount (P)	Q'ty
II) Production Cost				
- Seed	57 kg	91	57 kg	91
- Fertilizer ^{/1} : N	27 kg	184	72 kg	490
: P	9 kg	62	25 kg	173
: K	5 kg	16	13 kg	42
- Chemicals	2 kg	160	3.6kg	288
- Labor	55 days	550	70 days	700
- Animal power ^{/2}	15 days	375	15 days	375
- Irrigation fee ^{/2}	-	-	161	242
- Harvesting ^{/3}	-	-	805	874
- Miscellaneous ^{/4}	-	-	160	163
- Total	2,115		3,285	3,438
III) Net Return per Hectare (I - II)	1,910		2,350	2,680

^{/1} : Nutriment ^{/2} : Wet season : 2 cavans/ha, Dry season : 3 cavans/ha
^{/3} : 1/7 of production
^{/4} : About 5% of production cost

TABLE-5.8.5(3) ECONOMIC NET RETURN PER HECTARE FOR PADDY CULTIVATION
UNDER FUTURE WITH IRRIGATION PROJECT

Item	Irrigated		Irrigated Dry Season
	Wet Season	Dry Season	
I) Gross Income			
- Yield (ton/ha)	4.5	5.0	
- Unit price (P/ton)	1,610	1,610	
- Gross income (P)	7,245	8,050	
	Amount	Amount	Amount
	(P)	(P)	(P)
II) Production Cost			
- Seed	60 kg	60 kg	96
- Fertilizer ¹ : N	80 kg	80 kg	544
: P	25 kg	25 kg	173
: K	13 kg	13 kg	42
- Chemicals	3.6kg	3.6kg	288
- Labor	72 days	72 days	720
- Animal power ²	15 days	15 days	375
- Irrigation fee ³			161
- Harvesting ⁴			1,035
- Miscellaneous ⁴			171
Total			3,605
III) Net Return per Hectare (I - II)	3,640		4,100

¹ : Nutrient ² : Wet season : 2 cavans/ha, Dry season : 3 cavans/ha
³ : 1/7 of production
⁴ : About 5% of production cost

TABLE-5.8.6 ECONOMIC NET RETURN PER HECTARE FOR COCONUT
PLANTING UNDER PRESENT CONDITION

Item	(P)
I) Gross Income	
- Copra 0.99 ton/ha x P3,290	<u>3,260</u>
II) Production Cost	<u>310</u>
1) Weeding : 3.6 man-days x P10	36
2) Harvesting	
- Packing of nuts 5 man-days x P10	50
- Gathering and piling 4.3 man-days x P10	43
- Husking 2.9 man-days x P10	29
- Hauling to farmhouse 3.2 man-days x P10	32
3) Copra Processing	100
4) Transportation cost	20
III) Net Return per Hectare (I - II)	<u>2,950</u>

TABLE-5.8.7 ANNUAL PROJECT BENEFIT UNDER
FULL DEVELOPMENT STAGE

(Unit: P10³)

Item	Quinali (A)	Quinali (B)	Yawa	Whole Project Area
1) Flood Damage Reduction Benefit	28,977	2,508	3,302	34,787
2) Negative Benefit by River Improvement	-284 ^{/1}	-	-	-284
3) Mud/Debris Flow Damage Reduction Benefit ^{/2}	1,841	-	1,661	3,502
- Agriculture	(1,763)	(-)	(1,461)	(3,224)
- Houses	(36)	(-)	(138)	(174)
- Indirect damage ^{/3}	(42)	(-)	(62)	(104)
4) Irrigation Benefit (Land Enhancement)	24,198	9,478	-	33,676
Total	54,732	11,986	4,963	71,681

^{/1} - Inundation area due to rise of the water level of Lake Bato : 170ha
 - Net return per hectare of irrigated wet season paddy : P1,670/ha
 - Negative benefit : P284,000

^{/2} Total damage due to mud/debris flow/ 5 years

^{/3} Number of population affected x P64/person (costs for relief goods and medical assistance per person) + 5 years

TABLE-5.8.8 CASUALTIES BY TYPHOONS IN THE PROJECT AREA

Name of Typhoon	Year	Number of Casualties			
		Depth	Missing	Injured	Total
Sening	1970	206	137	865	1,208
Herming	1971	3	3	-	6
Konsing	1972	11	4	-	15
Luming	1973	1	-	-	1
Sisang	1975	8	-	-	8
Daling	1981	138	16	107	261

- Source: (1) The Philippine National Red Cross, Legazpi, 1980
 (2) Regional Office of Ministry of Social and Service Development, Legazpi, 1982
 (3) Result of field interview survey in 1982

TABLE-5.8.9 DISBURSEMENT SCHEDULE OF ECONOMIC COST

Year in Order	Quinali(A)			Quinali(B)			Yawa			Total		
	Sabo	River	Irri- gation Total	Sabo	River	Irri- gation Total	Sabo	River	Total			
											(Unit: F10 ³)	
1	-	36,791	10,461	47,252	-	20,966	-	20,966	11,331	-	11,331	79,549
2	2,941	36,791	21,067	60,799	-	20,969	10,196	31,165	13,597	8,203	21,800	113,764
3	10,323	59,367	21,067	90,757	-	31,449	10,199	41,648	8,384	8,211	17,595	150,000
4	9,725	85,427	21,063	116,215	-	31,449	10,196	41,645	10,739	8,207	18,946	176,806
5	10,068	82,204	-	92,272	-	31,448	-	31,448	14,854	8,201	23,055	146,775
6	13,962	80,909	-	94,871	-	31,448	-	31,448	11,171	-	11,171	137,490
7	18,084	74,245	-	92,329	-	20,966	-	20,966	4,715	-	4,715	118,010
8	11,234	60,149	-	71,383	4,206	20,964	-	25,170	-	-	-	96,553
9	-	40,125	-	40,125	-	-	-	-	-	-	-	40,125
10	-	36,198	-	36,198	-	-	-	-	-	-	-	36,198
Total	76,337	592,206	73,658	742,201	4,206	209,659	30,591	244,456	75,791	32,822	108,613	1,095,270

TABLE-5.8.10 BENEFIT AND COST STREAM FOR ECONOMIC EVALUATION
OF QUINALI (A) RIVER BASIN

(Unit: P10³)

Year in Order	Economic Benefit					Economic Cost									Total cost
	Flood Damage Reduction Benefit	Negative Benefit by River Improvement	Mud/Debris Flow Damage Reduction Benefit	Irrigation Benefit	Total Benefit	River			Sabo			Irrigation			
						Const- ruction cost	O&M cost	Sub-total	Const- ruction cost	O&M cost	Sub-total	Const- ruction cost	O&M cost	Sub-total	
1	-	-	-	-	-	36,791	-	36,791	-	-	-	10,461	-	10,461	47,252
2	1,159	-8	-	-	1,151	36,791	242	37,033	2,941	-	2,941	21,067	-	21,067	61,041
3	3,187	-20	-	-	3,167	59,367	485	59,852	19,323	-	10,323	21,067	-	21,067	91,242
4	6,085	-39	-	-	6,046	85,427	876	86,303	9,725	83	9,808	21,063	-	21,063	117,174
5	10,142	-185	-	8,276	18,233	82,204	1,438	83,642	10,068	144	10,212	-	2,032	2,032	95,886
6	14,199	-201	1,841	16,237	32,076	80,909	1,979	82,888	13,962	206	14,168	-	2,032	2,032	99,088
7	18,256	-179	1,841	24,198	44,116	74,245	2,512	76,757	18,084	293	18,377	-	2,032	2,032	97,166
8	22,312	-219	1,841	24,198	48,132	60,149	3,001	63,150	11,234	406	11,640	-	2,032	2,032	76,822
9	25,500	-250	1,841	24,198	51,289	40,125	3,397	43,522	-	477	477	-	2,032	2,032	46,031
10	27,238	-267	1,841	24,198	53,010	36,198	3,662	39,860	-	477	477	-	2,032	2,032	42,369
11	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
12	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
13	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
14	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
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21	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
22	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	16,142	16,142	20,519
23	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
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41	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
42	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	16,142	16,142	20,519
43	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
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48	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
49	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409
50	28,977	-284	1,841	24,198	54,732	-	3,900	3,900	-	477	477	-	2,032	2,032	6,409

TABLE-5.8.11 BENEFIT AND COST STREAM FOR ECONOMIC EVALUATION
OF QUINALI (B) RIVER BASIN

(Unit: ₱10³)

Year in Order	Economic Benefit					Economic Cost									Total cost	
	Flood Damage Reduction Benefit	Negative Benefit by River Improvement	Mud/Debris Flow Damage Reduction Benefit	Irrigation Benefit	Total Benefit	River			Sabo			Irrigation				
						Const- ruction cost	O&M cost	Sub-total	Const- ruction cost	O&M cost	Sub-total	Const- ruction cost	O&M cost	Sub-total		
1	-	-	-	-	-	-	-	20,966	-	-	-	-	-	-	-	20,966
2	251	-	-	-	251	20,969	138	21,107	-	-	-	10,196	-	10,196	-	31,303
3	502	-	-	-	502	31,449	276	31,725	-	-	0	10,199	-	10,196	-	41,921
4	878	-	-	-	878	31,449	484	31,933	-	-	-	10,196	-	10,196	-	42,129
5	1,254	-	-	3,014	4,268	31,448	691	32,139	-	-	-	-	768	768	-	32,907
6	1,630	-	-	6,246	7,876	31,448	898	32,346	-	-	-	-	768	768	-	32,907
7	2,006	-	-	9,478	11,484	20,966	1,106	22,072	-	-	-	-	768	768	-	22,840
8	2,257	-	-	9,478	11,785	20,964	1,244	22,208	4,206	-	4,206	-	768	768	-	27,182
9	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
10	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
12	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
13	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
14	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
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22	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
23	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	5,656	5,656	-	7,064
24	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
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42	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
43	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	5,656	5,656	-	7,064
44	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
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48	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
49	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176
50	2,508	-	-	9,478	11,986	-	1,382	1,382	-	26	26	-	768	768	-	2,176

TABLE-5.8.12 BENEFIT AND COST STREAM FOR ECONOMIC EVALUATION
OF YAWA RIVER BASIN

(Unit: P10³)

Year in Order	Economic Benefit					Economic Cost									Total cost	
	Flood Damage Reduction Benefit	Negative Benefit by River Improvement	Mud/Debris Flow Damage Reduction Benefit	Irrigation Benefit	Total Benefit	River			Sabo			Irrigation				
						Const- ruction cost	O&M cost	Sub-total	Const- ruction cost	O&M cost	Sub-total	Const- ruction cost	O&M cost	Sub-total		
1	-	-	-	-	-	-	-	-	-	11,331	-	11,331	-	-	-	11,331
2	-	-	-	-	-	8,203	-	8,203	13,597	71	13,668	-	-	-	-	21,871
3	-	-	-	-	826	8,211	52	8,263	9,384	155	9,539	-	-	-	-	17,802
4	1,651	-	-	-	1,651	8,207	105	8,312	10,739	214	10,953	-	-	-	-	19,265
5	2,477	-	-	-	2,477	8,201	157	8,358	14,854	281	15,135	-	-	-	-	23,493
6	3,302	-	1,661	-	4,963	-	209	209	11,171	375	11,544	-	-	-	-	11,753
7	3,302	-	1,661	-	4,963	-	209	209	4,715	443	5,158	-	-	-	-	5,367
8	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
9	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
10	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
11	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
12	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
13	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
14	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
.
.
.
21	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
22	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
23	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
.
.
.
41	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
42	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
43	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
.
.
.
48	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
49	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681
50	3,302	-	1,661	-	4,963	-	209	209	-	472	472	-	-	-	-	681

TABLE-5.8.13 BENEFIT AND COST STREAM FOR ECONOMIC EVALUATION
OF THE WHOLE PROJECT

(Unit: P10³)

Year in Order	Economic Benefit					Economic Cost									Total cost
	Flood Damage Reduction Benefit	Negative Benefit by River Improvement	Mud/Debris Flow Damage Reduction Benefit	Irrigation Benefit	Total Benefit	River			Sabo			Irrigation			
						Const- ruction cost	O&M cost	Sub-total	Const- ruction cost	O&M cost	Sub-total	Const- ruction cost	O&M cost	Sub-total	
1	-	-	-	-	-	57,757	-	57,757	11,331	-	11,331	10,461	-	10,461	75,549
2	1,410	-8	-	-	1,402	65,963	380	66,343	16,538	71	16,609	31,263	-	31,263	114,215
3	4,515	-20	-	-	4,495	99,027	813	99,840	19,707	173	19,880	31,266	-	31,266	150,986
4	8,614	-39	-	-	8,575	125,083	1,465	126,548	20,464	297	20,761	31,259	-	31,239	178,548
5	13,873	-185	-	11,290	24,978	121,853	2,286	124,139	24,922	456	25,378	-	2,800	2,800	152,317
6	19,131	-201	3,502	22,483	44,915	112,357	3,086	115,443	25,133	586	25,719	-	2,800	2,800	143,962
7	23,564	-179	3,502	33,676	60,563	95,211	3,827	99,038	22,799	736	23,535	-	2,800	2,800	125,373
8	27,871	-219	3,502	33,676	64,830	81,113	4,454	85,567	15,440	879	16,319	-	2,800	2,800	104,686
9	31,310	-250	3,502	33,676	68,238	40,125	4,988	45,113	-	975	975	-	2,800	2,800	48,888
10	33,048	-267	3,502	33,676	69,959	36,198	5,253	41,451	-	975	975	-	2,800	2,800	45,226
11	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
12	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
13	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
14	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
.
.
.
21	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
22	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	16,910	16,910	23,376
23	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	7,688	7,688	14,154
24	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
.
.
41	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
42	34,789	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	16,910	16,910	23,376
43	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	7,688	7,688	14,154
44	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
.
.
48	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
49	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266
50	34,787	-284	3,502	33,676	71,681	-	5,491	5,491	-	975	975	-	2,800	2,800	9,266

TABLE-5.8.14 ECONOMIC BENEFIT-COST RATIO
AND INTERNAL RATE OF RETURN
OF THE PROJECT

Project	B/C Ratio		IRR
	Discount Rate		
	(4%)	(6%)	(%)
Quinali (A)	1.27	0.98	5.9
Quinali (B)	0.83	0.64	2.7
Yawa	0.83	0.63	2.8
Whole	1.13	0.87	4.9

TABLE-5.8.15 SENSITIVITY ANALYSIS OF THE PROJECT

(Unit: %)

	Change in Benefit			
	No change	10% down	1 year delay	10% down & 1 year delay
1) Quinali (A) Project				
Change 1) No change	5.9	5.0	5.4	4.7
in Cost 2) 20% up	4.4	3.6	4.1	3.4
2) Quinali (B) Project				
Change 1) No change	2.7	2.0	2.5	1.9
in Cost 2) 20% up	1.5	0.9	1.4	0.8
3) Yawa Project				
Change 1) No change	2.8	2.2	2.6	2.0
in Cost 2) 20% up	1.7	1.1	1.6	1.0
4) Whole Project				
Change 1) No change	4.9	4.1	4.6	3.8
in cost 2) 20% up	3.6	2.8	3.3	2.6

TABLE-7.2.1. DEVASTATION AREA IN 1980 AND 1982

(Unit: ha)

Name of River	Area in 1980	Area in 1982	1982-1980
<u>Quinali (A) River</u>			
Quirangay	149	162	+13
Tumpa	30	50	+20
Maninila	93	151	+58
Masarawag	107	133	+26
Ogsong (Nabonton Creek)	245	284	+39
Nasisi	164	194	+30
Sub total	<u>788</u>	<u>974</u>	<u>+186</u>
<u>Quinali (B) River</u>	<u>40</u>	<u>42</u>	<u>+2</u>
<u>Yawa River</u>			
Anuling	98	161	+63
Budiao	89	125	+36
Pawa-Burabod	84	144	+60
Sub total	<u>271</u>	<u>430</u>	<u>+159</u>
<u>East And Northeast</u>			
<u>Stream</u>			
Buyuan	74	142	+68
Matanag	46	58	+12
Basud	110	121	+11
Sub total	<u>230</u>	<u>321</u>	<u>+91</u>
Ground total	<u>1,329</u>	<u>1,767</u>	<u>+438</u>

TABLE-7.3.1 NECESSITY OF SABO WORKS

Name of Streams	Present River Condition (Degree of Devastation)	Necessity of Sabo Works			Main objects to be Protected
		River Basin Management of Sediment	Sabo Works for Preventing Direct Disaster due to Sediment		
Quinali (A) River Basin					
1. Quirangay River	**	B	A	Camalig, PNR	
2. Tumpa River	*	C	C		
3. Maninila River	*	C	C		
4. Masarawag River	***	B	B		
5. Ogsong River	**	B	B		
6. Nasisi River	**	A	B	Downstream reaches	
Yawa River Basin					
7. Anuling River	***	A	A	Legazpi, Salvacion	
8. Budiao River	***	A	B	Legazpi	
9. Pawa-Burabod River	***	A	A	Legazpi, Mabinit, Bonga, Buyuan and Burabod	

Remarks: *** - Extremely devastated A - Very urgently necessary
 ** - Devastated B - Urgently necessary
 * - Not much devastated C - Not urgently necessary

TABLE-7.5.1 FINANCIAL CONSTRUCTION COST, SABO PROJECT

(Unit: 1,000 Pesos)

Description	Stage - I		Stage - II		Total		Grand
	Foreign	Local	Foreign	Local	Foreign	Local	
	Currency Portion	Currency Portion	Currency Portion	Currency Portion	Currency Portion	Currency Portion	
1. Contract Cost							
(1) Direct Cost	23,622	43,926	15,207	27,838	38,829	71,764	110,593
(2) General	2,363	4,392	1,520	2,784	3,883	7,176	11,059
(3) Supervision & Miscellaneous	1,559	2,899	1,004	1,837	2,563	4,736	7,299
(4) Profit	2,755	5,122	1,773	3,246	4,528	8,368	12,896
(5) Contractor's Tax	910	1,689	584	1,072	1,494	2,761	4,255
Sub total	31,209	58,028	20,088	36,777	51,297	94,805	146,102
2. Right of Way/Site Acquisition	-	25	-	15	-	40	40
3. Resettlement	-	-	-	-	-	-	-
4. Engineering Cost	-	8,923	-	5,687	-	14,610	14,610
5. Project Management Cost	-	4,462	-	2,843	-	7,305	7,305
6. Contingency							
(1) Physical Contingency	4,681	8,704	3,013	5,517	7,694	14,221	21,915
(2) Price Escalation	8,074	37,390	11,708	58,710	19,782	96,100	115,882
Total	43,964	117,532	34,809	109,549	78,773	227,081	305,854

TABLE-7.5.2 FINANCIAL CONSTRUCTION COST DISBURSEMENT SCHEDULE FOR THE SABO PROJECT

(Unit: 1,000 Pesos)

	1st year (1983)		2nd Year (1984)		3rd Year (1985)		4th Year (1986)		5th Year (1987)		6th Year (1988)		7th Year (1989)		8th Year (1990)	
	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local
1. Contract Cost																
(1) Direct Cost	2,848	5,376	4,180	7,829	5,213	9,293	5,219	9,657	6,342	11,771	6,425	11,849	5,871	10,718	2,911	5,271
(2) General	285	538	418	783	504	929	522	965	634	1,178	643	1,185	586	1,072	291	527
(3) Supervision & Miscellaneous	188	355	276	517	332	613	344	637	418	777	425	782	387	707	192	348
(4) Profit	332	627	487	913	587	1,083	609	1,126	739	1,373	750	1,382	684	1,250	339	614
(5) Contractor's Tax	110	207	162	301	194	357	201	372	243	453	247	457	225	412	112	203
Sub total	3,763	7,103	5,523	10,343	6,650	12,275	6,895	12,757	8,376	15,552	8,490	15,655	7,753	14,159	3,845	6,963
2. Right of Way/Site Acquisition	-	3	-	5	-	5	-	5	-	7	-	7	-	5	-	3
3. Resettlement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Engineering Cost	-	1,086	-	1,586	-	1,893	-	1,965	-	2,393	-	2,414	-	2,192	-	1,081
5. Project Management Cost	-	543	-	794	-	946	-	983	-	1,196	-	1,207	-	1,096	-	540
6. Contingency																
(1) Physical Contingency	564	1,065	828	1,551	998	1,841	1,034	1,914	1,257	2,333	1,274	2,349	1,162	2,124	577	1,044
(2) Price Escalation	263	1,136	800	3,524	1,496	6,695	2,143	9,905	3,372	16,130	4,251	20,864	4,696	23,605	2,761	14,241
Total	4,590	10,936	7,151	17,803	9,144	23,655	10,072	27,529	13,005	37,611	14,015	42,496	13,611	43,181	7,183	23,872

TABLE-7.5.3 ECONOMIC COST, SABO PROJECT

(Unit: 1000 Pesos)

Description	Foreign Currency Portion	Local Currency Portion	Total
1. Contract Cost			
(1) Direct Cost			
(a) Quiranagay River	4,054	7,109	11,163
(b) Tumpa River	49	37	86
(c) Maninila River	403	667	1,070
(d) Masarawag River	3,928	5,920	9,848
(e) Ogsong River	3,205	5,885	9,090
(f) Nasisi River	8,137	10,967	19,104
(g) Anuling River	7,616	12,391	20,007
(h) Budiao River	4,402	7,201	11,603
(i) Pawa-Burabod River	7,035	11,356	18,391
Sub total (1)	38,829	61,533	100,362
(2) General	3,883	6,153	10,036
(3) Supervision & Miscellaneous	2,563	4,061	6,624
(4) Profit	-	-	-
(5) Contractor's Tax	-	-	-
Sub total	45,275	71,747	117,022
2. Right of Way/Site Acquisition	-	-	-
3. Engineering Cost	-	11,702	11,702
4. Project Management Cost	-	5,851	5,851
5. Contingency			
(1) Physical Contingency	6,791	10,762	17,553
(2) Price Escalation	-	-	-
Total	52,066	100,062	152,128

TABLE-7.5.4 ECONOMIC COST DISBURSEMENT SCHEDULE FOR THE SABO PROJECT

(Unit: 1,000 Pesos)

	1st Year (1983)		2nd Year (1984)		3rd Year (1985)		4th Year (1986)		5th Year (1987)		6th Year (1988)		7th Year (1989)		8th Year (1990)	
	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local
1. Contract Cost																
(1) Direct Cost	2,848	4,627	4,180	6,730	5,033	7,966	5,219	8,282	6,342	10,100	6,425	10,156	5,871	9,171	2,911	4,501
(2) General	285	463	418	673	503	797	522	828	634	1,010	643	1,015	587	917	291	450
(3) Supervision & Miscellaneous	188	305	276	445	332	527	344	547	418	666	425	670	387	605	192	297
(4) Profit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5) Contractor's Tax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub total	3,321	5,395	4,874	7,848	5,868	9,290	6,085	9,657	7,394	11,776	7,493	11,841	6,845	10,693	3,394	5,248
2. Right of Way/Site Acquisition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Resettlement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Engineering Cost	-	872	-	1,272	-	1,516	-	1,574	-	1,918	-	1,932	-	1,754	-	864
5. Project Management Cost	-	436	-	636	-	758	-	787	-	958	-	967	-	877	-	432
6. Contingency																
(1) Physical Contingency	498	809	731	1,177	881	1,394	913	1,448	1,109	1,767	1,124	1,776	1,026	1,604	509	787
(2) Price Escalation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	3,819	7,512	5,605	10,933	6,749	12,958	6,998	13,466	8,503	16,419	8,617	16,516	7,871	14,928	3,903	7,331

TABLE-7.5.5 DISASTER PREDICTION AND WARNING SYSTEM
PROJECT COST (STAGE-I)

Description	Foreign Currency (Japanese Yen)	Local Currency (Peso)
1. Telemetry System by 150 MHz Radio System	128,056,000	-
2. Warning System by Multi- Access Radio System	300,083,000	-
3. Multiplex Radio Com- munication System	249,348,000	-
4. HF Communication System	9,800,000	-
5. Installation Materials	92,000,000	-
6. Installation Work	204,721,000	1,988,000
7. Training (Factory & on the Job)	27,000,000	-
8. Maintenance Service (one year)	73,000,000	-
9. Sub Total (1. to 8.)	1,084,008,000	1,988,000
10. Consultancy Service	130,080,000	-
11. Basic Project Cost	1,214,088,000	1,988,000
12. Contingency	121,409,000	198,000
13. Total Project Cost	1,335,497,000	2,186,000

TABLE-7.5.6 DISASTER PREDICTION AND WARNING SYSTEM
PROJECT COST (STAGE-II)

Description	Foreign Currency (Japanese Yen)	Local Currency (Peso)
1. Telemetry System by 150 MHz Radio System	36,470,000	-
2. Warning System by Multi- Access Radio System	86,275,000	-
3. Multiplex Radio Com- munication System	83,102,000	-
4. HF Communication System	17,980,000	-
5. Installation Materials	35,660,000	-
6. Installation Work	107,320,000	1,145,000
7. Training (Factory & on the Job)	-	-
8. Maintenance Service (one year)	-	-
9. Sub-total (1. to 8.)	366,807,000	1,145,000
10. Consultancy Service	47,226,000	-
11. Basic Project Cost	414,033,000	1,145,000
12. Contingency	41,403,000	115,000
13. Total Project Cost	455,436,000	1,260,000

TABLE-7.5.7 DISASTER PREDICTION AND WARNING SYSTEM
PROJECT COST (STAGE-III)

Description	Foreign Currency (Japanese Yen)	Local Currency (Peso)
1. Telemetry System by 150 MHz Radio System	86,944,000	-
2. Warning System by Multi- Access Radio System	5,075,000	-
3. Multiplex Radio Com- munication System	-	-
4. HF Communication System	-	-
5. Installation Materials	19,210,000	-
6. Installation Work	23,746,000	456,000
7. Training (Factory & on the Job)	-	-
8. Maintenance Service (one year)	-	-
9. Sub-total (1. to 8.)	134,975,000	456,000
10. Consultancy Service	38,000,000	-
11. Basic Project Cost	172,975,000	456,000
12. Contingency	17,298,000	46,000
13. Total Project Cost	190,273,000	502,000

TABLE-7.7.1 SEDIMENT RUNOFF REDUCTION BENEFIT

Name of River	Sediment Runoff Volume (10 ³ m ³)	Allowable Sediment Volume (10 ³ m ³)	Reduction of Sediment Runoff <u>/1</u> (10 ³ m ³)	Dredging Cost <u>/4</u> (P10 ³)	Annual Benefit <u>/5</u> (P10 ³)
I) <u>Quinali (A)</u>	<u>1,807.3</u>	<u>543.2</u>	<u>1,264.1</u>	<u>50,564</u>	<u>1,011</u>
- Quirangay	260.1	82.6	177.5	7,100	142
- Tumpa	43.7	35.2	8.5	340	7
- Maninila	94.0	36.7 ^{/2}	57.3	2,292	46
- Masarawag	276.8	77.6	199.2	7,968	159
- Ogsong	140.5	32.7	107.8	4,312	86
- Nasisi	992.1	278.4 ^{/3}	713.7	28,548	571
II) <u>Yawa</u>	<u>902.2</u>	<u>213.4</u>	<u>688.8</u>	<u>27,552</u>	<u>551</u>
- Anuling	415.6	85.8	329.8	13,192	264
- Budiao	234.6	58.1	176.5	7,060	141
- Pawa-Burabod	252.0	69.5	182.5	7,300	146
Total	2,709.5	756.6	1,952.9	78,116	1,562

/1: Sediment runoff volume after the implementation of the Sabo project is reduced less than the allowable sediment volume; therefore, reduction volume of sediment for the project benefit is estimated at difference between them.

/2: For the Maninila river, the sediment runoff volume under with-project condition is reduced to 42,600 m³ which is over the allowable sediment volume; however, this excess is included in the reduction benefit because excess volume is regulated by sand retarding function of consolidation works of the Sabo project.

/3: Sediment runoff volume under with-project condition is more than the allowable sediment volume, and this excess is regulated by

the natural retarding function. Therefore, this excess volume is excluded from the reduction benefit.

4: Unit dredging cost = P40/m³

5: Dredging cost/50 years (probable flood)

TABLE-7.7.2 PROJECT BENEFIT AND COSTS
FOR THE SABO PROJECT

(Unit: ₱10³)

Item	Total
I) <u>Annual Project Benefit</u>	<u>5,064</u>
1) Mud/debris flow damage reduction benefit	<u>3,502</u>
- Crops ^{/1}	3,224
- Houses ^{/2}	174
- Indirect benefit ^{/3}	104
2) Sediment runoff reduction benefit	<u>1,562</u>
II) <u>Project Cost</u>	
1) Construction cost	<u>152,128</u>
- 1st stage	92,962
- 2nd stage	59,166
2) O & M cost	<u>949</u>
- 1st stage	580
- 2nd stage	369

/1: Total damage of crops (Quinali A and Yawa)/Return period of mud/debris flow = ₱16,120,000/5 years ÷ ₱3,224,000

/2: Total damage of houses (Quinali A and Yawa)/ 5 years = ₱869,000/5 years ÷ ₱174,000

/3: Number of population affected x cost of relief goods and medical assistance per person/5 years = 8,140 persons x ₱64/person/5 years ÷ ₱104,000

TABLE-7.7.3 BENEFIT AND COST STREAM FOR ECONOMIC
EVALUATION OF THE SABO PROJECT

(Unit: $\text{P}10^3$)

Year in Order	Project Benefit		Total	1st Stage		2nd Stage		Total
	Mud/debris Flow Damage Reduction Benefit	Sediment Runoff Reduction Benefit		Construction Cost	O & M Cost	Construction Cost	O & M Cost	
1	-	-	-	11,331	-	-	-	11,331
2	-	-	-	16,538	71	-	-	16,609
3	-	-	-	19,707	155	-	-	19,862
4	-	-	-	20,464	297	-	-	20,761
5	-	-	-	24,922	425	-	-	25,347
6	3,502	1,562	5,064	-	580	25,133	-	25,713
7	3,502	1,562	5,064	-	580	22,799	157	23,536
8	3,502	1,562	5,064	-	580	11,234	299	12,113
9	3,502	1,562	5,064	-	580	-	369	949
10	3,502	1,562	5,064	-	580	-	369	949
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50	3,502	1,562	5,064	-	580	-	369	949

TABLE-7.7.4 CASH FLOW STATEMENT FOR THE SABO PROJECT

(Unit: P10³)

Year in Order	Cash Outflow					Cash Inflow				Balance	
	Capital Cost		Loan Repayment ^{/3}		O&M Cost	Construction Fund		Government Subsidy	Total		
	F.C. ^{/1}	L.C. ^{/2}	Interest	Principal		F.C. ^{/1}	L.C. ^{/2}				
1	4,590	10,936	-	-	-	15,526	4,590	10,936	0	15,526	0
2	7,151	17,803	161	-	48	25,163	7,151	17,803	209	25,163	0
3	9,144	23,655	411	-	126	33,336	9,144	23,655	537	33,336	0
4	10,072	27,529	731	-	228	38,560	10,072	27,529	959	38,560	0
5	13,005	37,611	1,083	-	344	52,043	13,005	37,611	1,427	52,043	0
6	14,015	42,496	1,539	-	448	58,498	14,015	42,496	1,987	58,498	0
7	13,611	43,181	2,029	242	677	59,740	13,611	43,181	2,948	59,740	0
8	7,183	23,872	2,497	618	853	35,023	7,183	23,872	3,968	35,023	0
9	-	-	2,726	1,099	950	4,775	-	-	4,775	4,775	0
10	-	-	2,688	1,629	950	5,267	-	-	5,267	5,267	0
11	-	-	2,631	2,313	950	5,894	-	-	5,894	5,894	0
12	-	-	2,550	3,051	950	6,551	-	-	6,551	6,551	0
13	-	-	2,443	3,767	950	7,160	-	-	7,160	7,160	0
14	-	-	2,312	4,143	950	7,410	-	-	7,410	7,410	0
15	-	-	2,166	4,143	950	7,259	-	-	7,259	7,259	0
16	-	-	2,022	4,143	950	7,115	-	-	7,115	7,115	0
17	-	-	1,877	4,143	950	6,970	-	-	6,970	6,970	0
18	-	-	1,732	4,143	950	6,825	-	-	6,825	6,825	0
19	-	-	1,587	4,143	950	6,680	-	-	6,680	6,680	0
20	-	-	1,442	4,148	950	6,535	-	-	6,535	6,535	0
21	-	-	1,297	4,143	950	6,390	-	-	6,390	6,390	0
22	-	-	1,151	4,143	950	6,244	-	-	6,244	6,244	0
23	-	-	1,007	4,143	950	6,100	-	-	6,100	6,100	0
24	-	-	862	4,143	950	5,955	-	-	5,955	5,955	0
25	-	-	717	4,143	950	5,810	-	-	5,810	5,810	0
26	-	-	572	3,901	950	5,423	-	-	5,423	5,423	0
27	-	-	435	3,525	950	4,910	-	-	4,910	4,910	0
28	-	-	312	3,044	950	4,306	-	-	4,306	4,306	0
29	-	-	205	2,514	950	3,669	-	-	3,669	3,669	0
30	-	-	117	1,830	950	2,897	-	-	2,897	2,897	0
31	-	-	53	1,092	950	2,095	-	-	2,095	2,095	0
32	-	-	15	376	950	1,341	-	-	1,341	1,341	0
33	-	-	-	-	950	950	-	-	950	950	0

^{/1} F.C.: Foreign Currency Portion ^{/2} L.C.: Local Currency Portion
^{/3} Interest: 3.5%
Grace period: 6 years
Repayment period including grace period: 25 years

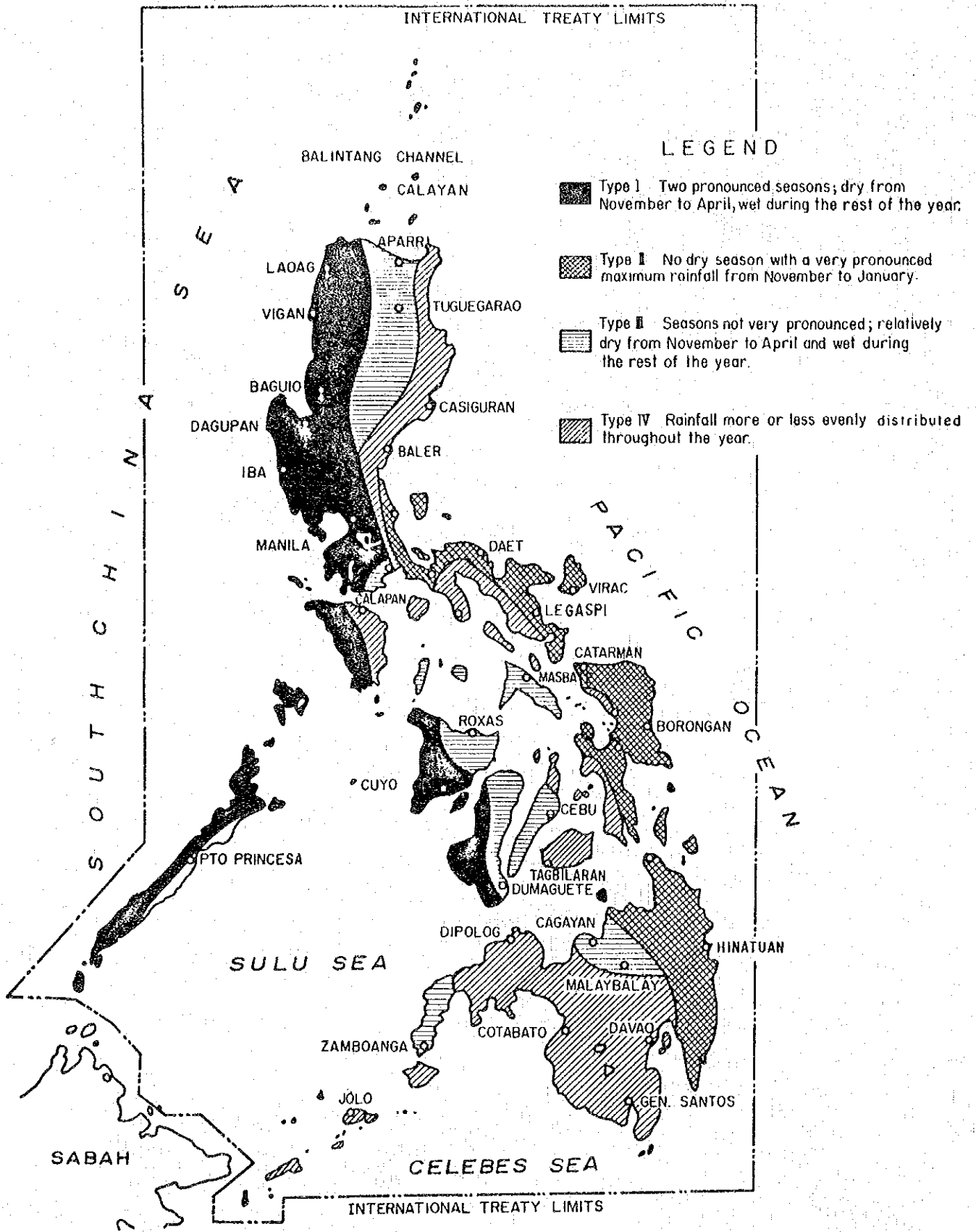
TABLE-7.7.5 CASUALTIES DUE TO MUD/DEBRIS FLOW
CAUSED BY TYPHOON "DALING"

City/Barangay	Dead	Missing	Injured	Total
Legazpi				
Mabinit	14	5	30	49
Bonga	4	-	30	34
Daraga				
Budiao	3	-	2	5
Salvacion	7	7	10	24
Banadero	1	1	3	5
Kilikao	-	-	20	20
Camalig				
Quirangay	2	-	6	8
Guinobatan				
Maninila	3	-	-	3
Muladbucad Pequeno	2	-	1	3
Ligao				
Batang	2	-	5	7
Nasisi	1	-	-	1
Total	39	13	107	159

Source: Result of field interview survey in 1982.

FIGURES

FIG.- 3.2.1 CLIMATE MAP OF THE PHILIPPINES



**FIG- 3.2.2
LOCATION MAP OF
GAGING STATIONS**

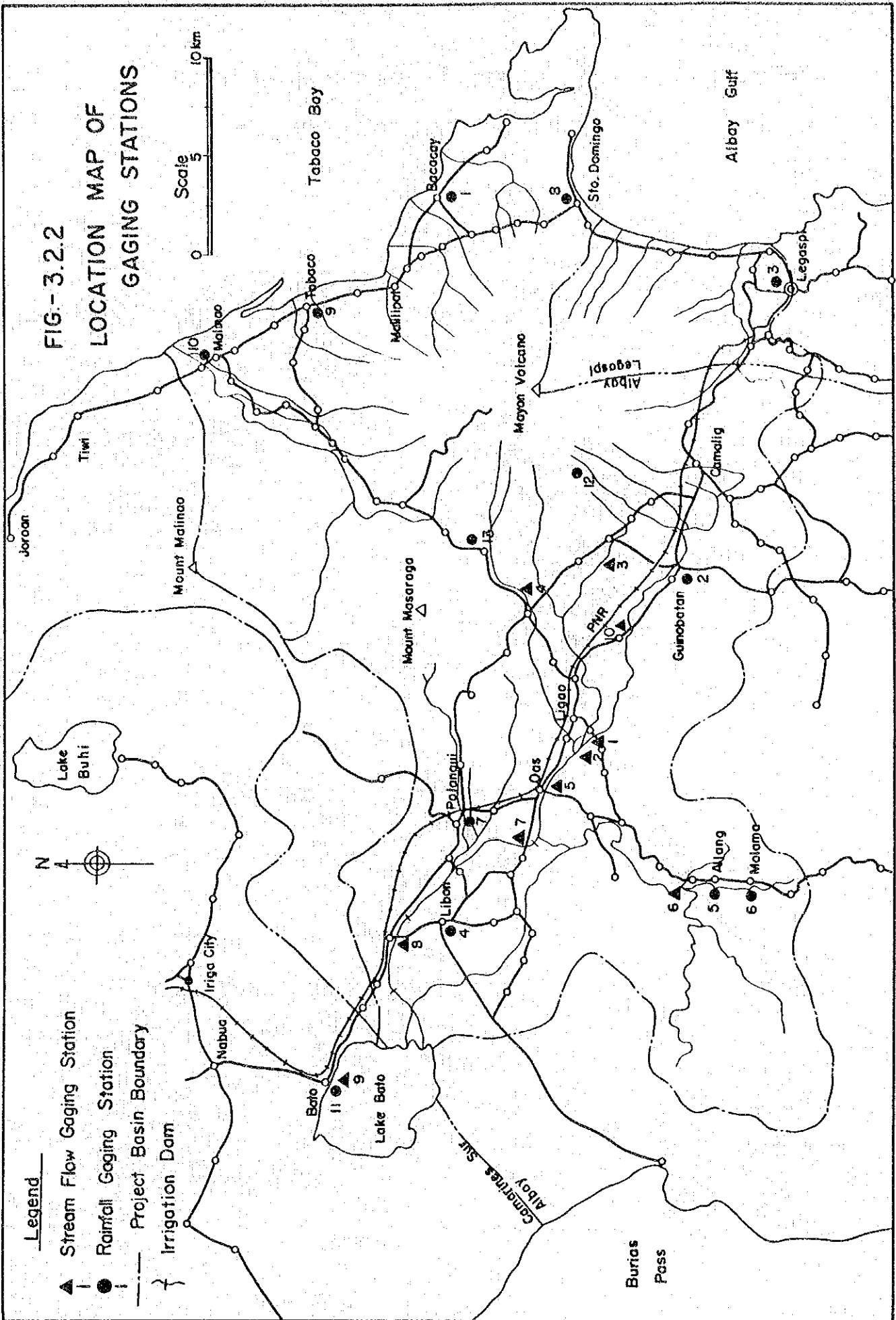


FIG.-3.2.3 LIST OF RAINFALL RECORD LENGTH

NO.	Station	Year.																														
		56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82				
1	Bacacay																															
2	Guinobatan																															
3	Legaspi																															
4	Libon																															
5	Allang																															
6	Malama																															
7	Polangui																															
8	Sto. Domingo																															
9	Tabaco																															
10	Malinao																															
11	Bato*																															
12	Masarawag**																															
13	Tambo**																															

* Station outside the project area

** Stations installed by the study team. (no longer operational)





Legend:  daily record
 6-hour record
 monthly record
 hourly record

FIG. - 3.2.4 MONTHLY TEMPERATURE RECORD

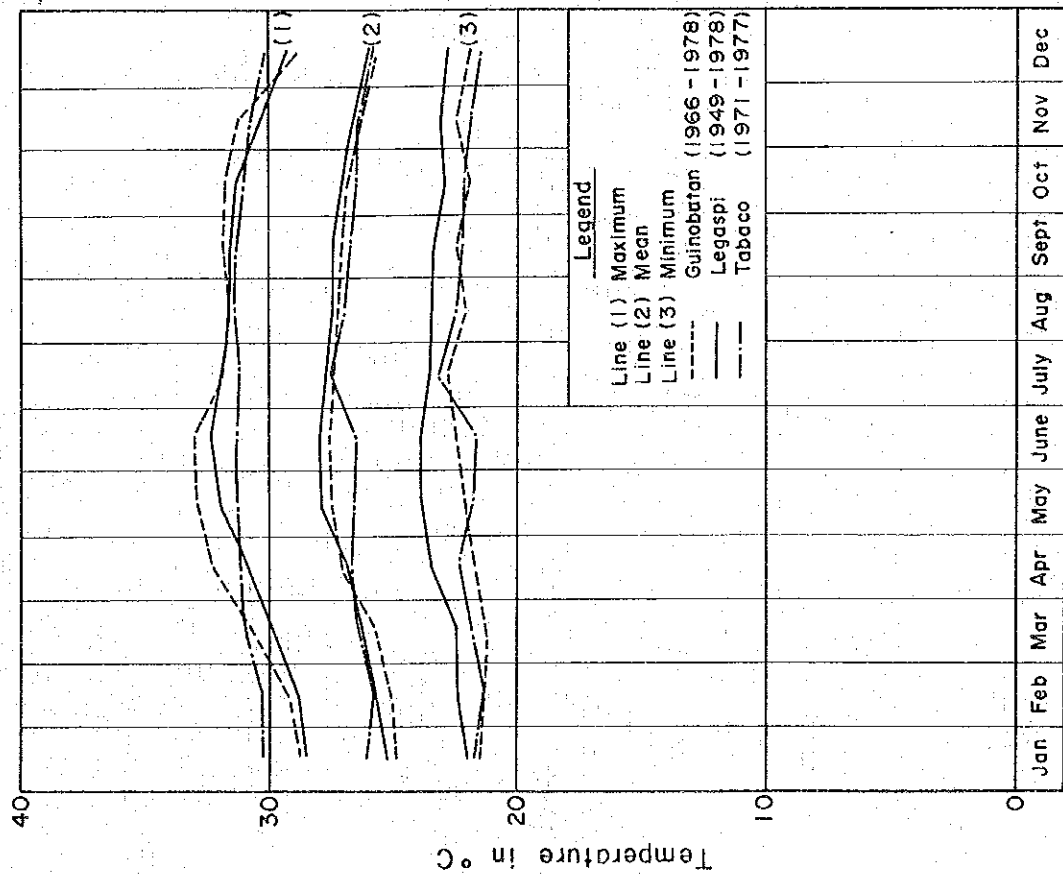


FIG. - 3.2.5 MONTHLY RELATIVE HUMIDITY AT LEGAZPI

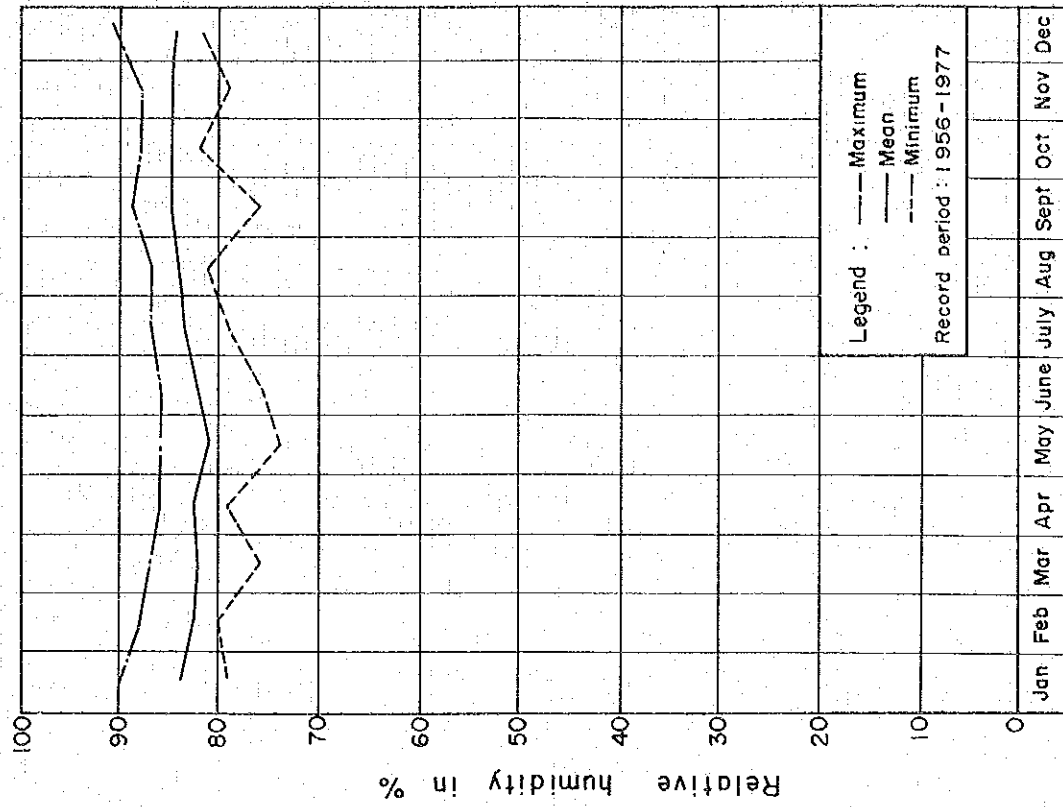


FIG. - 3.2.6 LIST OF STREAM FLOW RECORD LENGTH

NO.	Station	Year	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82				
1	Bobongsuran. San Francisco R. (131 km ²)																																		
2	Bobongsuran. Cabilogan R. (164 km ²)																																		
3	Benantuan. Ogsong River (11 km ²)																																		
4	Nasisi Nasisi River (39 km ²)	51																																	
5	Obaliw. Irrayo River (217 km ²)																																		
6	Allang. Talisay River (90 km ²)																																		
7	Busac. Quinali River (232 km ²)																																		
8	San Agustin. San Agustin R. (262 km ²)																																		
9	Poblacion. Lake Bato (874 km ²)	*																																	
10	Banao Br. San Francisco R. (91 km ²)	**																																	




* Station outside the project area
 ** Stations established by the study team. (no longer operational)
 Legend:  daily discharge record
 daily gage height record
 hourly gage height record
 All stations are located in the Quinali (A) River basin.

FIG.- 3.2.7 FLUCTUATION OF LAKE BATO SURFACE WATER LEVEL

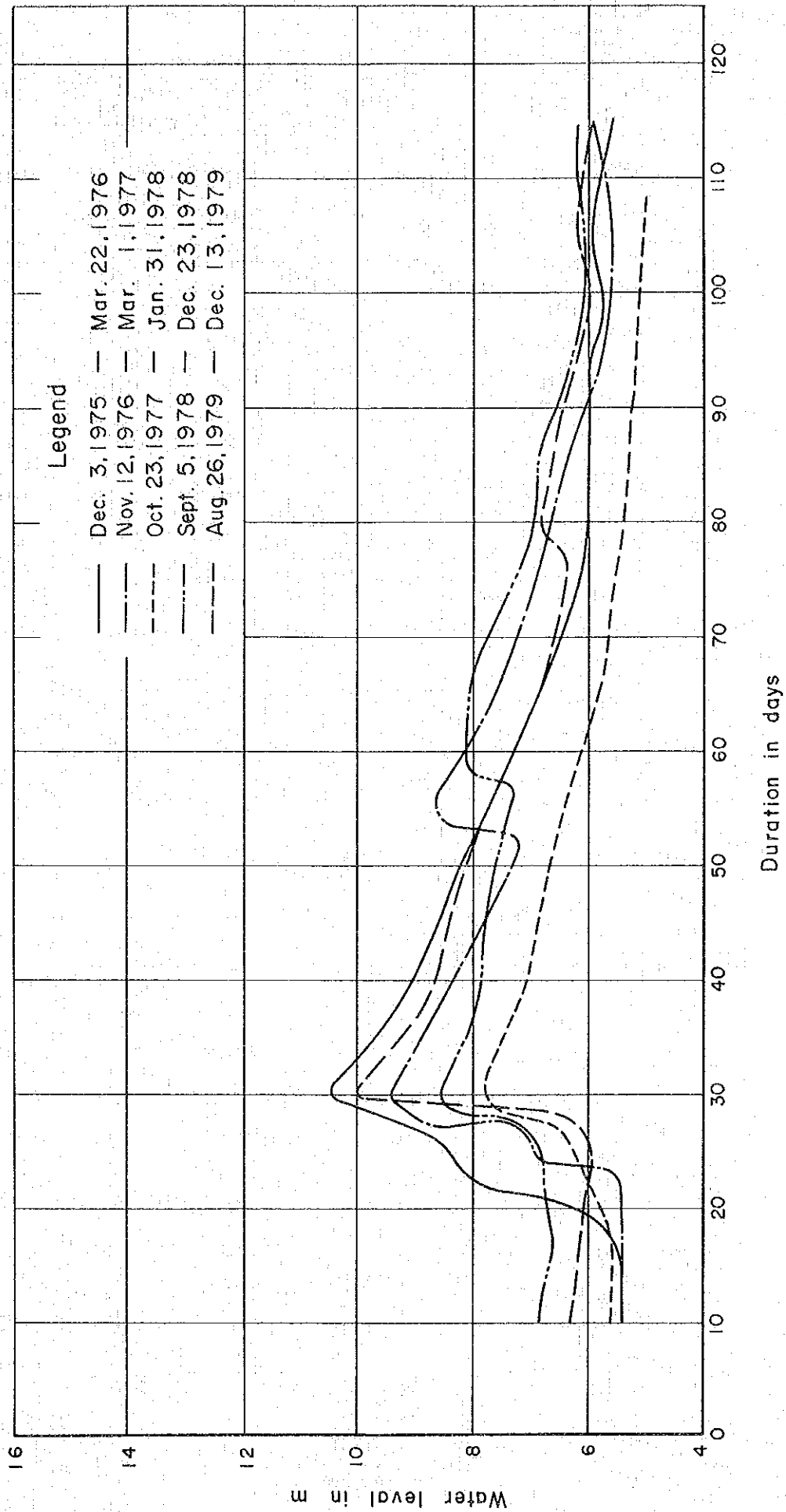


FIG.-3.3.1 LOCATION MAP OF EXISTING RIVER STRUCTURES AND RIVER CONTROL WORKS UNDERWAY

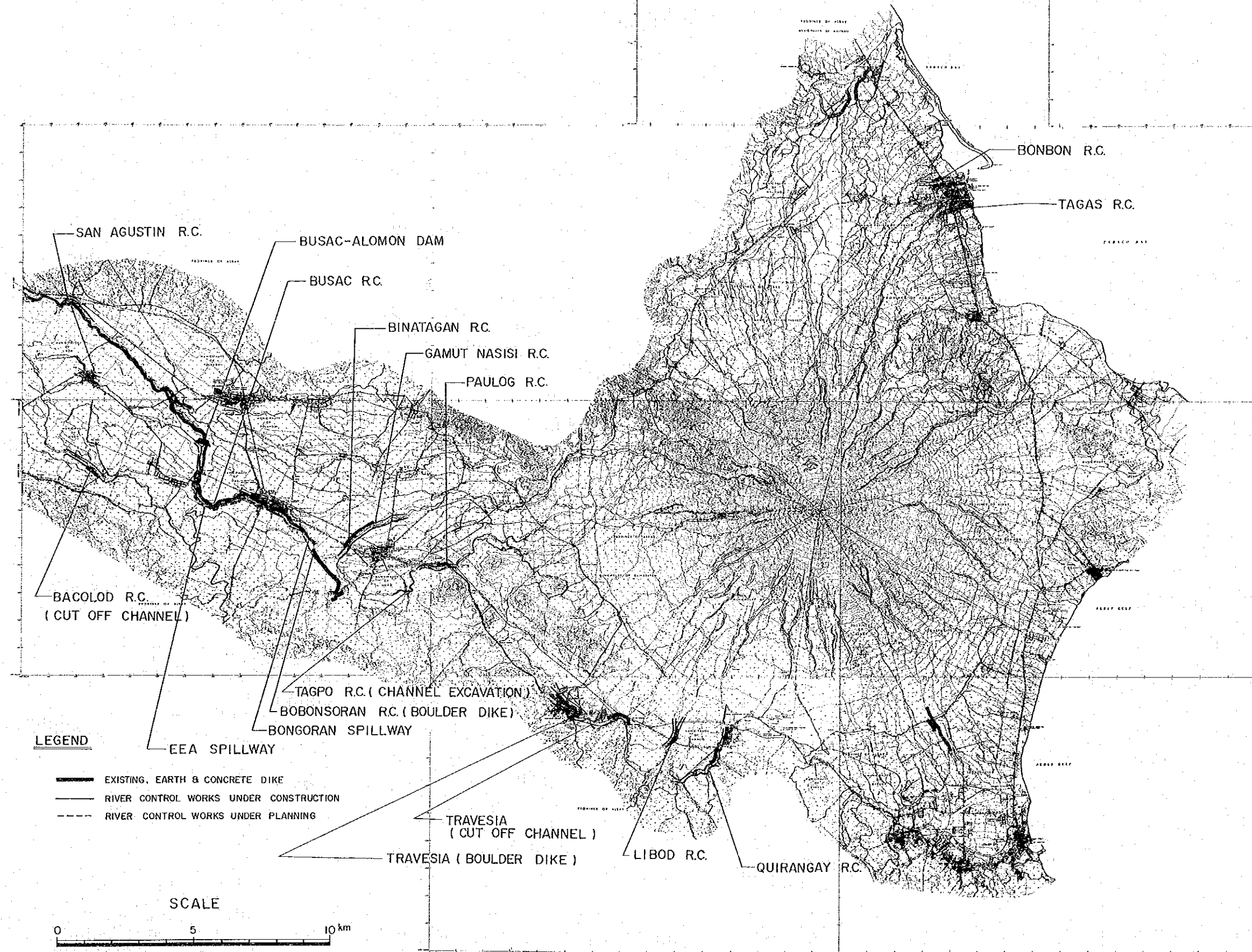
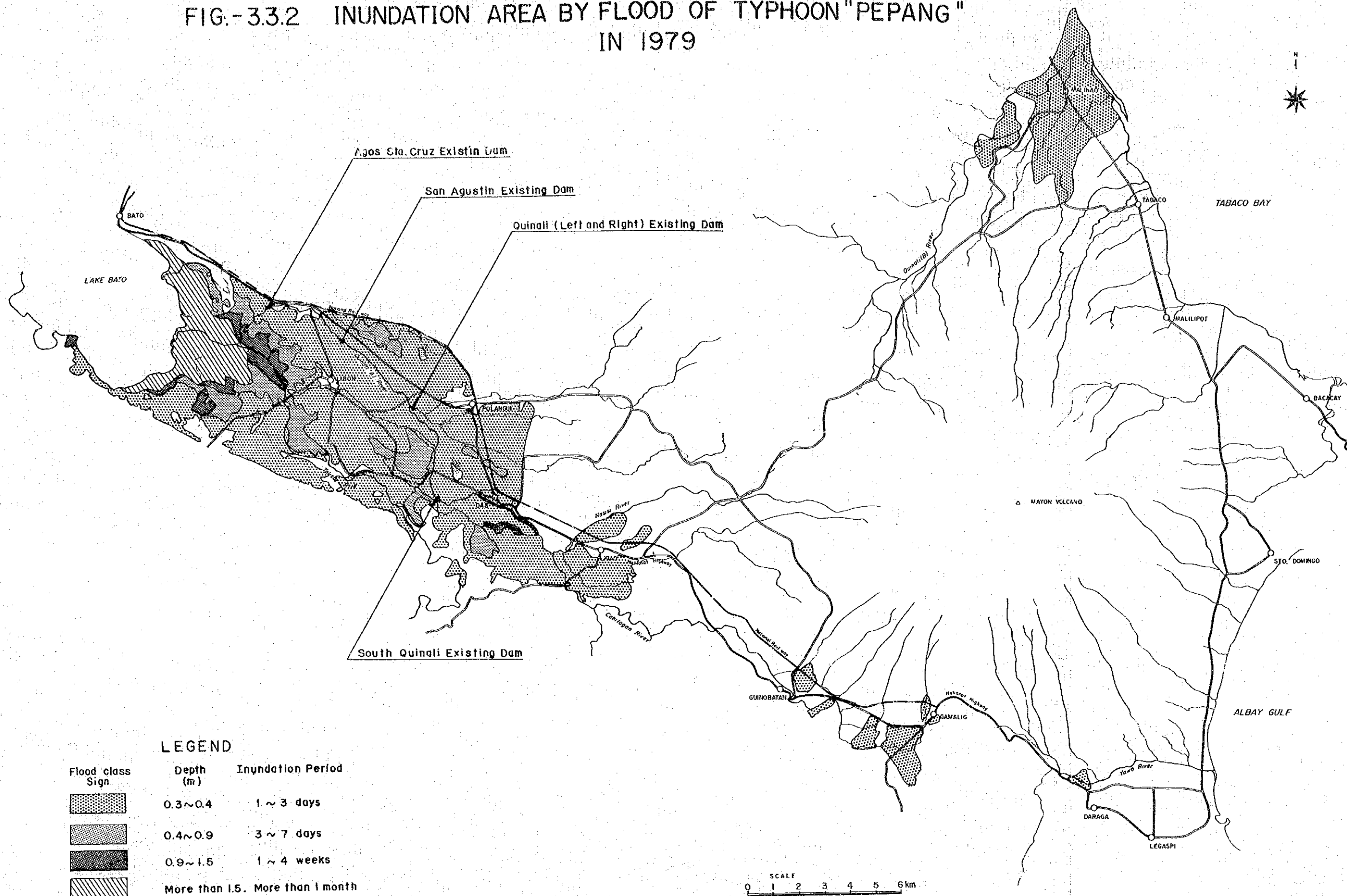


FIG.-33.2 INUNDATION AREA BY FLOOD OF TYPHOON "PEPANG" IN 1979



LEGEND

Flood class Sign	Depth (m)	Inundation Period
	0.3~0.4	1 ~ 3 days
	0.4~0.9	3 ~ 7 days
	0.9~1.5	1 ~ 4 weeks
	More than 1.5	More than 1 month

SCALE
0 1 2 3 4 5 6 km