Table 5.8 Economic Project Cost for Framework Plan

Work item	Unit	Work quantity	Unit cost (₱)	Amount (₱ mil.)	Remarks
I. CHANNEL WORKS					
1. Main Works	-	-	-	(21,124)	
Preparatory w.	l.s.	-	-	1,361	8 %
Dike embankment w.	km	482	-	7,409	
Embankment (1)	m3	102,900,000	58	5,968	
Embankment (2)	m3	13,100,000	110	1,441	High dike
Revetment w.	km	45.1	-	904	
Revetment (1)	m2	739,000	820	606	for low w. chan.
Revetment (2)	m2	488,000	610	298	for high w. chan.
Narrow excavation w.	m3	43,200,000	94	4,061	
Cut-off channel w.	km	34.5	-	3,487	
Excavation (1)	m3	52,800,000	45	2,376	for main Cagayan
Excavation (1)	m3	17,800,000	45	801	for tributarites
Revetment (3)	m2	516,000	600	310	
Bank protection w.	km	112.3	-	550	
Revetment (3)	m2	838,000	600	503	
Groyne	unit	1,880	24,900	47	
Drainage sluice w.	unit	720	626,000	451	
Bridge w.	m2	24,800	5,950	148	
Miscellaneous	l.s.	-	-	2,755	15 % of the above
2. Compensation	m2	-	-	(225)	
Dike	m2	24,600,000	5.7	140	
COC	m2	11,300,000	5.7	64	
Others	m2	3,590,000	5.7	21	10 %
3. Engineering & Adm.	-	-	-	(3,169)	
Engineering	l.s.	-	-	2,112	10 % of (1)
Administration	l.s.	-	-	1,056	5 % of (1)
4. Contingency	l.s.	-	-	(3,678)	15 % of (1+2+3)
Total	-	-	-	28,196	
II. DAM WORKS					
1. Main Works	l.s.	-	-	(4,370)	
Cagayan No.1	l.s.	-	-	991	
Alimit No.1 (A)	l.s.	-	-	1,343	
Ilagan No.1	l.s.	-	-	1,412	
Siffu No.1 (A)	l.s.	-	-	342	
Mallig No.2	l.s.	-	-	282	
2. Compensation	l.s.	-	-	(139)	
3. Engineering & Adm.	-	-	-	(656)	
Engineering	l.s.	-	-	437	10 % of (1)
Administration	l.s.	-	-	219	5 % of (1)
4. Contingency	l.s.	-	-	(1,033)	20 % of (1+2+3)
Total	-	-	-	6,198	
GRAND TOTAL	-	-	-	34,394	

Table 5.9 Principal Features of Framework Plan

1)	Channel Works	
	a) Dike embankment works:	116,000,000 m3
	b) Revetment works (45.1 km long):	1,227,000 m2
	c) Drainage sluice works:	720 units
	d) Narrow excavation works:	43,200,000 m3
	e) Cut-off channel works (34.5 km long):	70,600,000 m3
	f) Bank protection works:	112.3 km
	g) Appurtenant facility works:	3 bridges
	- Buntun bridge:	Reconstruction
	- Gamu bridge:	Reconstruction
	- Naguilian bridge:	Reconstruction

2)	Flood Control dam Works		
		(Dam height: m)	(F.C.: MCM)
	- Cagayan No.1	45.0	318
	- Alimit No.1(A)	84.0	200
	- Ilagan No.1	69.0	382
	- Siffu No.1(A)	44.0	96.1
	- Mallig No.2	43.0	93.4

3)	Compensation	
	a) Channel works:	39,490,000 m2
	b) Dam works:	113,500,000 m2
	- Cagayan No.1 dam	47,700,000 m2
	- Alimit No.1 dam	10,000,000 m2
	- Ilagan No.1 dam	29,100,000 m2
	- Siffu No.1(A) dam	14,400,000 m2
	- Mallig No.2 dam	12,300,000 m2

4)	Project Cost (Economic):	₱34,394,000,000
	a) Channel works:	₱28,196,000,000
	b) Dam works:	₱ 6,198,000,000

Table 5.10 Economic Project Cost for Long-Term Plan

Work item	Unit	Work quantity	Unit cost (₱)	Amount (₱ mil.)	Remarks
I. CHANNEL WORKS					
1. Main Works	-	-	-	(15,987)	
Preparatory w.	l.s.	-	-	1,030	8 %
Dike embankment w.	km	480	-	3,451	
Embankment (1)	m3	59,500,000	58	3,451	
Revetment w.	km	45.1	-	770	
Revetment (1)	m2	734,000	820	602	for low w. chan.
Revetment (2)	m	276,000	610	168	for high w. chan.
Narrow excavation w.	m3	43,200,000	94	4,061	
Cut-off channel w.	km	34.5	-	3,487	
Excavation (1)	m3	52,800,000	45	2,376	for main Cagayan
Excavation (1)	m3	17,800,000	45	801	for tributarites
Revetment (3)	m2	516,000	600	310	
Bank protection w.	km	112.3	-	550	
Revetment (3)	m2	838,000	600	503	
Groyne	unit	1,880	24,900	47	unit in total
Drainage sluice w.	unit	720	626,000	451	
Bridge w.	m2	17,300	5,950	103	
Miscellaneous	l.s.	-	-	2,085	15 % of the above
2. Compensation	m2	-	-	(176)	
Dike	m2	16,700,000	5.7	95	
COC	m2	11,300,000	5.7	64	
Others	m2	2,800,000	5.7	16	10 %
3. Engineering & Adm.	-	-	-	(2,398)	
Engineering	l.s.	-	-	1,599	10 % of (1)
Administration	l.s.	-	-	799	5 % of (1)
4. Contingency	l.s.	-	-	(2,784)	15 % of (1+2+3)
Total	-	-	-	21,345	
II. DAM WORKS					
1. Main Works	l.s.	-	-	(4,370)	
Cagayan No.1	l.s.	-	-	991	
Alimit No.1 (A)	l.s.	-	-	1,343	
Ilagan No.1	l.s.	-	-	1,412	
Siffu No.1 (A)	l.s.	-	-	342	
Mallig No.2	l.s.	-	-	282	
2. Compensation	l.s.	-	-	(139)	
3. Engineering & Adm.	-	-	-	(656)	
Engineering	l.s.	-	-	437	10 % of (1)
Administration	l.s.	-	-	219	5 % of (1)
4. Contingency	l.s.	-	-	(1,033)	20 % of (1+2+3)
Total	-	-	-	6,198	
GRAND TOTAL	-	-	-	27,543	

Table 5.11 Probable Flood Discharges (Long-Term Plan)

(Without Project) (m3/s)

Stretch	Return Period (year)					
	2	5	10	25	50	100
1	6,300	10,000	12,100	15,900	18,300	21,600
2	6,400	11,000	13,700	18,700	22,000	26,600
3	6,100	10,300	12,900	17,800	21,100	25,600
4	5,400	9,400	11,700	16,300	19,500	23,900
5	3,300	6,000	7,400	10,700	13,400	16,000
6	2,000	3,000	3,800	5,200	7,500	8,700
7	1,200	1,600	2,000	2,700	3,000	3,300
8	2,000	3,400	4,700	6,700	7,600	9,400
9	2,700	4,500	6,000	7,200	9,500	10,600

(With Improved Narrows and Dams) (m3/s)

Stretch	Return Period (year)					
	2	5	10	25	50	100
1	6,200	9,700	11,600	15,100	17,500	20,700
2	6,500	10,400	12,700	17,100	20,200	24,500
3	6,100	9,800	12,000	16,300	19,400	23,700
4	5,400	8,900	11,000	15,100	18,100	22,200
5	3,100	5,500	6,700	9,800	12,300	14,700
6	2,000	3,000	3,800	5,200	7,500	8,700
7	1,200	1,600	2,000	2,700	3,000	3,200
8	1,800	2,800	3,700	5,700	6,500	8,200
9	2,500	4,000	5,300	6,400	8,300	9,300

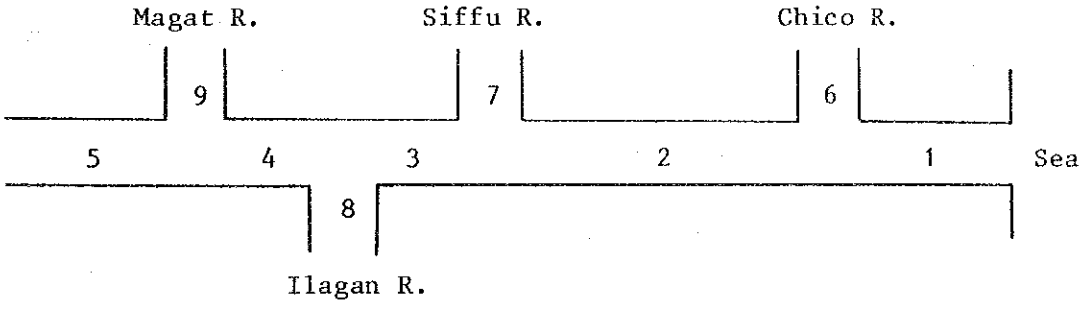

Table 5.12 Probable Flood Damage (Long-Term Plan)

(Unit: ₱ 10^6)

Item	2 year	5 year	10 year	25 year	50 year	100 year
(Without Project: Constant Property Condition)						
Buildings	1,754	3,000	3,863	5,161	5,809	6,402
Agricultural crops	130	231	286	347	380	424
Livestocks	16	29	36	44	48	53
Infrastructure	1,508	2,580	3,322	4,438	4,996	5,506
Sub-total	3,408	5,840	7,507	9,990	11,233	12,385
Indirect damages	170	292	375	500	562	619
Total damages	3,578	6,132	7,882	10,490	11,795	13,004
(With Improved Narrows and Dams: Constant Property Condition)						
Buildings	1,529	2,542	3,176	4,264	5,063	5,785
Agricultural crops	99	192	242	305	341	384
Livestocks	12	24	30	38	43	48
Infrastructure	1,315	2,186	2,731	3,667	4,354	4,975
Sub-total	2,955	4,944	6,179	8,274	9,801	11,192
Indirect damages	148	247	309	414	490	560
Total damages	3,103	5,191	6,489	8,688	10,291	11,752

Table 5.13 Principal Features of Long-Term Plan

1)	Channel Works		
	a) Dike embankment works:		59,500,000 m3
	b) Revetment works (45.1 km long):		1,010,000 m2
	c) Drainage sluice works:		720 units
	d) Narrow excavation works:		43,200,000 m3
	e) Cut-off channel works (34.5 km long):		70,600,000 m3
	f) Bank protection works:		112.3 km
	g) Appurtenant facility works:		3 bridges
	- Buntun bridge:		Reconstruction
	- Gamu bridge:		Extension
	- Naguilian bridge:		Extension
2)	Flood Control dam Works	(Dam height: m)	(F.C.: MCM)
	- Cagayan No.1	45.0	318
	- Alimit No.1(A)	84.0	200
	- Ilagan No.1	69.0	382
	- Siffu No.1(A)	44.0	96.1
	- Mallig No.2	43.0	93.4
3)	Compensation		
	a) Channel works:		30,800,000 m2
	b) Dam works:		113,500,000 m2
	- Cagayan No.1 dam		47,700,000 m2
	- Alimit No.1 dam		10,000,000 m2
	- Ilagan No.1 dam		29,100,000 m2
	- Siffu No.1(A) dam		14,400,000 m2
	- Mallig No.2 dam		12,300,000 m2
4)	Project Cost (Economic):		₱27,543,000,000
	a) Channel works:		₱21,345,000,000
	b) Dam works:		₱ 6,198,000,000
5)	Economic Evaluation	(Const. propertry)	(Vari. property)
	a) Benefit (₱ mil./yr)	1,637.0	3,834.1 /1
	- Flood reduction	1,564.0	3,698.6 /1
	- Bank protection	73.0	135.5
	b) IRR (%)	4.8	14.2

/1 Annual benefit for variable property: as of 2005

Table 5.14 Economic Viability of Candidate Schemes for Master Plan

Sub-project	Cost (₱ mil.)		Constant Prop. C.		Variable Prop. C.		Rank
	Const.	Total O & M	Total B (mil.)	IRR (%)	Total B (mil.)	IRR (%)	
Tuguegarao dike	500.6	117.5	2,867.0	11.6	13,718.2	23.1	1
Cabagan dike	276.9	65.1	817.8	5.3	3,865.1	13.6	4
Narrow imp. (Site-NLL)	900.1	211.5	4,065.5	8.9	19,135.6	18.9	2
- do - (Site-NLR)	2,717.4	638.6	7,919.5	5.2	37,453.6	13.5	5
- do - (Site-NUP)	3,072.5	722.0	230.3	-	1,089.8	-	11
Cagayan No.1 dam	1,487.0	334.6	3,616.7	3.8	17,655.8	11.6	8
Magat/Alimit dam	1,852.8	416.9	5,507.6	5.1	26,389.5	13.1	6
Ilagan No.1 dam	1,964.8	442.1	1,760.9	-	8,636.8	5.4	10
Siffu No.1 (A) dam	489.7	110.2	1,452.6	5.1	6,632.0	12.8	7
Mallig No.2 dam	402.2	90.5	752.0	2.2	3,417.3	9.3	9
Bank protection	903.4	212.3	3,431.0	7.3	10,620.5	13.7	3

Note : 1. Constant and variable Prop. C. denote total benefit and IRR under the constant and variable property conditions of basin during project life of 50 years.
2. Regarding dam projects, single purpose for flood control is assumed.

Table 6.1 Present Agricultural Situation of the Basin

Item	Unit	Country	Basin	Share (%)
I. Population (1985)				
1) Total	10^3	54,668	2,136	3.9
2) Rural Population	10^3	32,847	1,733	5.3
3) Share of the above in total	%	60.1	81.1	-
4) Total Labor Force	10^3	16,110	611	3.8
5) Agricultural Labor Force /1				
- Agriculture	10^3	7,095	416	5.9
- Forestry	10^3	771	7	0.9
- Fishery	10^3	80	9	11.3
- Others	10^3	1	-	-
Total	10^3	7,947	432	5.4
6) Share of the above in total	%	49.3	70.7	-
II. G D P (1985 at 1972 constant price)				
1) Total	₱10^6	90,469	1,650	1.8
2) Contribution to GDP	₱10^6			
- Agriculture	₱10^6	16,336	631	3.9
(Paddy)	₱10^6	(4,370)	(430)	(9.8)
(Corn)	₱10^6	(1,539)	(84)	(5.5)
(Others)	₱10^6	(10,427)	(117)	(1.1)
- Livestock	₱10^6	4,974	77	1.5
- Fishery	₱10^6	4,224	7	0.2
- Forestry	₱10^6	702	147	20.9
Total		26,236	862	3.3
3) Share of the above in total GDP	%	29.0	52.2	-
4) Agricultural Labor productivity /2	₱	3,004	1,702	56.7
III. Land Use				
1) Total Area	Km^2	300,000	27,300	9.1
2) Forestry		111,330	11,500	10.3
3) Grassland (idle)		81,000	10,000	12.3
4) Agricultural Land				
- Temporary crops	Km^2	44,880	3,773	8.4
- Permanent crops	Km^2	33,130	270	0.8
- Pasture	Km^2	6,100	1,269	20.8
- Others	Km^2	6,230	27	0.4
Total		90,340	5,339	5.9
5) Share of the above in total area		30.1	19.6	-

Item	Unit	Country	Basin	Share (%)
IV. Agricultural Production (1982-84 Average)				
1) Harvested Area				
- Palay	10^3 ha	3,268	352	10.8
- Corn	10^3 ha	3,263	301	9.2
- Peanut	10^3 ha	50	25	50.0
- Sugar cane	10^3 ha	458	10	2.2
- Tobacco	10^3 ha	59	16	27.1
- Coconut	10^3 ha	3,189	7	0.2
- Others	10^3 ha	1,581	41	2.6
Total		11,868	752	6.3
2) Production				
- Palay	10^3 ton	7,898	837	10.6
- Corn	10^3 ton	3,254	256	7.9
- Peanut	10^3 ton	42	18	42.9
- Sugar cane	10^3 ton	458	10	2.2
- Tobacco	10^3 ton	53	12	22.6
- Coconut	10^3 ton	3,403	23	0.7
- Others	10^3 ton	13,105	201	1.5
Total		28,213	1,357	4.8
3) Value (Current price)				
- Palay	10^6 ₱	12,319	1,290	10.5
- Corn	10^6 ₱	4,367	402	9.2
- Peanut	10^6 ₱	307	94	30.6
- Sugar cane	10^6 ₱	8,417	115	1.4
- Tobacco	10^6 ₱	520	123	23.7
- Coconut	10^6 ₱	7,192	29	0.4
- Others	10^6 ₱	14,688	274	1.9
Total		47,810	2,327	4.9
4) Yield				
- Palay	ton/ha	2.41	2.38	98.8
- Corn	ton/ha	1.00	0.85	85.0
- Peanut	ton/ha	0.84	0.74	88.1
- Sugar cane	ton/ha	7.35	4.56	62.0
- Tabacco	ton/ha	0.88	0.71	80.7
- Cocount	ton/ha	1.07	3.29	307.5

Notes: /1: Gainful workers 15 years old and over
/2: GDP of Agriculture and Livestock divided by Agricultural Labor force of Agriculture

Source: BAECON, NEDA

Table 6.2 Present Agricultural Production in the Basin (1985)

A. Crop Production

Crops	Physical Area (10^3 ha) /2	Cropping Intensity (%) /2	Harvested Area (10^3 ha) /2	Average Yield (ton/ha) /2	Production (10^3 ton) /2
1) Palay - Irrigated	146.7 /1	180	264.1	2.63	694
Rainfed	100.3	100	100.3	2.23	224
(Total)	247.0		364.4		918
2) Corn - Diversified Area	102.0	200	204.0	0.94	192
After rainfed Paddy	20.0	100	20.0	0.94	19
(Total)	122.0		224.0		211
3) Peanut	-	-	23.7	0.74	18
4) Tobacco	14.2	100	14.2	0.64	9
5) Sugar cane	10.0	100	10.0	39.20	392
6) Root Crops (Sweet Potato)	4.1	175	7.2	4.76	34
7) Vegetables	-	-	4.4	4.02	18
8) Beans	-	-	2.5	0.34	1
9) Fruit & Nuts	14.4	100	14.4	4.80	69
10) Coffee	6.5	100	6.5	0.37	2
11) Coconut	4.1	100	4.1	2.12	9
12) Others	2.0	100	2.0	3.00	6
Crops Total	404.3 /3				

B. Livestock Production

Unit: 10^3 head

Livestock, Poultry & Dairy Product	Total Population	Annual Change in No. of Head (1984/85)	No. of Slaughtered	Annual Production
1) Carabao	344	10	28	38
2) Cattle	128	4	9	13
3) Hog	454	16	276	292
4) Goat	47	2	5	7
5) Chicken & Duck	3,023	105	7,317	7,422
6) Egg	-	-	-	6.55 (10^3ton)
7) Milk	-	-	-	472 (10^3ℓ)

C. Fishery Production

	Area (ha)	Unit Yield (t/ha)	Production (ton)
Total Fishery Product	2,725	0.57	1,547

D. Forestry Production

	Area (km^2)	Logwood Production (10^3 m^3)
Total Forestry Product	11,500	715

Source: /1 : Actually cultivated area under irrigation during wet season.
/2 : Estimated based on data from BAECON Statistics Division, MAF, RIARS in Ilagan, NEDA Region II and field inspection survey.
/3 : Excluding corn area after rainfed paddy cultivation.

Table 6.3 Number of Livestock and Poultry in the Basin (1985)

(Unit: head)

Province	Carabao	Cattle	Hog	Goat	Poultry	Duck
Cagayan	147,690	22,030	155,960	9,910	653,560	58,030
- Backyard	147,310	17,070	154,270	9,510	648,060	54,180
- Commercial	380	4,960	1,690	400	5,500	3,850
Ifugao	10,150	13,350	34,890	5,230	315,590	3,980
- Backyard	9,840	4,570	34,720	2,670	313,990	3,980
- Commercial	310	8,780	170	2,560	1,600	-
Isabela	102,640	41,410	138,650	9,860	1,028,250	116,650
- Backyard	102,640	28,610	118,400	9,530	950,300	109,950
- Commercial	-	12,800	20,250	330	77,950	6,700
Kalinga Apayao	33,120	18,900	31,310	3,750	129,380	41,180
- Backyard	32,870	10,030	30,250	3,750	127,130	40,580
- Commercial	250	8,870	1,060	-	2,250	600
Nueva Vizcaya	20,890	15,630	42,610	9,920	300,980	51,120
- Backyard	20,890	8,620	39,810	9,600	266,680	49,430
- Commercial	-	7,010	2,800	320	34,300	1,690
Quirino	15,170	7,820	26,580	6,670	170,650	22,710
- Backyard	15,170	4,630	26,500	6,580	170,650	21,650
- Commercial	-	3,190	80	90	-	1,060
Mt. Province	13,200	8,090	22,550	860	121,300	8,130
- Backyard	13,140	7,800	22,500	860	121,300	8,130
- Commercial	60	290	50	-	-	-
Aurora	440	370	1,250	500	790	600
- Backyard	440	370	1,250	500	790	600
- Commercial	-	-	-	-	-	-
Total	343,300	127,600	453,800	46,700	2,720,500	302,400
- Backyard	342,300	81,700	427,700	43,000	2,598,900	288,500
- Commercial	1,000	45,900	26,100	3,700	121,600	13,900

Source: BAECON

Table 6.4 National Irrigation System/Project

Name of System/Project	Service Area(ha)	Time Completed
1. Existing System	131,480	
(1) Dummun River Irrigation System	2,070	Dec. 1982
(2) Zinundungan River Irrigation System	1,760	Jun. 1983
(3) Baggao Irrigation System	1,812	Jun. 1983
(4) Solana-Tuguegarao Irrigation System	3,143	Dec. 1979
(5) Pinacanauan River Irrigation System	1,200	1980
(6) Tumauini Irrigation System	3,987	Dec. 1983
(7) Chico River Irrigation System, Stage-I	20,108	Jun. 1986
(8) Magat River Integrated Irrigation System	97,400	Jun. 1986
2. On-going Project	19,317	Anticipated Completion Time
(1) San Pablo-Cabagan Irrigation Project	2,890	May 1986
(2) Mallig River Irrigation Project	2,427	Jun. 1986
(3) Cagayan Integrated Agricultural Development Project	14,000	Dec. 1988
Total	150,797	

Table 6.5 Irrigated Area of Existing NIS

Name of System	Service Area (ha)	Irrigated Area (ha)									
		1985		1984		1983		1982		1981	
		WS	DS	WS	DS	WS	DS	WS	DS	WS	DS
1. Zinundungan RIS	1,760	1,726	1,713	1,700	2,173	1,754 /2	787 /2	1,247 /2	1,647 /2	1,249 /2	853 /2
2. Dummun RIS	2,070	1,444	1,370	1,460	1,374	1,460	379	1,441	1,287	1,426	1,292
3. Baggao IS	1,812	1,306	1,051	1,280	964	1,441 /2	451 /2	1,284 /2	688 /2	1,307 /2	912 /2
- Paranan Area	1,263	848	605	791	537	955	329	835	501	925	491
- Pared Area	549	458	446	489	427	486	122	449	187	382	421
4. Pinacanauan RIS	1,200	290	292	319	279	275	279	220	240	222	221
5. Solana - Tuguegarao IS	3,143	-	958	907	972	1,200	1,095	325	551	-	-
- Solana Area	2,829	0	958	907	972	1,106	1,095	210	449	-	-
- Tuguegarao Area	314	-	-	-	-	94	-	115	102	-	-
6. Tumauini IS	3,987	1,447	1,279	1,879	1,872	1,432	302	1,814 /2	1,470 /2	1,965 /2	1,724 /2

/1: Magat Integrated Irrigation System and Chico River Irrigation System are not presented because these are just completed in 1987.

/2: under construction (pertial operation)

Source: NIA Regional Office

Table 6.6 Average Irrigated Area/1 of Existing NIS

Name of NIS	Service Area (ha)	Wet Season Crop		Dry SEason Crop		Annual	
		Irrigated Area (ha)	Ratio of Irrigated Area	Irrigated Area (ha)	Ratio of Irrigated Area	Irrigated Area (ha)	Ratio of Irrigated Area
1. Dummun RIS	2,070	1,446	0.70	1,140	0.55	2,586	1.25
2. Zinundungan RIS	1,760	1,713	0.97	1,943/3	1.10	3,656	2.07
3. Baggo IS	1,812	1,293	0.71	1,008	0.56	2,301	1.27
4. Solana-Tuguegarao IS/2	3,143	486	0.15	715	0.23	1,201	0.38
5. Pinacanauan RIS	1,200	265	0.22	262	0.22	528	0.44
6. Tumauini IS	3,987	1,586	0.40	1,151	0.29	2,737	0.69
Total	13,972	6,789	0.49	6,219	0.45	13,008	0.93

/1: Average for recent five (5) years or after completion of the system. And Magat IIS and Chico RIS are not presented because these are just completed in 1987.

/2: Pump irrigation system

/3: Including third crop

Table 6.7 Communal Irrigation Systems

	Name of Province	No. of System	Service Area(ha)	Ratio of Irrigated Area		
				Wet Season	Dry Season	Annual
1.	Cagayan	37	6,347	0.91	0.98	1.89
2.	Kalinga-Apayao	103	5,998	0.59	0.42	1.01
3.	Isabela	34	5,560	0.89	0.18	1.07
4.	Ifugao	170	6,473	0.43	0.52	0.95
5.	Nueva Vizcaya	233	25,871	0.87	0.78	1.65
6.	Quirino	36	4,871	0.31	0.27	0.58
7.	Mountain	543	3,170	0.68	0.97	1.65
	Total	1,156	58,290	0.73	0.63	1.36

Table 6.8 Pump Irrigation Systems

	Name of Province	Number of PIS	Service Area (ha)
1.	Cagayan	11	788
2.	Kalinga-Apayao	1	30
3.	Isabela	21	1,652
4.	Ifugao	3	130
5.	Nueva Vizcaya	1	32
6.	Quirino	3	210
7.	Mountain	0	-
	Total	40	2,842

Table 6.9 Private Pump Irrigation Systems

	Name of Province	Pump Issued System		Operation System	
		No. of System	Service Area(ha)	No. of System	Irrigated Area (ha)
1.	Cagayan	889	7,802	456	3,783
2.	Kalinga-Apayao	236	1,741	92	419
3.	Isabela	1,791	17,375	962	4,800
4.	Ifugao	112	708	75	568
5.	Nueva Vizcaya	162	1,996	146	1,849
6.	Quirino	171	1,220	90	629
7.	Mountain	4	30	4	30
	Total	3,365	30,872	1,825	12,078

Table 6.10 Soil and Land Classification

(Unit: Km^2)

Land Categories	Soil Series	Textural Class	Land Capability Class	Areas
1. Tidal Swamp		undifferentiated		170
2. Recent River Terraces	Agustin	sandy loam	R6/U3sf	27
	San Manuel	sandy loam	R6/U3sf	152
	San Manuel	fine sandy loam	R3sf/U2sf	93
	San Manuel	silt loam	R3sf/U2sf	75
	Cauayan	fine sandy loam	R3sf/U2sf	133
		sub-total		480
3. Alluvial Terraces	Toran	clay	R1/U3df	46
	Bigaa	clay	R1/U3df	820
	Bantog	clay	R1/U3df	37
	Bantog	clay loam	R1/U2d	77
	Pada-pada	clay	R1/U3df	29
	Tagulod	clay	R1/U3df	321
	Tagulod	clay loam	R1/U2d	1,130
	Cauayan	clay loam	R1/U2d	815
	Quingua	clay loam	R2s/U1	55
		sub-total		3,330
4. River cut plain Piedmont	Quingua	clay loam	R2s/U1	167
	Quingua	silty clay loam	R2s/U1	172
	Quingua	silt loam	R2s/U1	132
	Rugao	clay loam	R2t/U1	87
	Bago	sandy clay loam	R4st/U3st	401
	Guibalaon	clay loam	R3st/U2st	39
	Nambaran	clay loam	R3st/U2st	42
	Maligaya	clay loam	R3st/U2st	75
	Umingan	loam	R3st/U2st	45
		sub-total		1,160
5. Hill Slopes	Alaminos	clay loam	R6/U3ste	1,960
	Alaminos	sandy clay loam	R6/U4ste	330
	Cauayan	clay loam	R6/U3ste	120
	Bolinao	clay loam	R6/U3ste	152
	Ilagan	sandy clay loam	R6/U4ste	2,377
	Guimbalaon	clay loam	R6/U3ste	555
	Guimbalaon	clay loam gravelly	R6/U4ste	482
	Rugao	clay loam	R6/U3ste	662
	Bauang	clay loam	R6/U3ste	367
	Aroman	clay loam	R6/U3ste	60
	Alimodian	clay loam	R6/U3ste	105
		sub-total		7,270
6. Mountainside		undifferentiated		14,890
		Total		27,300

Note: Land Capability Classifications

R - Rice
U - Upland Crops

1 - Highly suitable
2 - Moderately suitable
3.- Marginally suitable
4 - Limited arable
6 - Not arable

Limitations
1. s - soils
2. t - topography
3. d - drainage
4. f - flood
5. e - erosion

Source: Soil description for soil series, BF in Manila
Soil map prepared by consultants

Table 6.11 Estimate of Potential Maximum Agricultural Production (GVA)

	1985			Future		
	Physical Area (10^3ha)	GVA per ha (₱/ha)	Total GVA (10^3) /1	Physical Area (10^3ha)	GVA per ha (₱/ha)	Total GVA (10^3₱)
Lowland						
1. Paddy Field	247	1,780	439	311	3,560	1,107
(Paddy)			(430)			
(Corn)			(9)			
2. Corn Field	102	1,180	120	137	2,360	323
(Corn)			(85)			
(Peanut, Vegetables, & Beans)			(35)			
3. Other Annual Crop Land (Tobacco, Sugarcane, & Root Crops)	28	1,250	35	28	2,500	70
4. Grassland (idle)	99	-	-	-	-	-
(Total)	476		594	476		1,500
Upland						
1. Permanent Crop Land (Fruits & Nuts, Coffee, Coconut & Others)	27	1,370	37	200	2,740	548
2. Pasture Land	127	610	77/2	300	1,220	366
3. Grassland (idle)	450			104	-	-
(Total)	604		114	604		914
T o t a l	1,080		708	1,080		2,414

Note: /1 : See Table 2.7.2
/2 : Total GVA of livestock

Table 6.12 Candidate Schemes for Irrigation Development

Name of Scheme	Project Area (ha, Net) New Area	Existing Irrigation Area	Total	Water Source	Irrigation System
1. New Irrigation Scheme					
(1) Chico Mallig Irrigation Project, Stage II	29,100	2,100	31,200	Chico R.	Gravity
(2) Matuno River Development Project	3,450	9,230	12,680	Matuno R.	Gravity
(3) Dabubu River Irrigation Project	1,000	-	1,000	Dabubu R.	Gravity
(4) Zinundungan Irrigation Extension Project	1,600	150	1,750	Zinundungan R.	Gravity
(5) Alcala Amulung West Irrigation Project	6,750	-	6,750	Cagayan R.	Pump
(6) Tuguegarao Irrigation Project	1,400	-	1,400	Tuguegarao R.	Pump
(7) Lulutan Irrigation Project	2,950	-	2,950	Cagayan R.	Pump
(8) Ilagan Irrigation Project	3,140	60	3,200	Ilagan R.	Pump
(9) Gappal Irrigation Project	4,400	-	4,400	Cagayan R.	Pump
T o t a l	53,790	11,540	65,330		
2. Rehabilitation/Improvement Scheme					
(1) Dummun River Irrigation System	-	2,070	2,070	Dummun R.	Gravity
(2) Baggao Irrigation System	-	1,812	1,812	Pared & Paranan R.	Gravity
(3) Solana-Tuguegarao Irrigation System	-	3,143	3,143	Cagayan R.	Pump
(4) Pinacanauan Irrigation System	-	1,200	1,200	Tuguegarao R.	Gravity
(5) Tumauini Irrigation System	-	3,987	3,987	Pinacanauan R.	Gravity
T o t a l		12,212	12,212		

Table 6.13 Soil Classification and Present Land Use in New Irrigation Schemes

(Unit: ha)

Description / Name of Scheme	Zinundungan Extension	Alcala-Amulung West	Tuguegarao	Lulutan	Ilagan	Gappal	Dabubu	Chico Mallig	Matuno	Total
1. Irrigation Area	1,750	6,750	1,400	2,950	3,200	4,400	1,000	31,200	12,680	65,330
2. Soil Classification										
(1) Tagulod Clay Loam	1,450	3,360	380	2,270	-	2,640	-	12,800	-	22,900
(2) Tagulod Clay	-	-	-	-	-	660	-	-	-	660
(3) Quingua Silty Clay Loam	-	850	-	-	2,400	750	-	640	-	4,640
(4) Quingua Clay Loam	300	680	220	500	240	350	-	-	-	2,290
(5) Quingua Silty Loam	-	-	-	-	560	-	-	1,600	-	2,160
(6) San Manuel Silty Loam	-	470	620	180	-	-	-	-	1,600	2,870
(7) San Manuel Sandy Loam	-	670	-	-	-	-	-	-	-	670
(8) Bontog Clay	-	720	-	-	-	-	-	-	-	720
(9) Carig Sandy Clay Loam	-	-	90	-	-	-	-	6,160	-	6,250
(10) Cauayan Sandy Loam	-	-	-	-	-	-	1,000	-	-	1,000
(11) Bigaa Clay	-	-	90	-	-	-	-	780	-	870
(12) Isabela Clay	-	-	-	-	-	-	-	470	-	470
(13) Bago Sandy Clay Loam	-	-	-	-	-	-	-	8,010	2,920	10,930
(14) Bago Clay Loam	-	-	-	-	-	-	-	740	-	740
(15) Prenza Clay Loam	-	-	-	-	-	-	-	-	3,060	3,060
(16) Maligaya Clay Loam	-	-	-	-	-	-	-	-	5,100	5,100
T o t a l	1,750	6,750	1,400	2,950	3,200	4,400	1,000	31,200	12,680	65,330
3. Present Land Use										
(1) Paddy Field	1,450	3,850	250	2,410	200	3,300	550	22,060	11,050	45,120
- Irrigated	150	0	0	0	60	0	0	2,100	9,230	11,540
- Rainfed	1,300	3,850	250	2,410	140	3,300	550	19,960	1,820	33,580
(2) Diversified Farmland	300	2,900	1,150	540	3,000	1,100	450	3,170	1,630	14,240
(3) Grassland	-	-	-	-	-	-	-	5,970	-	5,970
T o t a l	1,750	6,750	1,400	2,950	3,200	4,400	1,000	31,200	12,680	65,330

Table 6.14 Present Population and Household in New Irrigation Schemes

Name of Scheme	Irrigation Area (ha)	Related Municipality	Total Population	No. of Total Household	No. of Farm Household	Average Irrigation Area per Farm (ha/farm) Household
1. Chico Irrigation Project Stage II						
- Chico East	8,100	Piat & Tuao	20,700	3,800	3,500	2.31
- Liwan Gadu Area	9,000	Enrile & Sta. Maria	22,900	3,800	2,900	3.10
- Enrile Area	4,100	Solana, Enrile & Rizal	23,500	4,100	3,800	1.08
- Magsaysay Area	10,000	Magsaysay, Sto. Tomas & Cabagan	30,200	5,300	4,800	2.08
(Total)	31,200		97,300	17,000	15,000	2.08
2. Matuno River Development Project	12,680	Bagabag, Solano, Bayombong, Bambang & Villaverde	79,300	14,300	7,200	1.76
3. Dabubu Irrigation Project	1,000	San Agustin	5,100	900	800	1.25
4. Zinundungan Irrigation Extension Project	1,750	Lasam	5,100	1,000	800	2.18
5. Alcala Amulung West Irrigation Project	6,750	Alcala, Amulung & Solana	12,900	2,400	2,200	3.07
6. Tuguegarao Irrigation Project	1,450	Tuguegarao	8,800	1,600	900	1.61
7. Lulutan Irrigation Project	2,950	Ilagan	13,000	2,200	1,800	1.64
8. Ilagan Irrigation Project	3,200	Ilagan & Benito Soliven	26,900	4,700	3,800	0.84
9. Gappal Irrigation Project	4,400	Naguilian, Cauayan & Angadanan	21,000	3,600	2,600	1.69
Total	65,330		269,400	47,400	35,100	1.86

Source: Barangay Population Statistics 1980 and
Urban andrural population projection 1980, NCSO

Table 6.15 Present Crop Production in New Irrigation Schemes

Name of Scheme	Paddy	Corn	Peanuts	Sweet Potato	Tobacco	Sugar Cane	Total Cultivated Area (ha)	Irrigation Area (ha)	Cropping Intensity (%)
1. Chico Stage-II									
a. Cultivated Area (ha)	22,060	7,800	630	100	-	500	31,090	31,200	100
b. Unit Yield (ton/ha)	2.3	0.9	0.7	5.0	-	19			
c. Production (tons)	50,740	7,010	440	500	-	19,500			
2. Matuno									
a. Cultivated Area (ha)	17,050	2,970	320	50	-	-	20,390	12,680	161
b. Unit Yield (ton/ha)	2.6	1.0	0.7	5.0	-	-			
c. Production (tons)	44,300	2,970	220	250	-	-			
3. Dabubu									
a. Cultivated Area (ha)	500	820	90	-	50	-	1,460	1,000	146
b. Unit Yield (ton/ha)	2.2	0.9	0.7	-	0.6	-			
c. Production (tons)	1,100	730	60	-	30	-			
4. Zinundungan Extension									
a. Cultivated Area (ha)	1,750	770	60	-	-	-	2,580	1,750	147
b. Unit Yield (ton/ha)	2.5	1.1	0.7	-	-	-			
c. Production (tons)	4,380	850	40	-	-	-			
5. Alcala-Amulung West									
a. Cultivated Area (ha)	3,850	5,410	580	60	-	230	10,130	6,750	150
b. Unit Yield (ton/ha)	2.2	0.9	0.7	5.0	-	39			
c. Production (tons)	8,470	4,870	410	300	-	8,970			
6. Tuguegarao									
a. Cultivated Area (ha)	250	1,890	230	-	-	-	2,370	1,400	169
b. Unit Yield (ton/ha)	2.2	1.2	0.7	-	-	-			
c. Production (tons)	550	2,270	160	-	-	-			
7. Lulutan									
a. Cultivated Area (ha)	2,410	1,340	110	-	60	-	3,920	2,950	133
b. Unit Yield (ton/ha)	2.2	1.0	0.7	-	0.6	-			
c. Production (tons)	5,300	1,340	80	-	40	-			
8. Ilagan									
a. Cultivated Area (ha)	200	4,840	600	60	300	-	6,000	3,200	188
b. Unit Yield (ton/ha)	2.3	0.9	0.7	5.0	0.6	-			
c. Production (tons)	460	4,360	420	300	180	-			
9. Gappal									
a. Cultivated Area (ha)	3,300	2,420	220	-	110	-	6,050	4,400	138
b. Unit Yield (ton/ha)	2.2	0.9	0.7	-	0.6	-			
c. Production (tons)	7,260	2,180	150	-	70	-			
10. Total									
a. Cultivated Area (ha)	51,370	28,260	2,840	270	520	730	83,990	65,330	129
b. Unit Yield (ton/ha)	2.4	0.9	0.7	5.0	0.6	39			
c. Production (tons)	122,590	26,580	1,980	1,350	310	28,470			

Table 6.16 Present Crop Production in Rehabilitation/Improvement Schemes

Name of Scheme	Irrigated Paddy			Rainfed Paddy	Corn	Peanuts/1	Total Cultivated Area (ha)	Irrigation Service Area (ha)	Cropping Intensity (%)	No. of/2 Irrigated Farmers
	Wet	Dry	Total							
1. Dummun R.I.S.										
a. Cultivated Area (ha)	870	470	1,340	1,200	640	(150)	3,180	2,070	1.54	1,320
b. Unit Yield (ton/ha)	3.7	3.8	3.7	2.4	1.0	0.7				
c. Production (tons)	3,219	1,786	5,005	2,880	640	105				
2. Baggao I.S.										
a. Cultivated Area (ha)	800	870	1,670	940	190	(40)	2,800	1,812	1.55	970
b. Unit Yield (ton/ha)	3.3	3.5	3.4	2.3	1.1	0.7				
c. Production (tons)	2,640	3,045	5,685	2,162	209	28				
3. Solana I.S.										
a. Cultivated Area (ha)	445	695	1,140	2,130	430	(100)	3,700	2,829	1.31	1,300
b. Unit Yield (ton/ha)	3.1	3.1	3.1	2.2	1.2	0.7				
c. Production (tons)	1,380	2,155	3,535	4,686	516	70				
4. Pinacanauan R.I.S.										
a. Cultivated Area (ha)	270	260	530	930	190	(40)	1,650	1,200	1.38	520
b. Unit Yield (ton/ha)	3.2	3.8	3.5	2.3	1.2	0.7				
c. Production (tons)	864	988	1,852	2,139	228	28				
5. Tumauini I.S.										
a. Cultivated Area (ha)	1,430	670	2,100	2,550	1,270	(290)	5,920	3,987	1.48	1,840
b. Unit Yield (ton/ha)	3.4	3.4	3.4	2.3	0.9	0.7				
c. Production (tons)	4,862	2,278	7,140	5,865	1,143	203				
6. Total										
a. Cultivated Area (ha)	3,815	2,965	6,780	7,750	2,720	(620)	17,250	11,898	1.45	5,950
b. Unit Yield (ton/ha)	3.4	3.5	3.4	2.3	1.0	0.7				
c. Production (tons)	12,965	10,252	23,217	17,732	2,736	434				

/1:Intercropping with corn.

/2:The average for recent five years of after completion of the System

Table 6.17 Present Population and Household in Rehabilitation/Improvement Schemes

Name of Scheme	Irrigation/1 Area (ha)	Related Municipality	Total/2 Population	No, of/2 Total Household	No, of/2 Farm Household	Average Irrigation Area per Farm Household (ha)
1. Dummun R.I.S.	2,070	Cattaran	6,600	1,200	1,100	1.88
2. Baggao I.S.	1,812	Baggao	8,600	1,500	1,300	1.39
3. Solana I.S.	2,829	Solana	22,900	4,100	3,500	0.81
4. Pinacanauan R.I.S.	1,200	Peñablanca	10,000	1,800	1,400	0.86
5. Tumauini I.S.	3,987	Tumauini	23,800	4,000	3,200	1.25
Total	11,898		71,900	12,600	10,500	1.13

Source: /1: NIA Regional Office, Cauayan.
/2: Barangay Population Census, NCSO.

Table 6.18 Future Land Use and Harvested Area in Irrigation Development Schemes

I. New Irrigation Scheme

(Unit: ha)

Name of Schemes	Future Land Use			Harvested Area in Paddy Field and Diversified Cropland																	Total Harvested Area	Total Cropping Intensity (%)
				Paddy Field (Pattern A or B)						Diversified Cropland (Pattern C)												
				Paddy			Beans			Corn			Vegetables			Tobacco	Beans					
	Paddy Field	Diversified Cropland	Total Service Area	Wet	Dry	Total	Wet	Total	Cropping Intensity (%)	Wet	Dry	Total	Wet	Dry	Total	Dry	Wet	Total	Cropping Intensity (%)		
1. Chico Mallig IP	28,030	3,170	31,200							2,850	2,220	5,070	320	320	640	630	1,590	7,930	250		
(Pattern A&C)				28,030	28,030	56,060	28,030	84,090	300											92,020	295
(Pattern B&C)				28,030	28,030	56,060	-	56,060	200											63,990	205
2. Matuno RIP	11,050	1,630	12,680							1,470	1,140	2,610	160	160	320	330	820	4,080	250		
(Pattern A&C)				11,050	11,050	22,100	11,050	33,150	300											37,230	294
(Pattern B&C)				11,050	11,050	22,100	-	22,100	200											26,180	206
3. Dabubu RIP	550	450	1,000							400	310	710	50	50	100	90	230	1,130	250		
(Pattern A&C)				550	550	1,100	550	1,650	300											2,780	278
(Pattern B&C)				550	550	1,100	-	1,100	200											2,230	223
4. Zinundungan IEP	1,450	300	1,750							210	270	480	30	30	60	60	150	750	250		
(Pattern A&C)				1,450	1,450	2,900	1,450	4,350	300											5,100	291
(Pattern B&C)				1,450	1,450	2,900	-	2,900	200											3,650	209
5. Alcala Amulung West IP	3,850	2,900	6,750							2,610	2,030	4,640	290	290	580	580	1,450	7,250	250		
(Pattern A&C)				3,850	3,850	7,700	3,850	11,550	300											18,800	291
(Pattern B&C)				3,850	3,850	7,700	-	7,700	200											14,950	221
6. Tuguegarao IP	250	1,150	1,400							1,030	800	1,830	120	120	240	230	580	2,880	250		
(Pattern A&C)				250	250	500	250	750	300											3,630	250
(Pattern B&C)				250	250	500	-	500	200											3,380	233
7. Lulutan IP	2,410	540	2,950							490	380	870	50	50	100	110	270	1,350	250		
(Pattern A&C)				2,410	2,410	4,820	2,410	7,230	300											8,580	312
(Pattern B&C)				2,410	2,410	4,820	-	4,820	200											6,170	224
8. Ilagan IP	200	3,000	3,200							2,700	2,100	4,800	300	300	600	600	1,500	7,500	250		
(Pattern A&C)				200	200	400	200	600	300											8,100	253
(Pattern B&C)				200	200	400	-	400	200											7,900	247
9. Gappal IP																					
(Pattern A&C)	3,300	1,100	4,400	3,300	3,300	6,600	3,300	9,900	300	990	770	1,760	110	110	220	220	550	2,750	550	12,650	2882
(Pattern B&C)				3,300	3,300	6,600	-	6,600	200											9,350	213

(to be continued)

(continuation)

II. Rehabilitation/Improvement Scheme

(Unit: ha)

Name of Schemes	Future Land Use			Harvested Area					Cropping Intensity (%)
	Paddy Field	Diversified Cropland	Total Service Area	Paddy			Beans	Total	
				Wet	Dry	Total	Wet		
1. Dummun RIS	2,070	-	2,070						
(Pattern A)				2,070	2,070	4,140	2,070	6,210	300
(Pattern B)				2,070	2,070	4,140	-	4,140	200
2. Baggao IS	1,812	-	1,812						
(Pattern A)				1,742	1,812	3,554	1,812	5,366	296
(Pattern B)				1,812	1,812	3,624	-	3,624	200
3. Solana IS	2,829	-	2,829						
(Pattern A)				2,829	2,829	5,658	2,829	8,487	300
(Pattern B)				2,829	2,829	5,658	-	5,658	200
4. Pinacanauan IS	1,200	-	1,200						
(Pattern A)				1,200	1,200	2,400	1,200	3,600	300
(Pattern B)				1,200	1,200	2,400	-	2,400	200
5. Tumauini IS	3,987	-	3,987						
(Pattern A)				3,730	3,160	6,890	3,987	10,877	273
(Pattern B)				3,987	3,890	7,877	-	7,877	198
* Zinundungan RIS	1,760	-	1,760						
(Pattern A)				1,760	1,760	3,520	1,760	5,280	300
(Pattern B)				1,760	1,760	3,520	-	3,520	200

Table 6.19 Production Cost per Hectare

I. Paddy, Corn and Tobacco

	Unit	Unit Price (₱)	Paddy				Corn				Tobacco			
			Without Project			With Project	Without Project		With Project		Without Project		With Project	
			Rainfed		Irrigated		Rainfed		Irrigated		Rainfed		Irrigated	
1. Level of Unit Yield	(ton/ha)		2.23		3.45	4.75	0.9		3.75		0.6		2.0	
2. Farm Inputs			Q'ty	Amount(₱)	Q'ty	Amount(₱)	Q'ty	Amount(₱)	Q'ty	Amount(₱)	Q'ty	Amount(₱)	Q'ty	Amount(₱)	Q'ty	Amount(₱)
1) Seed - Paddy	(kg)	8.6	80	688	50	430	46	396								
- Corn	(kg)	18.0							19	342	20	360				
- Tobacco (3,000 seedlings)		72.4											6	435	6	435
2) Fertilizer - N	(kg)	12.4	34	422	70	868	75	930	10	124	75	930	20	248	50	620
- P_2O_5	(kg)	9.1	4	36	14	128	30	273	-	-	85	774	-	-	50	455
- K_2O	(kg)	5.3	4	21	14	74	30	159	-	-	40	212	-	-	50	265
3) Agro-chemicals																
- Liquid	(ℓ)	235	1.5	353	1.7	400	3	705	-	-	2.5	588	2	470	2	470
- Granular	(kg)	21	2.0	42	3.9	82	17	357	-	-	17.0	357	-	-	17	357
Sub-total				1,562		1,982		2,820		466		3,206		1,153		2,602
3. Labor Cost	(man-day)	11														
1) Nursery Preparation			2	22	2	22	3	33	-	-	-	-	3	33	9	99
2) Land Preparation			16	176	16	176	16	176	10	110	11	121	18	198	21	231
3) Transplanting/Planting			18	198	20	220	20	220	9	99	9	99	10	110	11	121
4) Fertilizing			2	22	3	33	3	33	2	22	2	22	3	33	4	44
5) Weeding/Cultivating			4	44	5	55	5	55	7	77	7	77	10	110	11	121
6) Spraying			1	11	2	22	3	33	-	-	2	22	3	33	8	88
7) Irrigating			-	-	2	22	3	33	-	-	2	22	-	-	2	22
8) Harvesting			15	165	16	176	20	220	10	110	12	132	20	220	24	264
9) Threshing			4	44	5	55	13	143	9	99	10	110	32 /1	352	40 /1	440
10) Drying			3	33	4	44	5	55	7	77	8	88	-	-	-	-
11) Others			3	33	3	33	5	55	3	33	7	77	-	-	-	-
Sub-total			68	748	78	858	96	1,056	57	627	70	770	99	1,089	130	1,430
4. Animal Power	(day)	33	13	429	13	429	15	495	14	462	20	660	19	627	30	990
5. Mechanical Power	(day)	620	1	620	2	1,240	2	1,240	-	-	-	-	-	-	-	-
6. Others				171		261		299		75		229		151		248
Total				3,530		4,770		5,910		1,630		4,880		3,020		5,270

Note: /1; Sorting, sticking and others

(to be continued)

(continuation)

II. Peanuts, Sweet Potatoes, Sugar Cane, Beans and Vegetables

	Unit	Unit Price (₱)	Without Project (Rainfed)						With Project (Irrigated)			
			Peanuts		Sweet Potatoes		Sugar Cane		Beans		Vegetables	
1. Level of Unit Yield	(ton/ha)		0.7		5.0		39.0		1.5		13.0	
2. Farm Inputs			Q'ty	Amount(₱)	Q'ty	Amount(₱)	Q'ty	Amount(₱)	Q'ty	Amount(₱)	Q'ty	Amount(₱)
1) Seed - Peanuts	(kg)	7.9	68	538								
- Sweet Potatoes	(kg)	0.9			450	405						
- Sugar Cane	(1,000 seedlings)	50.0					3.5	175				
- Beans	(kg)	5.4							35	189		
- Vetetables	(kg)	335.0									2	670
2) Fertilizer - N	(kg)	12.4	-	-	15	186	120	1,488	20	248	70	868
- P_2O_5	(kg)	9.1	-	-	15	137	20	182	20	182	90	819
- K_2O	(kg)	5.3	-	-	15	80	20	106	20	106	70	371
3) Agro-chemicals												
- Liquid	(ℓ)	235	-	-	2	470	1.5	353	2	470	8	1,880
- Granular	(kg)	21	-	-	-	-	-	-	-	-	-	-
Sub-total												
3. Labor Cost	(man-day)	11										
1) Nursery Preparation			-	-	2	22	-	-	-	-	-	-
2) Land Preparation			14	154	16	176	3	33	15	165	21	231
3) Transplanting/Planting			4	44	13	143	38	418	5	55	12	132
4) Fertilizing			-	-	1	11	10	110	2	22	16	176
5) Weeding/Cultivating			14	154	3	33	5	55	15	165	15	165
6) Spraying			-	-	1	11	2	22	8	88	36	396
7) Irrigating			-	-	-	-	-	-	2	22	2	22
8) Harvesting			18	198	22	242	40	440	16	176	86	946
9) Threshing			6	66	-	-	-	-	7	77	-	-
10) Drying			4	44	-	-	-	-	4	44	-	-
11) Others			1	11	2	22	4	44	2	22	12	132
Sub-total			61	671	60	660	102	1,122	76	836	200	2,200
4. Animal Power	(day)	33	18	594	25	825	24	792	23	759	20	660
5. Mechanical Power	(day)	620	-	-		-	2	1,240	-	-	-	-
6. Others				87		137		302		140		392
Total				1,890		2,900		5,760		2,930		7,860

Table 6.20 Crop Production under without and with Project Conditions in Irrigation Development Schemes

I. New Irrigation Scheme

Unit : Ton

Item	Proposed Cropping Pattern A&C			Proposed Cropping Pattern B&C		
	Without Project	With Project	Incre-mental	Without Project	With Project	Incre-mental
1. Chico Mallig I P						
Paddy -Wet season	50,738	126,135	75,397	50,738	114,923	64,185
-Dry season	0	140,150	140,150	0	140,150	140,150
(Total)	50,738	266,285	215,547	50,738	255,073	204,335
Corn	7,020	19,013	11,993	7,020	19,013	11,993
Tobacco	0	1,260	1,260	0	1,260	1,260
Vegetables	0	8,320	8,320	0	8,320	8,320
Beans	0	44,430	44,430	0	2,385	2,385
Peanuts	441	0	-441	441	0	-441
Sweet potatoes	500	0	-500	500	0	-500
Sugar cane	19,500	0	-19,500	19,500	0	-19,500
2. Matuno R I P						
Paddy -Wet season	25,415	49,725	24,310	25,415	45,305	19,890
-Dry season	18,900	55,250	36,350	18,900	55,250	36,350
(Total)	44,315	104,975	60,660	44,315	100,555	56,240
Corn	2,970	9,788	6,818	2,970	9,788	6,818
Tobacco	0	660	660	0	660	660
Vegetables	0	4,160	4,160	0	4,160	4,160
Beans	0	17,805	17,805	0	1,230	1,230
Peanuts	224	0	-224	224	0	-224
Sweet potatoes	250	0	-250	250	0	-250
Sugar cane	0	0	0	0	0	0
3. Dabubu R I P						
Paddy -Wet season	1,100	2,475	1,375	1,100	2,255	1,155
-Dry season	0	2,750	2,750	0	2,750	2,750
(Total)	1,100	5,225	4,125	1,100	5,005	3,905
Corn	738	2,663	1,925	738	2,663	1,925
Tobacco	30	180	150	30	180	150
Vegetables	0	1,300	1,300	0	1,300	1,300
Beans	0	1,170	1,170	0	345	345
Peanuts	63	0	-63	63	0	-63
Sweet potatoes	0	0	0	0	0	0
Sugar cane	0	0	0	0	0	0
4. Zinundungan I E P						
Paddy -Wet season	4,375	6,525	2,150	4,375	5,945	1,570
-Dry season	0	7,250	7,250	0	7,250	7,250
(Total)	4,375	13,775	9,400	4,375	13,195	8,820
Corn	847	1,800	953	847	1,800	953
Tobacco	0	120	120	0	120	120
Vegetables	0	780	780	0	780	780
Beans	0	2,400	2,400	0	225	225
Peanuts	42	0	-42	42	0	-42
Sweet potatoes	0	0	0	0	0	0
Sugar cane	0	0	0	0	0	0
5. Alucala Amulung West I P						
Paddy -Wet season	8,470	17,325	8,855	8,470	15,785	7,315
-Dry season	0	19,250	19,250	0	19,250	19,250
(Total)	8,470	36,575	28,105	8,470	35,035	26,565
Corn	4,869	17,400	12,531	4,869	17,400	12,531
Tobacco	0	1,160	1,160	0	1,160	1,160
Vegetables	0	7,540	7,540	0	7,540	7,540
Beans	0	7,950	7,950	0	2,175	2,175
Peanuts	406	0	-406	406	0	-406
Sweet potatoes	300	0	-300	300	0	-300
Sugar cane	8,970	0	-8,970	8,970	0	-8,970
6. Tuguegarao I P						
Paddy -Wet season	550	1,125	575	550	1,025	475
-Dry season	0	1,250	1,250	0	1,250	1,250
(Total)	550	2,375	1,825	550	2,275	1,725
Corn	2,268	6,863	4,595	2,268	6,863	4,595
Tobacco	0	460	460	0	460	460
Vegetables	0	3,120	3,120	0	3,120	3,120
Beans	0	1,245	1,245	0	870	870
Peanuts	161	0	-161	161	0	-161
Sweet potatoes	0	0	0	0	0	0
Sugar cane	0	0	0	0	0	0

(to be continued)

(continuation)

Unit : Ton

Item	Proposed Cropping Pattern A&C			Proposed Cropping Pattern B&C		
	Without Project	With Project	Incre-mental	Without Project	With Project	Incre-mental
7. Lulutan I P						
Paddy -Wet season	5,302	10,845	5,543	5,302	9,881	4,579
-Dry season	0	12,050	12,050	0	12,050	12,050
(Total)	5,302	22,895	17,593	5,302	21,931	16,629
Corn	1,340	3,263	1,923	1,340	3,263	1,923
Tobacco	36	220	184	36	220	184
Vegetables	0	1,300	1,300	0	1,300	1,300
Beans	0	4,020	4,020	0	405	405
Peanuts	77	0	-77	77	0	-77
Sweet potatoes	0	0	0	0	0	0
Sugar cane	0	0	0	0	0	0
8. Ilagan I P						
Paddy -Wet season	460	900	440	460	820	360
-Dry season	0	1,000	1,000	0	1,000	1,000
(Total)	460	1,900	1,440	460	1,820	1,360
Corn	4,356	18,000	13,644	4,356	18,000	13,644
Tobacco	180	1,200	1,020	180	1,200	1,020
Vegetables	0	7,800	7,800	0	7,800	7,800
Beans	0	2,550	2,550	0	2,250	2,250
Peanuts	420	0	-420	420	0	-420
Sweet potatoes	300	0	-300	300	0	-300
Sugar cane	0	0	0	0	0	0
9. Gappal I P						
Paddy -Wet season	7,260	14,850	7,590	7,260	13,530	6,270
-Dry season	0	16,500	16,500	0	16,500	16,500
(Total)	7,260	31,350	24,090	7,260	30,030	22,770
Corn	2,178	6,600	4,422	2,178	6,600	4,422
Tobacco	66	440	374	66	440	374
Vegetables	0	2,860	2,860	0	2,860	2,860
Beans	0	5,775	5,775	0	825	825
Peanuts	154	0	-154	154	0	-154
Sweet potatoes	0	0	0	0	0	0
Sugar cane	0	0	0	0	0	0

(to be continued)

(continuation)

II. Rehabilitation/Improvement Scheme

Unit : Ton

Item	Proposed Cropping Pattern A&C			Proposed Cropping Pattern B&C		
	Witout Project	With Project	Incre-mental	Witout Project	With Project	Incre-mental
1. Dummun R I S						
Paddy-Irrigated(Wet)	3,219	9,315	6,096	3,219	8,487	5,268
(Dry)	1,786	10,350	8,564	1,786	10,350	8,564
-Rainfed (Wet)	2,880	0	-2,880	2,880	0	-2,880
(Total)	7,885	19,665	11,780	7,885	18,837	10,952
Beans	0	3,105	3,105	0	0	0
Corn	640	0	-640	640	0	-640
Peanuts	105	0	-105	105	0	-105
2. Baggao I S						
Paddy-Irrigated(Wet)	2,640	7,839	5,199	2,640	7,429	4,789
(Dry)	3,045	9,060	6,015	3,045	9,060	6,015
-Rainfed (Wet)	2,162	0	-2,162	2,162	0	-2,162
(Total)	7,847	16,899	9,052	7,847	16,489	8,642
Beans	0	2,718	2,718	0	0	0
Corn	209	0	-209	209	0	-209
Peanuts	28	0	-28	28	0	-28
3. Solana I S						
Paddy-Irrigated(Wet)	1,380	12,731	11,351	1,380	11,599	10,219
(Dry)	2,155	14,145	11,990	2,155	14,145	11,990
-Rainfed (Wet)	4,686	0	-4,686	4,686	0	-4,686
(Total)	8,221	26,876	18,655	8,221	25,744	17,523
Beans	0	4,244	4,244	0	0	0
Corn	516	0	-516	516	0	-516
Peanuts	70	0	-70	70	0	-70

Item	Proposed Cropping Pattern A&C			Proposed Cropping Pattern B&C		
	Witout Project	With Project	Incre-mental	Witout Project	With Project	Incre-mental
4. Pinacanauan I S						
Paddy-Irrigated(Wet)	864	5,400	4,536	864	4,920	4,056
(Dry)	988	6,000	5,012	988	6,000	5,012
-Rainfed (Wet)	2,139	0	-2,139	2,139	0	-2,139
(Total)	3,991	11,400	7,409	3,991	10,920	6,929
Beans	0	1,800	1,800	0	0	0
Corn	228	0	-228	228	0	-228
Peanuts	28	0	-28	28	0	-28
5. Tumauini I S						
Paddy-Irrigated(Wet)	4,862	16,785	11,923	4,862	16,347	11,485
(Dry)	2,278	15,800	13,522	2,278	19,450	17,172
-Rainfed (Wet)	5,865	0	-5,865	5,865	0	-5,865
(Total)	13,005	32,585	19,580	13,005	35,797	22,792
Beans	0	5,981	5,981	0	0	0
Corn	1,143	0	-1,143	1,143	0	-1,143
Peanuts	203	0	-203	203	0	-203
(6. Zinundungan R I S)						
Paddy-Irrigated(Wet)	3,959	7,920	3,961	3,959	7,216	3,257
(Dry)	3,003	8,800	5,797	3,003	8,800	5,797
-Rainfed (Wet)	1,700	0	-1,700	1,700	0	-1,700
(Total)	8,662	16,720	8,058	8,662	16,016	7,354
Beans	0	2,640	2,640	0	0	0
Corn	473	0	-473	473	0	-473
Peanuts	70	0	-70	70	0	-70

Table 6.21 Unit Design Discharge

Name of Scheme	Unit Design Discharge (ℓ/s/ha)	
	Cropping Pattern-A	Cropping Pattern-B
1. New Schemes		
(1) Chico River Irrigation Project Stage II	1.66	1.68
(2) Matuno River Development Project	1.50	1.56
(3) Dabubu River Irrigation Project	1.22	1.15
(4) Zinundungan Irrigation Extension Project	1.48	1.48
(5) Alcala Amulung West Irrigation Project	1.39	1.36
(6) Tuguegarao Irrigation Project	1.10	0.99
(7) Lulutan Irrigation Project	1.42	1.39
(8) Ilagan Irrigation Project	0.95	0.91
(9) Gappal Irrigation Project	1.36	1.33
2. Rehabilitation Schemes		
(1) Dummun River Irrigation System	1.86	1.90
(2) Baggao Irrigation System	1.77	1.77
(3) Solana-Tuguegarao Irrigation System	1.77	1.77
(4) Pinacanauan Irrigation System	1.77	1.77
(5) Tumauini Irrigation System	1.80	1.77

Table 6.22 Salient Features of New Irrigation Schemes

Salient Features of Chico Mallig Irrigation Project

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	31,200	31,200
2. Dam & Reservoir		
a) Require storage volume (10^6 m³)	537	480
3. Irrigation Facilities (km)		
a) Diversion canal		
- Open channel	31.4	
- Tunnel	3.3	
b) Main canal (km)	134.5	
c) Lateral/sublateral canals (km)	416.1	
d) Bifurcation (Nos)	5	
e) Headgate (Nos)	140	
f) Turnouts (Nos)	870	
g) Other Strectures (Nos)	940	
4. Drainage Facilities		
a) Main & Collector drains (km)	76.9	
b) Structures (Nos)	20	
5. O & M roads (km)	356.0	

Salient Features of Dabubu Irrigation Project

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	1,000	1,000
2. Dam & Reservoir		
a) Required storage volume (10^6. m³)	2.0	1.5
3. Headworks		
a) Diversion weir (Lm x Hm)	200x2	
b) Intake (Bm x Hm x Nos)	2.0x1.5x1	
4. Irrigation Facilities		
a) Main canal (km)	13.6	
b) Lateral/sublateral canals (km)	19.0	
c) Headgates (Nos)	5	
d) Turnouts (Nos)	24	
e) Other structures (Nos)	35	
5. Drainage Facilities		
a) Main & Collector drains (km)	-	
b) Structures (Nos)	-	
6. O & M roads (km)	32.6	

Salient Features of Zinundungan Irrigation Extension Project

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	1,750 (3,510)/1	1,750 (3,510)
2. Dam & Reservoir		
a) Required storage volume (10^6m³)	53.1	34.7
3. Irrigation Facilities		
a) Main canal (km)	-	
b) Lateral/sublateral canal (km)	37.0	
c) Headgate (Nos)	4	
d) Turnouts (Nos)	43	
e) Other structures (Nos)	69	
4. Drainage Facilities		
a) Main & Collector drains (km)	-	
b) Structures (Nos)	-	
5. O & M roads (km)	32.8	

/1 Including existing service area of Zinundungan RIS.

Salient Features of Matuno River Irrigation Project

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	12,680	12,680
2. Dam & Reservoir		
a) Required storage volume (10^6 m³)	66.7	45.5
3. Headworks		
a) Manamtum		
- Weir (Lm x Hm)	127x2.5	
- Intake (Bm x Hm x Nnos)	2.0x1.5x1	
b) Bayombon		
- Weir (Lm x Hm)	305x1.6	
- Intake (Bm x Hm x Nnos)	3.85x1.5x4	
c) Lanog		
- Weir (Lm x Hm)	35x1.8	
- Intake (Bm x Hm x Nnos)	1.5x0.8x2 2.0x1.0x2	
4. Irrigation Facilities		
a) Main canal		
- Existing canal with rehab. (km)	32.4	
- New canal (km)	58.0	
b) Lateral/sublateral canal		
- Existing canal with rehab. (km)	98.6	
- New canal (km)	94.8	
c) Headgates (Nos)	2	
d) Turnouts (Nos)	370	
e) Other structures (Nos)	1,390	
5. Drainage Facilities		
a) Main & Collector drains (km)	194.9	
b) Structures (Nos)	80	
6. O & M roads (km)	343.9	

Salient Features of Alcala Amulung West Irrigation Project

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	6,750	6,750
2. Pump Station		
a) Pump type	Vertical mixed flow	
b) Total head (m)	28.6	
c) Unit capacity (m³/min)	112	
d) Bore (mm)	1,000	
e) Nos of Unit	6	
3. Irrigation Facilities		
a) Main canal (km)	27.8	
b) Lateral/sublateral canals (km)	91.9	
c) Headgates (Nos)	22	
d) Turnouts (Nos)	170	
e) Other structures (Nos)	220	
4. Drainage Facilities		
a) Main & Collector drains (km)	9.0	
b) Structures (Nos)	1	
5. O & M roads (km)	59.5	

(to be continued)

(continuation)

Salient Features of Tuguegarao Irrigation Project

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	1,400	1,400
2. Pump Station		
a) Pump type	Vertical mixed flow	
b) Total head (m)	23.1	
c) Unit capacity (m³/min)	31.8	
d) Bore (mm)	500	
e) Nos of Unit	4	
3. Irrigation Facilities		
a) Main canal (km)	9.5	
b) Lateral/sublateral canals (km)	14.9	
c) Headgates (Nos)	6	
d) Turnouts (Nos)	28	
e) Other structures (Nos)	44	
4. Drainage Facilities		
a) Main & Collector drains (km)	6.8	
b) Structures (Nos)	4	
5. O & M roads (km)	16.0	

Salient Features of Lulutan Irrigation Project

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	2,950	2,950
2. Pump Station		
a) Pump type	Verrical mixed flow	
b) Total head (m)	26.0	
c) Unit capacity (m³/min)	83.8	
d) Bore (mm)	800	
e) Nos of Unit	4	
3. Irrigation Facilities		
a) Main canal (km)	13.5	
b) Lateral/sublateral canals (km)	27.0	
c) Headgates (Nos)	10	
d) Turnouts (Nos)	74	
e) Other structures (Nos)	84	
4. Drainage Facilities		
a) Main & Collector drains (km)	18.9	
b) Structures (Nos)	4	
5. O & M roads (km)	23.2	

Salient Features of Ilagan Irrigation Project

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	3,200 (5,500) /1	3,200 (5,500)
2. Pump Station		
a) Pump type	Vertical mixed flow	
b) Total head (m)	19.0	19.0
c) Unit capacity (m³/min)	114.9	106.1
d) Bore (mm)	1,000	900
e) Nos of Unit	5	5
3. Irrigation Facilities		
a) Main canal (km)	16.9	
b) Lateral/sublateral canals (km)	46.2	
c) Headgates (Nos)	15	
d) Turnouts (Nos)	86	
e) Other structures (Nos)	120	
4. Drainage Facilities		
a) Main & Collector drains (km)	6.0	
b) Structures (Nos)	3	
5. O & M roads (km)	51.6	

/1 Including 2,300 ha of Tumauini RIS area which would be served by Ilagan Pumping Station

Salient Features of Cappal Irrigation Project (Case-1)

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	4,400	4,400
2. Pump Station		
a) Pump type	Vertical mixed flow	
b) Total head (m)	32.9	
c) Unit capacity (m³/min)	119.6	
d) Bore (mm)	1,000	
e) Nos of Unit	4	
3. Irrigation Facilities		
a) Main canal (km)	40.3	
b) Lateral/sublateral canals (km)	44.1	
c) Headgates (Nos)	15	
d) Turnouts (Nos)	120	
e) Other structures (Nos)	170	
4. Drainage Facilities		
a) Main & Collector drains (km)	-	
b) Structures (Nos)	-	
5. O & M roads (km)	53.0	

Salient Features of Cappal Irrigation Project (Case-2)

Works	Quantities	
	Cropping Pattern-A	Cropping Pattern-B
1. Net Project Area (ha)	4,400	4,000
2. Dam & Reservoir /1 (Required storage volume 10^6 m³)		
a) Colorado dam	58.4	42.1
b) Calaocan dam	41.0	28.6
c) Sta Maria dam	18.1	16.2
3. Irrigation Facilities		
a) Headreaches (km)	29.4	
b) Main canal (km)	32.2	
c) Lateral/sublateral canals (km)		
d) Headgates (Nos)	15	
e) Turnouts (Nos)	120	
f) Other structures (Nos)	200	
4. Drainage Facilities		
a) Main & Collector drains (km)	-	
b) Structures (Nos)	-	
5. O & M roads (km)	82.4	

/1 Salient features of the dam and appurtenant facilities are shown in ANNEX 0A.

Table 6.23 Salient Features of Rehabilitation/Improvement Schemes

Salient Features of
Dumnun River Irrigation System

Works	Existing Facilities	Proposed Works	
		Rehabilitation	New Construction
1. Dam & Reservoir			
a) Required storage volume (10^6 m³)	-	-	24.1/1 14.2/2
2. Headworks			
a) Intake (Bm x Hm x Nos)	1.3x0.9x3	-	-
3. Irrigation Facilities			
a) Main canal (km)	20.4	18.3	-
b) Lateral/sublateral canals (km)	35.7	22.3	2.7
c) Headgates (Nos)	9	2	-
d) Turnouts (Nos)	66	55	-
e) Other structures (Nos)	194	36	1
4. Drainage Facilities			
a) Drainage canals (km)	25.7	25.7	-
b) Structures (Nos)	7	-	-
5. O & M roads			
a) Roads (km)	35.3	29.5	9.7
b) Gravel metalling (km)	5.8	29.5	9.7
6. On-Farm Facilities			
a) Farm ditches (km)	81.5	65.3	63.4
b) Farm drains (km)	-	-	136.0

/1 For cropping pattern-A
/2 For cropping pattern-B

Salient features of
Solana-Tuguegarao Irrigation System

Works	Existing Facilities	Proposed Works	
		Rehabilitation	New Construction
1. Pumping Station	(Solana Station)		
a) Pump type	Vertical mixed flow		Vertical mixed flow
b) Bore (mm)	-	-	1,000
c) Pump unit (m³/min)	78	90	109
d) Pump unit (Nos)	4	4	1
2. Irrigation Facilities			
a) Main canal (km)	18.4	11.4	-
b) Lateral/sublateral canal (km)	25.7	10.9	-
c) Headgates (Nos)	8	8	-
d) Turnouts (Nos)	67	63	-
e) Other structures (Nos)	117	5	2
3. Drainage Facilities			
a) Drainage canals (km)	12.9	12.9	-
b) Structures (Nos)	3	-	-
4. O & M roads			
a) Roads (km)	32.9	16.9	-
b) Gravel metalling (km)	16.0	16.9	-
5. On-Farm Facilities			
a) Farm ditches (km)	118.7	90.2	79.4
b) Farm drains (km)	-	-	187.0

Salinet Features of
Baggao Irrigation System

Works	Existing Facilities	Proposed Works	
		Rehabilitation	New Construction
1. Dam & Reservoir			
a) Required storage volume (10^6 m³)	-	-	18.1/1 10.1/2
2. Headworks			
a) Intake (Bm x Hm x Nos)			
- Pared	1.2x1.2x1	-	-
- Paranan	1.6x1.4x1	-	-
3. Irrigation Facilities			
a) Main canal (km)	24.8	9.8	-
b) Lateral/sublateral canal (km)	36.7	4.0	-
c) Headgates (Nos)	13	4	-
d) Turnouts (Nos)	76	49	-
e) Other structures (Nos)	303	42	6
4. Drainage Facilities			
a) Drainage canals (km)	13.1	13.1	-
b) Strucutres (Nos)	24	-	-
5. O & M roads			
a) Roads (km)	28.2	3.4	27.9
b) Gravel metalling (km)	24.8	3.4	27.9
6. On-Farm Facilities			
a) Farm ditches (km)	116.0	102.0	11.0
b) Farm drains (km)	-	-	120.0

/1 For cropping pattern-A
/2 For cropping pattern-B

Salient Features of
Pinacanauan Irrigation System

Works	Existing Facilities	Proposed Works	
		Rehabilitation	New Construction
1. Headworks			
a) Intake (Bm x Hm x Nos)	1.4x0.8x2	-	-
2. Irrigation Facilities			
a) Main canal (km)	23.1	8.2	-
b) Lateral/sublateral canal (km)	10.6	6.1	-
c) Headgates (Nos)	5	2	-
d) Turnouts (Nos)	71	71	-
e) Other structures (Nos)	161	29	-
3. Drainage Facilities			
a) Drainage canals (km)	2.9	-	-
b) Structures (Nos)	-	-	-
4. O & M roads			
a) Roads (km)	26.4	25.4	3.3
b) Gravel metalling (km)	1.0	25.4	3.2
5. On-Farm Facilities			
a) Farm ditches (km)	34.7	23.9	49.3
b) Farm drains (km)	-	-	79.0

(to be continued)

(continuation)

Salient Features of
Tumaini Irrigation System

Works	Existing Facilities	Proposed Works	
		Rehabilitation	New Construction
1. Dam & Reservoir			
a) Required storage volume (10^6 m^3)	-	-	(6.9)/1 (4.3)/2
2. Headworks			
a) Intake (Em x Hm x Nos)	1.2x0.9x4	-	-
3. Booster-Pump (Nos)	-	-	(800mm x 4units)/1 (700mm x 4units)/2
4. Irrigation Facilities			
a) Main canal (km)	23.5	9.6	-
b) Lateral/sublateral canal (km)	82.3	29.8	10.0
c) Headgates (Nos)	21	13	3
d) Turnouts (Nos)	183	40	-
e) Other structures (Nos)	322	84	6
5. Drainage Facilities			
a) Drainage canals (km)	23.3	23.3	-
b) Structures (Nos)	11	-	-
6. O & M roads			
a) Roads (km)	52.0	16.4	38.4
b) Gravel metalling (km)	35.5	16.4	38.4
7. On-Farm Facilities			
a) Farm ditches (km)	118.0	41.2	16.1
b) Farm drains (km)	11.6	4.1	252.0

/1 For the cropping pattern-A

/2 For the cropping pattern-B

Table 6.24 Possibly Maximum Irrigation Area

(Dependability of 80%)

Name of System	Service Area (ha)	Irrigation Area (ha)			
		Cropping Pattern-A		Cropping Pattern-B	
		Paddy	Beans	Paddy	Beans
Dummun RIS	2,070	1,390(0.67)	2,070(1.00)	2,420(1.17)	-
Baggao IS	1,812	1,790(0.99)	1,812(1.00)	2,308(1.27)	-
Pared Area	549	1,030(1.88)	549(1.00)	1,098(2.00)	-
Paranan Area	1,263	760(0.60)	1,263(1.00)	1,210(0.96)	-
Solana-Tugeugarao IS/1	2,829	3,630(1.28)	2,829(1.00)	3,610(1.28)	-
Pinacanauan RIS	1,200	2,400(2.00)	1,200(1.00)	2,400(2.00)	-
Tumauini IS	3,987	2,290(0.57)	3,987(1.00)	3,820(0.96)	-

Note:

- Figures in parentheses show multi-cropping index.
- Out of the Solana-Tuguegarao service area (3,143 ha), Solana area of 314 ha is abandoned due to change of land use.
- Annual irrigation area is estimated assuming that present pump capacity will be restored to the nominal one.

Table 6.25 Unit Cost for Irrigation System

Work Item	Unit	Unit Cost (₱)		
		F.C.	L.C.	Total
1. Excavation	m^3			
headworks, earth		25	15	40
large canal, earth		15	10	25
small canal, earth		-	30	30
rock		90	60	150
2. Embankment	m^3			
excavated material		15	5	20
borrowed material		40	20	60
3. Backfill	m^3	15	20	35
4. Reinforcement concrete	m^3	850	600	1,450
5. Plain concrete	m^3	800	550	1,350
6. Lining concrete	m^3	800	550	1,350
7. Reinforcement bar	ton	10,600	4,600	15,200
8. Wooden form	m^2	50	200	250
9. Stone masonry	m^3	690	560	1,250
10. Concrete pipe	m			
ϕ400		260	150	410
ϕ500		360	190	550
ϕ600		450	250	700
ϕ700		550	300	850
ϕ800		780	420	1,200
ϕ1,000		910	490	1,400
11. Gravell metalling	m^2	20	15	35

Table 6.26 Project Cost For Each Candidate Scheme

UNIT : 10^6 P

	CHICO-NALLIG		MATUNO		DABUBU		ZINUNDUNGAN		ALCALA-AMULUNG	
	A	B	A	B	A	B	A	B	A	B
I. DAM & RESERVOIR										
1. DIRECT COST	-	-	-	-	18.38	17.23	-	-	-	-
2. INDIRECT COST	-	-	-	-	3.05	2.87	-	-	-	-
3. CONTINGENCY	- *	- *	- *	- *	3.21	3.02	- *	- *	-	-
4. TOTAL	1188.68	1153.08	578.28	460.46	24.63	23.12	226.13	197.40	-	-
II. IRRIGATION										
1. DIRECT COST	1576.34	1576.34	576.93	576.93	55.13	55.13	48.19	48.19	319.58	319.58
2. INDIRECT COST	282.86	282.87	104.00	104.00	9.60	9.60	9.71	9.71	57.61	57.61
3. CONTINGENCY	278.88	278.88	102.14	102.14	9.71	9.71	8.69	8.69	56.58	56.58
4. TOTAL	2138.09	2138.10	783.07	783.07	74.44	74.44	66.59	66.59	433.77	433.77
GRAND TOTAL	3326.77	3291.18	1361.35	1243.53	99.07	97.56	292.72	263.99	433.77	433.77

UNIT : 10^6 P

	TUGUEGARAO		LULUTAN		ILAGAN		GAPPAL-PUMP		GAPPAL-DAM	
	A	B	A	B	A	B	A	B	A	B
I. DAM & RESERVOIR										
1. DIRECT COST	-	-	-	-	-	-	-	-	287.99	269.73
2. INDIRECT COST	-	-	-	-	-	-	-	-	56.10	52.25
3. CONTINGENCY	-	-	-	-	-	-	-	-	51.61	48.29
4. TOTAL	-	-	-	-	-	-	-	-	395.70	370.27
II. IRRIGATION										
1. DIRECT COST	73.34	73.34	135.37	135.37	121.81	120.45	226.89	226.89	153.69	153.69
2. INDIRECT COST	12.97	12.97	24.58	24.58	22.67	22.39	40.02	40.02	29.14	29.14
3. CONTINGENCY	12.94	12.94	23.99	23.99	21.66	21.43	40.04	40.04	27.43	27.43
4. TOTAL	99.25	99.25	183.94	183.94	166.14	164.27	306.95	306.95	210.26	210.25
GRAND TOTAL	99.25	99.25	183.94	183.94	166.14	164.27	306.95	306.95	605.96	580.52

UNIT : 10^6 P

	DUMMUN		BAGGAO		SOLANA-TUGUEGARAO		PINACANAUAN		TUMAUINI	
	A	B	A	B	A	B	A	B	A	B
I. DAM & RESERVOIR										
1. DIRECT COST	-	-	-	-	-	-	-	-	67.69	52.25
2. INDIRECT COST	-	-	-	-	-	-	-	-	10.60	8.20
3. CONTINGENCY	- *	- *	- *	- *	-	-	-	-	11.74	9.07
4. TOTAL	354.56	312.62	355.46	280.93	-	-	-	-	90.03	69.52
II. IRRIGATION										
1. DIRECT COST	24.95	24.95	19.07	19.07	53.89	53.89	16.80	16.80	215.71	199.00
2. INDIRECT COST	4.94	4.94	3.90	3.90	9.70	9.70	3.21	3.21	35.05	32.50
3. CONTINGENCY	4.48	4.48	3.44	3.44	9.54	9.54	3.00	3.00	37.61	34.73
4. TOTAL	34.37	34.37	26.41	26.41	73.13	73.13	23.01	23.01	288.37	266.23
GRAND TOTAL	388.93	346.99	381.87	307.34	73.13	73.13	23.01	23.01	378.4	335.75

*:ALLOCATED COST

Note: A: Cropping pattern-A
B: Cropping pattern-B

Table 6.27 Economic Cost for Each Candidate Scheme

UNIT;P10^6

ITEMS	CHICO-MALLIG		MATUNO		DABUBU		ZINUNDUNGAN		ALCALA- AMULUNG	
	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B
1. DAM	1098.03	1065.50	543.93	433.11	22.38	20.98	208.63	182.12	0.00	0.00
2. IRRIGATION	1888.78	1888.78	718.10	718.10	67.94	67.94	60.67	60.67	403.91	403.91
GRAND-TOTAL	2986.81	2954.28	1262.03	1151.21	90.32	88.92	269.30	242.79	403.91	403.91

UNIT;P10^6

ITEMS	TUGUEGARAO		LULUTAN		ILAGAN		GAPPAL PUMP		GAPPAL DAM	
	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B
1. DAM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	355.05	332.62
2. IRRIGATION	93.09	93.09	172.29	172.29	153.88	152.37	286.80	286.80	192.46	192.46
GRAND-TOTAL	93.09	93.09	172.29	172.29	153.88	152.37	286.80	286.80	547.51	525.08

UNIT;P10^6

ITEMS	DUMUN		BAGAO		SOLANA TUGUEGARAO		PINANCANAUAN		TUMAUINI	
	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B	PAT-A	PAT-B
1. DAM	327.76	288.99	328.59	259.69	0.00	0.00	0.00	0.00	82.94	64.07
2. IRRIGATION	31.03	31.03	23.91	23.91	68.13	68.13	20.98	20.98	271.08	250.08
GRAND-TOTAL	358.79	320.02	352.50	283.60	68.13	68.13	20.98	20.98	354.02	314.15

Table 6.28 Summary of Financial and Economic Prices for Agricultural Outputs and Inputs

Outputs & Inputs			Financial Price (1985)	Economic Price/1 (1995)
Outputs				
- Paddy (import parity)		(₱/ton)	3,500	3,800
- Corn (import parity)		(₱/ton)	3,000	2,700
- Beans		(₱/ton)	9,900	5,300
- Peanuts		(₱/ton)	7,500	5,700
- Tobacco		(₱/ton)	10,000	18,100
- Sugar cane		(₱/ton)	290	300
- Sweet potatoes		(₱/ton)	900	900
- Vegetables		(₱/ton)	3,700	3,700
Inputs				
(1) Seed	- Paddy	(₱/kg)	7.5	8.6
	- Corn	(₱/kg)	20.0	18.0
	- Beans	(₱/kg)	10.0	5.4
	- Peanuts	(₱/kg)	10.4	7.9
	- Tobacco	(₱/3,000 seedlings)	40.0	72.4
	- Vegetables	(₱/kg)	335.0	335.0
(2) Fertilizer	- N	(₱/kg)	9.7	12.4
	- P_2O_5	(₱/kg)	9.5 /2	9.1
	- K_2O	(₱/kg)	9.5 /2	5.3
(3) Agro-chemicals/3	- Liquid	(₱/ℓ)	220	235
	- Granular	(₱/kg)	20	21
(4) Labor		(₱/day)	25	11 /4
(5) Hired animal		(₱/day)	33	33
(6) Operation cost of farm machinery		(₱/day)	620	620

/1 : 1985 constant price

/2 : Economic price of agro-chemicals are estimated as below:

$EP = FP \times SP \times IR$

EP ; Economic price of agro-chemicals
FP : Financial price of agro-chemicals
SP : Conversion factor for shadow price (0.82)
IR : Average increased rate of price for fertilizer from 1985 to 1995 (1.30)

	1985 Cosntant Price		Average Increased Rate
	1985 (US$/ton)	1995 (US$/ton)	
Urea	136	209	1.54
T.S.P	122	149	1.22
KCl	84	97	1.15
Average			1.30

(Source:: IBRD Price Projection)

/3 : Estimated on the basis of compound fertilizer (14:14:14)

/4 : Adjusted by the conversion factor of 0.52 for rural unskilled labor and consumption conversion factor of 0.84 as follows:.

Conversion factor to economic price (0.44) = 0.52 x 0.84

Table 6.29 Annual Incremental Benefits in Irrigation Development Schemes

Name of Scheme	Total Annual Incremental Benefit (10^3P)		Annual Incremental Benefit per ha (P/ha)	
	Proposed Cropping Pattern		Proposed Cropping Pattern	
	A&C	B&C	A&C	B&C
New Irrigation Scheme				
(1) Chico Mallig IP	778,335	596,421	24,946	19,116
(2) Matuno RIP	259,526	187,810	20,467	14,811
(3) Dabubu RIP	24,135	20,565	24,135	20,565
(4) Zinundungan IEP	61,032	49,034	22,563	17,186
	(21,547) /1	(18,960) /1	(12,242) /1	(10,772) /1
(5) Alcala Amulung West IP	159,980	134,993	23,701	19,999
(6) Tuguegarao IP	32,887	31,264	23,491	22,331
(7) Lulutan IP	70,350	54,709	23,847	18,545
(8) Ilagan IP	72,672	71,374	22,710	22,305
(9) Gappal IP	105,041	83,624	23,873	19,006
Rehabilittion/Improvement Scheme				
(1) Dummun RIS	41,328	27,893	19,965	13,475
(2) Baggao IS	33,527	22,567	18,503	12,454
(3) Solana IS	63,341	44,981	22,390	15,900
(4) Pinacanauan IS	25,679	17,891	21,399	14,909
(5) Tumauini IS	71,444	57,896	17,919	14,521

/1 : Irrigation benefits derived from the water supply to the existing Zinundungan River Irrigation System.

Table 6.30 Summary of Annual Equivalent Flood Damages in Irrigation Development Schemes

(Unit: 10⁶P)

Name of Scheme	Proposed Cropping Pattern	
	A&C	B&C
New Irrigation Scheme		
(1) Chico Mallig IP	28.35	20.24
(2) Matuno RIP	31.78	22.64
(3) Dabubu RIP	-	-
(4) Zinundungan IEP & RIS	10.77	7.04
(5) Alcala Amulung West P	27.34	22.07
(6) Tuguegarao IP	4.46	4.11
(7) Lulutan IP	1.61	1.19
(8) Ilagan IP	3.69	3.67
(9) Gappal IP	2.83	2.34
Rehabilitation/Improvement Scheme		
(1) Dummun RIS	3.17	1.96
(2) Baggao IS	-	-
(3) Solana IS	10.22	6.36
(4) Pinacanauan IS	-	-
(5) Tumauini IS	3.94	2.45

Table 6.31 Annual Production Foregone in Irrigation Devleopment Schemes

(Unit: 10⁶P)

Name of Scheme	Proposed Cropping Pattern A&C		Proposed Cropping Pattern B&C	
	Dam Reservoir	Irrigation Facility	Dam Reservoir	Irrigation Facility
New Irrigation Scheme				
(1) Chico Mallig IP	1.42	3.21	1.37	3.21
(2) Matuno RIP	-	2.40	-	2.40
(3) Dabubu RIP	-	0.10	-	0.10
(4) Zinundungan IEP	0.40	0.28	0.37	0.28
(5) Alcala Amulung West IP	-	0.75	-	0.75
(6) Tuguegarao IP	-	0.11	-	0.11
(7) Lulutan IP	-	0.42	-	0.42
(8) Ilagan IP	-	0.25	-	0.25
(9) Gappal IP				
- Dam	0.09	0.65	0.07	0.65
- Pump	-	0.54	-	0.54

Table 6.32 Economic Internal Rate of Returns for Irrigation Devlopment Schemes

(Unit: %)

Name of Scheme	Proposed Cropping Pattern A&C	B&C
New Irrigation Scheme		
(1) Chico Mallig IP	15.7	12.9
(2) Matuno RIP	12.4	10.1
(3) Dabubu RIP	19.5	17.2
(4) Zinundungan IEP	13.4	12.5
(5) Alcala Amulung West IP	17.3	14.9
(6) Tuguegarao IP	19.4	18.7
(7) Lulutan IP	22.8	18.0
(8) Ilagan IP	28.0	27.7
(9) Gappal IP - Pump	20.2	16.2
- Dam	13.5	11.4
Rehabilitation/Improvement Scheme		
(1) Dummun RIS	8.0	5.7
(2) Baggao IS	7.3	5.7
(3) Solana IS	39.0	28.5
(4) Pinacanauan IS	75.7	56.0
(5) Tumauini IS	12.6	11.7

Table 6.33 Net Farm Income per ha of Irrigation Development Schemes (Financial Price)

(Unit: 10^3 ₱/ha)

Name of Scheme	Proposed Cropping Pattern A & C			Proposed Cropping Pattern B & C		
	Without Project	With Project	(2)/(1)	Without Project	With Project	(4)/(3)
	(1)	(2)		(3)	(4)	
New Irrigation Scheme						
(1) Chico Mallig IP	4	32	8.0	4	20	5.0
(2) Matuno RIP	8	30	3.8	8	20	2.5
(3) Dabubu RIP	4	30	7.5	4	24	6.0
(4) Zinundungan IEP	6	27	4.5	6	19	3.2
(5) Alcala Amulung West IP	4	24	6.0	4	18	4.5
(6) Tuguegarao IP	4	24	6.0	4	22	5.5
(7) Lulutan IP	5	29	5.8	5	18	3.6
(8) Ilagan IP	3	26	8.7	3	25	8.3
(9) Gappal IP - Pump	4	28	7.0	4	18	4.5
- Dam	4	31	7.8	4	22	5.5
Rehabilitation / Improvement Scheme						
(1) Dummun RIS	9	32	3.6	9	20	2.2
(2) Baggao IS	9	33	3.7	9	20	2.2
(3) Solana IS	6	28	4.7	6	16	2.7
(4) Pinacanauan IS	7	33	4.7	7	20	2.9
(5) Tumauini IS	7	27	3.9	7	18	2.6

Table 6.34 Number of Beneficiaries per ha of Irrigation Service Area

(Unit: person/ha)

Name of Scheme	Beneficialies per ha (person/ha)	Index (Total Average = 100)
New Irrigation Scheme		
(1) Chico Mallig IP	3.1	71
(2) Matuno RIP	6.3	141
(3) Dabubu RIP	5.1	115
(4) Zinundungan IEP	2.9	66
(5) Alcala Amulung West IP	1.9	43
(6) Tuguegarao IP	6.1	137
(7) Lulutan IP	4.4	100
(8) Ilagan IP	8.4	190
(9) Gappal IP	4.8	108
(Average)	(4.1)	(93)
Rehabilitation/Improvement Scheme		
(1) Dummun RIS	3.2	72
(2) Baggao IS	4.8	108
(3) Solana IS	8.1	183
(4) Pinacanauan IS	8.3	189
(5) Tumauini IS	6.0	135
(Average)	(6.0)	(137)
Total Average	4.4	100

Table 6.35 Priority Ranking of Irrigation Development Schemes

Name of Scheme	Net Farm Income/1 per Ha under with Project Condition (10^3 ₱/ha)	Ranking by Net Farm Income	Number of Beneficiaries per Ha (Person/ha)	Ranking by Number of Beneficiaries	Overall Ranking
Above 15% of EIRRs					
Pinacanauan IS	33	1	8.3	2	1
Chico Mallig IP	32	2	3.1	8	2
Dabubu RIS	30	3	5.1	5	3
Lulutan IP	29	4	4.4	7	4
Solana IS	28	5	8.1	3	5
Gappal IP (Pump)	28	5	4.8	6	6
Ilagan IP	26	6	8.4	1	7
Tuguegarao IP	24	7	6.1	4	8
Alcala Amulung West IP	24	7	1.9	9	9
Under 15% of EIRRs					
Baggao IS	33	1	4.8	3	10
Dummun RIS	32	2	3.2	4	11
Matuno RIP	30	3	6.3	1	12
Tumauini IS	27	4	6.0	2	13
Zinundungan IEP	27	4	2.9	5	14

Note: /1; Taken the case of proposed cropping pattern A & C.

Table 6.36 Conditions for Irrigation Water Demand Calculation

Name of System/Scheme	Area Code/Base Point No.	Meteoro Station	Rain Gauge	Irrigation Service Area/Irrigation Area (ha)													
				1985			1990			1995			2000			2005		
				SA	W	D	SA	W	D	SA	W	D	SA	W	D	SA	W	D
CISs	UC-3	Consuelo	Consuelo	1,535	370	330	1,535	1,535	460	1,535	1,535	460	1,535	1,535	460	1,535	1,535	460
CIPs	"	"	"	-	-	-	630	630	189	630	630	189	630	630	189	630	630	189
CISs	UC-4	"	"	531	400	350	531	531	350	531	531	350	531	531	350	531	531	350
CISs	UC-5	"	"	445	110	100	445	445	135	445	445	135	445	445	135	445	445	134
CISs	UC-6B	Echague	Ilagan	1,541	1,220	250	1,541	1,541	462	1,541	1,541	462	1,541	1,541	462	1,541	1,541	462
Dabubu River IP	6	"	"	-	-	-	-	-	-	1,000	See Fig. 10.3		1,000	See Fig. 10.3		1,000	See Fig. 10.3	
CIPs		"	"	-	-	-	-	-	-	1,425	1,425	428	2,850	2,850	855	3,680	3,680	1,104
CISs	UC-7	"	"	2,797	780	680	2,797	2,797	840	2,797	2,797	840	2,797	2,797	840	2,797	2,797	840
CIPs	"	"	"	-	-	-	-	-	-	615	615	185	1,550	1,550	465	1,550	1,550	465
Gappal IP	8	"	"	-	-	-	-	-	-	-	-	-	4,400	See Fig. 10.3		4,400	See Fig. 10.3	
CIPs	UC-8B	"	"	-	-	-	-	-	-	-	-	-	480	480	144	1,050	1,050	315
CIPs	UC-9	"	"	-	-	-	-	-	-	-	-	-	-	-	-	300	300	100
Lulutan IP	15	"	"	-	-	-	-	-	-	-	-	-	2,950	See Fig. 10.3		2,950	See Fig. 10.3	
CISs	M-1	Consuelo, Sto Domingo	Consuelo	10,858	8,040	7,170	10,858	10,858	7,170	10,858	10,858	7,170	10,858	10,858	7,170	10,267	10,267	6,780
CIPs	"	"	"	-	-	-	370	370	111	370	370	111	370	370	111	370	370	111
Matuno IP (Manamtam)	10	Sto Domingo, Wacal, Baretbet	Nayon	-	-	-	-	-	-	-	-	-	-	-	-	1,090	See Fig. 10.3	
Matuno IP (Bayombong)	11	"	"	-	-	-	-	-	-	-	-	-	-	-	-	11,590	See Fig. 10.3	
CISs	M-2	Consuelo, Sto Domingo	"	208	90	110	208	208	110	208	208	110	208	208	110	208	208	110
CISs	M-3	Wacal, Baretbet	"	18,015	12,170	11,370	18,015	18,015	11,370	18,015	18,015	11,370	18,015	18,015	11,370	9,376	9,376	5,918
CIPs	"	"	"	-	-	-	200	200	60	1,000	1,000	300	1,000	1,000	300	1,000	1,000	300
Magat RIS	13	Baligatan, Echague	Ilagan	89,800	65,900	62,488	89,800	89,800	89,800	89,800	89,800	89,800	89,800	89,800	89,800	89,800	89,800	89,800
CISs	M-4	Baligatan	Nayon	1,991	860	1,040	1,991	1,991	1,041	1,991	1,991	1,041	1,991	1,991	1,040	1,991	1,991	1,040
CISs	M-5	"	"	110	50	60	110	110	60	110	110	60	110	110	60	110	110	60
Ilagan IP	18	Echague	Ilagan	-	-	-	-	-	-	-	-	-	3,200	See Fig. 10.3		3,200	See Fig. 10.3	
Tumauini IS (Ilagan)	18	"	"	-	-	-	-	-	-	-	-	-	-	-	-	2,300	2,300	2,300
CISs	I-3	"	"	200	160	30	200	200	60	200	200	60	200	200	60	200	200	60
CISs	I-4	"	"	590	470	100	590	590	177	530	530	160	530	530	160	530	530	160
CIPs	"	"	"	-	-	-	570	570	171	800	800	240	800	800	240	800	800	240

(to be continued)

(continuation)

Name of System/Scheme	Area Code/Base Point No.	Meteoro Station	Rain Gauge	Irrigation Service Area/Irrigation Area (ha)													
				1985			1990			1995			2000			2005		
				SA	W	D	SA	W	D	SA	W	D	SA	W	D	SA	W	D
CISs	S-1	Baligatan	Nayon	967	600	840	967	967	840	967	967	840	967	967	840	967	967	840
SIFFU RIS	29	Baligatan, Echague	Ilagan	12,200	9,100	8,400	12,200	12,200	12,200	12,200	12,200	12,200	12,200	12,200	12,200	12,200	12,200	12,200
CISs	S-3	Baligatan	Naneng	266	150	110	266	266	110	266	266	110	266	266	110	266	266	110
Mallig RIS	31	Alimanao, Tuguegarao	Ilagan	2,427	1,260	1,050	2,427	2,427	1,214	2,427	2,427	1,214	2,427	2,427	1,214	2,427	2,427	1,214
CISs	S-5	"	"	815	550	230	815	815	245	815	815	245	815	815	245	815	815	245
CIPs	"	"	"	-	-	-	570	570	171	1,600	1,600	480	1,600	1,600	480	1,600	1,600	480
CISs	C-1	Bontoc	Bontoc	1,916	1,300	1,860	1,916	1,916	1,860	1,916	1,916	1,860	1,916	1,916	1,860	1,916	1,916	1,860
CISs	C-2	"	Naneng	1,961	1,020	890	1,961	1,961	890	1,961	1,961	890	1,961	1,961	890	1,961	1,961	890
CISs	C-3	"	"	919	540	440	919	919	440	919	919	440	919	919	440	919	919	440
Chico RIS	23	Alimanao, Tuguegarao	Tuguegarao	18,484	11,210	6,970	18,484	18,484	18,484	18,484	18,484	18,484	18,484	18,484	18,484	18,484	18,484	18,484
Chico Mallig IP	30	"	"	-	-	-	-	-	-	31,200	See Fig. 10.3		31,200	See Fig. 10.3		31,200	See Fig. 10.3	
CISs	C-4	"	"	889	510	360	889	889	360	889	889	360	889	889	360	889	889	360
CISs	C-5	"	"	1,019	580	410	1,019	1,019	410	1,019	1,019	410	1,019	1,019	410	1,019	1,019	410
Chico RIS (Chico West)	25	"	Tuao	1,624	1,330	1,150	1,624	1,624	1,624	1,624	1,624	1,624	1,624	1,624	1,624	1,624	1,624	1,624
CISs	C-6	"	"	2,178	810	1,320	2,178	2,178	1,320	2,178	2,178	1,320	1,818	1,818	1,102	1,818	1,818	1,102
CIPs	"	"	"	-	-	-	570	570	171	1,995	1,995	599	2,350	2,350	705	2,350	2,350	705
CISs	LC-1	"	Ilagan	390	310	60	390	390	117	390	390	117	390	390	117	390	390	117
CIPs	"	"	"	-	-	-	200	200	60	200	200	60	200	200	60	200	200	60
Tumauini IS (Tumauini)	33	"	"	3,987	1,450	1,280	3,987	1,450	1,280	3,987	1,450	1,280	3,987	1,450	1,280	1,687	See Fig. 10.3	
San Pablo-Cabagan IS	34	"	Tuguegarao	2,890	60	50	2,890	2,890	1,445	2,890	2,890	1,445	2,890	2,890	1,445	2,890	2,890	1,445
Pinacanauan RIS	35	"	"	1,200	290	290	1,200	See Fig. 10.3		1,200	See Fig. 10.3		1,200	See Fig. 10.3		1,200	See Fig. 10.3	
CISs	LC-5	"	"	3,060	2,420	490	3,060	3,060	918	3,060	3,060	918	1,742	1,742	523	1,742	1,742	523
CIPs	"	"	"	-	-	-	290	290	87	1,715	1,715	515	3,100	3,100	930	3,100	3,100	930
Tuguegarao IP	36	"	"	-	-	-	-	-	-	-	-	-	1,400	See Fig. 10.3		1,400	See Fig. 10.3	
Sol-Tuguegarao IS	37	"	"	3,143	0	960	3,143	0	960	2,829	See Fig. 10.3		2,829	See Fig. 10.3		3,143	See Fig. 10.3	
AI-Amulung West IP	37	"	"	-	-	-	-	-	-	-	-	-	6,750	See Fig. 10.3		6,750	See Fig. 10.3	
CISs	LC-6	"	"	430	150	250	430	430	250	430	430	250	430	430	250	430	430	250
CIPs	"	"	"	-	-	-	-	-	-	1,175	1,175	353	1,220	1,220	366	1,220	1,220	366
CIADP (Iguig Area)	38	"	"	775	410	400	775	775	775	775	775	775	775	775	775	775	775	775
CISs	LC-7	"	"	482	160	280	482	482	280	482	482	280	60	60	35	60	60	35

(to be continued)

(continuation)

Name of System/Scheme	Area Code/Base Point No.	Meteoro Station	Rain Gauge	Irrigation Service Area/Irrigation Area (ha)														
				1985			1990			1995			2000			2005		
				SA	W	D	SA	W	D"	SA	W	D	SA	W	D	SA	W	D
CIPs	LC-7	Alimanao, Tuguegarao	Tuguegarao	-	-	-	-	-	-	375	375	113	1,800	1,800	540	3,650	3,650	1,095
CIADP (Alcala-Amulung Area)	39	"	"	2,350	1,160	1,180	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350
Baggao IS (Pared Area)	40	"	"	549	460	450	549	460	450	549	460	450	549	460	450	549	See Fig. 10.3	
Baggao IS (Paranan Area)	42	"	"	1,263	850	610	1,263	850	610	1,263	850	610	1,263	850	610	1,263	See Fig. 10.3	
CISs	LC-10	"	"	1,981	670	1,130	1,981	1,981	1,130	1,981	1,981	1,130	1,981	1,981	1,130	1,981	1,981	1,130
CIPs	"	"	"	-	-	-	-	-	-	-	-	-	1,370	1,370	411	3,900	3,900	1,170
CISs	LC-11	"	Tuao	76	30	40	76	76	40	76	76	40	76	76	40	76	76	40
Zinundungan RIS	44	"	"	1,760	1,730	1,710	1,760	1,760	1,760	1,760	1,760	1,760	1,760	1,760	1,760	1,760	1,760	1,760
Zinundungan Ext. IP	44	"	"	-	-	-	-	-	-	-	-	-	-	-	-	1,750	See Fig. 10.3	
Dummun RIS	46	"	Aparri	2,070	1,440	1,370	2,070	1,440	1,370	2,070	1,440	1,370	2,070	1,440	1,370	2,070	See Fig. 10.3	
CIPs	LC-12	"	"	-	-	-	-	-	-	-	-	-	200	200	60	200	200	60
CISs	LC-13	"	"	1,340	460	770	1,340	1,340	770	1,190	1,190	684	1,190	1,190	684	1,190	1,190	684
CIPs	"	"	"	-	-	-	-	-	-	-	-	-	845	845	254	2,350	2,350	705
CIADP (Lower Cagayan Area)	47	"	"	10,875	270	60	10,875	10,875	10,875	10,875	10,875	10,875	10,875	10,875	10,875	10,875	10,875	10,875
CISs	LC-14	"	"	780	270	450	780	780	450	780	780	450	780	780	450	780	780	450
CIPs	"	"	"	-	-	-	-	-	-	-	-	-	-	-	-	650	650	195
Total				213,687			217,087			226,063			282,328			296,077		

Table 6.37 Present Irrigation Water Demend (1985)

UNIT: M^3/S

NAME OF SYSTEM	AREA CODE/ BASE POINT NO	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
I. UPPER CAGAYAN BASIN													
CISs	UC-3	0.38	0.46	0.50	0.29	0.11	0.31	0.33	0.18	0.20	0.06	0.00	0.17
CISs	UC-4	0.40	0.49	0.53	0.30	0.12	0.33	0.36	0.19	0.22	0.06	0.00	0.18
CISs	UC-5	0.11	0.14	0.15	0.09	0.03	0.09	0.10	0.05	0.06	0.02	0.00	0.05
CISs	UC-6B	0.25	0.30	0.39	0.21	0.29	1.00	1.50	1.08	0.89	0.21	0.00	0.10
CISs	UC-7	0.69	0.80	1.06	0.56	0.23	0.64	0.96	0.69	0.57	0.13	0.00	0.28
SUB TOTAL		1.83	2.19	2.63	1.45	0.78	2.37	3.25	2.19	1.94	0.48	0.00	0.78
II. NAGAT BASIN													
CISs	N-1	8.52	10.50	11.80	6.87	2.35	7.01	7.79	5.95	5.65	1.93	0.00	3.91
CISs	N-2	0.12	0.15	0.17	0.10	0.03	0.08	0.11	0.08	0.08	0.02	0.00	0.06
CISs	N-3	11.54	20.21	16.66	9.19	3.59	11.30	14.66	13.63	9.85	3.33	0.00	5.47
NAGAT RIS	13	65.07	73.24	14.80	32.19	101.98	71.56	87.84	37.63	0.00	0.00	46.01	37.09
CISs	N-4	1.12	1.36	1.66	1.03	0.30	0.79	1.04	0.90	0.74	0.24	0.00	0.51
CISs	N-5	0.06	0.08	0.10	0.06	0.02	0.05	0.06	0.05	0.04	0.01	0.00	0.03
SUB TOTAL		86.43	105.54	45.19	49.44	108.27	90.79	111.70	58.24	16.36	5.53	46.01	47.07
III. ILAGAN BASIN													
CISs	I-3	0.03	0.04	0.05	0.02	0.04	0.13	0.20	0.14	0.12	0.03	0.00	0.01
CISs	I-4	0.10	0.12	0.16	0.08	0.11	0.39	0.58	0.41	0.34	0.08	0.00	0.04
SUB TOTAL		0.13	0.16	0.21	0.10	0.15	0.52	0.78	0.55	0.46	0.11	0.00	0.05
IV. SIFFU. MALLIG BASIN													
CISs	S-1	0.90	1.10	1.34	0.84	0.22	0.55	0.73	0.63	0.51	0.17	0.00	0.41
SIFFU RIS	29	8.75	9.85	1.99	4.45	14.08	9.88	12.13	5.20	0.00	0.00	6.19	4.99
CISs	S-3	0.12	0.15	0.18	0.11	0.04	0.12	0.16	0.14	0.12	0.04	0.00	0.05
MALLIG RIS	31	1.20	1.56	0.18	0.27	1.63	1.45	1.66	1.40	1.19	0.15	0.77	0.64
CISs	S-5	0.25	0.32	0.39	0.23	0.15	0.50	0.76	0.59	0.43	0.13	0.00	0.10
SUB TOTAL		11.22	12.98	4.08	5.90	16.12	12.50	15.44	7.96	2.25	0.49	6.96	6.19
V. CHICO BASIN													
CISs	C-1	2.30	2.55	2.32	1.01	0.30	0.83	0.52	0.46	0.52	0.24	0.00	0.99
CISs	C-2	1.00	1.16	1.10	0.56	0.24	0.64	0.45	0.39	0.45	0.13	0.00	0.42
CISs	C-3	0.50	0.58	0.54	0.28	0.13	0.34	0.24	0.20	0.24	0.07	0.00	0.21
CHICO RIS	23	9.13	10.33	11.65	1.65	0.00	0.00	4.59	7.57	11.37	8.69	6.90	7.74
CISs	C-4	0.44	0.52	0.63	0.37	0.16	0.50	0.67	0.51	0.41	0.12	0.00	0.18
CISs	C-5	0.50	0.59	0.72	0.42	0.18	0.57	0.76	0.57	0.47	0.14	0.00	0.20
CHICO WEST	25	1.45	1.69	1.91	0.29	0.00	0.00	0.52	0.87	1.35	1.35	0.86	0.86
CISs	C-6	1.56	1.89	2.29	1.29	0.31	0.73	0.99	0.77	0.66	0.19	0.00	0.64
SUB TOTAL		16.88	19.31	21.16	6.07	1.32	3.61	8.74	11.34	15.47	10.64	7.76	11.24
VI. LOWER CAGAYAN BASIN													
CISs	LC-1	0.07	0.08	0.10	0.06	0.06	0.28	0.43	0.33	0.24	0.07	0.00	0.03
TUMAUINI IS	33	1.46	1.90	2.20	0.35	1.87	1.67	1.91	1.61	1.37	0.17	0.94	0.79
S/PAB.CAGA. IS	34	0.06	0.08	0.09	0.01	0.06	0.08	0.07	0.06	0.06	0.01	0.04	0.04
PINACANAUAN RIS	35	0.38	0.45	0.51	0.08	0.39	0.38	0.36	0.30	0.28	0.03	0.22	0.26
CISs	LC-5	0.60	0.71	0.86	0.50	0.62	2.36	3.19	2.40	1.97	0.57	0.00	0.24
S/TUGUEGARAO IS	37	1.24	1.50	1.69	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.85
CISs	LC-6	0.31	0.36	0.44	0.26	0.06	0.15	0.20	0.15	0.12	0.04	0.00	0.12
CIADP(LGUIG)	38	0.52	0.62	0.70	0.11	0.55	0.53	0.51	0.42	0.40	0.05	0.31	0.35
CISs	LC-7	0.34	0.40	0.49	0.29	0.07	0.16	0.21	0.16	0.13	0.04	0.00	0.14
CIADP(A/AMULU)	39	1.53	1.84	2.07	0.32	1.55	1.51	1.45	1.20	1.13	0.14	0.91	1.04
BAGGAO(PARED)	40	0.58	0.70	0.79	0.12	0.61	0.60	0.57	0.48	0.45	0.05	0.35	0.40
BAGGAO(PARANAN)	42	0.79	0.95	1.07	0.17	1.13	1.10	1.06	0.88	0.83	0.10	0.47	0.54
CISs	LC-10	1.38	1.63	1.97	1.16	0.28	0.65	0.88	0.66	0.54	0.16	0.00	0.55
CISs	LC-11	0.05	0.06	0.07	0.04	0.01	0.03	0.04	0.03	0.02	0.01	0.00	0.02
ZINUNDUNGAN RIS	44	2.12	2.64	2.99	0.44	2.16	2.01	2.00	1.72	1.69	0.21	1.35	1.41
DUMMUN RIS	46	1.19	1.86	2.31	0.38	2.01	1.89	1.96	1.62	1.20	0.14	0.94	0.74
CISs	LC-13	0.70	0.97	1.29	0.81	0.20	0.45	0.66	0.50	0.32	0.09	0.00	0.31
CIADP(L/CAGA.)	47	0.05	0.08	0.10	0.02	0.38	0.36	0.37	0.30	0.23	0.03	0.04	0.03
CISs	LC-14	0.41	0.57	0.75	0.47	0.12	0.27	0.38	0.29	0.19	0.05	0.00	0.18
SUB TOTAL		13.78	17.42	20.49	5.83	12.17	14.48	16.25	13.11	11.17	1.96	6.31	8.05
TOTAL		130.27	157.60	93.76	68.79	138.81	124.27	156.16	93.39	47.65	19.21	67.04	73.38

Table 6.38 Future Irrigation Water Demand (2005)

UNIT: M^3/S

NAME OF SYSTEM	AREA CODE/ BASE POINT NO	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
I. UPPER CAGAYAN BASIN													
CISs	UC-3	0.52	0.64	0.70	0.40	0.37	1.28	1.38	0.73	0.85	0.25	0.00	0.24
CIPs	UC-3	0.22	0.26	0.29	0.16	0.15	0.53	0.56	0.30	0.35	0.10	0.00	0.10
CISs	UC-4	0.40	0.49	0.53	0.30	0.14	0.44	0.48	0.25	0.29	0.09	0.00	0.18
CISs	UC-5	0.15	0.19	0.20	0.12	0.11	0.37	0.40	0.21	0.25	0.07	0.00	0.07
CISs	UC-6B	0.47	0.54	0.72	0.38	0.38	1.27	1.90	1.36	1.12	0.26	0.00	0.19
DABUBU IP	6	0.66	0.91	1.09	0.14	0.81	0.56	0.73	0.46	0.21	0.13	0.06	0.59
CIPs	UC-6	1.12	1.30	1.72	0.91	0.92	3.03	4.53	3.25	2.68	0.63	0.00	0.46
CISs	UC-7	0.83	0.99	1.31	0.70	0.70	2.30	3.44	2.47	2.04	0.48	0.00	0.35
CIPs	UC-7	0.47	0.55	0.72	0.39	0.39	1.27	1.91	1.37	1.13	0.26	0.00	0.19
BAPPAL IP	8	3.58	4.55	5.26	0.54	4.37	3.16	3.94	2.51	1.01	0.66	0.24	3.06
CIPs	UC-8B	0.32	0.37	0.49	0.26	0.26	0.86	1.29	0.93	0.77	0.18	0.00	0.13
CIPs	UC-9	0.10	0.12	0.16	0.08	0.08	0.25	0.37	0.27	0.22	0.05	0.00	0.04
LULUTAN IP	15	2.55	3.17	3.63	0.34	3.12	2.28	2.81	1.80	0.70	0.46	0.15	2.16
SUB TOTAL		11.41	14.08	16.82	4.72	11.80	17.60	23.74	15.91	11.62	3.62	0.45	7.76
II. MAGAT BASIN													
CISs	M-1	8.06	9.93	11.16	6.50	2.60	8.95	9.95	7.60	7.22	2.47	0.00	3.69
CIPs	M-1	0.13	0.16	0.18	0.11	0.09	0.32	0.36	0.27	0.26	0.09	0.00	0.06
MATUNO (HANAH.)	10	1.08	1.28	1.36	0.13	1.17	1.21	1.14	0.91	0.27	0.22	0.14	1.02
MATUNO (BAYOH.)	11	11.47	13.57	14.34	1.35	12.39	12.82	12.10	9.65	2.87	2.32	1.44	10.78
CISs	M-2	0.12	0.15	0.17	0.10	0.05	0.19	0.25	0.19	0.19	0.05	0.00	0.06
CISs	M-3	6.01	10.52	8.67	4.79	2.53	8.71	11.45	10.50	7.59	2.57	0.00	2.85
CIPs	M-3	0.30	0.53	0.44	0.24	0.24	0.93	1.22	1.12	0.81	0.27	0.00	0.15
MAGAT RIS	13	117.84	118.74	84.29	55.75	111.00	98.31	142.29	74.11	41.17	29.95	48.87	90.91
CISs	M-4	1.12	1.36	1.66	1.03	0.55	1.83	2.42	2.08	1.70	0.56	0.00	0.51
CISs	M-5	0.06	0.08	0.10	0.06	0.03	0.10	0.13	0.11	0.09	0.03	0.00	0.03
SUB TOTAL		146.19	156.32	122.37	70.06	130.85	133.37	181.31	106.54	62.17	38.53	50.45	110.06
III. ILAGAN BASIN													
ILAGAN IP	18	0.90	1.93	2.64	0.56	1.13	0.54	0.98	0.55	0.48	0.30	0.27	1.02
TUMAUINI(ILA.)	18	2.65	3.24	3.35	0.28	2.97	2.65	3.04	2.00	0.15	0.00	0.00	1.89
CISs	I-3	0.06	0.07	0.09	0.05	0.05	0.17	0.25	0.18	0.15	0.03	0.00	0.03
CISs	I-4	0.16	0.19	0.25	0.13	0.13	0.44	0.65	0.47	0.39	0.09	0.00	0.07
CIPs	I-4	0.24	0.28	0.38	0.20	0.20	0.66	0.98	0.71	0.58	0.14	0.00	0.10
SUB TOTAL		4.01	5.71	6.71	1.22	4.48	4.46	5.90	3.91	1.75	0.56	0.27	3.11
IV. SIFFU, MALLIG BASIN													
CISs	S-1	0.91	1.10	1.34	0.83	0.30	0.89	1.17	1.01	0.83	0.27	0.00	0.41
SIFFU RIS	29	13.68	15.97	16.70	5.50	5.22	14.90	16.90	8.22	7.42	4.79	3.43	11.79
CISs	S-3	0.12	0.15	0.18	0.11	0.07	0.22	0.28	0.25	0.21	0.07	0.00	0.05
MALLIG RIS	31	1.36	1.78	0.84	0.00	1.11	3.25	3.10	2.66	0.92	0.00	0.35	1.03
CISs	S-5	0.27	0.34	0.42	0.24	0.21	0.73	1.13	0.87	0.64	0.19	0.00	0.11
CIPs	S-5	0.53	0.66	0.82	0.47	0.42	1.44	2.22	1.71	1.26	0.37	0.00	0.21
SUB TOTAL		16.87	20.00	20.30	7.15	7.33	21.43	24.80	14.72	11.28	5.69	3.78	13.60
V. CHICO BASIN													
CISs	C-1	2.30	2.55	2.32	1.01	0.42	1.23	0.76	0.68	0.76	0.35	0.00	0.99
CISs	C-2	1.00	1.17	1.10	0.56	0.44	1.24	0.87	0.74	0.86	0.25	0.00	0.42
CISs	C-3	0.50	0.58	0.54	0.28	0.21	0.58	0.41	0.35	0.40	0.12	0.00	0.21
CHICO RIS	23	23.60	28.43	12.99	0.00	8.66	27.08	22.25	18.88	7.19	0.00	5.52	20.07
CHICO MALLIG	30	38.23	44.19	44.76	4.36	38.41	36.93	35.95	23.25	7.88	6.39	2.93	29.44
CISs	C-4	0.44	0.52	0.63	0.37	0.25	0.87	1.17	0.88	0.72	0.21	0.00	0.18
CISs	C-5	0.50	0.59	0.71	0.42	0.28	0.99	1.34	1.01	0.83	0.24	0.00	0.20
CHICO WEST	25	1.99	2.47	1.14	0.00	0.73	2.19	1.81	1.59	0.63	0.00	0.49	1.69
CISs	C-6	1.30	1.58	1.91	1.07	0.52	1.65	2.23	1.72	1.48	0.44	0.00	0.53
CIPs	C-6	0.83	1.01	1.22	0.69	0.60	2.13	2.88	2.23	1.92	0.56	0.00	0.34
SUB TOTAL		70.71	83.69	67.32	8.76	50.52	74.89	69.67	51.33	22.67	8.56	8.94	54.07
VI. LOWER CAGAYAN BASIN													
CISs	LC-1	0.13	0.16	0.20	0.12	0.10	0.35	0.54	0.42	0.31	0.09	0.00	0.05
CIPs	LC-1	0.07	0.08	0.10	0.06	0.05	0.18	0.28	0.21	0.16	0.05	0.00	0.03
TUMAUINI IS	33	0.99	1.21	1.25	0.11	1.84	1.65	1.89	1.24	0.87	0.70	0.22	0.82
S/PAS.CAGA. IS	34	1.84	2.22	1.02	0.00	1.35	4.23	3.48	2.95	1.12	0.00	0.43	1.57
PINACANAUAN RIS	35	1.57	1.78	1.79	0.15	1.60	1.56	1.50	0.97	0.32	0.26	0.11	1.21
CISs	LC-5	0.64	0.75	0.91	0.53	0.46	1.70	2.29	1.73	1.42	0.41	0.00	0.26
CIPs	LC-5	1.14	1.34	1.62	0.95	0.83	3.02	4.08	3.07	2.52	0.73	0.00	0.46
TUGUEGARAO IP	36	0.88	1.33	1.46	0.32	0.69	0.52	0.67	0.42	0.25	0.19	0.13	0.65
S/TUGUEGARAO IS	37	3.71	4.19	4.22	0.36	3.78	3.67	3.53	2.29	0.74	0.61	0.26	2.86
A/ANUL.WEST IS	37	6.44	8.13	8.47	1.22	6.05	5.49	5.71	3.65	1.48	1.16	0.68	4.89
CISs	LC-6	0.30	0.36	0.44	0.26	0.13	0.42	0.57	0.43	0.35	0.10	0.00	0.13
CIPs	LC-6	0.45	0.53	0.64	0.37	0.32	1.19	1.61	1.21	0.99	0.29	0.00	0.18
CIADP(LGUIG)	38	1.01	1.15	1.15	0.10	1.03	1.01	0.97	0.63	0.05	0.00	0.00	0.74
CISs	LC-7	0.04	0.05	0.06	0.04	0.01	0.06	0.08	0.06	0.05	0.01	0.00	0.02
CIPs	LC-7	1.34	1.58	1.91	1.12	0.97	3.56	4.80	3.62	2.97	0.86	0.00	0.55
CIADP(A/AMULU)	39	3.08	3.48	3.50	0.30	3.14	3.05	2.93	1.90	0.16	0.00	0.00	2.24
BAGGAO(PARED)	40	0.63	0.71	0.72	0.06	0.73	0.71	0.68	0.44	0.14	0.12	0.05	0.49
BAGGAO(PARANAN)	42	1.65	1.87	1.88	0.16	1.69	1.64	1.58	1.02	0.33	0.27	0.12	1.28
CISs	LC-10	1.38	1.63	1.97	1.16	0.58	1.93	2.61	1.96	1.61	0.47	0.00	0.56
CIPs	LC-10	1.43	1.69	2.04	1.20	1.04	3.81	5.13	3.87	3.17	0.92	0.00	0.58
CISs	LC-11	0.05	0.06	0.07	0.04	0.02	0.07	0.09	0.07	0.06	0.02	0.00	0.02
IINUNDUNGAN RIS	44	2.21	2.58	2.61	0.21	2.20	2.05	2.03	1.36	0.12	0.00	0.00	1.63
IINUN. EXTEN.	44	1.93	2.37	2.43	0.24	1.90	1.72	1.73	1.17	0.43	0.36	0.17	1.50
DUNMUN RIS	46	1.83	2.68	2.95	0.27	2.89	2.72	2.82	1.82	0.52	0.31	0.13	1.67
CIPs	LC-12	0.05	0.08	0.10	0.06	0.06	0.20	0.29	0.22	0.14	0.04	0.00	0.02
CISs	LC-13	0.62	0.86	1.14	0.72	0.37	1.17	1.70	1.29	0.83	0.23	0.00	0.28
CIPs	LC-13	0.64	0.89	1.18	0.74	0.65	2.31	3.35	2.55	1.63	0.45	0.00	0.28
CIADP(L/CAGA.)	47	9.63	14.08	15.52	1.41	15.20	14.31	14.79	9.57	0.62	0.00	0.00	8.52
CISs	LC-14	0.41	0.57	0.75	0.47	0.24	0.77	1.11	0.85	0.54	0.15	0.00	0.18
CIPs	LC-14	0.18	0.25	0.33	0.20	0.18	0.64	0.93	0.70	0.45	0.12	0.00	0.08
SUB TOTAL		46.29	58.66	62.43	12.95	50.10	65.71	73.77	51.69	24.35	8.92	2.32	33.75
TOTAL		295.48	337.86	295.95	104.86	255.08	317.46	379.19	244.10	133.84	65.88	66.21	222.35

Table 6.39 Grass Yield and Total Digestible Nutrients

	Fresh Yield (ton/ha)	Dry Matter Yield (ton/ha)	TDN/1 (kg)
(1) Pasture Grass			
- Guinea grass	40.0	8.4	6.0
- Para grass	70.0	14.7	10.5
- Centro	30.0	6.6	6.9
- Stylo	50.0	9.0	9.1
(Average)	47.5	9.8	8.3
(2) Meadow Grass			
- Guinea grass	70.0	14.7	10.5
- Para grass	90.0	18.9	13.5
- Centro	50.0	11.0	11.5
- Stylo	70.0	12.6	12.7
- Napier grass	140.0	28.0	22.4
- Ipil-ipil	50.0	17.0	12.5
(Average)	80.0	17.0	13.9

Note: /1: Total digestible nutrients

Table 6.40 Cattle Herd Composition in the Average Cattle Farm of 280 ha

Classification of Cattle	Average Age (Month)	Average Weight (kg/head)	No. of Cattle (head)	Percent (%)
(1) Grazing				
a. Breeding				
- Bull	78	over 530	7	2
- Cow	78	over 425	140	38
- Young bull/1	30	470	7	2
- Heifer	30	380	30	8
- Yearling heifer	18	305	46	12
- Yerarling bull	18	355	5	1
(sub total)		(399)	(235)	(63)
b. Calves				
- Male	6	150	48	13
- Female	6	130	48	13
(sub total)		(140)	(96)	(26)
Total of Grazing		324	331	89
(2) Feedlot Feeding		355	41	11
Total		327	372	100

/1: Including young bull of 2 heads for new blood line

Table 6.41 Outlines of Pasture Management and Calf Production

I. Present Condition	
(1) Grazing rate	0.4 heads/ha/year
(2) Average area of cattle farm	280 ha
(3) Capacity of grazing cattle in (2)	120 heads/280 ha
(4) Grazing system	Continuous grazing
II. Future Condition	
(1) Average feed intake	48 kg of fresh grass/head/day
a) TDN of 48 kg (Fresh grass)	8.4 kg/head/day
b) TDN requirement for beef cattle (Average live weight of 320 kg)	5.0 kg/ha
c) % of (a) to (b)	168%
(2) Average fresh grass yield in the pasture	47.5 tons/ha
(3) Possible feed intake ratio	0.55
(4) Grazing rate	$\frac{\text{Avergae Yield/ha} \times \text{Possible feed intake ratio}}{\text{Average feed intake} \times 365 \text{ days}}$
	$= \frac{47.5 \text{ tons/ha} \times 0.5}{0.048 \times 365}$
	= 1.3 heads/ha/year
(5) Area of pasture	275 ha
(6) Maximum capacity of grazing cattle in (5)	357 heads
(7) Number of grazing cattle in the future	331 heads
(8) % of (7) to (6)	93%
(9) Grazing system	Rotational Grazing
a) Number of paddock	6~8
b) Grazing duration	7~10 days/paddock

Table 6.42 Outlines of Feedlot Management

I. Period and Live Weight	
(1) Period	8 months
a) Starting	16 months old
b) Completing	24 months old
(2) Increase in live weight	150 kg or more/head
a) Starting	250 kg/head
b) Completing	400 kg or more/head
(3) Average daily gain	0.65 kg/day

II. Feeding Plan per Day

	Feed Intake (kg)	Dry Matter (kg)	TDN (kg)
(1) Forage grass	19.00	4.06	3.31
(2) Rice bran	2.40	2.19	1.68
(3) Total	21.40	6.25	4.99

III. Meadow	
(1) Average yield of meadow grass	68 tons/ha
(2) Annual number of yearling steers for fattening	41 heads
(3) Feeding period	240 days (8 months)
(4) Forage requirement	4,560 kg/head/240 days (19 kg/day x 240 days)
(5) Area of meadow required	2.8 ha
	$\left(\frac{4.56 \text{ ton} \times 41 \text{ heads}}{68 \text{ tons/ha}}\right)$

Table 7.1 Generation Except NAPOCOR (1984)

Region	Province	Coop	Generation
I	Ilocos Norte	Inec	Mini-Hydro - 4,550 kW (Agua Grande, Pagudpud)
			Dendro-Thermal - 3,100 kW (Solsona/Dingras)
	Ilocos Sur	Iseco	Mini-Hydro - 525 kW (Dawara, Suyo)
	Pangasinan I	Panelco I	Dendro-Thernam - 3,400 kW (Bolinao)
	Pangasinan III	Panelco III	Mini-Hydro - 750 kW (Bachelor, Natividad)
II	Isabela I	Iselco I	Mini-Hydro - 1,440 kW (Magat A, Ramon)
	Isabela II	Iselco II	Mini-Hydro - 750 kW (Tumauini: RIS, Tumauini)
			Dendro-Thermal - 3,100 kW (Ilagan)
IV	Batangas II	Batelec II	Gastfier Plant - 35 kW
V	Camarines Sur IV	Casureco IV	Dendro-Thermal - 3,100 kW (Caramoan)
			Mini-Hydro - 350 kW (Cuyaoyao, Sagnay)
		Total	21,100 kW

Table 7.2 Power Development Record in Luzon by Plant Type (by NAPOCOR)

Year of Commission	Power Plant	Type	No. of Units	Installed Capacity (MW)
1945	Caliraya	Hydro	4 x 8 MW	32
1948	Botocan	Hydro	2 x 8 MW 1 x 1 MW	17
1956	Ambuklao	Hydro	3 x 25 MW	75
1957	Buhi-Barit	Hydro	1 x 1.8 MW	1.8
1959	Cawayan	Hydro	1 x 0.4 MW	0.4
1960	Binga	Hydro	4 x 25 MW	100
1965	Manila 1 (Tegen 1)	Thermal	1 x 100 MW	100
1966	Manila 2 (Tegen 2)	Thermal	1 x 100 MW	100
1967	Angat	Hydro	4 x 50 MW 3 x 6 MW	218
1968	Sucat 1 (Gardner 1)	Thermal	1 x 150 MW	150
1970	Sucat 2 (Gardner 2)	Thermal	1 x 200 MW	200
1971	Sucat 3 (Synder 1)	Thermal	1 x 200 MW	200
1972	Sucat 4 (Synder 2)	Thermal	1 x 300 MW	300
1972	Bataan 1	Thermal	1 x 75 MW	75
1974	Malaya 1	Thermal	1 x 300 MW	300
1977	Pantabangan	Hydro	2 x 50 MW	100
1977	Bataan 2	Thermal	1 x 150 MW	150
1979	Tiwi	Geothermal	6 x 55 MW	330
1979-80-84	Mak-Ban 1 to 6	Geothermal	6 x 55 MW	330
1979	Malaya 2	Thermal	1 x 350 MW	350
1981	Masiway	Hydro	1 x 12 MW	12
1983	Magat	Hydro	4 x 90 MW	360
1983	Kalayaan (Pumped)	Hydro	2 x 150 MW	300
1984	Batangas (Calaca) Coal 1	Coal thermal	1 x 300 MW	300
	Total:			4,101
- Retired - (1955-63)	Rockwell 1 to 5 6 to 8	Thermal	5 x 25 MW 3 x 60 MW	305

Source: NAPOCOR, EPD/PDD

Table 7.3 Demand and Supply in Luzon (1984)

Body	Generation (GWh)	Loss (GWh)	System Input (GWh)	Loss (GWh)	Consumption (Sales demand) (GWh)	Remarks
NAPOCOR	14,655	1,410	-	-	-	
MERALCO	0	0	9,800	1,372	8,428	14% loss
Cooperatives	78	3	1,390	430	960	31% loss
Private Utilities	0	0	686	110	576	16% loss
Industry	0	0	1,070	0	1,070	
Miscellaneous	0	0	374	0	374	
Total	14,733	1,413	13,320	1,915	11,408	23% loss

Table 7.4 Status of Energization in Luzon (1984)

Franchise Body	House Connections		Electrification Ratio (%)
	Potential	Actual	
50-cooperatives	2,281,374	1,423,017	62
MERALCO	1,787,189	1,596,982	89
19-private utilities	337,825	250,986	74
Total in Luzon main island	4,406,388	3,270,985	74

Table 7.5 Energy Sales by Customer Type (MERALCO in 1985)

Customer Type	Consumption (GWh)	(%)
Residential	2,831	36
Commercial	2,612	33
Industrial	2,358	30
Others	78	1
Total	7,879	100

Table 7.6 Status of Energization in the Basin (1984)

Name of Cooperatives	Municipalities		Barangays		House Connections		
	Coverage	Energized	Coverage	Energized	Potential	Actual	%
Region II (Cagayan Valley)							
1. Cagayan I	13	12	361	134	63,238	26,924	43
2. Cagayan II	20	16	446	290	63,553	26,481	42
3. Isabela I	15	15	498	285	73,092	38,864	53
4. Isabela II	21	19	535	249	74,280	24,712	33
5. Ifugao	9	6	123	38	21,795	2,473	11
6. Kalinga-Apayao	9	4	129	33	20,079	5,133	26
7. Nueva Vizcaya	15	14	230	142	40,280	20,456	51
8. Quirino	6	6	120	64	15,660	6,275	39
Sub-total	108	92	2,442	1,235	371,977	151,318	41
Region I (Ilocos)							
9. Mt. Province	9	5	132	45	15,558	3,060	19
Total	117	97	2,574	1,280	387,535	154,378	40

Table 7.7 Hydropower Potential of Selected Dams

Name of Dam		Cagayan No.2	Addalam	Alimit No.1	Ilagan No.1	Disabungan	Siffu No.1	Mallig No.2	Pinukpuk
Catchment Area	(km^2)	481	864	559	1,350	652	656	362	856
Qaverage	(m^3/s)	27.91	37.67	31.26	47.87	36.16	34.85	16.87	51.09
Max. Developed Water	(m^3/s)	13.02	16.67	16.41	28.27	21.36	18.29	8.86	24.67
Required Storage	($x10^6m^3$)	93.0	125.0	112.0	235.0	167.0	110.0	55.0	165.0
Firm Discharge	(m^3/s)	26.04	33.34	32.82	56.54	42.72	36.58	17.72	49.34
High Water Level	(El.m)	223.0	161.0	265.0	159.0	97.0	107.0	144.0	110.0
Rated Water Level	(El.m)	215.5	153.5	255.0	151.5	90.5	101.8	140.0	103.0
Low Water Level	(El.m)	208.0	146.0	245.0	144.0	84.0	96.5	136.0	96.0
Sediment Water Level	(El.m)	207.0	137.0	245.0	144.0	81.5	96.5	136.0	96.0
Tail Water Level	(El.m)	178.0	115.0	197.0	103.0	57.0	67.0	109.0	67.0
Total Head	(m)	37.5	38.5	58.0	48.5	33.5	34.8	31.0	36.0
Effective Head	(m)	33.8	34.7	52.2	43.7	30.2	31.3	27.9	32.4
Dead Storage	($x10^6m^3$)	80.0	100.0	83.9	202.5	120.0	98.4	54.8	128.4
Sediment Storage	($x10^6m^3$)	72.2	58.0	83.9	202.5	97.8	98.4	54.8	128.4
Installed Capacity	(kW)	7,300	9,600	14,300	20,600	10,700	9,500	4,100	13,300
Energy Output	(GWh/yr)	46	60	89	129	70	59	26	83

Table 7.8 Construction Cost of Hydropower Component

(Unit : Mil.Pesos)

Work Item	Alimit No.1			Siffu No.1			Dummon			Paranan			Zinundungan		
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
FINANCIAL COST															
A.Hydropower Component															
I. Preparatory Works	1.44	1.16	2.60	0.86	0.68	1.54	0.24	0.19	0.43	0.23	0.17	0.40	0.38	0.30	0.68
II. Civil Works															
Waterway	2.02	1.63	3.65	1.37	0.82	2.19	0.79	0.48	1.27	0.75	0.46	1.21	0.81	0.48	1.29
Powerhouse	15.92	12.85	28.77	9.42	7.63	17.05	2.30	1.86	4.16	2.01	1.63	3.64	4.04	3.27	7.31
Sub-Total of II	17.94	14.48	32.42	10.79	8.45	19.24	3.09	2.34	5.43	2.76	2.09	4.85	4.85	3.75	8.60
III. Metal Works	12.67	1.41	14.08	2.58	0.28	2.86	1.04	0.12	1.16	0.96	0.11	1.07	1.12	0.13	1.25
IV. Electrical Works	82.39	19.54	101.93	53.23	8.13	61.36	10.80	1.20	12.00	9.27	1.03	10.30	18.90	2.10	21.00
Total of I - IV	**114.44**	**36.59**	**151.03**	**67.46**	**17.54**	**85.00**	**15.17**	**3.85**	**19.02**	**13.22**	**3.40**	**16.62**	**25.25**	**6.28**	**31.53**
V. Engineering Service	12.08	3.02	15.10	6.80	1.70	8.50	1.52	0.38	1.90	1.33	0.33	1.66	2.52	0.63	3.15
VI. Government Administration	0	7.55	7.55	0	4.25	4.25	0	0.95	0.95	0	0.83	0.83	0	1.58	1.58
VII. Physical Contingency	18.98	7.07	26.05	11.14	3.52	14.66	2.50	0.78	3.28	2.19	0.68	2.87	4.17	1.28	5.45
Total of I - VII	**145.50**	**54.23**	**199.73**	**85.40**	**27.01**	**112.41**	**19.04**	**5.92**	**24.96**	**16.76**	**5.25**	**22.01**	**31.94**	**9.76**	**41.70**
B.Allocated Dam Cost	**320.39**	**268.73**	**589.12**	**128.93**	**116.13**	**245.06**	**16.50**	**18.99**	**35.49**	**24.13**	**22.97**	**47.10**	**42.21**	**41.43**	**83.64**
Grand Total	**465.89**	**322.96**	**788.85**	**214.33**	**143.14**	**357.47**	**35.54**	**24.91**	**60.45**	**40.89**	**28.22**	**69.11**	**74.15**	**51.19**	**125.34**
ECONOMIC COST															
Grand Total	**465.89**	**263.68**	**729.57**	**214.33**	**113.96**	**328.29**	**35.54**	**19.92**	**55.46**	**40.89**	**23.38**	**64.27**	**74.15**	**39.81**	**113.96**

Table 8.1 Number of Existing Waterworks and Households Served in the Region II (including MT. Province) in 1985

Level of Waterworks	MPWH	LWUA	RWDC	BWP	Total
No. of Waterworks					
Level I	1,599	-	1,820	0	3,419
II	75	-	7	0	82
III	24	5	0	4	33
Total	1,688	5	1,827	4	3,534
No. of Households Served					
Level I	178,506	-	51,712	0	230,218
II	5,518	-	758	0	6,276
III	15,710	5,510	0	15,976	37,196
Total	199,734	5,510	52,470	15,976	273,690
No. of Households in the Region II (including Mt. Province)					463,283
Coverage by Waterworks					59.1%

Sources: EC-118 to EC-120

Table 8.2 Number of Connections and Water Consumption Served by Tuguegarao Water District in 1985

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total	Average
Number of Connections											
- Residential	589	591	601	585	611	696	861	934	1,007	6,475	719.4
- Commercial	377	374	374	360	377	376	389	405	417	3,449	383.2
- Industrial	2	2	2	2	2	3	4	4	4	25	2.8
- Municipal	8	8	8	7	7	7	7	6	7	65	7.2
- Total	976	975	985	954	997	1,082	1,261	1,349	1,435	10,014	1,112.6
Consumption (m^3/month)											
- Residential	9,616	9,867	8,627	7,794	9,676	15,586	16,536	21,185	22,206	121,093	13,455
- Commercial	8,768	8,723	7,680	6,672	7,195	10,365	10,273	12,301	13,836	85,813	9,535
- Industrial	23	108	95	103	96	204	261	337	305	1,532	170
- Municipal	89	100	150	115	229	631	568	560	731	3,173	353
- Total	18,496	18,798	16,552	14,864	17,196	26,786	27,638	34,383	37,078	211,611	23,513
Consumption Per Consumer Unit (l/day/unit)											
- Residential	526	597	463	444	511	746	620	732	735	5,374	597.1
- Commercial	750	833	662	618	616	919	852	980	1,106	7,336	815.1
- Industrial	370	1,929	1,532	1,717	1,548	2,267	2,104	2,718	2,542	16,727	1,858.6
- Municipal	559	446	403	548	1,055	3,005	2,617	3,010	3,481	14,924	1,658.2

Source: EC-103

Table 8.3 Criteria for Water Demand Projection

Item	1985	1990	1995	2000	2005
Unit Consumption					
Domestic Water (l/capita/day)					
Level I	30	30	30	30	30
Level II	60	60	60	60	60
Level III	100	105	110	115	120
Trade Establishment (m^3/establishment/day)	1.0	1.25	1.5	1.75	2.0
Other Facility					
School (m^3/unit/day)	1.0	1.25	1.5	1.75	2.0
Hospital (m^3/unit/day)	3.0	3.25	3.5	3.75	4.0
Others (Office etc.) (m^3/unit/day)	2.0	2.25	2.5	2.75	3.0
Construction (m^3/day/GVA(₱10^6 at 1972 prices))	31	31	31	31	31
Other Industries (m^3/day/GVA(₱10^6 at 1972 prices))	763	743	723	703	684
Service Factor for Domestic Demand (%)					
Rural : Level I	44	47	50	53	50
Level II	16	28	30	32	35
Level III	40	25	20	15	15
Urban : Level I	50	25	0	0	0
Level II	25	25	25	0	0
Level III	25	50	75	100	100
Existing Waterworks					
Capacity (10^3 m^3/day)	52.4	58.1/1	-	-	-
Loss Rate (%)	35	32.5	30	27.5	25

Note : /1 Existing capacity plus expansion plan
Sources: EC-376 and EC-379 to EC-387

Table 8.4 Projected Water Demand by Munincipality

(Unit : m³/day)

Province	1985	1990	1995	2000	2005
Cagayan	31,632	42,232	54,545	84,155	122,525
Ifugao	6,790	8,823	10,997	15,707	21,854
Isabela	63,518	88,306	119,444	196,047	302,122
Kalinga-Apayao	8,950	12,429	16,899	28,212	44,866
Nueva-Vizcaya	18,803	26,788	37,207	63,429	100,648
Quirino	6,973	10,124	14,267	24,400	38,921
Mountain Province	4,266	5,268	6,141	7,793	9,820
Aurora	331	439	538	647	754
Total	141,261	194,410	260,038	420,390	641,511

Table 8.5 Projected Water Demand by Sector

(Unit : m³/day)

Sector	1985	1990	1995	2000	2005
Domestic	82,465	111,495	143,504	179,761	211,343
Services & Public	17,258	23,722	31,307	39,872	49,182
Industrial	41,538	59,193	85,227	200,757	380,986
Total	141,261	194,410	260,038	420,390	641,511

Table 8.6 Projected Source Water Requirement by Supply Block

(Unit : m³/day)

Block Number	1985	1990	1995	2000	2005
Block 1	11,236	15,650	21,150	34,548	52,901
Block 2	6,977	9,157	11,596	17,324	25,116
Block 3	21,951	30,530	41,557	70,164	109,081
Block 4	9,550	12,132	14,981	22,095	31,517
Block 5	14,901	20,113	26,387	41,954	62,569
Block 6	9,143	12,470	16,539	26,658	40,069
Block 7	12,664	17,185	22,853	37,570	57,222
Block 8	13,568	18,578	24,947	41,661	63,997
Block 9	14,465	19,269	24,911	38,751	57,041
Block 10	10,445	13,072	15,711	21,665	29,139
Block 11	6,563	7,804	8,773	10,749	13,093
Block 12	12,911	17,676	23,746	39,757	61,168
Block 13	6,159	7,868	9,627	13,474	18,447
Block 14	4,359	5,531	6,642	8,488	10,801
Block 15	10,947	14,994	20,308	34,669	55,174
Block 16	2,823	3,420	3,833	4,243	4,647
Block 17	12,290	16,306	21,333	35,336	52,911
Block 18	13,075	16,622	20,216	28,208	37,972
Block 19	7,528	9,497	11,426	15,557	20,580
Block 20	15,772	20,142	24,947	36,974	51,904
Total (m³/day)	217,325	288,015	371,484	579,848	855,349
Total (t/sec)	2.52	3.33	4.30	6.71	9.90

Table 8.7 Projected Source Water Requirement by Sector

(Unit : m³/day)

Sector	1985	1990	1995	2000	2005
Domestic	126,869	165,178	205,006	247,946	281,791
Services & Public	26,551	35,144	44,725	54,996	65,577
Industrial	63,905	87,693	121,753	276,906	507,981
Total	217,325	288,015	371,484	579,848	855,349

Table 9.1 Results of First Screening

	NO.	NAME OF DAM	SUB-BASIN	RIVER	(A) CATCHMENT AREA (sq.km)	(B) DAM HEIGHT (m)	CREST ELEVATION (EL.m)	NWL (EL.m)	SEDIMENT LEVEL (EL.m)	RIVERBED ELEVATION (EL.m)	GROSS STORAGE (Mcm)	(C) EFFECTIVE STORAGE (Mcm)	SEDIMENT STORAGE (Mcm)	(D) EMBANKMENT VOLUME (Mcm)	STORAGE (1) (C)/(D)	EFFICIENCY (2) (1)*(A) /1000	(3) (2)*(B) /1000	SE(1) >60	SE(2) >40	SE(3) >5	HYDRO HIGH HEAD SCHEME	SELECTED DAMSITES	REMARKS
	1	Dueoon	Dueoon	Dueoon	112	54	153	148	122	104	145	120	17	1.4	91.4	10.2	0.5	o				o	
x	2	Tanudan	Chico	Tanudan	370	150	445	440	355	308	295	239	56	7.3	32.7	12.1	1.8						
	3	Chico No.5	Chico	Chico	3354	55	105	100	98	55	685	182	503	4.5	38.0	120.7	6.6		•	•			Discarded due to difficult compensation
	4	Chico No.4	Chico	Chico	1410	186	456	451	308	295	740	529	211	18.2	29.1	41.0	8.5		o	o			
	5	Chico No.3	Chico	Chico	920	70	585	580	800	500	43	-	138	1.7	-	-	-					o	
	6	Chico No.2	Chico	Chico	720	187	832	827	756	670	560	452	108	10.2	44.3	31.6	5.3			•	•	o	
	7	Chico No.1	Chico	Chico	371	186	1021	1016	957	800	219	163	56	10.7	15.1	8.0	1.6						
	8	Chico-Malitz	Chico	Chico	1990	135	305	300	236	175	2120	1822	298	37.7	48.3	96.1	13.0		•	•		•	
x	9	Pasil	Chico	Pasil	244	150	788	785	756	645	70	33	37	8.3	4.0	1.0	0.2						Subject to compensation for an intake weir
	10	Natalac	Chico	Natalac	655	70	90	85	47	25	900	800	100	2.2	361.8	238.2	16.7	o	•	•		o	
x	11	Nabuasaan	Chico	Nabuasaan	195	75	180	175	164	110	49	20	29	1.5	13.3	2.6	0.2						Subject to land compensation
x	12	Pinukpuk	Chico	Saltan	858	82	182	157	106	75	1150	1022	128	5.8	182.5	156.2	14.4	o	•	•		o	
	13	Saltan	Chico	Saltan	408	130	340	335	278	215	305	244	61	7.4	33.0	13.4	1.7					o	
	14	Babaca	Chico	Babaca	253	120	240	235	180	125	340	302	38	3.8	79.5	20.1	2.4	o					
x	15	Bisag	Pared	Pared	885	40	60	55	38	25	950	846	104	1.1	789.1	534.5	21.4					•	
	16	Pared	Pared	Pared	110	89	142	137	95	67	150	133	17	5.0	28.8	2.9	0.2	•	•	•			Subject to land compensation
	17	Dadap	Pared	Dadap	74	51	94	89	82	48	100	89	11	3.6	24.7	1.8	0.1						
	18	Paranas	Pared	Paranas	84	75	200	195	155	130	88	78	10	2.1	37.1	2.4	0.2						
x	19	Asuncadday	Tuguegarao	Tuguegarao	441	55	85	80	52	35	448	382	66	1.2	318.3	140.4	7.7						
	20	Tuguegarao	Tuguegarao	Tuguegarao	220	130	200	195	127	75	300	267	33	7.7	34.7	7.6	1.0	•	•	•		•	Subject to geological condition
	21	Natuted	Tuguegarao	Natuted	81	65	160	155	113	60	110	98	12	1.7	57.6	4.7	0.4						
	22	Pinacanauan	Pinacanauan	Pinacanauan	115	131	237	232	181	111	155	138	17	8.4	16.4	1.9	0.3						
	23	Tuaoini	Tuaoini	Tuaoini	165	127	252	247	181	130	223	198	25	7.0	28.3	4.7	0.6						
x	24	Siffu No.1(A)	Siffu-Malitz	Siffu	656	65	125	120	91	65	540	442	98	1.7	280.9	170.0	11.1						
	24'	Siffu No.1(B)	Siffu-Malitz	Siffu	628	59	130	125	108	78	335	241	94	1.8	133.9	83.8	5.0	o	o	o		o)	One dacsite to be selected considering geological condition
	25	Siffu No.2	Siffu-Malitz	Siffu	387	113	275	270	210	187	480	425	55	4.5	94.4	34.8	4.0	o	o	o		o	
	26	Malitz No.1	Siffu-Malitz	Malitz	436	77	150	145	101	78	580	525	55	2.8	201.9	88.0	6.6	o	•	•		o	
	27	Malitz No.2	Siffu-Malitz	Malitz	362	80	185	180	131	110	498	444	54	1.0	444.0	160.7	9.8	o	o	•		o	
	28	Ilagan No.1	Ilagan	Ilagan	1350	89	160	153	137	96	628	425	203	3.6	118.1	150.4	11.2	o	•	o			
	29	Ilagan No.2	Ilagan	Ilagan	878	122	285	280	178	148	1125	994	131	10.9	91.2	79.9	10.0	o	o	o		o	
	30	Ilagan No.3	Ilagan	Ilagan	268	130	495	490	424	370	480	425	55	13.8	30.8	11.3	1.5						
	31	Abuan No.1	Ilagan	Abuan	474	120	183	178	107	58	640	569	71	2.8	57.5	27.3	3.8						
x	32	Abuan No.2	Ilagan	Abuan	271	121	285	280	218	169	362	321	41	6.8	47.2	12.8	1.5						
	33	Disabuagan	Ilagan	Disabuagan	552	65	105	100	72	35	606	508	98	4.4	115.5	75.3	4.9	o	•			•	
	34	Catalangan	Ilagan	Catalangan	235	107	215	210	155	113	320	285	35	4.5	83.3	14.9	1.6	o				•	
	35	Tao-tao No.1	Nagat	Tao-tao	84	38	140	135	128	107	28	18	10	0.3	53.1	3.4	0.1						
	36	Tao-tao No.2	Nagat	Tao-tao	75	44	280	275	265	241	28	17	11	0.5	34.0	2.6	0.1						
x	37	Alisit No.1(A)	Nagat	Alisit	550	125	315	310	243	195	740	656	84	7.1	92.4	51.7	6.5	o	•	•		o)	*Alisit No. 1 (A) is selected on the basis of higher storage efficiency
	37'	Alisit No.1(B)	Nagat	Alisit	517	95	325	320	280	235	279	201	78	2.6	77.3	40.0	3.8	•	•				
	38	Alisit No.2	Nagat	Alisit	421	142	415	410	340	278	570	505	65	10.4	48.8	20.8	3.0						
	39	Ibulao No.1	Nagat	Ibulao	595	125	380	375	310	260	650	581	69	33.1	16.9	10.1	1.3						
	40	Ibulao No.2	Nagat	Ibulao	386	150	600	595	551	455	160	101	59	10.0	10.1	4.0	0.6						
	41	Matuno No.1	Nagat	Matuno	550	133	530	525	502	402	157	75	82	8.1	9.3	5.1	0.7				•	•	Hydropower project with high head thru long headrace tunnel
	42	Matuno No.2	Nagat	Matuno	220	150	795	790	724	650	190	157	33	11.4	13.8	3.0	0.5						
	43	Sta.Cruz No.1	Nagat	Sta. Cruz	87	144	735	730	658	590	88	78	10	12.0	8.5	0.4	0.1						
	44	Sta.Cruz No.2	Nagat	Sta. Cruz	82	103	680	675	617	582	85	56	9	3.2	17.5	1.1	0.1						
	45	Benar	Nagat	Benar	37	87	455	450	418	393	35	29	6	2.3	12.6	0.5	0.0						
	46	Marona	Nagat	Marona	51	83	628	623	574	550	88	80	8	5.4	11.1	0.8	0.0						
x	47	Canayan No.1	Upper Cagayan	Canayan	2364(1214)	55	165	160	139	115	956	774	182	1.2	645.0	783.0	43.1						
x	48	Canayan No.2	Upper Cagayan	Canayan	1031 (481)	80	245	240	205	170	383	311	72	3.1	100.3	48.2	3.9	o	•	•		•	Subject to land compensation and geological condition
	49	Casecnan	Upper Cagayan	Casecnan	1150	191	432	426.5	310	248	2300	2127	173	28.9	73.6	84.6	16.2	o	•			•	Subject to geological condition
	50	Addalam(A)	Upper Cagayan	Addalam	864 (5571)	50	187	182	137	113	240	182	58	2.0	62.8	54.3	3.4	o	•	•	•	•	Transbasin diversion scheme
x	50'	Addalam(B)	Upper Cagayan	Addalam	821 (344)	47	187	182	158	125	85	13	32	1.3	10.0	8.2	0.4						
	51	Dideyan	Upper Cagayan	Dideyan	477	108	653	648	618	540	570	507	72	8.2	61.8	39.0	4.3	o				o	
	52	Dibulwan	Upper Cagayan	Dibulwan	159	150	385	380	295	240	182	158	24	10.3	15.3	2.4	0.4				o	o	Hydropower project with high head thru long headrace tunnel Transbasin diversion scheme

NOTES: △ : Macanas dacsite newly found out in this study.
△1 : Catchment areas in parenthesis of Cagayan No.1 (47) and Cagayan No. 2 (48) are excluded those of Casecnan.
△2 : Catchment areas in parenthesis of Addalam (A) (50) and Addalam (B)(50') are excluded those of Dideyan

Table 9.2 Results of Second Screening

	NO.	NAME OF DAM	C.A. (sq.km)	IRRIGATION EFFICIENCY (US$ /y/cu.m)	CLASS	POWER GENERATION EFFICIENCY (US$ /y/cu.m)	CLASS	FLOOD CONTROL EFFICIENCY (1) (US$ /y/cu.m)	CLASS	FLOOD CONTROL EFFICIENCY (2) (US$ /y/cu.m)	CLASS	COMPENSATION NUMBER OF BUILDINGS IN RESERVOIR	ACCESSIBILITY LENGTH OF ACCESS ROAD (km)	GELOGICAL CONDITION	SELECTED DAMSITE /1	REMARKS
1	1	Dumoon	112	1.58	B	0.80	C	0.10	C	0.52	C	40	16	Conglomerate,Sandstone		Low efficiencies,thought possible for irrigation.
2	4	Chico No.4	1410	0.58	C	3.37	A	0.59	C	2.70	C	390	0	Sandstone,Mudstone	oo	High efficiency for power generation.Topo maps available.
3	6	Chico No.2	720	0.89	C	0.35	A	0.91	C	2.80	C	230	0	Basic volcanics	o	High efficiency for power generation.
4	8	Chico-Mallig	1990	0.92	C	1.64	C	0.53	C	2.74	C	860	0	Sandstone/Shale		Low efficiencies
5	10	Matalag	855	5.90	A	3.65	A	0.56	C	2.89	C	2150	0	Conglomerate,Sandstone		High efficiencies, but difficult due to compensation.
6	12	Pinukpuk	858	3.04	A	3.05	B	1.12	B	4.41	B	1050	0	Conglomerate,Sandstone	o	Effective for each purpose.
7	14	Babaca	253	1.70	B	2.05	B	0.97	C	4.74	B	470	11	Conglomerate,Sandstone		Postponed for future development.
8	15	Bitag	695	11.20	A	3.05	B	3.08	A	4.23	B	3900	0	Sandstone		High efficiencies, but difficult due to compensation.
9	19	Azzugaddan	441	6.03	A	3.30	A	2.54	A	5.73	A	780	13	Limestone weathered		High efficiencies, but foundation consists of weathered lime-stone,hence more geological survey needed.
10	24	Siffu No.1(A)	856	4.31	A	2.89	B	3.27	A	8.45	A	80	7	Pebble-conglomerate	o	High efficiencies for each purpose.
11	24'	Siffu No.1(B)	626	2.68	A	2.70	B	2.00	B	4.84	B	80	15	Sandstone,Shale		Siffu No.1(B) is discarded in favor of (A) due to lower efficiency.
12	25	Siffu No.2	367	1.39	B	1.45	C	1.21	B	3.29	B	40	40	Volcanic rocks		Postponed for future development.
13	26	Mallig No.1	436	2.37	B	1.62	C	1.79	B	5.56	A	160	8	Conglomerate,Sandstone		Postponed for future development.
14	27	Mallig No.2	362	6.68	A	2.82	B	3.72	A	11.73	A	100	12	Sandstone,Shale	o	High efficiencies for each purpose.
15	28	Ilagan No.1	1350	2.38	B	4.57	A	3.13	A	5.07	A	40	27	Meta-Andesite,Diorite	o	High efficiencies for each purpose.
16	29	Ilagan No.2	876	1.57	B	1.89	B	2.02	B	2.80	C	0	41	Meta-Andesite,Agglomerate		Postponed for future development.
17	33	Dinabungan	852	1.80	B	1.57	C	1.50	B	2.20	C	270	5	Granodiorite,Sandstone	o	Flood control will be expected.
18	34	Catalangan	235	1.02	C	1.13	C	0.87	C	0.87	C	20	19	Andesite,Phyoclastics		Low efficiencies.
19	37	Alimit No.1(A)	559	1.40	B	1.57	C	1.25	B	4.77	B	0	25	Andesite,Agglomerate	o	Alternative for irrigation and water supply in case Magat storage is partly allocated for flood control.
20	41	Matuno No.1	550	0.19	C	3.79	A	0.29	C	1.10	C	0	8	Conglomerate	oo	High efficiency for power generation.Topo maps available.
21	47	Cagayan No.1	2364 (1214)	12.90	A	8.35	A	12.32	A	34.05	A	1440	22	Limestone (Calloo-)	o	High efficiencies. Compensation probles can probably be set-tled.
22	48	Cagayan NO.2	1631 (481)	2.01	B	2.17	B	2.04	B	5.61	A	0	50	Limestone (Sicaloo-)	o	High efficiencies. Alternative in case compensation probles in Cagayan No. 1 cannot be settled.
23	49	Cagacgan	1150	1.18	C	2.96	B	1.18	B	2.88	C	120	80	Agglomerate	oo	Definite design on-going by NIA. Topo maps available.
24	50	Addalam(A)	864 (387)	1.26	B	3.19	B	1.45	B	3.37	B	0	25	Agglomerate	o	Effective for each purpose.
25	51	Diduyon	477	1.35	B	9.58	A	0.88	C	1.98	C	0	55	Agglomerate,Andesite	oo	High efficiency for power generation.Topo maps available.
26	52	Dibuluan	159	0.29	C	0.77	C	0.14	C	0.73	C	0	28	Metasediments		Low efficiencies.

NOTE : /1 : oo .... Feasibility Study completed.

Table 9.3 Result of Geological Survey

Dam Name	Geology	Geological Age	Strike/Dip	Hardness/Weathering	Fault, Fracture Zone
Pinukpuk	conglomerate, sandstone	Upper Miocene	N30°E/30°SE	soft-partly hard	-
Chico No.4 /1	sandstone,shale, siltstone	Upper Miocene	N60°W/70°NE	hard-medium/moderately weathered (upland)	fault is present at the abutment
Chico No.2 /1	basic volcanics (basalt-spilite, diabase)	Cretaceous-Paleogene	-	generally very hard	-
Siffu No.1	pebble-conglomerate	Pliocene	strike: N-S dip: 30°E	soft/moderately to highly weathered	active structure inferred may be no problem
Mallig No.2	sandstone with conglomerate, mudstone	Upper Miocene	N10°/60°E	soft-medium/moderately weathered	-
Ilagan No.1	meta-ancesite, diorite	Cretaceous-Paleogene	-	very hard-medium/slightly altered	-
Disabungan	sandstone, andesite granodiorite	Cretaceous-Paleogene/Pliocene	almost horizontal (sandstone)	very soft, highly (upland)/hard (river bank)	-
Alimit No.1	agglomerate, andesite	Cretaceous-Paleogene	N50-60°W/50°NE	generally hard, slightly-moderately weathered	-
Matuno No.1 /1	conglomerate, sandstone	Middle Miocene	strike: E-W, dip: 30-40°N	hard/moderately weathered	-
Cagayan No.1	limestone (Callao-)	Upper Miocene	strike: N-S dip: 7-8°W	hard/slightly-moderately with solutive texture	-
Cagayan No.2	limestone (Sicalao-)	Middle Miocene	strike: NE-SW dip: 10°NW	hard-medium/moderately weathered	-
Casecnan /1	agglomerate	Upper Oligocene	strike: NE-SW dip: 20-30°N	hard, massive	sheared zone, consolidated
Addalam	agglomerate	Oligocene	N60°W/10°SW	med.-very hard/slightly-highly weathered (right)	-
Diduyon /1	agglomerate, andesite	Oligocene	N35-50°NE/25-35°E	hard/generally fresh	fault right bank
Dibuluan	metasediments	Cretaceous-Paleogene	strike: NE-SW dip: NW	medium hard/moderately weathered	-

Note; /1: Source, Feasibility or Pre-Feasibility Report of Each Projects

Table 9.4 Proposed Construction Material

(from surface inspection)

Number	Dam Name	Location	Material	Description	Class
1	Pinukpuk	2 km upstream river bed	sand, gravel	including cobble-boulder, hard	A
2	Siffu No. 1	0.8 km downstream both banks	conglomerate sand-stone (preocene) End Teriary	very loose, moderately weathered	B
3	Mallig No. 2	*2.5 km SW right bank	sandstone, mud-stone (End Tertiary)	moderately-highly weathered soft rock	C
		**11 km NW (Chico River Channel)	sand, gravel	including cobble-boulder, hard	A
4	Ilagan No. 1	2 km downstream and 5 km upstream river bed	sand, gravel	including cobble-boulder, hard	A
5	Disabungan	1 km upstream right bank	andesite etc. (metavolcanics) (Not to be specified)	moderately weathered soft rock	B
6	Alimit No. 1	1-2 km upstream right bank	agglomerate (cretaceous)	slightly-moderately weathered	A
7	Cagayan No. 1	3-5 km upstream river bed	sand, gravel	including cobble-boulder, hard	A
8	Cagayan No. 2	0.5-3 km upstream river bed	sand, gravel	including cobble-boulder, hard	A
9	Addalam	4 km SW both banks (upstream)	agglomerate (cretaceous)	slightly-moderately weathered	A

Notes: * and ** means alternative plan each other

Class - A: fresh-moderately weathered hard rock
- B: moderately weathered soft rock
- C: moderately-highly weathered soft rock

Table 9.5 Land Use and Number of Buildings in Reservoir Area

Name of Dam	Elevation (El.m)	Land Use (ha)				No. of Buildings (Nos.)
		Paddy	Agri-culture	Residen-tial	Others/1	
Pinukpuk	70	0	0	0	38	0
	80	8	26	0	336	113
	90	48	164	0	494	225
	100	76	272	0	692	470
	110	76	302	0	1,050	712
	120	76	314	0	1,420	965
	130	76	326	0	1,842	1,215
Siffu No.1	70	0	0	0	50	0
	80	0	30	0	180	25
	90	10	120	0	420	119
	100	40	240	0	700	219
	110	170	400	0	1,070	440
	120	340	590	0	1,610	492
	130	430	690	0	2,270	660
Mallig No.2	110	0	0	0	10	0
	120	0	10	0	70	0
	130	10	60	0	290	84
	140	30	150	0	630	198
	150	100	220	0	1,040	332
	160	140	270	0	1,560	409
	170	190	290	0	2,310	540
Disabungan	60	0	0	0	30	0
	70	0	160	0	210	79
	80	50	320	0	510	311
	90	70	410	0	860	531
	100	90	540	0	1,350	727
	110	100	640	0	2,030	881
Ilagan No.1	110	0	0	0	70	0
	120	0	50	0	250	2
	130	0	130	0	480	90
	140	0	210	0	890	267
	150	0	260	0	1,270	376
	160	0	270	0	1,820	415
	170	0	280	0	2,850	436

(to be continued)

(Continuation)

Name of Dam	Elevation (El.m)	Land Use (ha)				No. of Buildings (Nos.)
		Paddy	Agri-culture	Residen-tial	Others/1	
Addalam/2	120	0	0	0	199	0
	140	0	140	0	325	0
	160	0	320	0	766	0
	180	0	550	0	1,303	0
	200	0	740	0	1,774	0
	220	0	990	0	2,386	0
Cagayan No.1	120	0	0	0	20	0
	130	0	10	0	110	0
	135	0	50	0	300	0
	140	0	340	0	650	4
	145	20	840	10	1,090	230
	150	100	1,180	40	1,840	1,586
	160	240	1,430	60	3,310	3,458
	170	470	1,600	80	4,890	5,282
Cagayan No.2	180	0	0	0	50	0
	190	0	20	0	140	13
	200	0	100	0	290	38
	210	0	130	0	420	92
	220	0	160	0	560	173
	230	0	170	0	820	238
	240	0	180	0	1,220	288
	250	0	190	0	1,500	315
Alimit No.1/2	200	0	0	0	37	0
	220	0	0	0	166	0
	240	0	0	0	334	0
	260	0	0	0	652	0
	280	10	0	0	1,019	0
	300	50	0	0	1,394	0
	320	116	0	0	2,090	0
	340	186	0	0	2,777	0
	360	271	0	0	3,177	0

Notws; /1: Include forest and grass land
/2: Data source,MAF Region II's investigation.
Other site are estimated on the basis of the topographic map in a scale of 1 to 25,000.

Table 9.6 Results of Screening for Small Dam Project

No.	Name of Dam	River	C.A. (km^2)	Annual Rainfall (mm)	Available Water (MCM) [1]	Riverbed Elevation (El.m)	Possible Max. Elevation (El.m)	Sediment Level (El.m)	HWL (El.m)	Dam Crest (El.m)	Sediment Storage ($10^6 m^3$)	Effect. Storage ($10^6 m^3$)	Gross Storage ($10^6 m^3$)	Dam Height (m)	Dam Volume ($10^6 m^3$)	Storage Efficiency	Selected Damsites	Remarks (Dam height is decided by following limit.)
1	Cuising		5.3	2,100	3.74	45	72+	55.5	67	72	0.20	1.10	1.30	30	0.246	4.5		Maximum dam height (30 m).
2	Bulagao		17.3	2,100	12.21	37	60	46.3	55	60	0.65	2.05	2.70	26	0.160	12.8		Topographical condition.
3	San Luis		6.2	2,000	4.17	46	60	50.5	55	60	0.23	0.97	1.20	17	0.117	8.3		Topographical condition.
4	Anansi	Anansi	6.0	2,900	5.85	19	46+	22.8	41	46	0.22	4.68	4.90	30	0.504	9.3		Maximum dam height (30 m).
5	Nabialan	Afusing	6.7	2,000	4.50	37	50	41.5	45	50	0.25	0.95	1.20	16	0.137	6.9		Topographical condition.
6	Magogod		11.4	3,000	11.49	28	55+	35.0	50	55	0.43	2.87	3.30	30	0.332	8.6		Maximum dam height (30 m).
7	Manalo		26.9	2,900	26.21	25	52+	45.5	47	52	1.01	0.19	1.20	30	0.164	1.2		Maximum dam height (30 m).
8	Marohhod		21.0	2,800	19.76	25	52+	32.0	47	52	0.79	5.81	6.60	30	0.619	9.4		Maximum dam height (30 m).
9	Sta. Barbara		22.1	2,800	20.79	26	53+	38.6	48	53	0.83	2.17	3.00	30	0.281	7.7		Maximum dam height (30 m).
10	Bayo		7.5	2,600	6.55	27	50	33.0	45	50	0.28	2.72	3.00	26	0.295	9.2		Topographical condition.
11	San Juan		3.8	2,000	2.55	76	100	81.0	90	95	0.14	2.55	2.69	22	0.250	10.3		Hydrological condition.
12	Liwan Norte		6.0	2,000	4.03	59	70	61.5	65	70	0.23	0.57	0.80	14	0.025	22.8	*	Topographical condition.
13	Kinama		8.1	2,000	5.94	79	106+	87.5	101	106	0.30	1.80	2.10	30	0.187	9.6		Maximum dam height (30 m).
14	Liwan West		5.1	2,000	3.43	99	126+	106.1	121	126	0.19	1.91	2.10	30	0.276	6.9		Maximum dam height (30 m).
15	Santor		11.3	2,000	7.56	80	100	85.3	95	100	0.42	4.88	5.30	23	0.163	29.9	*	Topographical condition.
16	Maglatac 1	Paculagu	76.3	2,000	51.27	56	83+	70	78	83	2.86	6.84	9.70	30	0.263	26.0	*	Maximum dam height (30 m).
17	Maglatac 2	Paculagu	51.2	2,000	34.41	75	102+	87.5	97	102	1.92	8.08	10.00	30	0.386	20.9		Maximum dam height (30 m).
18	Minagbag		8.9	2,000	5.98	120	140	129.4	135	140	0.33	0.77	1.10	23	0.270	2.9		Topographical condition.
19	Laguiaday		15.9	2,000	10.68	90	117+	98.0	112	117	0.60	6.40	7.00	30	0.596	10.7		Maximum dam height (30 m).
20	Bubug		4.9	2,000	3.29	68	95+	75.3	90	95	0.18	3.29	3.47	30	0.430	7.7		Max. dam height & hydro. condition.
21	San Vicente		11.6	2,300	8.96	40	67+	47.0	62	67	0.44	8.16	8.60	30	0.774	10.5		Maximum dam height (30 m).
22	Sto. Rosario		5.8	2,000	3.90	65	90	69.5	81	86	0.22	3.90	4.12	24	0.194	9.9		Hydrological condition.
23	Maui		4.2	2,000	2.82	78	100	80.3	95	100	0.16	2.82	2.98	25	0.250	11.3		Topo. & hydrological condition.
24	Carmencita	Calinaman	5.0	2,000	3.76	85	110	92.0	105	110	0.19	3.36	3.55	28	0.500	6.7		Topo. & hydrological condition.
25	Miguel		3.1	2,000	2.08	50	70	54.0	65	70	0.12	2.08	2.20	23	0.334	6.6		Topo. & hydrological condition.
26	Mangga		14.3	2,000	9.61	90	100	93.6	95	100	0.54	0.46	1.00	13	0.090	5.1		Topographical condition.
27	Malalao		8.8	2,000	5.91	117	144+	123.5	139	144	0.33	3.47	3.80	30	0.228	15.2		Maximum dam height (30 m).
28	Turod		33.0	2,000	22.18	73	100+	82.0	95	100	1.24	6.96	8.20	30	0.423	16.5		Maximum dam height (30 m).
29	Rang-ayan 1		15.1	2,000	10.15	77	104+	92.0	99	104	0.57	0.73	1.30	30	0.117	6.2		Maximum dam height (30 m).
30	Rang-ayan 2		9.7	2,000	6.52	135	162+	146.5	157	162	0.16	2.14	2.50	30	0.151	14.2		Maximum dam height (30 m).
31	Sinamar		5.1	2,000	3.43	90	117+	95.0	112	117	0.19	2.61	2.80	30	0.445	5.9		Maximum dam height (30 m).
32	San Rafael	Cabanayan	6.0	2,000	4.03	88	115+	97.2	110	115	0.23	1.17	1.40	30	0.377	3.1		Maximum dam height (30 m).
33	Matuvalem	Barambam	20.2	2,000	13.57	88	115+	96.8	110	115	0.76	5.44	6.20	30	0.274	19.9		Maximum dam height (30 m).
34	Eden		13.5	2,000	9.07	95	122+	106.3	117	122	0.51	3.79	4.30	30	0.176	21.5		Maximum dam height (30 m).
35	Mapapi	Mapapi	12.8	2,000	8.60	95	122+	103.0	117	122	0.48	5.72	6.20	30	0.304	18.8		Maximum dam height (30 m).
36	Mangcuram	Manga	10.3	2,000	6.92	38	50	41.0	45	50	0.39	1.61	2.00	15	0.116	13.9		Topographical condition.
37	Pasa		17.9	2,900	17.44	90	117+	104.5	112	117	0.67	1.13	1.80	30	0.222	5.1		Maximum dam height (30 m).
38	Fuyo		6.0	2,700	5.44	66	90	71.0	84	89	0.23	5.44	5.67	26	0.507	10.7		Hydrological condition.
39	Yehan		10.7	2,300	8.27	47	70	52.0	64	69	0.40	8.27	8.67	25	0.424	19.5		Hydrological condition.
40	San Francisco		11.4	2,600	9.96	65	80	68.0	75	80	0.43	6.07	6.50	18	0.126	48.2	*	Topographical condition.
41	Songsong		14.8	2,700	10.44	30	50	39.1	45	50	0.56	2.54	3.10	23	0.113	22.5		Topographical condition.
42	Cuihang		20.8	2,100	14.68	38	60	45.0	55	60	0.78	10.02	10.80	25	0.510	19.6		Topographical condition.
43	Bagong		22.9	2,000	15.39	45	60	51.3	55	60	0.86	2.84	3.70	18	0.103	27.6	*	Topographical condition.
44	Sta. Maria		30.6	2,700	23.65	55	80	60.0	74	79	1.15	23.65	24.80	27	0.267	88.6	*	Hydrological condition.
45	Calaocan	Madalao	26.8	2,200	19.81	62	90	68.0	79	84	1.01	19.81	20.82	25	0.273	72.6	*	Hydrological condition.
46	Sannawag		14.3	2,100	24.20	57	70	63.4	65	70	1.29	0.81	2.10	16	0.058	14.0		Topographical condition.
47	Linglingay		15.6	2,000	10.48	55	70	57.5	65	70	0.59	6.11	6.70	18	0.116	52.7	*	Topographical condition.
48	Colorado	Sinalugan	63.9	2,100	45.09	60	87+	67.0	82	87	2.40	45.09	47.49	30	0.505	89.3	*	Max. dam height & hydro. condition.
49	Lourdes	Sto. Nino	12.7	2,000	8.53	49	60	52.7	55	60	0.48	0.82	1.10	14	0.040	15.5		Topographical condition.
50	Salvacion	Macaluat	54.1	2,000	36.36	67	80	77.6	75	80	2.03	0						No effective storage
51	San Felipe		11.9	2,000	8.00	79	90	82.8	85	90	0.45	0.95	1.40	14	0.082	11.6		Topographical condition.
52	Bacradal		14.8	2,000	9.95	65	80	71.0	75	80	0.56	2.04	2.60	18	0.112	18.2		Topographical condition.
53	San Sebastian		9.0	2,000	6.05	85	100	89.0	95	100	0.34	2.46	2.80	18	0.130	18.9		Topographical condition.
54	Bello	Diarao	42.5	2,200	31.42	118	145+	127.0	140	145	1.59	12.71	14.30	30	0.303	42.0	*	Maximum dam height (30 m).
55	Fermin		4.4	2,000	2.96	87	100	90.8	95	100	0.17	1.13	1.30	16	0.094	14.1		Topographical condition.
56	San Marcos		13.2	2,000	8.87	88	115+	97.3	110	115	0.50	4.30	4.80	30	0.199	21.6		Maximum dam height (30 m).

Notes: [1] ; Potential water to be stored.

Table 9.7 Results of Screening for Pond Scheme

Item		Pond 1 (Carmencita)	Pond 2	Pond 3	Pond 4
Catchment Area, at Intake	(km^2)	16.0	4.2	2.9	2.4
at Pond	(km^2)	0.8	0.4	0.3	0.7
Annual Rainfall	(mm)	2,000	2,000	2,000	2,000
Potential Water to be stored	(10^6m^3)	11.29	3.09	2.15	2.08
Ground Elevation	(El.m)	45	55	75	82
Possible Maximum Elevation	(El.m)	60	70	90	100
Sediment Level	(El.m)	48	58	80	85
HWL.	(El.m)	57	67	87	97
Dam Crest	(El.m)	60	70	90	100
Sediment Storage Volume	(10^6m^3)	0.06	0.03	0.02	0.04
Effective Storage Volume	(10^6m^3)	1.34	0.51	0.35	0.84
Gross Storage Volume	(10^6m^3)	1.40	0.54	0.37	0.88
Dam Height	(m)	18	18	18	21
Dam Volume	(10^6m^3)	0.117	0.085	0.072	0.125
Length of Intake Channel	(m)	900	500	800	1,200
Storage Efficiency (1)		11.5	6.0	4.9	6.7
Storage Efficiency (2)		1,490	1,020	440	700
Selected Pond		*			

Table 9.8 Priority Ranking for Proposed Small Dam

Name of Sites	With Irrigation Development				Without Irrigation Development			
	Net Present Value/1 (₱x10^6)	Benefit Cost Ratio	EIRR (%)	Priority Ranking	Net Present Value/1 (₱x10^6)	Benefit Cost Ratio	EIRR (%)	Priority Ranking
Liwan Norte	4.3	1.11	11.8	2	7.6	1.22	13.8	3
Santor	13.6	1.17	12.6	1	18.7	1.35	16.5	1
Maglatac 1	-24.4	0.81	7.1	7	4.7	1.07	11.1	5
San Francisco	0.4	1.01	10.1	5	-2.5	0.89	8.1	6
Bagong	-0.7	0.99	9.8	6	7.7	1.22	14.0	2
Linglingay	3.6	1.07	11.1	3	4.7	1.12	12.5	4
Bello	5.8	1.06	10.8	4	-9.9	0.70	5.1	7
Carmencita Pond	0.7	1.02	10.3		9.9	1.44	18.6	

Note: /1; Discount Rate ... 10% per annum

Table 9.9 Unit Price for Dam Construction

(Unit: Pesos)

Item	Unit	F.C.	L.C.	Total
New road	km	825,000	675,000	1,500,000
Road improvement	km	165,000	135,000	300,000
Bridge	m	22,500	27,500	50,000
Excavation, common	m^3	35	30	65
rock	m^3	120	90	210
tunnel	m^3	740	300	1,040
shaft	m^3	820	320	1,140
Embankment, core & earth	m^3	65	45	110
filter	m^3	95	75	170
rock	m^3	110	80	190
riprap	m^3	160	120	280
Concrete, dam	m^3	820	600	1,420
spillway & tailrace	m^3	910	890	1,800
powerhouse	m^3	950	950	1,900
tunnel	m^3	1,080	1,010	2,090
plug & anchor block	m^3	870	840	1,710
other structure	m^3	1,010	990	2,000
Grout, curtain	m	1,310	590	1,900
blanket or consoli.	m	910	510	1,420
Reinforcement bar	ton	10,450	4,750	15,200
Steel support	ton	12,350	8,550	20,900
Metal works, valve	ton	188,100	20,900	209,000
intake gate	ton	116,280	12,920	129,200
other gate	ton	109,440	12,160	121,600
trash rack	ton	76,950	8,550	85,500
penstock	ton	68,400	7,600	76,000

Table 10.1 1/5 Probable Annual Water Deficit at Balance Point

Unit: $x10^6m^3$/year

Balance Point	Annual Deficit 1985 Demand	1990 Demand	1995 Demand	2000 Demand	2005 Demand
1					
2					
3					
4					
5					
6			2 (80)	2 (80)	2 (80)
7			2 (78)	5 (78)	6 (78)
8				75 (82)	75 (82)
9			2 (78)	7 (78)	11 (78)
10					
11					87 (84)
12					
13		27 (75)	27 (75)	53 (75)	146 (75)
14					
15					
16					
17					
18					
19					
20					
21	2 (83)	2 (83)	2 (83)	2 (83)	2 (83)
22	3 (83)	3 (83)	3 (83)	3 (83)	3 (83)
23	40 (80)	139 (80)	139 (80)	139 (80)	139 (80)
24					
25					
26	15 (78)	17 (83)	18 (83)	19 (83)	20 (83)
27	4 (78)	4 (78)	5 (78)	5 (78)	6 (78)
28					
29					
30			650 (75)	650 (75)	650 (75)
31	2 (78)	2 (80)	55 (78)	55 (78)	55 (78)
32			7 (74)	7 (74)	8 (74)
33	7 (78)	7 (78)	7 (78)	7 (78)	5 (78)
34		10 (78)	10 (78)	10 (78)	10 (78)
35					
36					
37					
38					
39					
40					
41					
42	6 (63)	6 (63)	6 (63)	6 (63)	14 (78)
43					
44	14 (78)	13 (78)	13 (78)	13 (78)	38 (69)
45					
46	16 (80)	16 (80)	16 (80)	17 (80)	25 (80)
47			8 (78)	25 (81)	37 (69)
48			7 (78)	23 (78)	34 (69)

Note; Figures in parentheses are the years when 1/5 probable deficits occur.

Table 11.1 Allocated Dam Cost and Total Cost

(Unit: ₱ x 10^6)

Item	Dummon	Paranan	Zinundungan	Mallig No.2	Siffu No.1	Alimit No.1	Matuno No.1
I. Allocated Dam Cost							
Irrigation	354.56	355.46	226.13	1,188.68	-	-	578.28
Hydropower	35.49	47.10	83.64	-	245.06	589.12	2,023.20
Flood Control	-	-	-	388.48	304.15	978.22	-
Water Supply	-	-	-	-	-	80.47	53.68
Irrigation /1	-	-	-	-	286.05	137.70	239.12
Water Supply /1	-	-	-	-	109.56	51.86	92.72
Sub-Total of I	390.05	402.56	309.77	1,577.16	944.82	1,837.37	2,987.00
II. Specific Cost							
Irrigation	34.37	26.41	66.59	2,138.09	-	-	783.07
Hydropower	24.96	22.01	41.70	-	112.41	199.73	2,085.00
Sub-Total of II	59.33	48.42	108.29	2,138.09	112.41	199.73	2,868.07
III. Total	449.38	450.98	418.06	3,715.25	1,057.23	2,037.10	5,855.07

Note: /1 ; Supplement of Magat dam

Table 11.2 Assumed Cost Disbursement

(Unit: Mill. Pesos)

Item	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
I. MULTIPURPOSE PROJECT																				
1. Matiig Project				44.87	281.51	748.07	906.79	1,016.20	718.82											3,716.26
2. Siffu Project				31.72	158.58	264.31	338.31	264.31												1,057.23
3. Matuno Project						152.16	507.20	937.25	1,348.04	1,568.00	1,342.41									5,855.07
4. Alimit Project											61.10	305.57	509.28	651.87	509.28					2,037.10
																			Sub-Total	12,664.66
II. FLOOD CONTROL PROJECT																				
1. Tuguegarao Dike				27.60	131.70	131.70	131.70	131.70												554.40
2. Magapil (Nassiping Left,NLL)					49.00	232.30	232.30	232.30	232.30											978.20
3. Bank Protection		53.30	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	53.90	969.60
4. Cabagan Dike										15.50	72.80	72.80	72.80	72.80						306.70
5. Magapil (Nassiping Right,NLR)										147.70	312.10	312.10	312.10	312.10	312.10	312.10	312.10	312.10	312.10	2,956.60
																			Sub-Total	5,765.50
III. IRRIGATION PROJECT																				
1. Pinacanauan RIS			1.85	21.16																23.01
2. Dabubu RIP			6.54	46.81	46.72															99.07
3. Lulutan IP											7.60	88.29	87.85							183.94
4. Solana IS											2.92	35.10	35.10							73.12
5. Gappal IP											19.79	88.08	259.24	238.96						606.07
6. Ilagan IP													7.00	79.75	79.39					166.14
7. Tuguegarao IP													4.15	47.64	47.46					99.25
8. Alcala Amulung West IP														13.59	128.62	166.15	125.41			433.77
9. Bagao IS														21.23	85.97	182.51	161.27			450.98
10. Dummon RIS															20.75	84.38	182.50	161.75		449.38
11. Tumauini IS																	20.74	178.93	178.73	378.40
12. Zinundungan IEP																17.57	73.19	172.55	154.75	418.06
13. Magat O & M Improvement		157.75	352.96	234.71	183.46	131.13														1,060.00
																			Sub-Total	4,441.19
IV. HYDROPOWER																				
1. Ibulao									16.53	82.65	137.75	176.32	137.75							551.00
2. Tanudan												19.35	96.90	161.50	206.72	161.50				646.00
3. Didiyon															1,069.75	1,337.22	2,674.44	2,674.44	1,158.92	8,914.80
																			Sub-Total	10,111.80
Total	0.00	211.05	414.24	460.77	904.87	1,713.67	2,169.20	2,636.67	2,369.59	1,867.75	2,010.57	1,151.54	1,576.07	1,653.34	2,513.97	2,315.33	3,603.56	3,553.67	1,858.40	32,983.15
V. PROJECT COST BY SECTOR																				
1. Flood Control	0.00	53.30	53.90	90.62	291.87	552.21	612.35	616.26	383.32	217.10	468.15	585.53	683.38	751.82	610.56	366.00	366.00	366.00	366.00	7,436.35
2. Irrigation	0.00	157.75	360.34	369.43	559.38	948.74	1,031.64	1,185.50	1,065.94	540.95	477.20	251.96	460.66	484.13	412.86	404.61	489.67	441.94	289.61	9,925.56
3. Hydropower	0.00	0.00	0.00	10.72	53.62	212.62	525.21	828.85	920.33	1,109.70	1,065.22	314.03	431.86	417.39	1,490.55	1,544.72	2,747.88	2,745.73	1,202.79	15,621.22

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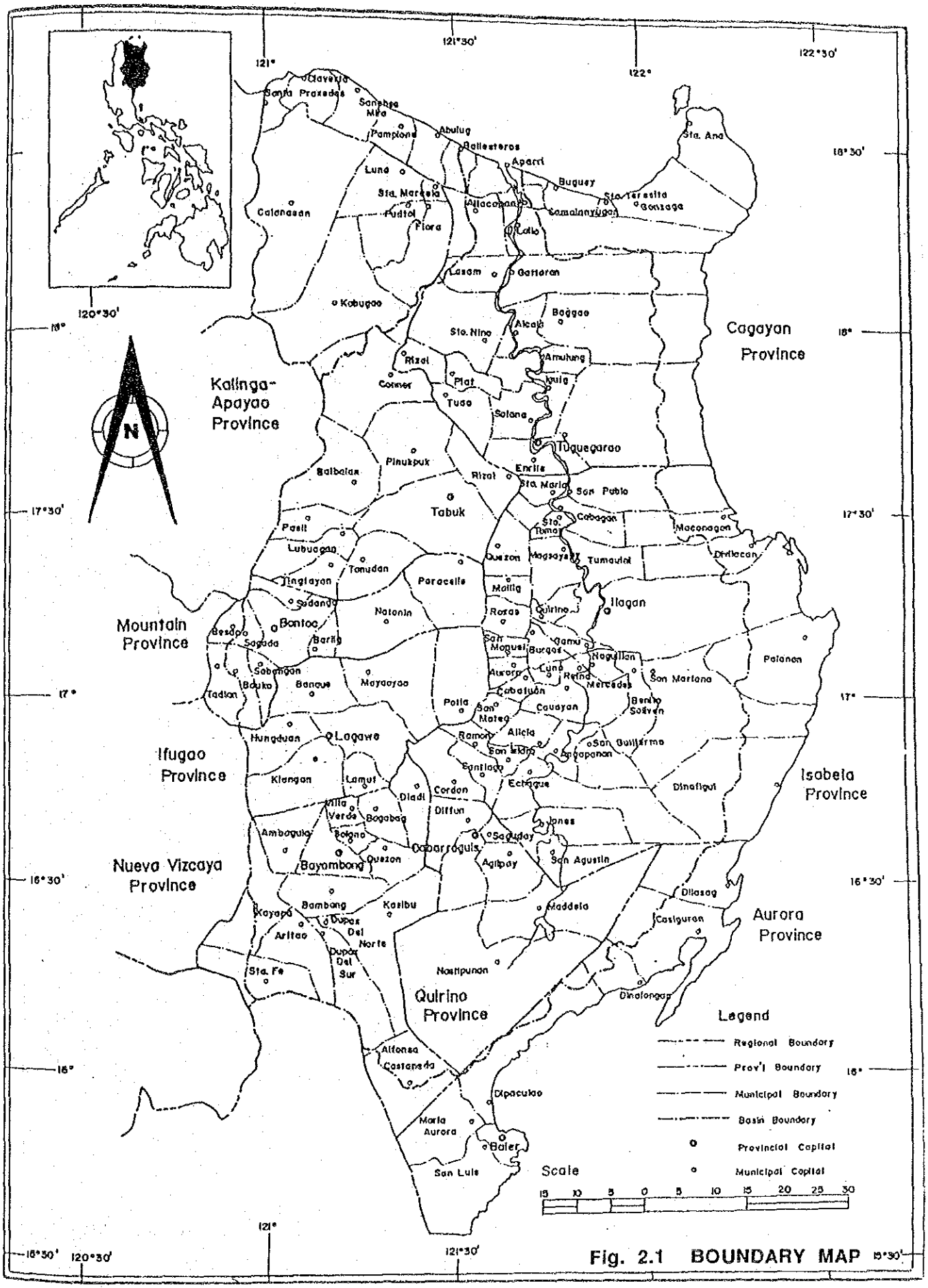


Fig. 2.1 **BOUNDARY MAP**

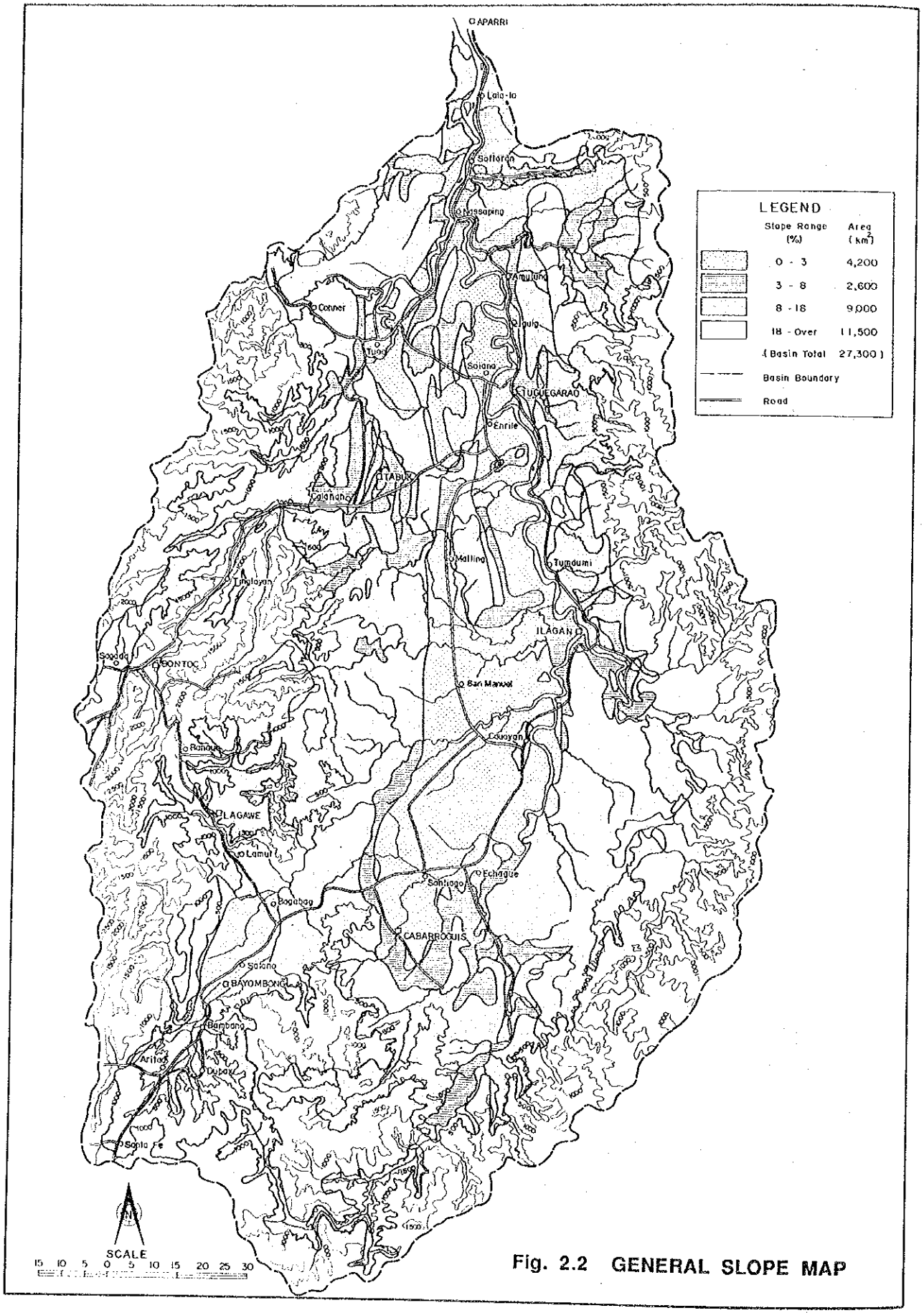


Fig. 2.2 GENERAL SLOPE MAP

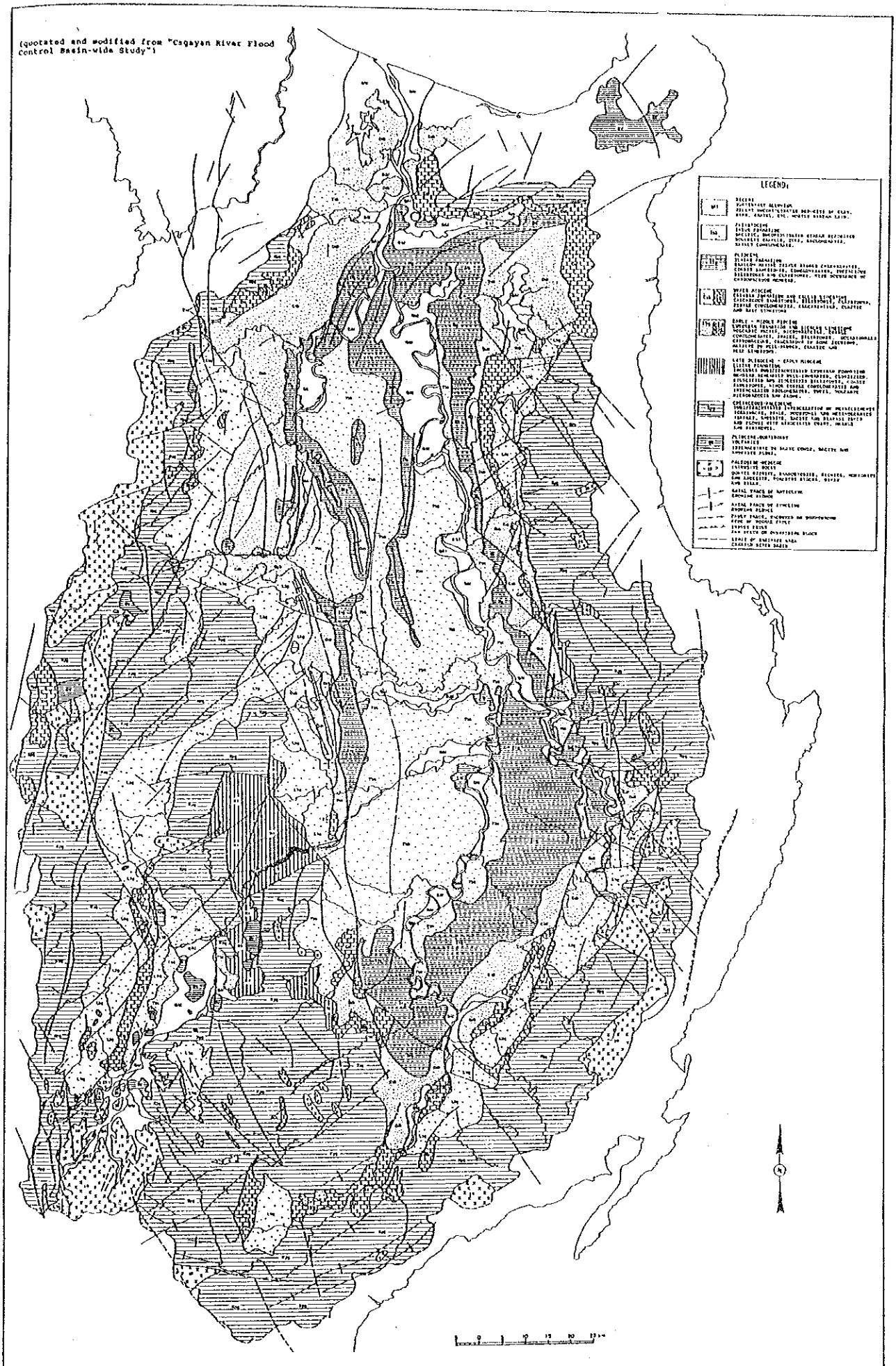


Fig. 2.3 GEOLOGICAL MAP OF CAGAYAN RIVER BASIN

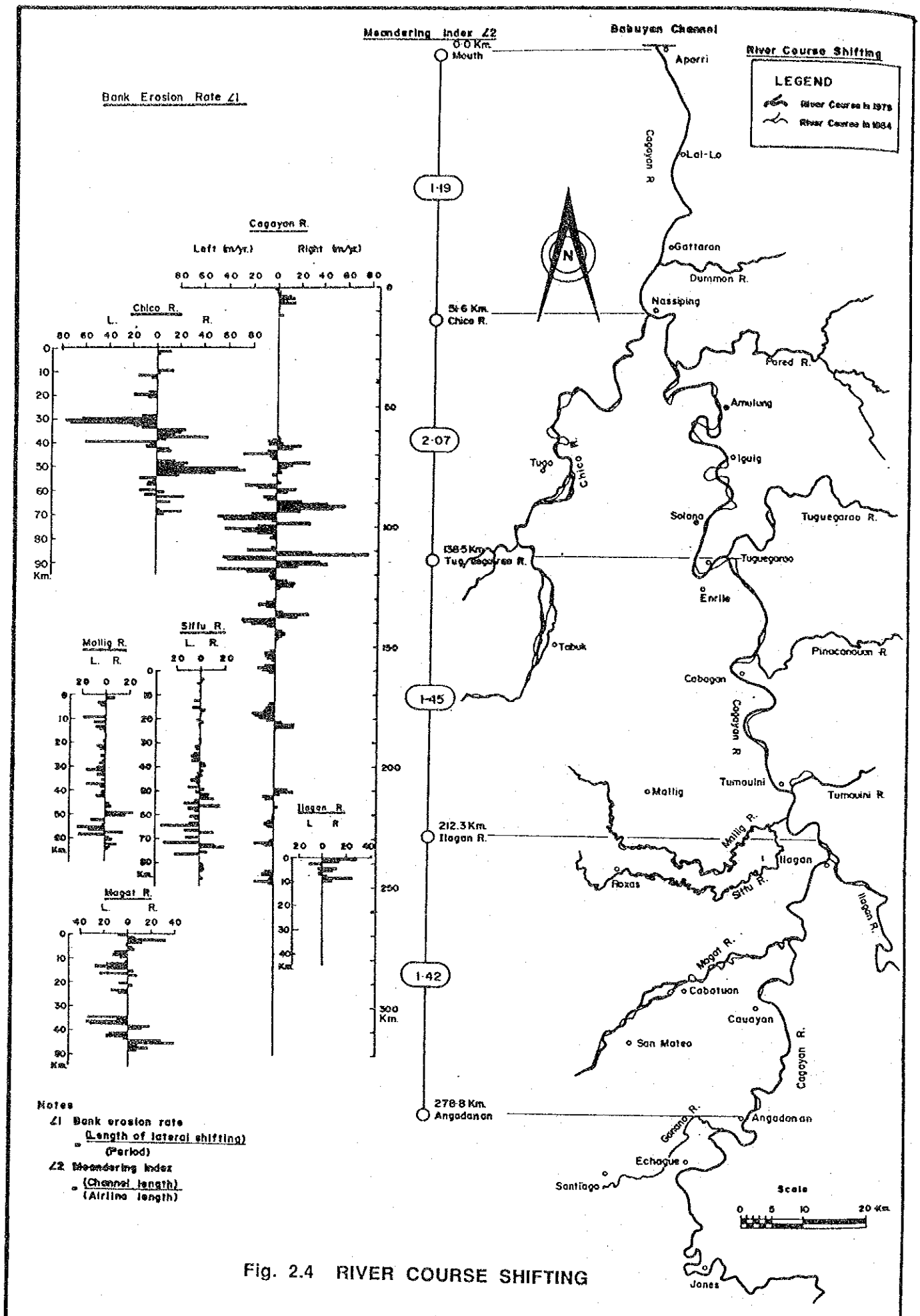


Fig. 2.4 RIVER COURSE SHIFTING

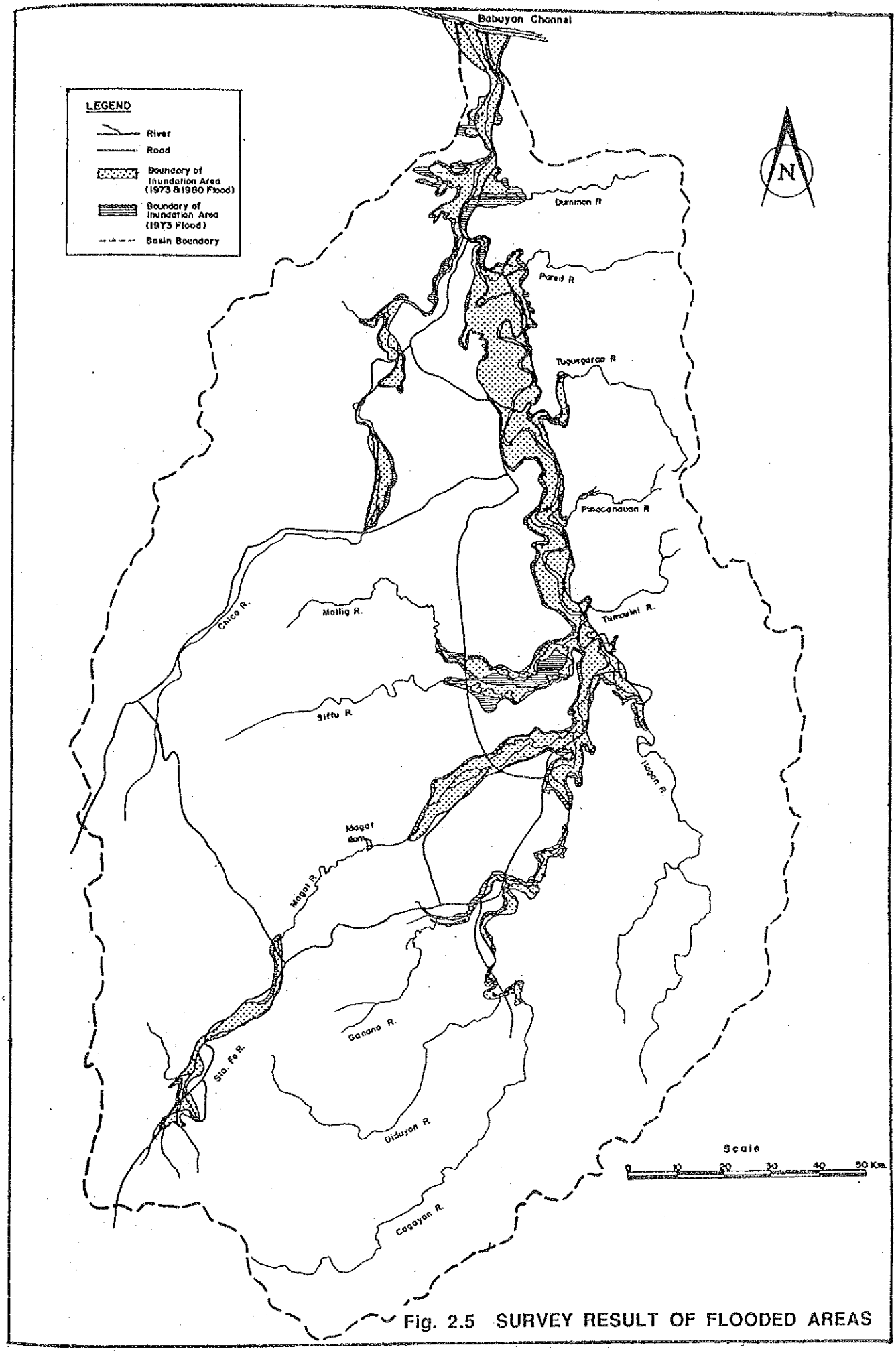
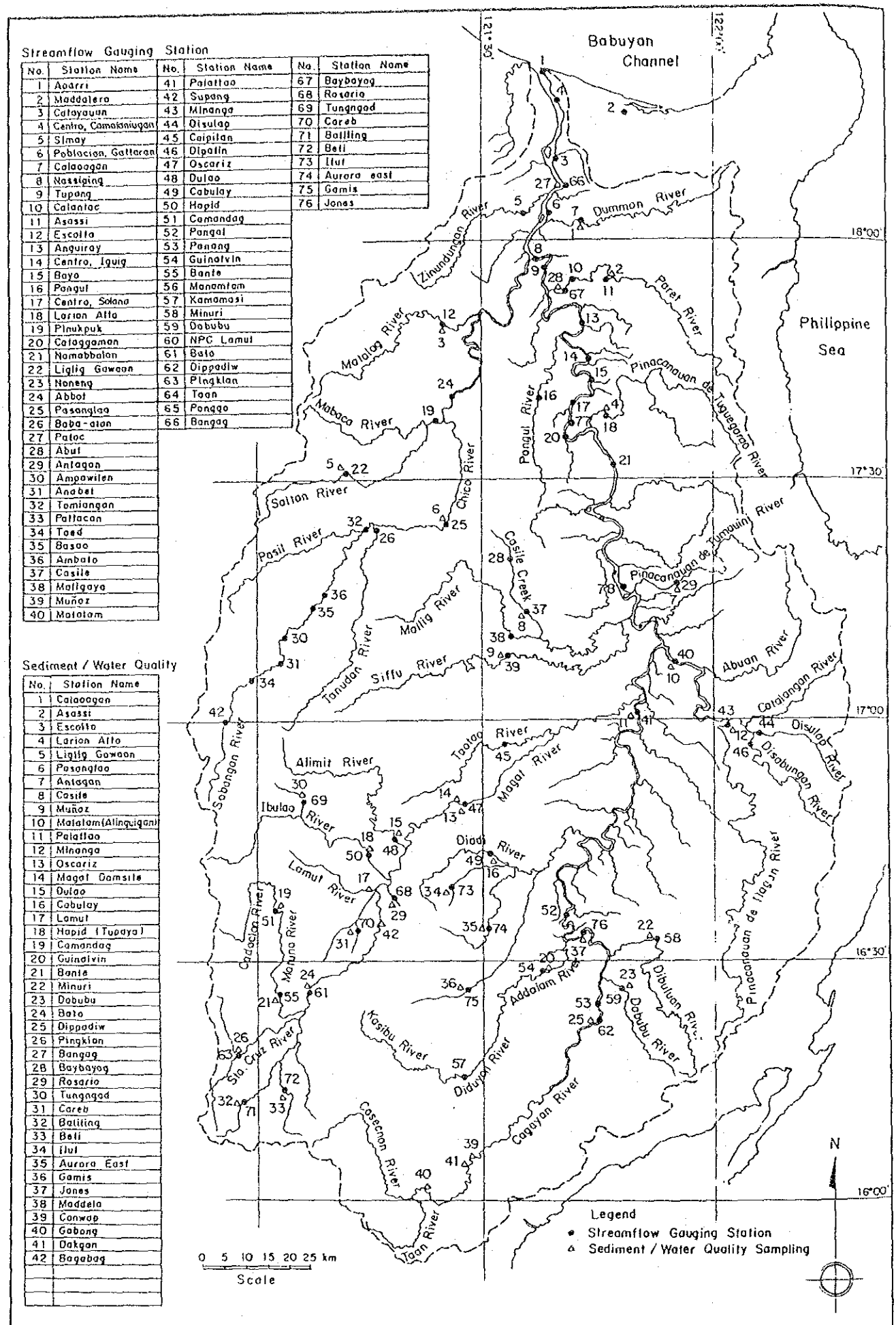


Fig. 2.5 SURVEY RESULT OF FLOODED AREAS



Streamflow Gauging Station

No.	Station Name	No.	Station Name	No.	Station Name
1	Aparri	41	Palattao	67	Baybayog
2	Maddalera	42	Supang	68	Rosario
3	Catayauan	43	Minanga	69	Tungngod
4	Centro, Camalaniugan	44	Disulap	70	Careb
5	Simay	45	Calpilan	71	Baliling
6	Poblacion, Gattaran	46	Dipalin	72	Bali
7	Calaoagan	47	Oscariz	73	Ilut
8	Nassiping	48	Dulao	74	Aurora east
9	Tupang	49	Cabulay	75	Gamis
10	Calantac	50	Hapid	76	Jones
11	Asassi	51	Camandag		
12	Escolta	52	Pangal		
13	Anguiray	53	Panang		
14	Centro, Iguig	54	Guinatvin		
15	Baya	55	Bante		
16	Pangul	56	Manamtam		
17	Centro, Solana	57	Kamamasi		
18	Larion Alto	58	Minuri		
19	Pinukpuk	59	Dabubu		
20	Calaggaman	60	NPC Lamut		
21	Namabbalan	61	Bato		
22	Liglig Gawaan	62	Dippadiw		
23	Noneng	63	Pingkian		
24	Abbot	64	Taan		
25	Pasanglao	65	Ponggo		
26	Baba-ason	66	Bangag		
27	Patoc				
28	Abut				
29	Antagan				
30	Ampawilen				
31	Anabel				
32	Tomiangan				
33	Pattacan				
34	Toad				
35	Basao				
36	Ambato				
37	Casile				
38	Mallgaya				
39	Muñoz				
40	Malatam				

Sediment / Water Quality

No.	Station Name
1	Calaoagan
2	Asassi
3	Escolta
4	Larion Alto
5	Liglig Gawaan
6	Pasanglao
7	Antagan
8	Casile
9	Muñoz
10	Malatam(Alinguigan)
11	Palattao
12	Minanga
13	Oscariz
14	Magat Damsite
15	Dulao
16	Cabulay
17	Lamut
18	Hapid (Tupaya)
19	Camandag
20	Guinatvin
21	Bante
22	Minuri
23	Dabubu
24	Bato
25	Dippadiw
26	Pingkian
27	Bangag
28	Baybayog
29	Rosario
30	Tungngod
31	Careb
32	Baliling
33	Bali
34	Ilut
35	Aurora East
36	Gamis
37	Jones
38	Maddela
39	Conwap
40	Gabong
41	Dakgan
42	Bagabag

Fig. 3.1 LOCATION OF HYDROLOGICAL STATIONS

Climatological Station

No.	Station Name	No.	Station Name
1	Aparri	10	Wacal
2	Tuguegarao	11	Bontoc
3	Echague	12	Bayombong
4	Santo Domingo	13	Hapid
5	Baretbet	14	Matasia
6	Alimanao R.	15	San Isidro
7	Consuelo		
8	Baligatan		
9	Lagawe		

Rainfall Gauging Station

No.	Station Name
1	Aparri
2	Lal-lo
3	Agguneran
4	Bitag Grande
5	Imurung
6	Bauan
7	Tuao
8	Tuguegarao
9	Bagabba
10	Pinukpuk
11	Salegseg
12	Tomiangan
13	Naneng
14	Guilguiia
15	Tumauini
16	Cabagan
17	Lubuagan
18	Basao
19	Ilagan
20	Sanga-an
21	Bontoc
22	Barlig
23	Bauko
24	Reina Mercedes
25	Mt. Polis
26	Mt. Data
27	Namulditan
28	Lagawe
29	Nayon
30	Echague
31	Diadi
32	Solano
33	Bayombong
34	Barat
35	Dupax
36	Malico
37	Imugan
38	Consuelo
39	Gabong
40	Dakgan
41	Casigurar
42	Taan
43	Upper Casecnan
44	Aurora
45	Aritao
46	Kayapa
47	Wacal
48	Banti
49	Conwap
50	Dippadiw
51	Tabayong
52	Lias
53	San Francisco
54	Cabarroguis
55	Hapid, Lamut
56	Baretbet
57	Baligatan
58	Poblacion Lagawe
59	Sto Domingo
60	Kasibu
61	Kamamasi
62	Biyoy
63	Alayan
64	Packet

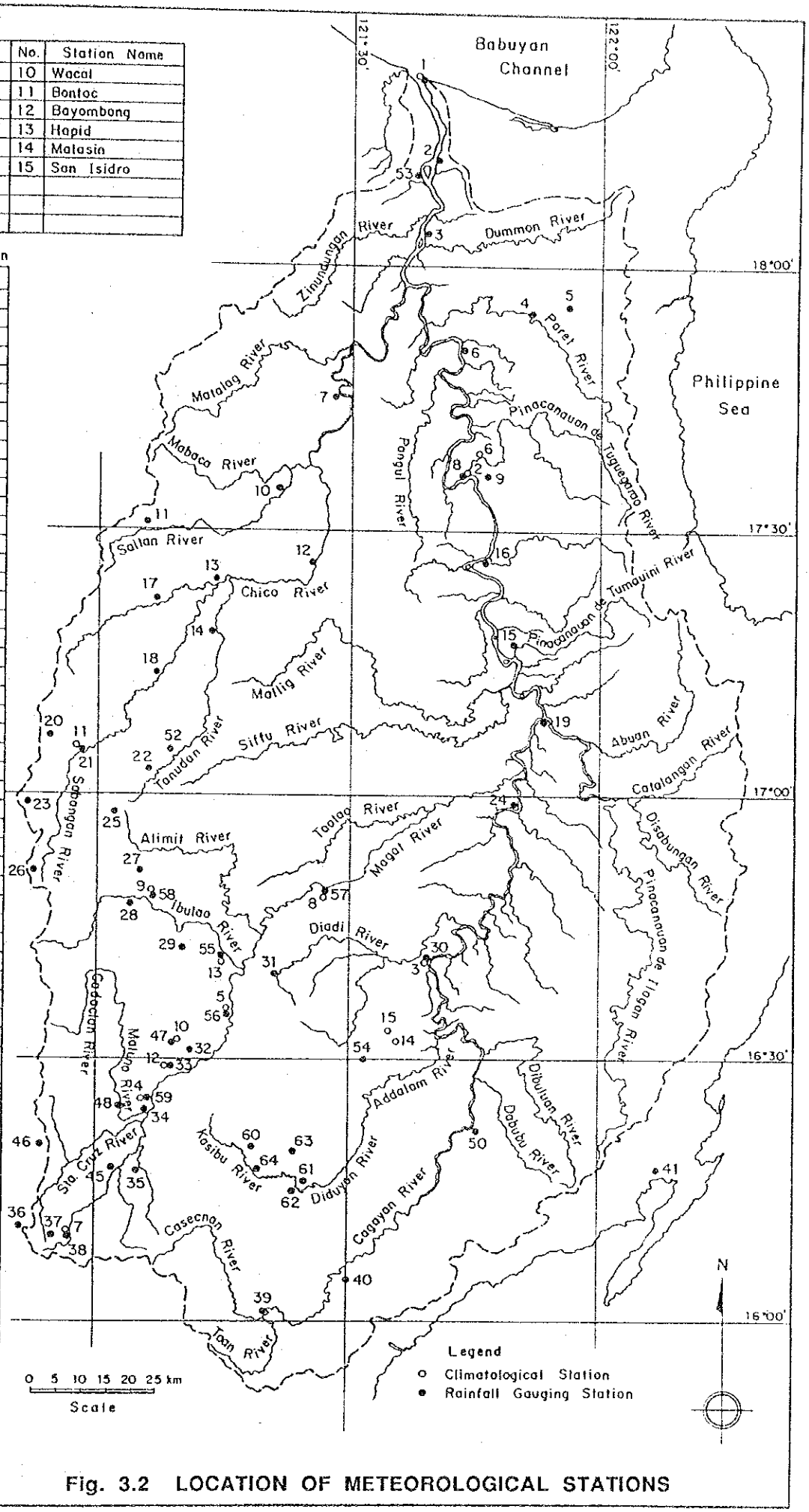
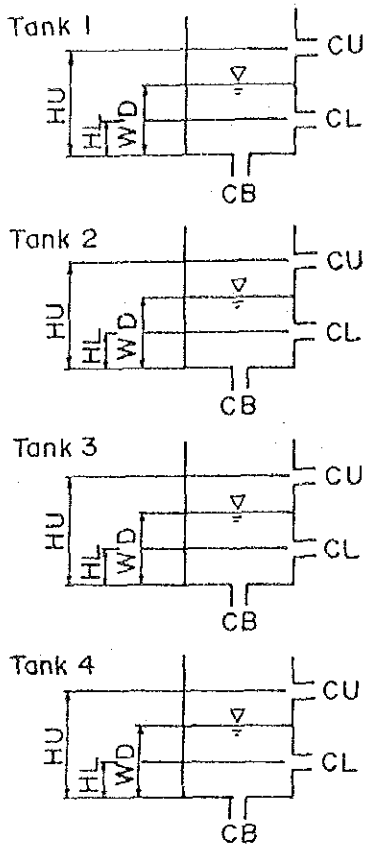


Fig. 3.2 LOCATION OF METEOROLOGICAL STATIONS



CU : Coefficient of upper hole

CL : Coefficient of lower hole

CB : Coefficient of bottom hole

HU : Height of upper hole (mm)

HL : Height of lower hole (mm)

WD : Initial water depth (mm)

Dulao				
	Tank 1	Tank 2	Tank 3	Tank 4
CU	0.35	0.04	0.02	0.0
CL	0.08	0.02	0.015	0.01
CB	0.25	0.12	0.06	0.001
HU	60	30	5	0
HL	10	10	0	0
WD	40	100	200	800

Minanga				
	Tank 1	Tank 2	Tank 3	Tank 4
CU	0.25	0.03	0.02	0.0
CL	0.10	0.02	0.015	0.014
CB	0.35	0.12	0.09	0.001
HU	60	30	10	0
HL	30	10	0	0
WD	50	150	150	600

Larion Alto				
	Tank 1	Tank 2	Tank 3	Tank 4
CU	0.30	0.07	0.03	0.0
CL	0.10	0.03	0.01	0.01
CB	0.30	0.09	0.05	0.001
HU	50	30	10	0
HL	10	10	0	0
WD	20	200	200	700

Ampawilen				
	Tank 1	Tank 2	Tank 3	Tank 4
CU	0.35	0.05	0.03	0.0
CL	0.12	0.03	0.02	0.01
CB	0.25	0.10	0.06	0.001
HU	60	30	5	0
HL	20	10	0	0
WD	10	100	200	700

Guinalvin				
	Tank 1	Tank 2	Tank 3	Tank 4
CU	0.35	0.05	0.02	0.0
CL	0.10	0.03	0.01	0.01
CB	0.35	0.15	0.07	0.001
HU	50	30	5	0
HL	10	10	0	0
WD	40	200	200	700

Pinukpuk				
	Tank 1	Tank 2	Tank 3	Tank 4
CU	0.30	0.08	0.02	0.0
CL	0.10	0.05	0.015	0.014
CB	0.30	0.15	0.12	0.001
HU	50	30	5	0
HL	10	10	0	0
WD	20	100	100	700

Fig. 3.3 TANK MODEL AND CALIBRATED COEFFICIENT

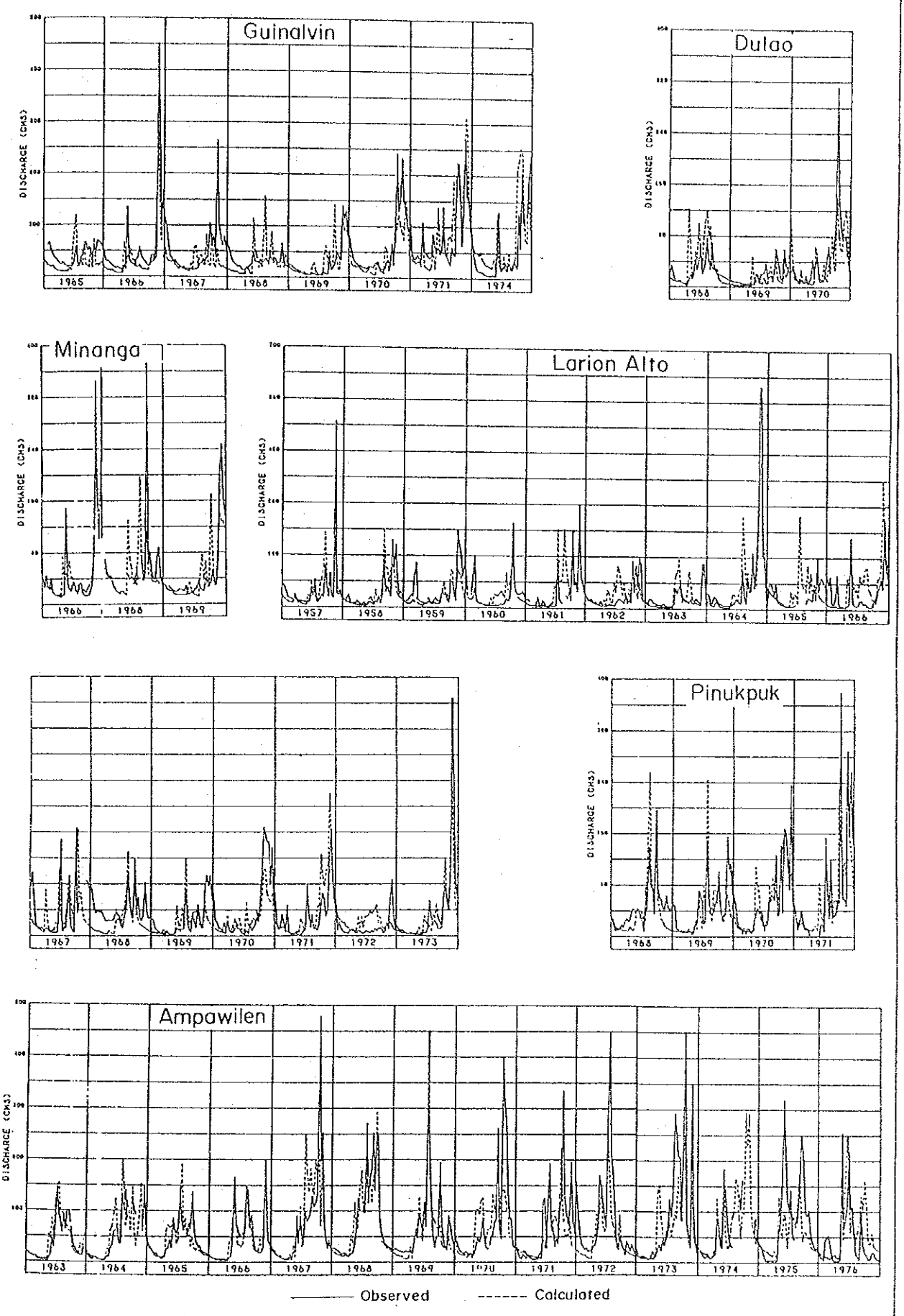


Fig. 3.4 OBSERVED AND CALCULATED RUNOFF HYDROGRAPH

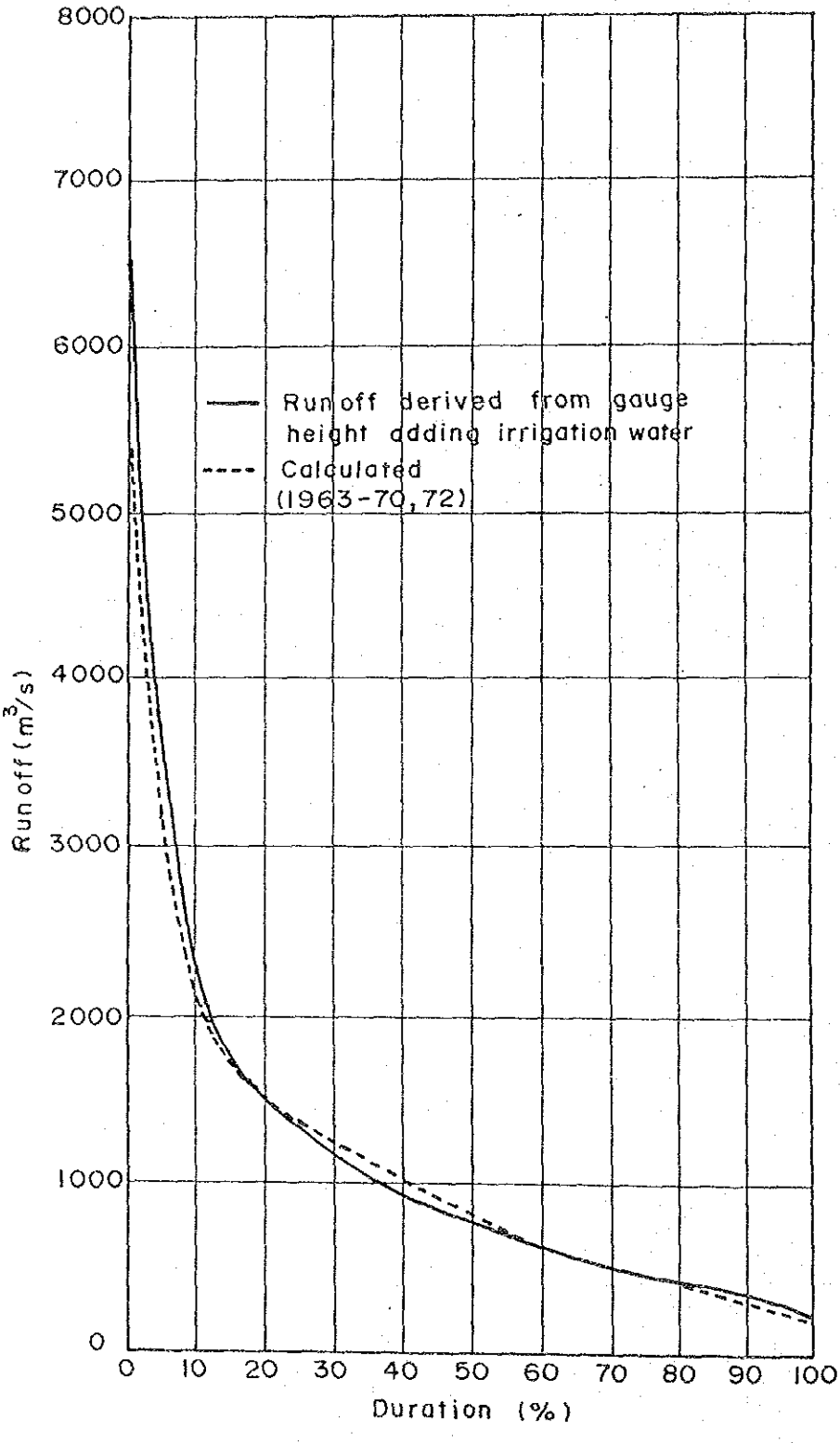


Fig. 3.5 FLOW DURATION CURVE AT NASSIPING

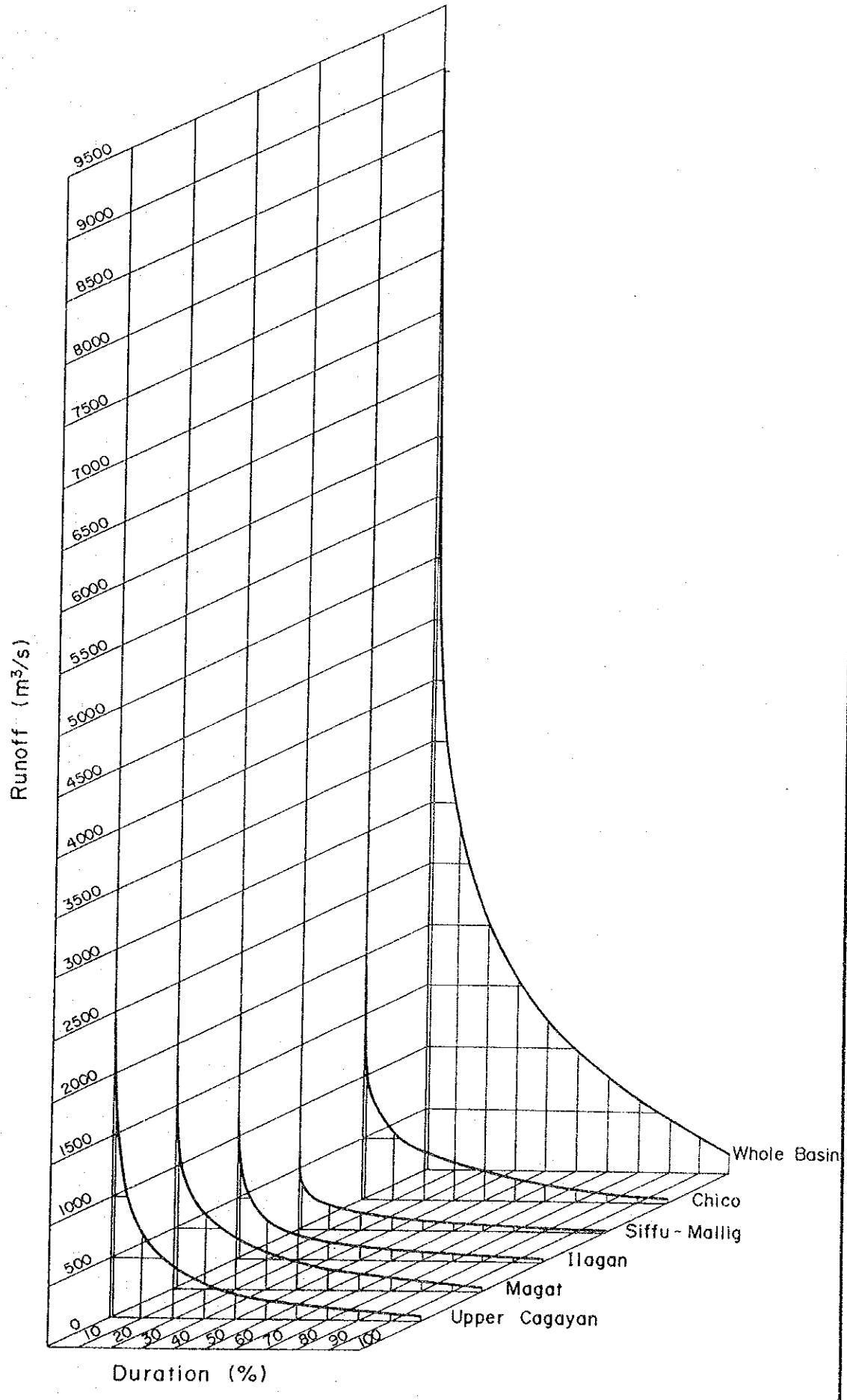


Fig. 3.6 DURATION CURVE OF ESTIMATED 10-DAY RUNOFF (1963-1984)

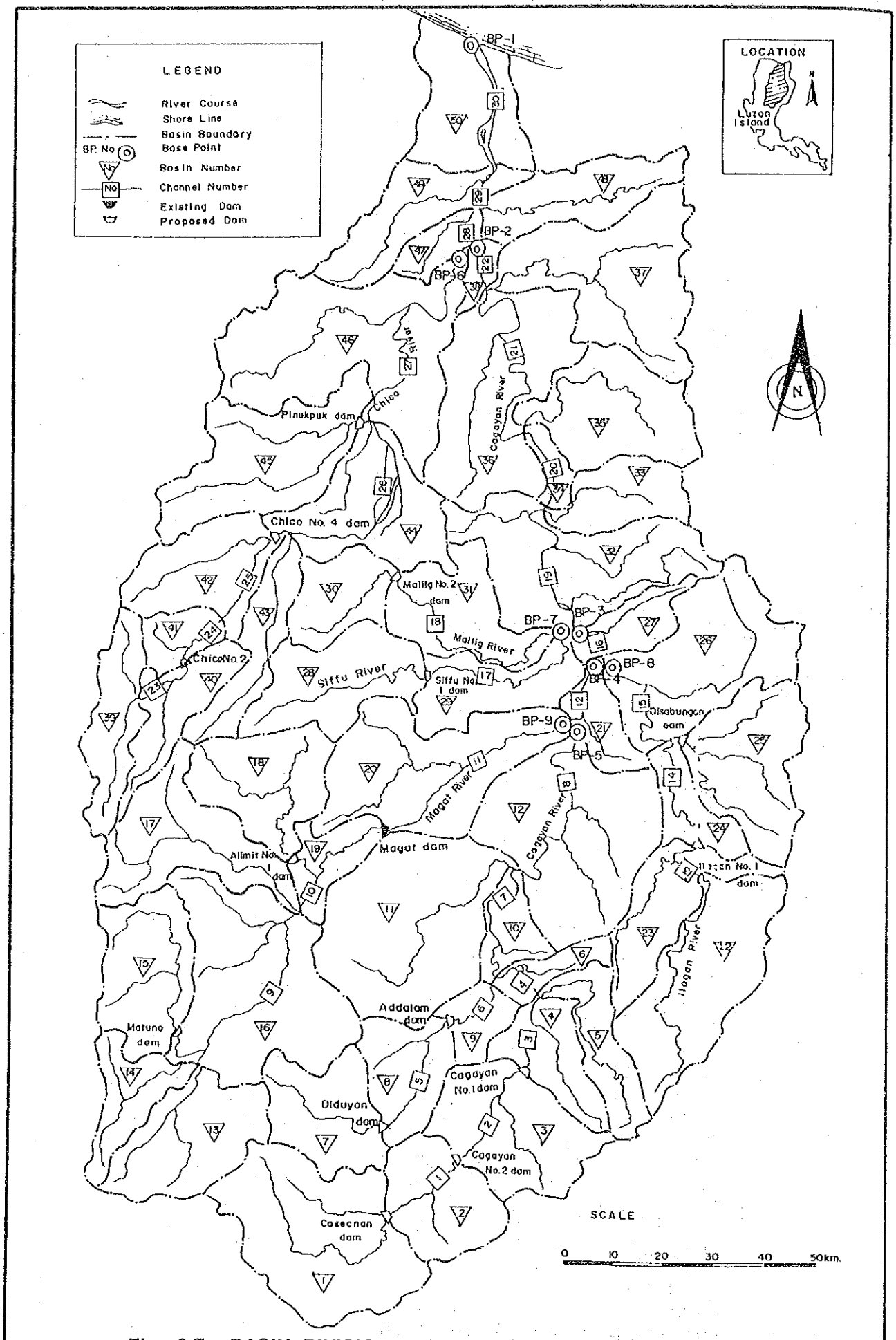
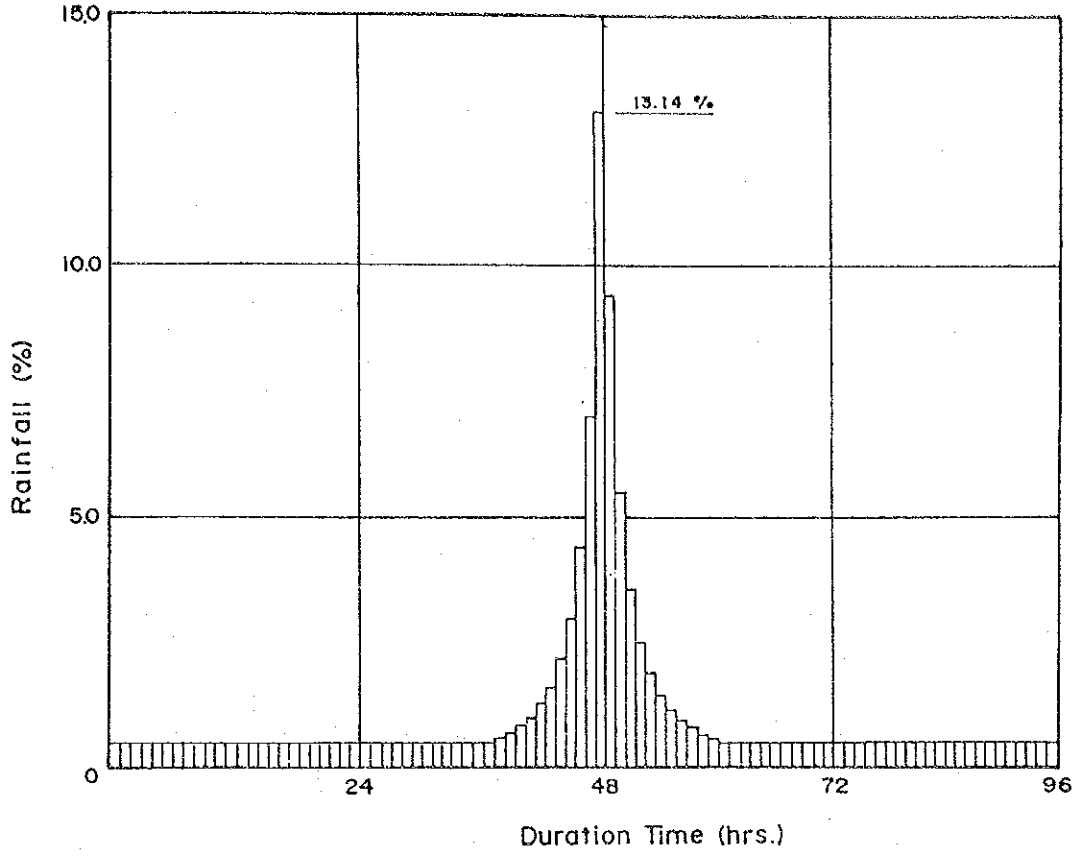


Fig. 3.7 BASIN DIVISION IN THE CAGAYAN RIVER SYSTEM



t (hr)	Rainfall (%)	t (hr)	Rainfall (%)	t (hr)	Rainfall (%)	t (hr)	Rainfall (%)
1	0.48	25	0.48	49	9.38	73	0.48
2	0.48	26	0.48	50	5.47	74	0.48
3	0.48	27	0.49	51	3.58	75	0.48
4	0.48	28	0.49	52	2.52	76	0.48
5	0.48	29	0.49	53	1.88	77	0.48
6	0.48	30	0.49	54	1.45	78	0.48
7	0.48	31	0.49	55	1.15	79	0.48
8	0.48	32	0.49	56	0.94	80	0.48
9	0.48	33	0.49	57	0.78	81	0.48
10	0.48	34	0.49	58	0.66	82	0.48
11	0.48	35	0.49	59	0.56	83	0.48
12	0.48	36	0.49	60	0.49	84	0.48
13	0.48	37	0.52	61	0.49	85	0.48
14	0.48	38	0.61	62	0.49	86	0.48
15	0.48	39	0.71	63	0.49	87	0.48
16	0.48	40	0.85	64	0.49	88	0.48
17	0.48	41	1.04	65	0.49	89	0.48
18	0.48	42	1.29	66	0.49	90	0.48
19	0.48	43	1.64	67	0.49	91	0.48
20	0.48	44	2.17	68	0.49	92	0.48
21	0.48	45	2.99	69	0.49	93	0.48
22	0.48	46	4.38	70	0.49	94	0.48
23	0.48	47	7.04	71	0.48	95	0.48
24	0.48	48	13.14	72	0.48	96	0.48

Fig. 3.8 HOURLY RAINFALL DISTRIBUTION

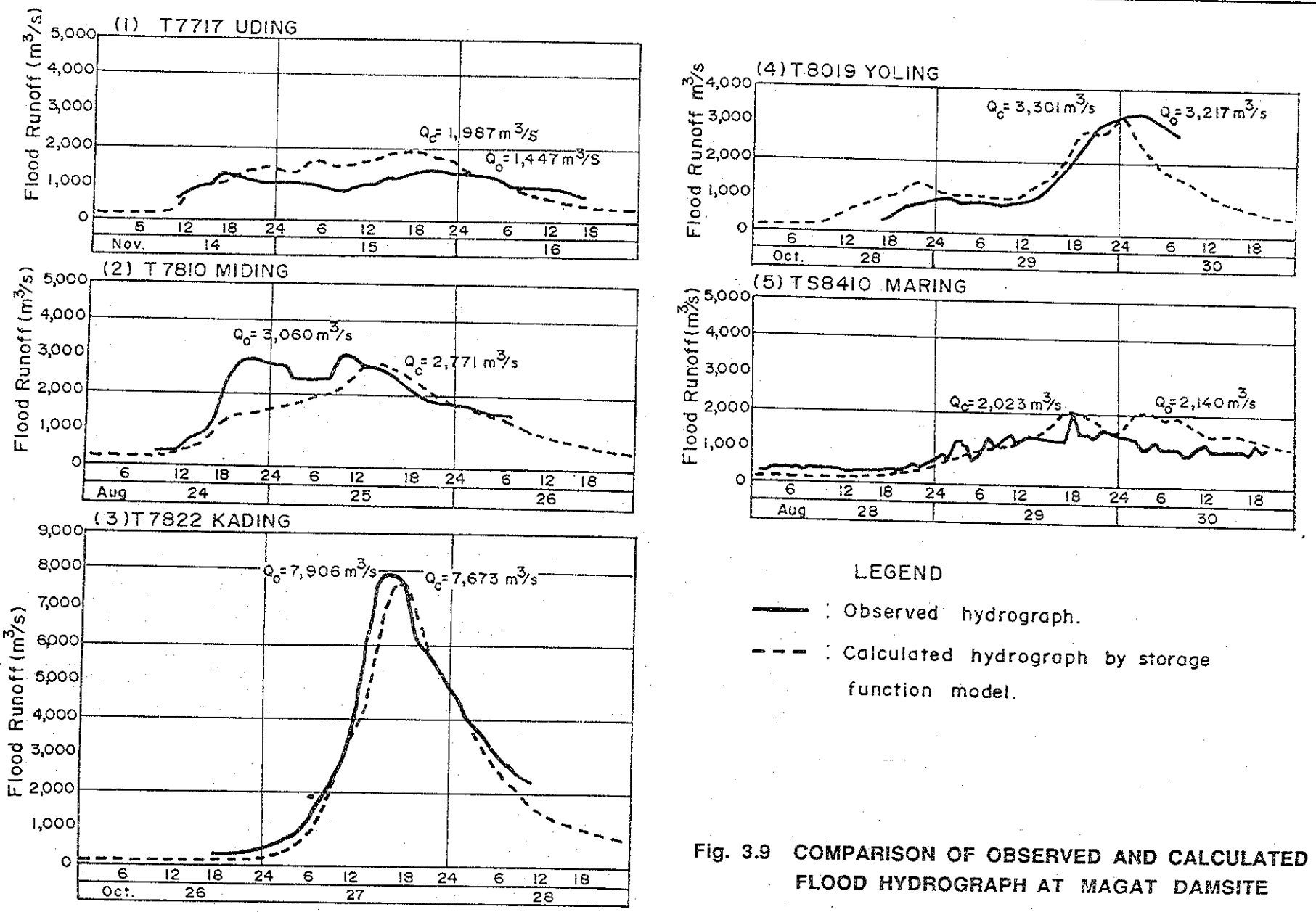
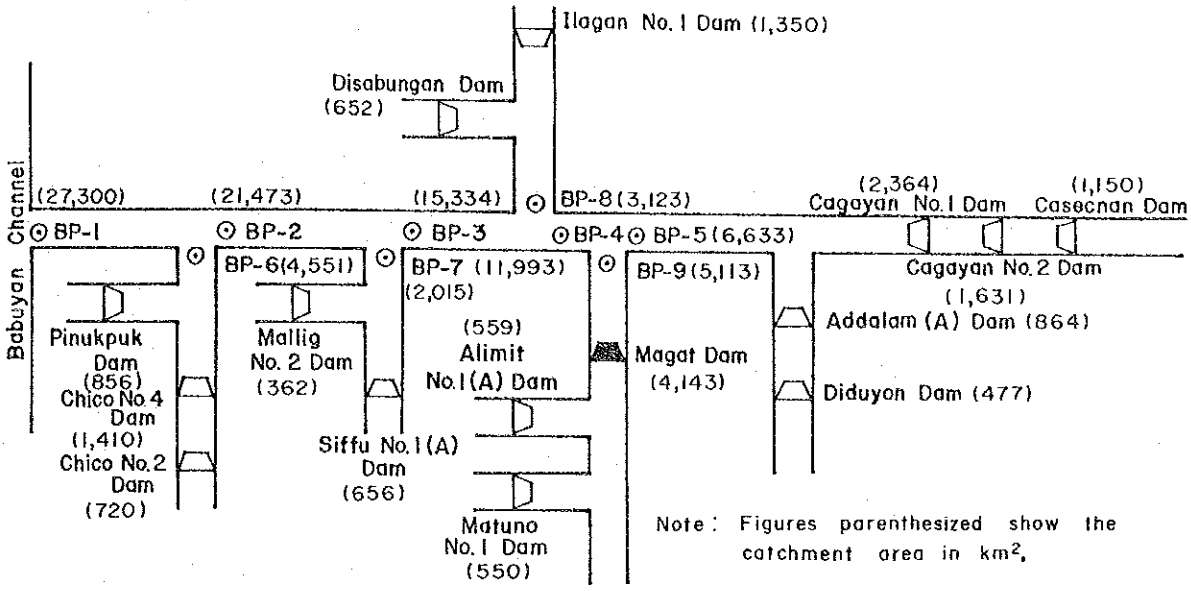


Fig. 3.9 COMPARISON OF OBSERVED AND CALCULATED FLOOD HYDROGRAPH AT MAGAT DAMSITE



Unit: m^3/s

	Base Point	1/2	1/5	1/10	1/25	1/50	1/100	1/200	1/1,000	1/10,000
Probable Flood Peak (1-day)	Casecnan	3,600	5,800	7,500	9,700	14,500	20,700	26,000	42,000	72,800
	Cagayan No.2	3,800	5,800	7,300	9,200	13,500	19,400	24,000	38,000	65,900
	Cagayan No.1	2,500	4,500	6,200	8,500	12,500	17,200	22,000	34,000	59,400
	Diduyon	1,300	2,000	2,600	3,700	5,200	7,500	9,500	14,500	25,000
	Addalam (A)	600	1,300	1,900	2,900	4,200	5,650	7,500	13,000	24,550
	Matuno No.1	750	1,050	1,300	1,550	1,800	2,050	2,300	3,000	4,150
	Alimit No.1 (A)	450	700	850	1,100	1,350	1,650	2,000	3,200	5,750
	Magat	-	-	-	-	-	-	-	-	-
	Ilagan No.1	1,750	3,200	4,300	6,350	7,600	8,950	11,500	17,000	28,050
	Disabungan	1,050	1,900	2,700	3,800	5,400	7,600	9,200	14,000	24,750
	Siffu No.1 (A)	400	700	950	1,300	1,600	1,950	2,500	4,000	7,100
	Mallig No.2	300	400	600	800	950	1,100	1,400	2,200	3,950
	Chico No.2	850	1,350	1,750	2,300	2,850	3,550	4,000	5,300	9,250
	Chico No.4	800	1,450	2,000	2,750	3,600	4,500	5,400	7,800	12,250
	Pinukpuk	700	1,200	1,600	2,200	2,700	3,150	4,000	6,300	10,700
Without Magat Dam	Base point No.1	6,200	9,900	12,000	15,700	18,100	21,400			
	Base point No.2	5,800	9,400	11,500	15,300	17,700	21,000			
	Base point No.3	6,100	10,300	12,900	17,700	20,900	25,300			
	Base point No.4	5,400	9,300	11,600	16,200	19,300	23,500			
	Base point No.5	3,300	5,900	7,200	10,100	12,500	14,700			
	Base point No.6	2,000	3,000	3,800	5,200	7,500	8,700			
	Base point No.7	1,200	1,600	2,000	2,700	3,000	3,300			
	Base point No.8	2,000	3,400	4,700	6,700	7,600	9,400			
	Base point No.9	2,700	4,500	6,000	7,200	9,500	10,600			
With Magat Dam	Base point No.1	6,200	9,700	11,600	15,000	17,300	20,300			
	Base point No.2	5,700	9,300	11,200	14,600	16,900	19,900			
	Base point No.3	6,100	9,800	12,000	16,100	19,000	22,600			
	Base point No.4	5,500	9,000	10,900	14,700	17,600	21,000			
	Base point No.5	3,300	5,900	7,200	10,100	12,500	14,700			
	Base point No.6	2,000	3,000	3,800	5,200	7,500	8,700			
	Base point No.7	1,200	1,600	2,000	2,700	3,000	3,300			
	Base point No.8	2,000	3,400	4,700	6,700	7,600	9,400			
	Base point No.9	2,500	3,500	4,300	5,000	6,300	7,000			

Fig. 3.10 PROBABLE FLOOD PEAK RUNOFF DISTRIBUTION UNDER THE PRESENT RIVER CONDITION

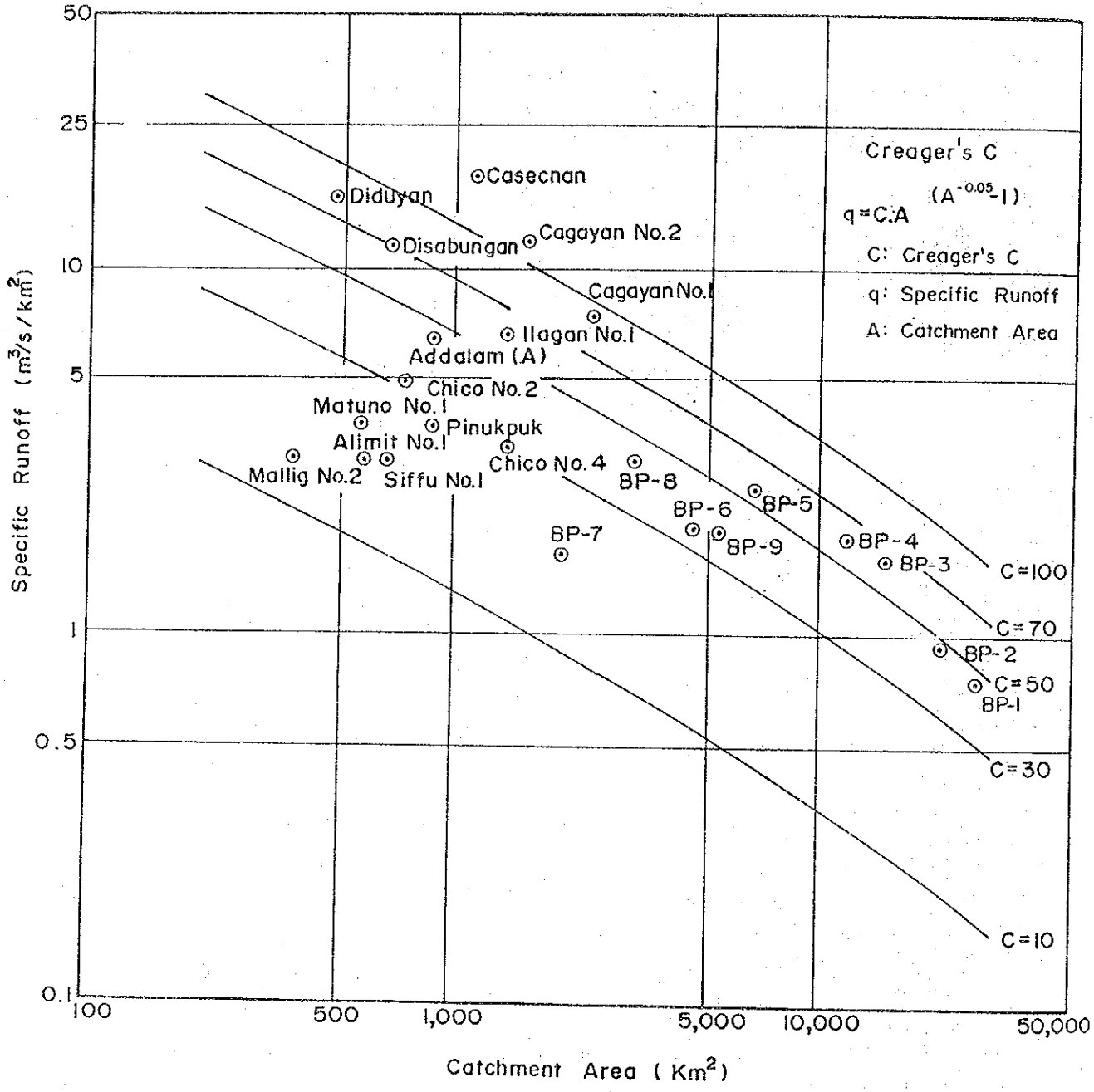
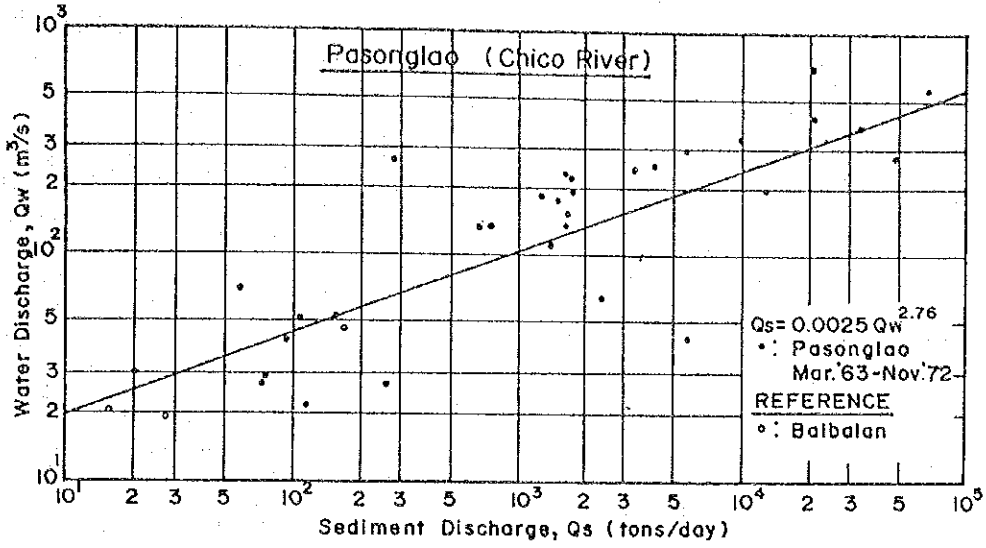
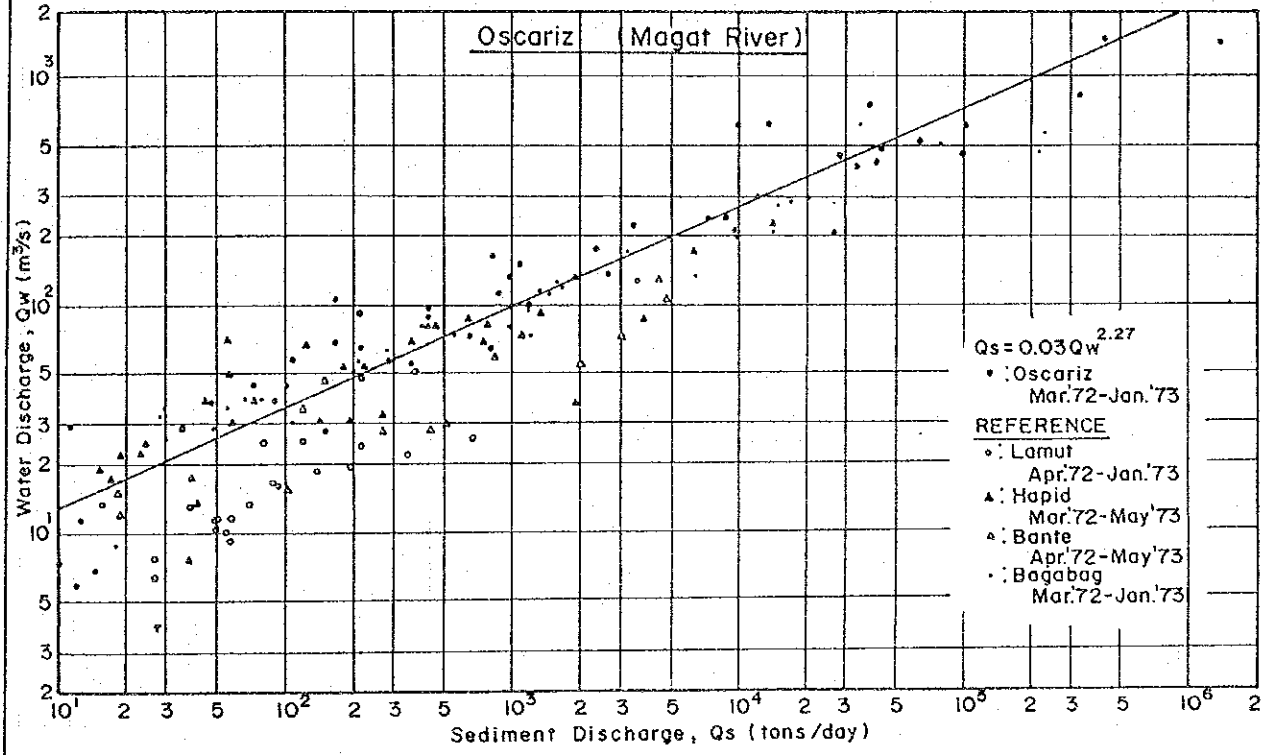


Fig. 3.11 SPECIFIC FLOOD PEAK RUNOFF (100-YR)





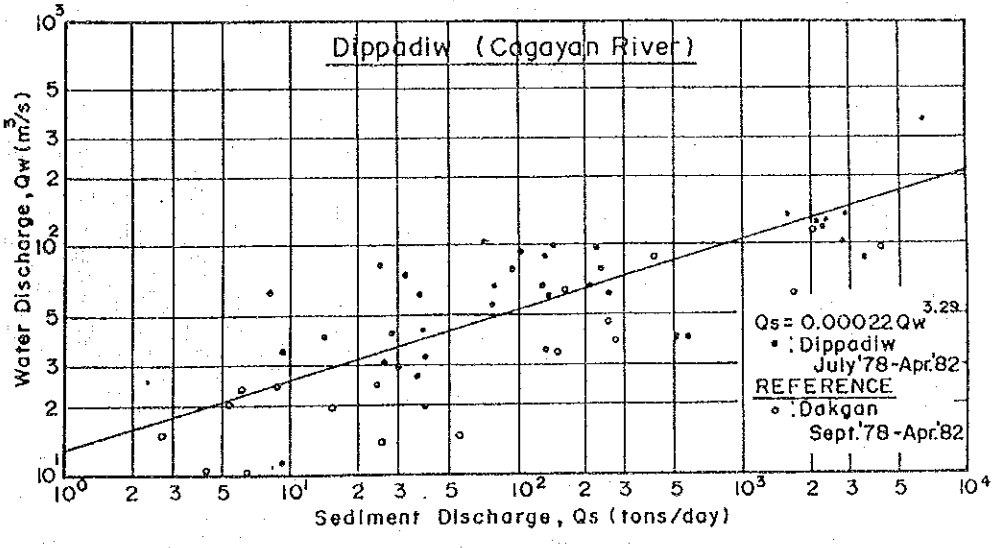


Fig. 3.12 SEDIMENT RATING CURVE IN THE CAGAYAN RIVER

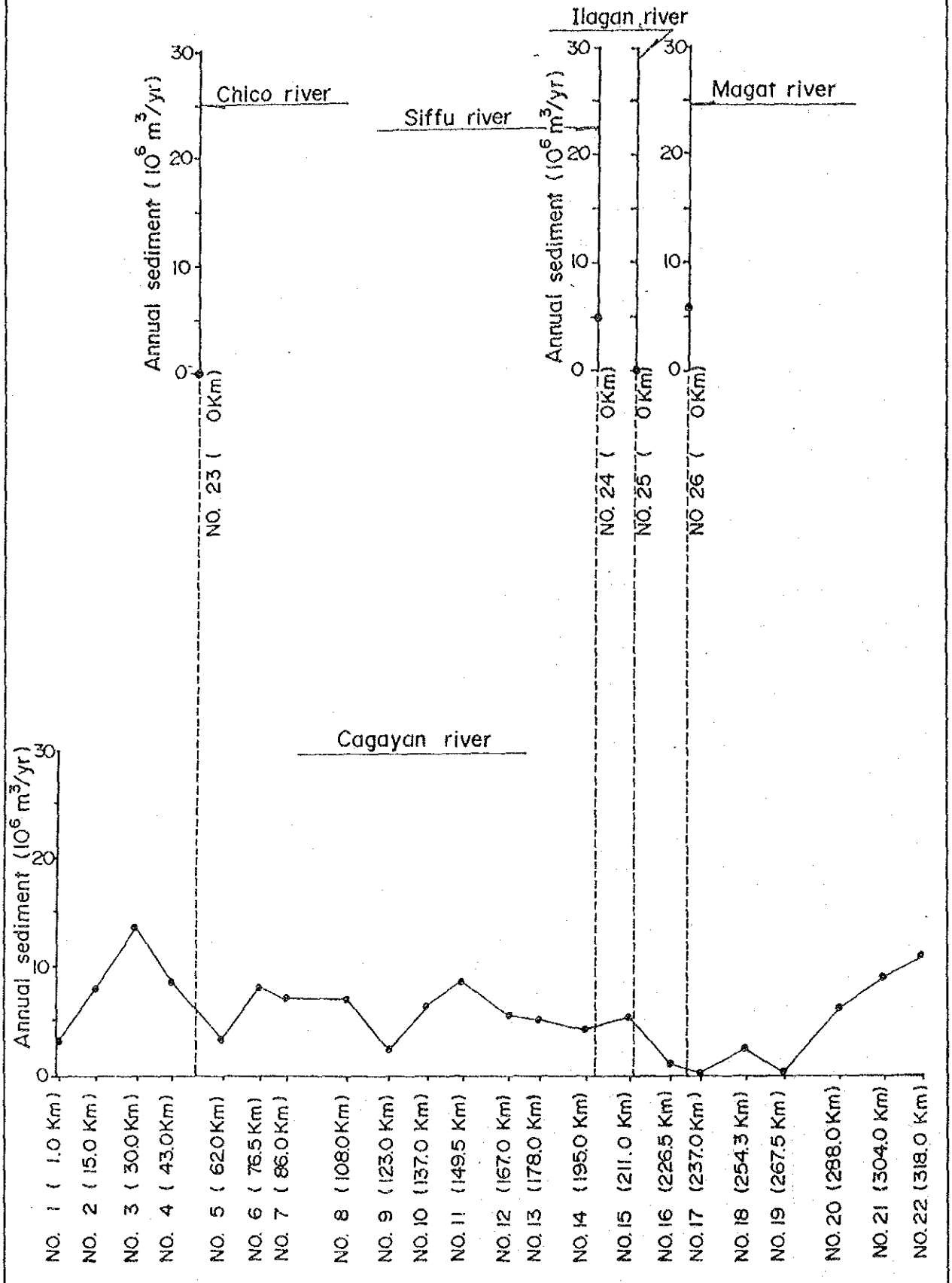


Fig. 3.13 SEDIMENT TRANSPORT CAPACITY

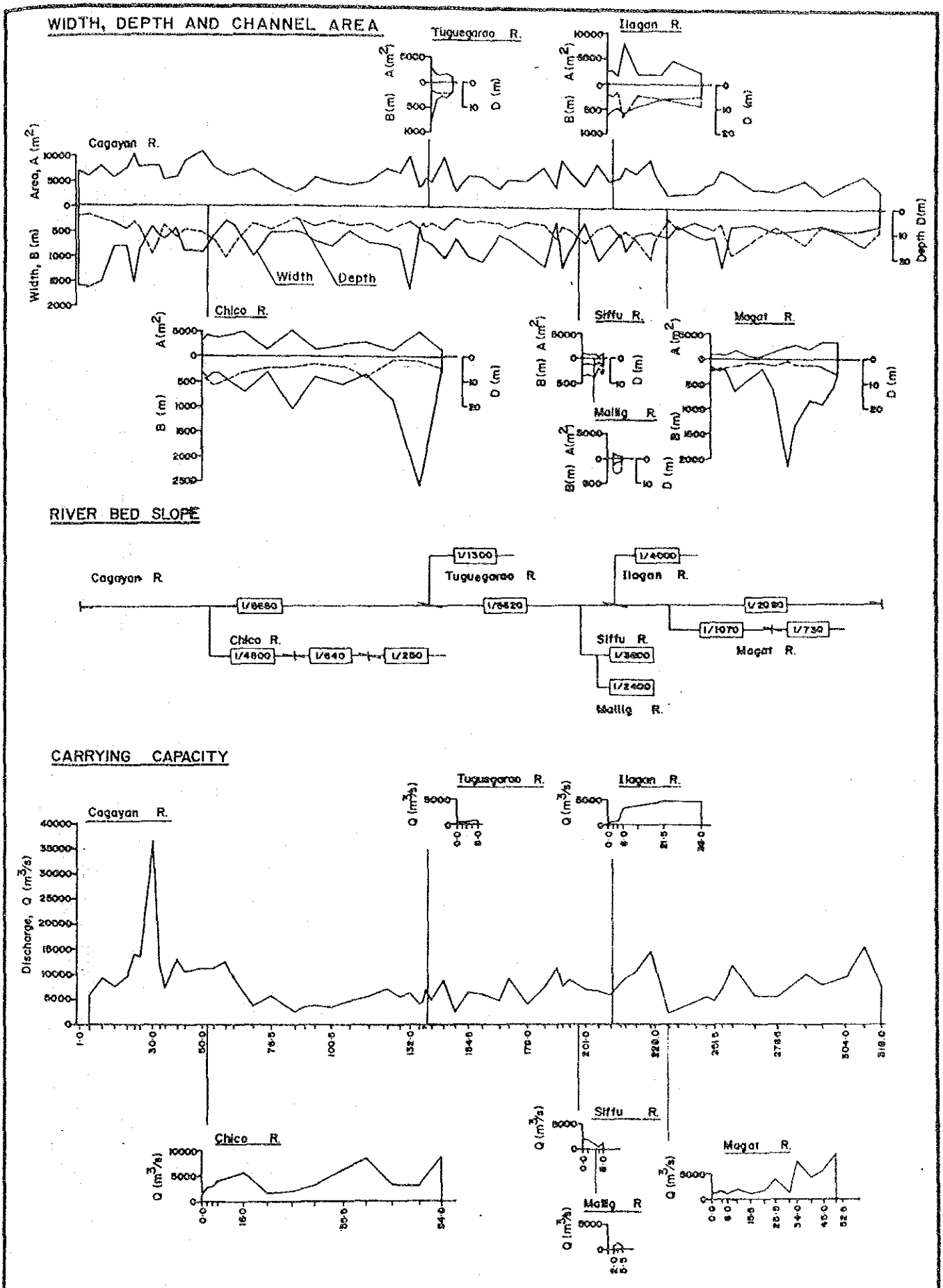


Fig. 5.1 CHARACTERISTICS OF EXISTING RIVER CHANNELS

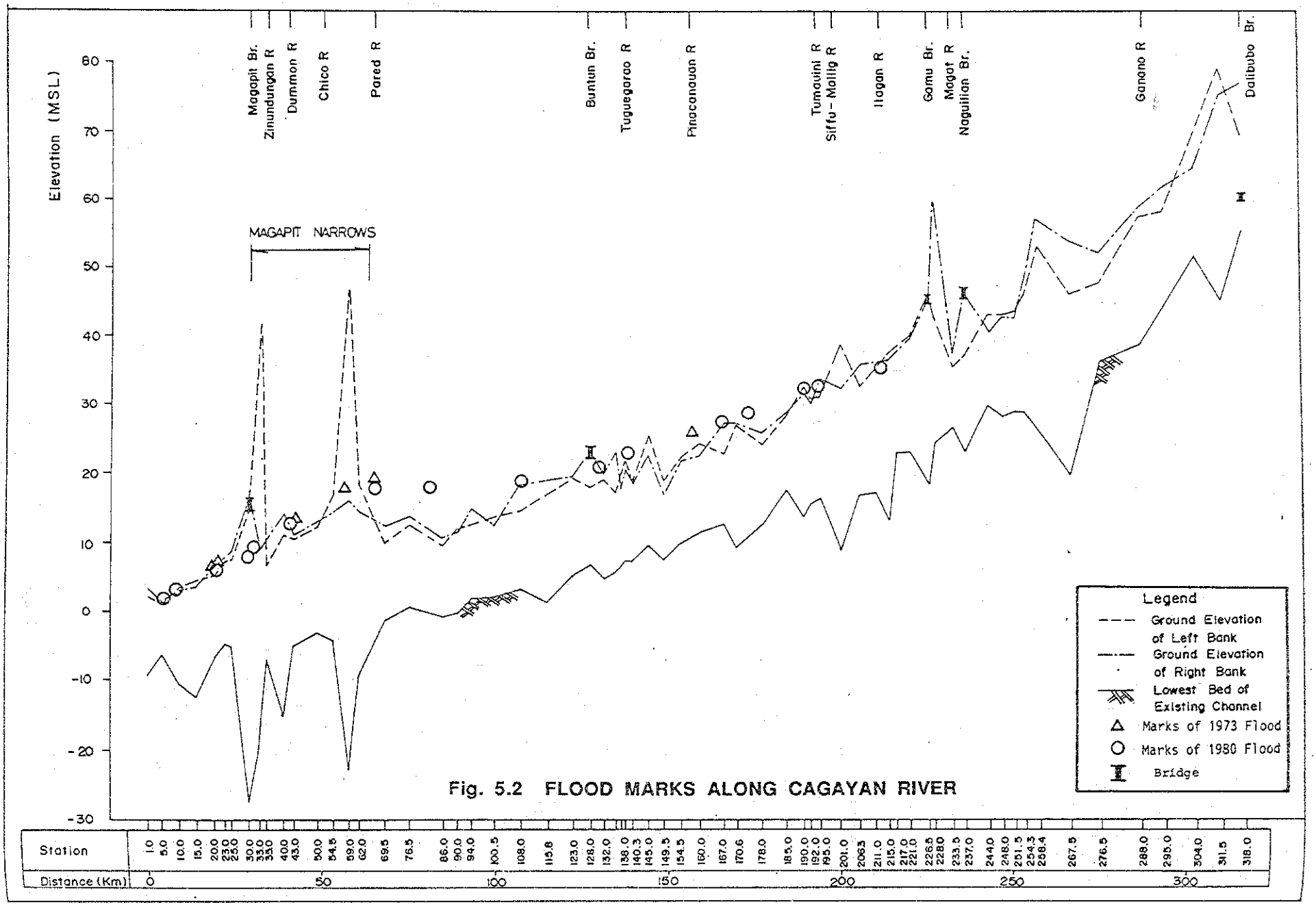


Fig. 5.2 FLOOD MARKS ALONG CAGAYAN RIVER

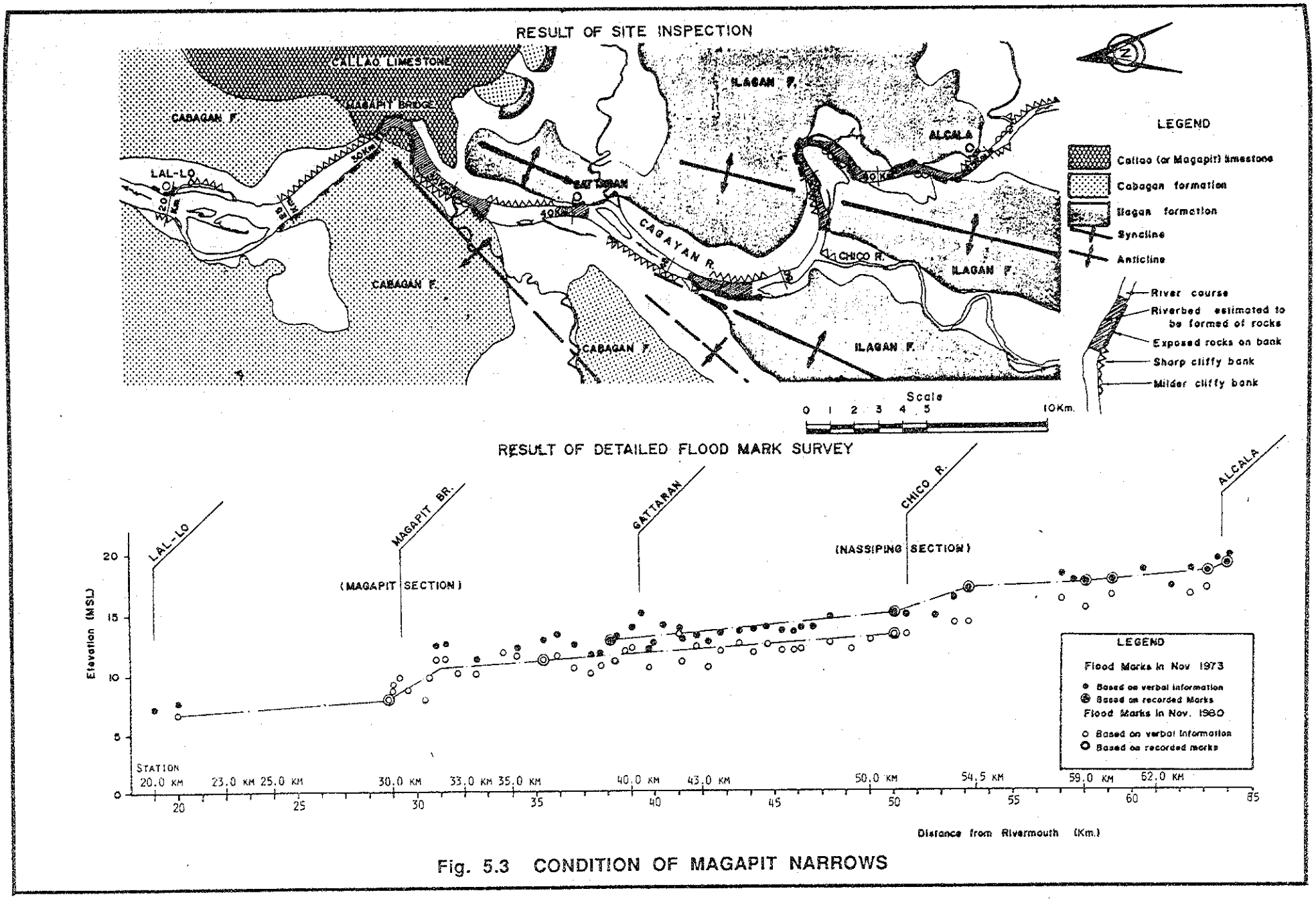


Fig. 5.3 CONDITION OF MAGAPIT NARROWS