Table 4.11(3) Construction Quantity and Costs for Flood Control Works

Item	Quantity	Cost (US$1,000)
3. Improvement of Cenranae River		
- Main Civil Works		11,704
Embankment (L = 37 km)	1,250,000 m^3	
Excavation	1,250,000 m^3	
Dredging	2,000,000 m^3	
Barrage (11 m x 3 gates)	1 site	
- Acquisition & Compensation		243
Land	144 ha	
House	160 houses	
- Contingency		2,389
- Engineering & Administration		1,456
- Total		15,792

Table 4.12 Summarized Construction Cost, Operation & Maintenance Cost and Benefit for Proposed Flood Control Plans

(Unit: US$1,000)

Plan	Const. Cost for River Improvement	Annual O/M Cost	Annual Benefit	
			Existing Condition	Proposed/1 Condition
1. Bila River Improvement Plan	19,680	89	2,397	2,987
2. Walanae River Flood Control Plan				
- Without Dam	31,680	144	2,557	-
- With Mong Dam	29,760	134	-	3,856
- With Walimpong Dam (V = 100 million m^3)	26,800	121	-	3,920
- With Walimpong Dam (V = 200 million m^3)	22,080	99	-	4,413
- With Walimpong Dam (V = 300 million m^3)	21,400	96	-	4,497
3. Cenranae River Improvement Plan	15,792	72	2,046	-

/1: Under the condition of the proposed irrigation project.

Table 4.13 Cost and Benefit of Inland Fisheries Development Plan/1

(Unit: 10^6Rp.)

Plan	Benefit	Cost
Lake Fishing (Protection area)	3,494.9	131.0
Paddy Culture	893.0	182.6
Lake Culture	279.7	0.0
Total	4,667.6	313.6

/1: Discount rate = 12.0%
Project life = 50 years

Table 4.14 Budget of Inland Fisheries Development Plan

(1) Lake Fishing: Setting Protection Area

Project	Production (t)	Growth Income (10^6Rp)	Fishing Expenditure (10^6Rp)	Net Income (10^6Rp)	Net Income/1 per household (Rp)
With	17,500	3,253.3	1,615.5	1,637.8	360,253
Without	13,500	2,509.7	1,246.2	1,263.5	274,116

/1: Including the share to the auction winner for using the fishing ground owned by regional government.

(2) Paddy Field Culture: Construction of Hatchery Pond

Project	Production (t)	Growth Income (10^6Rp)	Culturing Expenditure (10^6Rp)	Net Income (10^6Rp)	Net Income per household (Rp)
With	2,700	491.4	208.7	192.7	18,018/1
Without	27	4.9	3.0	1.9	18,018

/1: The survival ratio of fish fry is assumed to be seen between with and without project.

(3) Lake Culture: Fish Culture by Net Pond

Projcet	Production (t)	Growth Income (10^6Rp)	Culturing Expenditure (10^6Rp)	Net Income (10^6Rp)	Net Imcome per household (Rp)
With	3,300	600.6	540.9	59.7	16,415
Without	-	-	-	-	-

Table 4.15 Principal Features of Walimpong Dam

Items	Unit	Case-1	Case-2	Case-3
(Dam)				
Type of Dam	m	Rockfill	Rockfill	Rockfill
Top Elevation of Dam	m	82.00	82.00	82.00
Height of Dam	m	71.00	71.00	71.00
Length of Dam (incl. spillway)	m	900	900	900
Top Width of Dam	m	10	10	10
Dam Volume (incl. cofferdam)	10^3m^3	3,520	3,520	3,520
Overflow Elevation	m	67.00	67.00	67.00
Sediment Elevation	m	61.00	61.00	61.00
Riverbed Elevation	m	24.00	24.00	24.00
(Reservoir)				
Catchment Area	km^2	2,199	2,199	2,199
Reservoir Surface Area	km^2	55	55	55
N.H.W.L.	m	77.00	77.00	77.00
Spillway Desigh Flood W.L.	m	78.30	78.30	78.30
L.W.L.	m	61.00	61.00	61.00
Rule W.L. for Flood Control	m	75.00	73.00	70.50
Gross Reseroir Storage	10^6m^3	705	705	705
Effective Reservoir Storage	10^6m^3	540	540	540
Flood Control Storage Capacity	10^6m^3	100	200	300
Storage for Irrigation & Hydropower	10^6m^3	440	340	240
Sediment Volume	10^6m^3	165	165	165
(Discharge & Installment)				
Spillway Design Flood	m^3/s	7,000	7,000	7,000
River Maintenance Flow	m^3/s	12.3	12.3	12.3
Crest Gates	set	9	9	9
Intake Gates/1	set	4	4	4
River Outlet Gate	set	1	1	1

Note: /1: For irrigation and hydropower generation

Table 5.1 Economic Evaluation

(Unit: 10^3 US$)

Project	Construction Cost	O & M Cost	Annual Benefit	Cost & Benefit (Discount Rate - 12%) B	C	B - C	B/C	IRR
(I) Sectoral Project								
Irrigation								
(1) Bila	42,000	511	11,760	46,404	31,762	14,641	1.46	16.0
(2) Boya	23,900	372	3,803	16,742	20,080	-3,338	0.83	10.0
(3) Langkemme	22,400	272	4,603	21,857	18,420	3,437	1.19	13.5
(4) Lawo	10,500	133	1,959	10,363	9,188	1,175	1.13	13.0
(5) Cenranae	13,600	220	3,456	14,679	11,536	3,143	1.27	14.5
(6) Gilirang	65,200	782	15,712	59,538	49,253	10,285	1.21	14.0
(7) Walanae (Walimpong dam)	215,868	2,660	36,504	47,769	153,455	-35,686	0.77	10.0
(8) Sanrego	37,500	456	15,782	59,803	28.357	31,446	2.11	18.5
(9) Padangeng	20,900	282	2,935	13,938	17,338	-3,400	0.80	9.5
Flood Control								
(1) Bila (without irrigation plan)	19,680	89	2,397	11,266	13,614	-2,348	0.82	10.0
(2) Bila (with irrigation plan)	19,680	89	2,987	13,600	13,614	-14	1.00	12.0
(3) Walanae (with Walimpong dam)	36,000	266	4,413	15,420	25,267	-9,847	0.61	8.2
(4) Walanae (without Walimpong dam)	31,680	144	2,557	12,018	21,917	-9,899	0.55	6.5
(5) Cenranae	15,792	72	2,046	9,616	10,925	-1,309	0.88	10.5
Hydropower								
(1) Walanae (Walimpong dam)	35,381	393	3,548	15,690	25,147	-9,457	0.62	7.3
(II) Compound Project								
(1) Bila-Boya irrigation/flood control	85,580	972	18,550	76,746	65,456	11,289	1.17	13.5
(III) Multipurpose Dam Project								
(1) Walimpong Dam Plan 1	298,097	3,341	44,811	150,935	211,164	-60.229	0.71	9.3
Irrigation	214,476	2,644	36,504	117 769	152,415	-34,646	0.77	10.0
Flood control	39,328	271	3,920	13,529	27,389	-13,858	0.49	6.6
Hydropower	44,293	426	4,387	19,637	31,362	-11,725	0.63	7.4
(2) Walimpong Dam Plan 2	287,249	3,319	44,465	148,879	203,869	-54,990	0.73	9.5
Irrigation	215,868	2,660	36,504	117,769	153,455	-35,686	0.77	10.0
Flood control	36,000	266	4,413	15,420	25,267	-9,847	0.61	8.2
Hydropower	35,381	393	3,548	15,690	25,147	-9,457	0.62	7.3
(3) Walimpong Dam Plan 3	286,569	3,316	44,309	148,059	203,384	-55,325	0.73	9.4
Irrigation	217,260	2,677	36,504	117,769	154,503	-36,734	0.76	9.9
Flood control	35,320	263	4,497	15,725	24,812	-9,087	0.63	8.2
Hydropower	33,989	376	3,308	14,565	24,069	-9,504	0.61	7.0

Table 5.2 (1) Effect Accrued from the Proposed Projects

Name of Kabupaten	Name of Kecamatan	Number of farm household	Average land holding per farm household	Number of farmer and its percentage benefited from proposed irrigation projects	Land Use: Total paddy field (ha)		Technical irrigation area (ha)		Rainfed area (ha)		Upland area (ha)	
					Present condition	With project	Present condition	With project	Present condition	With project	Present condition	With project
Kab. Sidrap	Panca Lautang	2,902	2.18	0	5,080	*[1]	2,320	*	2,760	*	1,240	*
	Tellulimpoe	2,518	1.12	0	2,670	*	1,250	*	1,420	*	140	*
	Maritengae	6,011	2,02	0	11,930	*	10,390	*	1,540	*	220	*
	Dua Pitue	7,743	2.03	7,331 (95)	12,420	12,520	6,550	11,830	5,870	690	3,320	3,220
Kab. Bone	Cenranae	3,145	1.92	0	5,080	*	0	*	5,080	*	940	*
	Ajangale	6,366	0.92	5,934 (93)	4,750	5,750	0	5,400	4,750	350	1,060	60
	Dua Boccoe	5,366	0.76	5,132 (96)	3,060	3,960	1,700	3,900	1,360	60	1,020	120
	Tellusiatinge	5,810	0.96	0	4,990	*	640	*	4,350	*	590	*
	Ponre	1,972	1.31	0	1,890	*	0	*	1,890	*	700	*
	Ulaweng	6,444	0.76	0	920	*	0	*	920	*	4,010	*
	Lamuru	4,881	1.28	0	1,530	*	0	*	1,530	*	4,740	*
	Lappariaja	5,786	1.67	0	5,400	*	740	*	4,660	*	4,270	*
	Libureng	2,648	2.60	1,423 (53)	5,300	6,760	0	3,700	5,300	3,060	1,600	140
	Kahu	3,371	2.38	2,700 (80)	7,310	7,750	430	6,300	6,880	1,450	720	280
	Bonto Cani	1,610	1.51	0	1,600	*	0	*	1,600	*	840	*
Kab. Soppeng	Lalabata	8,694	1.36	8,436 (97)	6,780	6,850	2,800	6,650	3,980	200	5,050	4,980
	Liliriaja	6,975	1.68	6,975 (100)	6,640	7,160	2,560	7,160	4,080	*	5,050	4,530
	Marioriawa	4,648	1.51	988 (21)	4,150	4,200	3,400	4,200	750	*	2,880	2,830
	Marioriwawo	6,207	1.26	3,750 (60)	1,750	1,780	220	1,080	1,530	700	6,100	6,070
	Lilirilau	7,247	1.93	6,525 (90)	2,920	4,170	810	3,860	2,110	310	11,070	9,820
Kab. Wajo	Tempe	5,029	0.47	1,800 (36)	280	*	0	90	280	190	2,070	*
	Tanasitolo	4,166	1.53	1,875 (45)	4,020	*	0	1,800	4,020	2,220	2,360	*
	Maniang Pajo	2,405	4.12	1,495 (62)	7,000	7,050	520	4,400	6,480	2,650	2,900	2,850
	Belawa	4,467	2.36	3,524 (79)	4,610	4,660	1,630	3,680	2,980	980	5,960	5,910
	Sabang Paru	4,714	1.83	4,714 (100)	2,510	3,210	0	2,800	2,510	410	6,110	5,410
	Pammana	4,474	1.99	4,474 (100)	5,800	6,500	240	6,500	5,560	0	3,090	2,390
	Takkalalla	5,788	2.66	40 (2)	12,920	*	0	90	12,920	12,830	2,470	*
	Majauleng	5,077	2.54	1,906 (38)	10,350	*	220	4,110	10,130	6,240	2,570	*
	Sajoanging	4,394	4.19	1,955 (44)	15,790	*	0	7,020	15,790	8,770	2,630	*
Total or average		140,858	1.74	70,977 (50.4)	159,450	166,770	36,420	99,910	123,030	66,860	85,720	78,400

/1: Marks of asterisk indicate value as same as present condition.

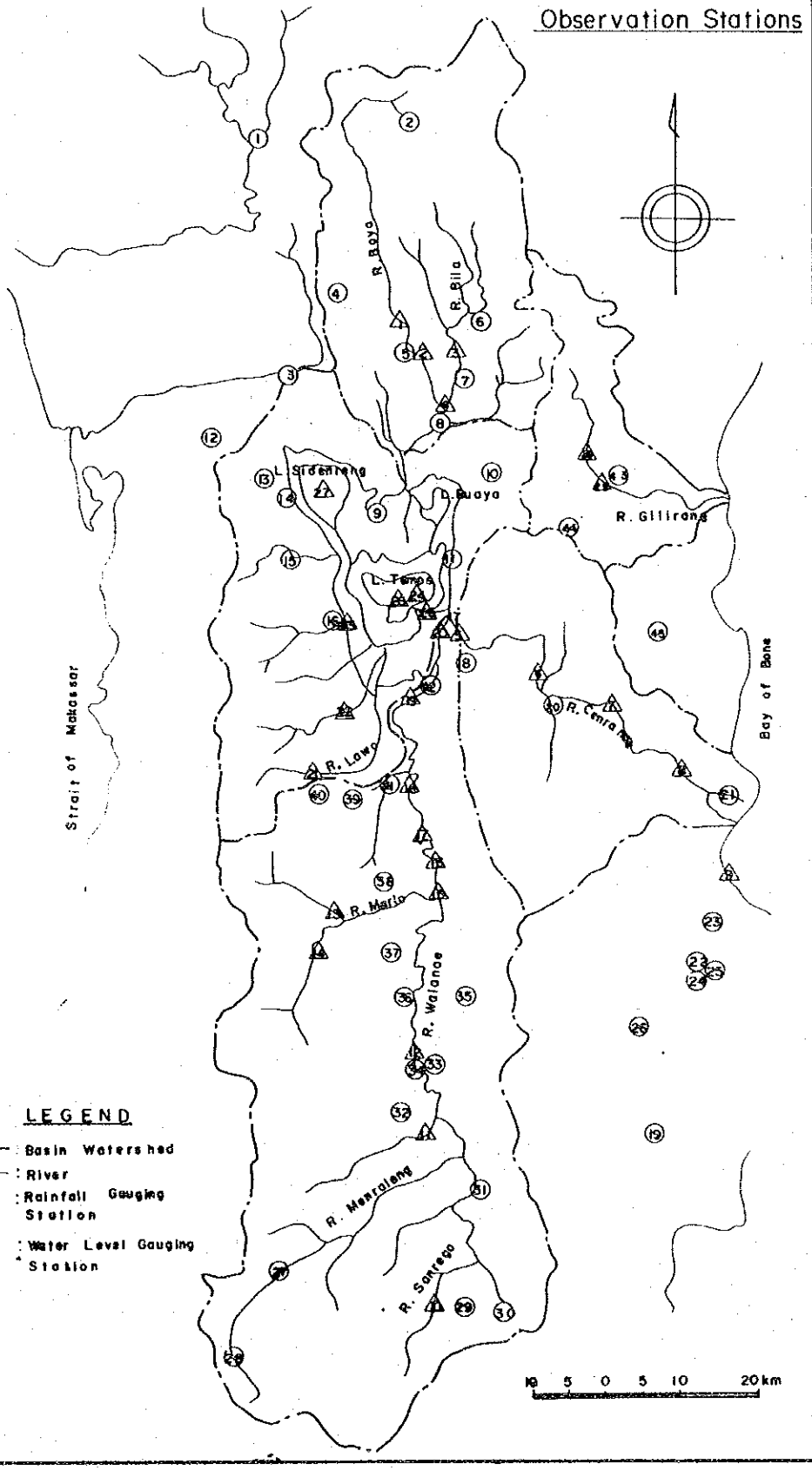
- to be continued

Table 5.2 (2) Effect Accrued from the Proposed Projects

Name of Kabupaten	Name of Kecamatan	Ratio of technical irrigation area for total paddy field		Total annual production of paddy (ha)		Net farm income per farmer (Rp)			Name of projects related to each kecamatan
		Present condition	With project	Present condition	With project	Present condition	With project EA/3	With project BA/4	
Kab. Sidrap	Panca Lautang	0.45	*/1	16,100	16,100	245,000	*		
	Tellulimpoe	0.48	*	8,600	8,600	144,000	*		
	Maritengae	0.87	*	64,200	64,200	455,000	*		
	Dua Pitue	0.52	0.95	60,700	144,000	315,000	350,000	(783,000)	Bila-Boya compound project
Kab. Bone	Cenranae	0	*	6,400	*	62,000	*		
	Ajangale	0	0.93	6,200	64,800	41,000	413,000	(440,000)	Walimpong dam project
	Dua Boccoe	0.55	0.98	3,900	46,800	30,000	353,000	(367,000)	Walimpong dam project
	Tellusiatinge	0.12	*	6,600	*	36,000	*		
	Ponre	0	*	3,600	*	97,000	*		
	Ulaweng	0	*	1,400	*	27,000	*		
	Lamuru	0	*	6,600	*	111,000	*		
	Lappariaja	0.13	*	16,600	*	176,000	*		
	Libureng	0	0.45	7,000	41,900	189,000	763,000	(1,256,000)	Sanrego irr. project
	Kahu	0.05	0.82	5,300	69,700	183,000	980,000	(1,178,000)	Sanrego irr. project
	Bonto Cani	0	*	3,700	*	97,000	*		
Kab. Soppeng	Lalabata	0.41	0.83	43,100	73,600	208,000	381,000	(387,000)	Langkemme and Lawo irr. projects and Walimpong dam project
	Liliriaja	0.39	1.00	48,600	78,200	304,000	507,000	(495,000)	Langkemme and Lawo irr. projects and Walimpong dam project
	Marioriawa	0.82	1.00	11,800	16,000	260,000	295,000	(424,000)	Walimpong dam project
	Marioriwawo	0.12	0.61	10,500	14,400	175,000	216,000	(243,000)	Langkemme irr. project and Walimpong dam project
	Lilirilau	0.28	0.93	6,600	46,300	48,000	273,000	(298,000)	Walimpong dam project
Kab. Wajo	Tempe	0	0.32	400	1,200	9,000	16,000	(30,000)	Cenranae irr. project
	Tanasitolo	0	0.45	3,900	18,200	70,000	263,000	(499,000)	Cenranae irr. project and Bila-Boya compound project
	Maniang pajo	0.07	0.62	8,500	45,700	236,000	1,034,000	(1,521,000)	Gilirang irr. project and Bila-Boya compound project
	Belawa	0.35	0.78	11,600	40,400	127,000	444,000	(529,000)	Bila-Boya compound project
	Sabang Paru	0	0.88	4,100	33,600	81,000	523,000	(523,000)	Walimpong dam project
	Pammana	0.04	1.00	6,700	78,000	116,000	725,000	(725,000)	Walimpong dam project
	Takkalalla	0	0.01	28,800	29,600	215,000	221,000	(1,097,000)	Cenranae irr. project
	Majauleng	0.19	0.40	17,800	51,500	168,000	485,000	(1,013,000)	Gilirang and Cenranae irr. projects
	Sajoanging	0	0.44	26,000	93,300	262,000	940,000	(1,786,000)	Gilirang and Cenranae irr. projects
Total or average		0.23	0.60	445,300	1,121,000 (924,000)/2	155,000	367,000	(715,000)	

/1: Marks of asterisk indicate value as same as present condition.
/2: 924,000 tons of dry stalk paddy is produced from nine proposed projects having the irrigable area of 81,000 ha.
/3: Average net farm income for each kecamatan
/4: Average net farm income for farmer benefited from the projects

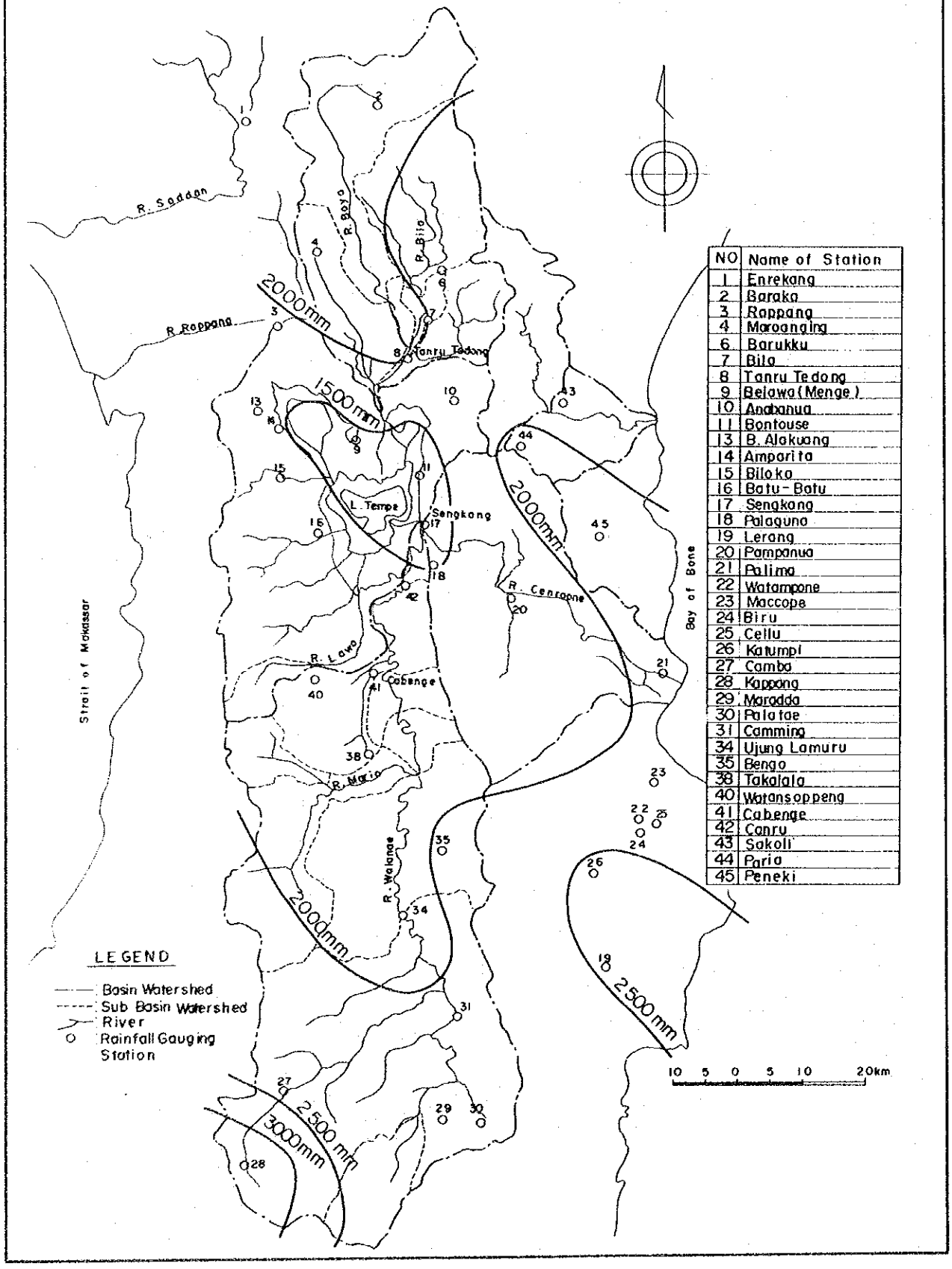
Fig. 3. 1 Location of Current Network of Hydrological Observation Stations



NO	Rainfall Gauging Station
1	Enrekang
2	Baraka
3	Rappang
4	Maroangin
5	Bulu Cenrana
6	Barukku
7	Bila
8	Tanru Tedong
9	Belawa(Menge)
10	Anabanua
11	Bontouse
12	Bulutimorang
13	B. Alakuang
14	Amparita
15	Biloka
16	Batu - Batu
17	Sengkang
18	Palaguna
19	Lerang
20	Pamponua
21	Palima
22	Watampone
23	Maccope
24	Biru
25	Celiu
26	Katumpi
27	Camba
28	Kappang
29	Maradda
30	Palatae
31	Camming
32	Parigi
33	Matango
34	Ujung Lamuru
35	Bengo
36	Paciro
37	Turucinnae
38	Takalala
39	B.B. Malanrae
40	Watansoppeng
41	Cabenge
42	Canru
43	Sakoli
44	Pario
45	Peneki

NO	Water Level Gauging Station
1	Bulu Cenrana(1)
2	Bulu Cenrana(2)
3	Bila
4	Tanru Tedong
5	Seng Kang
6	Kampiri
7	Solo
8	Genranae
9	Tg. Pallete
10	Sanrego
11	Batupute
12	Ujung Lamuru
13	Lang kemme
14	Sero
15	Kalempang
16	Pantjan Kang
17	Lakibong
18	Cabenge
19	Canru
20	Wage
21	Lawo
22	Padangeng
23	Batu - Batu
24	L. Tempe (Auto)
25	-do- (Nomal)
26	Laringgi
27	L. Sidenreng
28	Gilirang
29	Tarumpakkae

Fig 3.2 Annual Rainfall Isohyetal Map of Master Plan Basin.



NO	Name of Station
1	Enrekang
2	Baraka
3	Rappang
4	Maroanging
6	Barukku
7	Bila
8	Tanru Tedong
9	Belawa (Menge)
10	Anabanua
11	Bontouse
13	B. Alakuang
14	Amparita
15	Biloka
16	Batu-Batu
17	Sengkang
18	Palaguna
19	Lerang
20	Pamponua
21	Palima
22	Watampone
23	Maccope
24	Biru
25	Cellu
26	Katumpi
27	Camba
28	Kappong
29	Maradda
30	Palatae
31	Camming
34	Ujung Lamuru
35	Bengo
38	Takalala
40	Watansoppeng
41	Cabenge
42	Canru
43	Sakoli
44	Paria
45	Peneki

Fig. 3.3 (1) Annual Pattern of Mean Monthly Discharge.

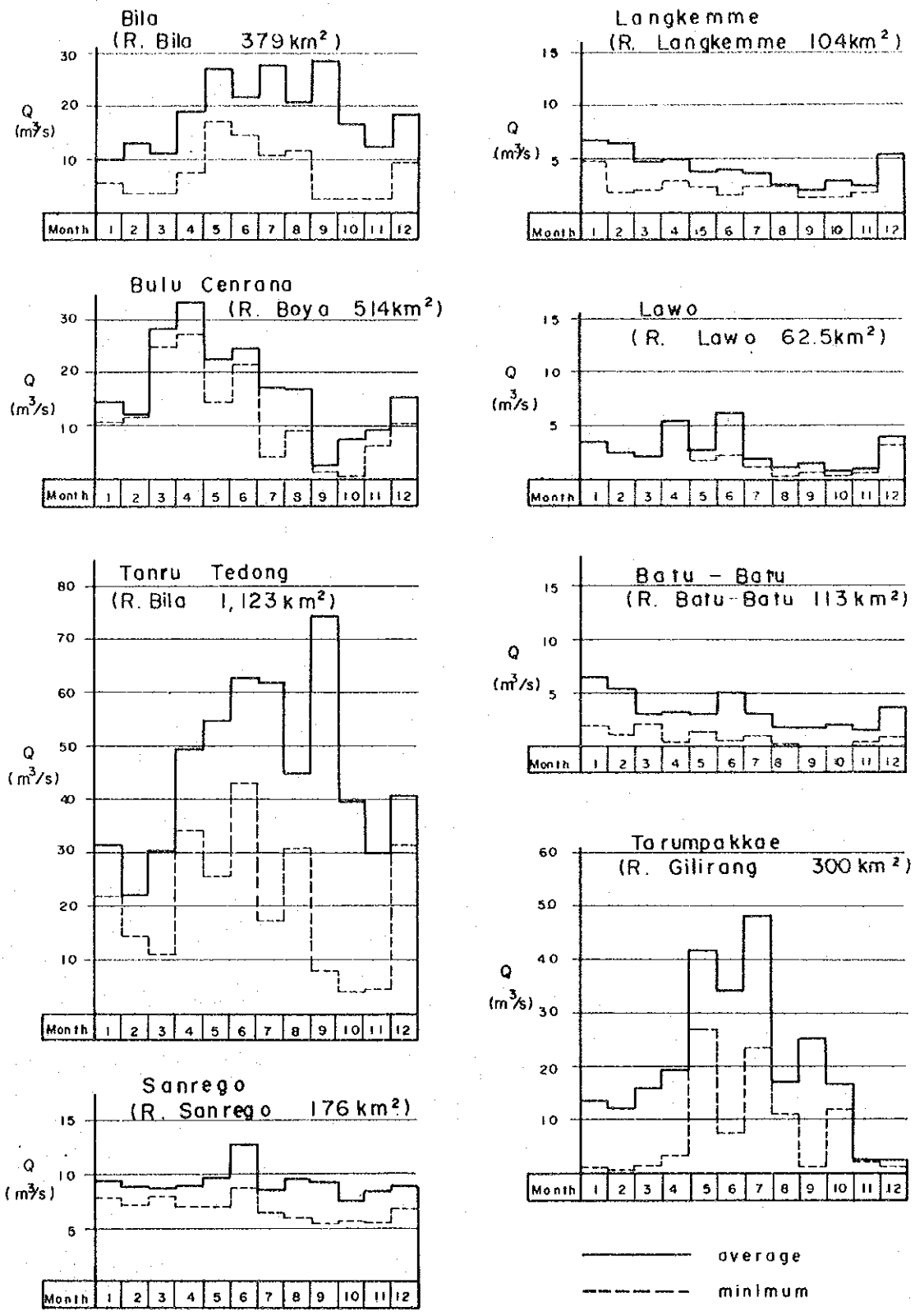


Fig. 3.3 (2) Annual Pattern of Mean Monthly Discharge.

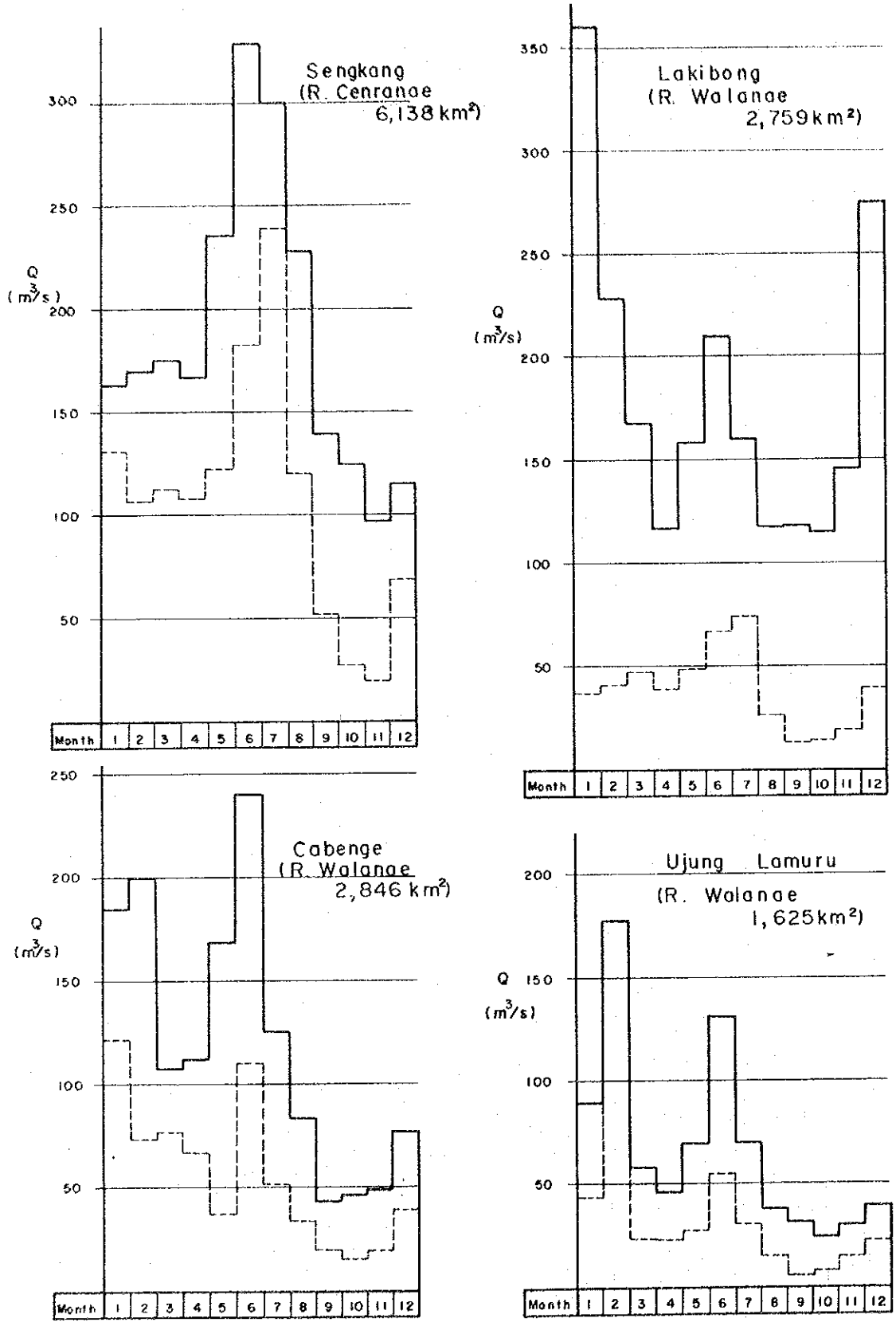


Fig 3.4 (1) Average Monthly Rainfall in River Basin Arranged in Magnitude Order

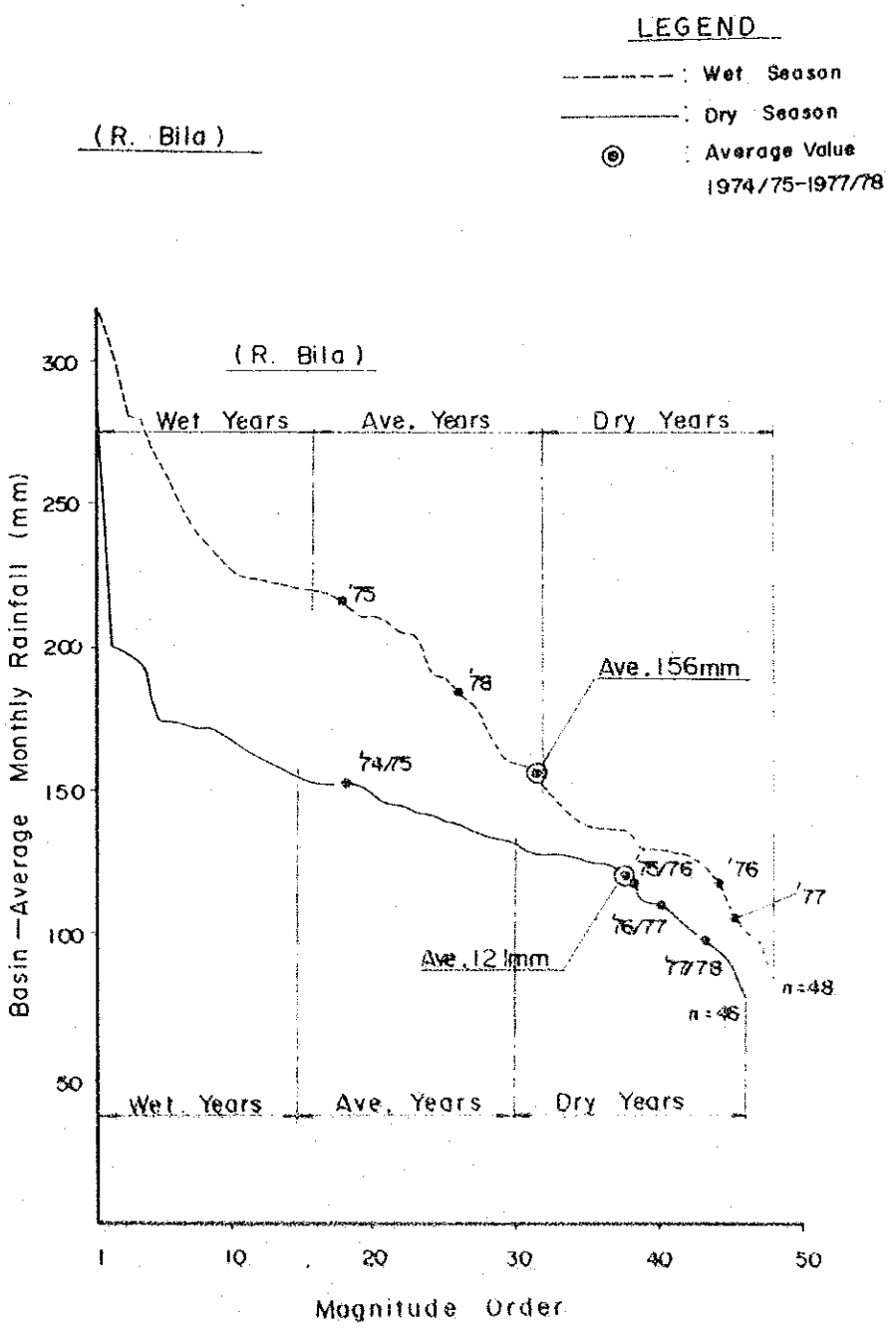


Fig 3.4 (2) Average Monthly Rainfall in River Basin Arranged in Magnitude Order

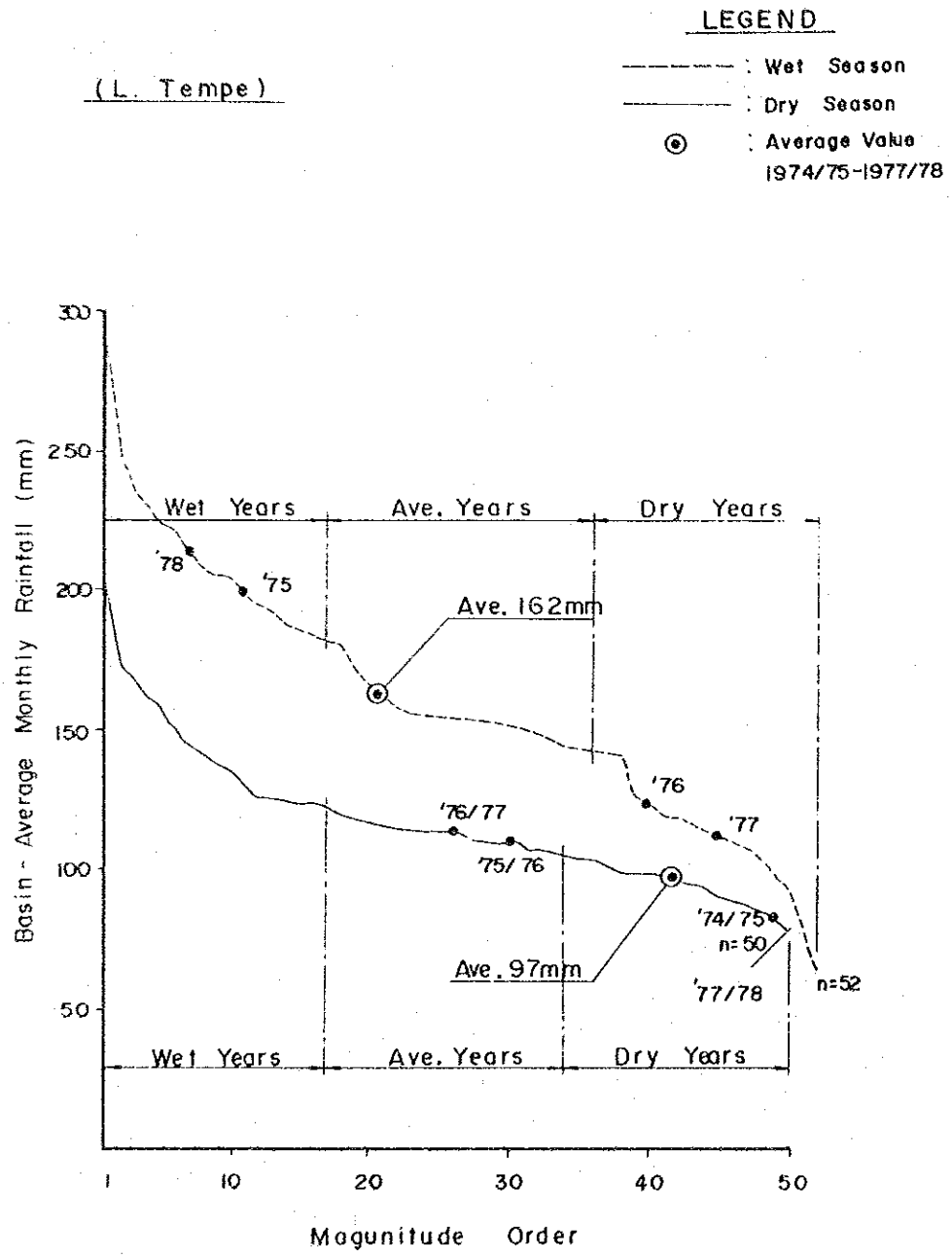


Fig. 3.4 (3) Average Monthly Rainfall in River Basin Arranged in Magunitude Order

LEGEND

: Wet Season

: Dry Season

: Average Value. 1974/75 - 1977/78

(R. Walanae)

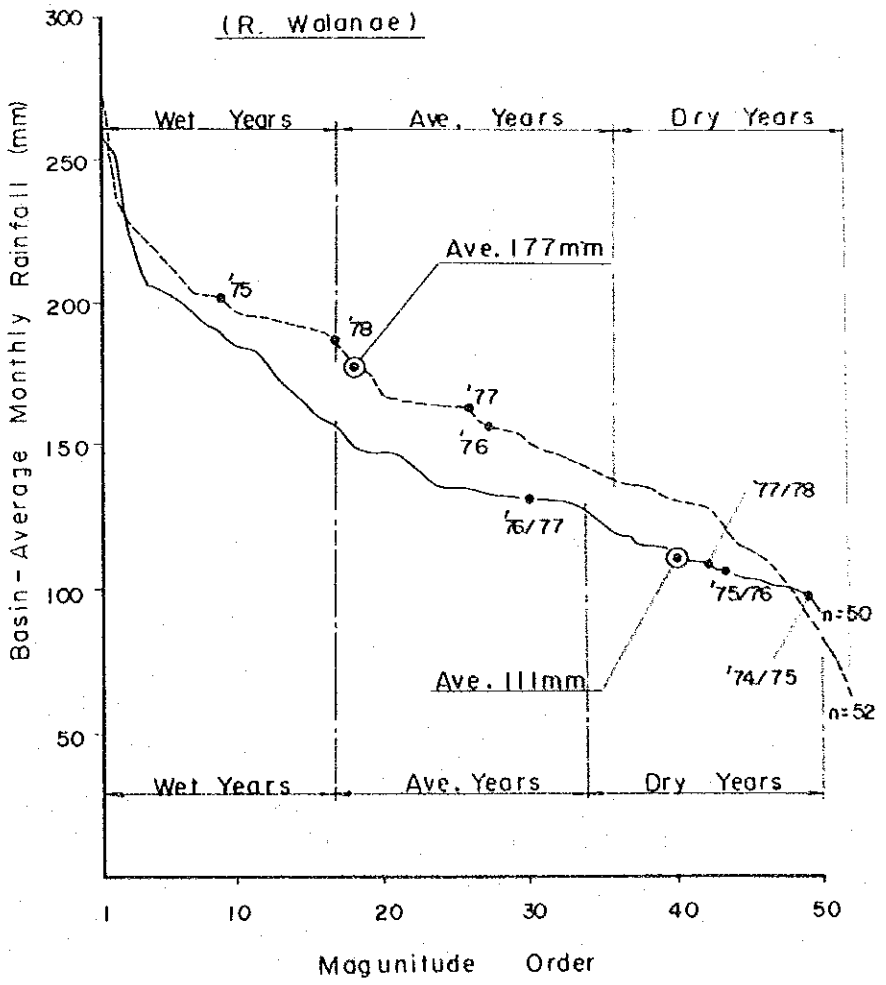
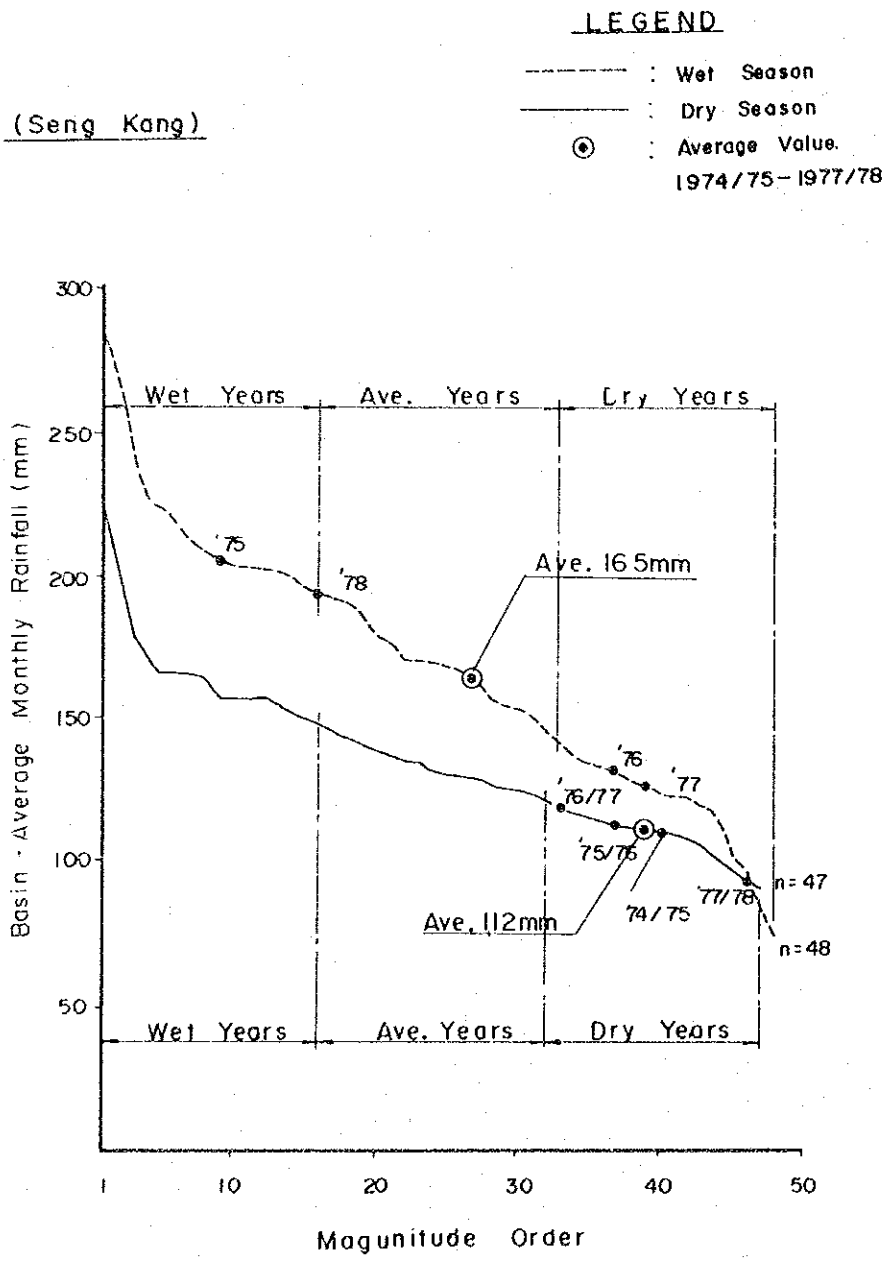


Fig 3.4.(4) Average Monthly Rainfall in River Basin Arranged in Magunitude Order

(Seng Kang)



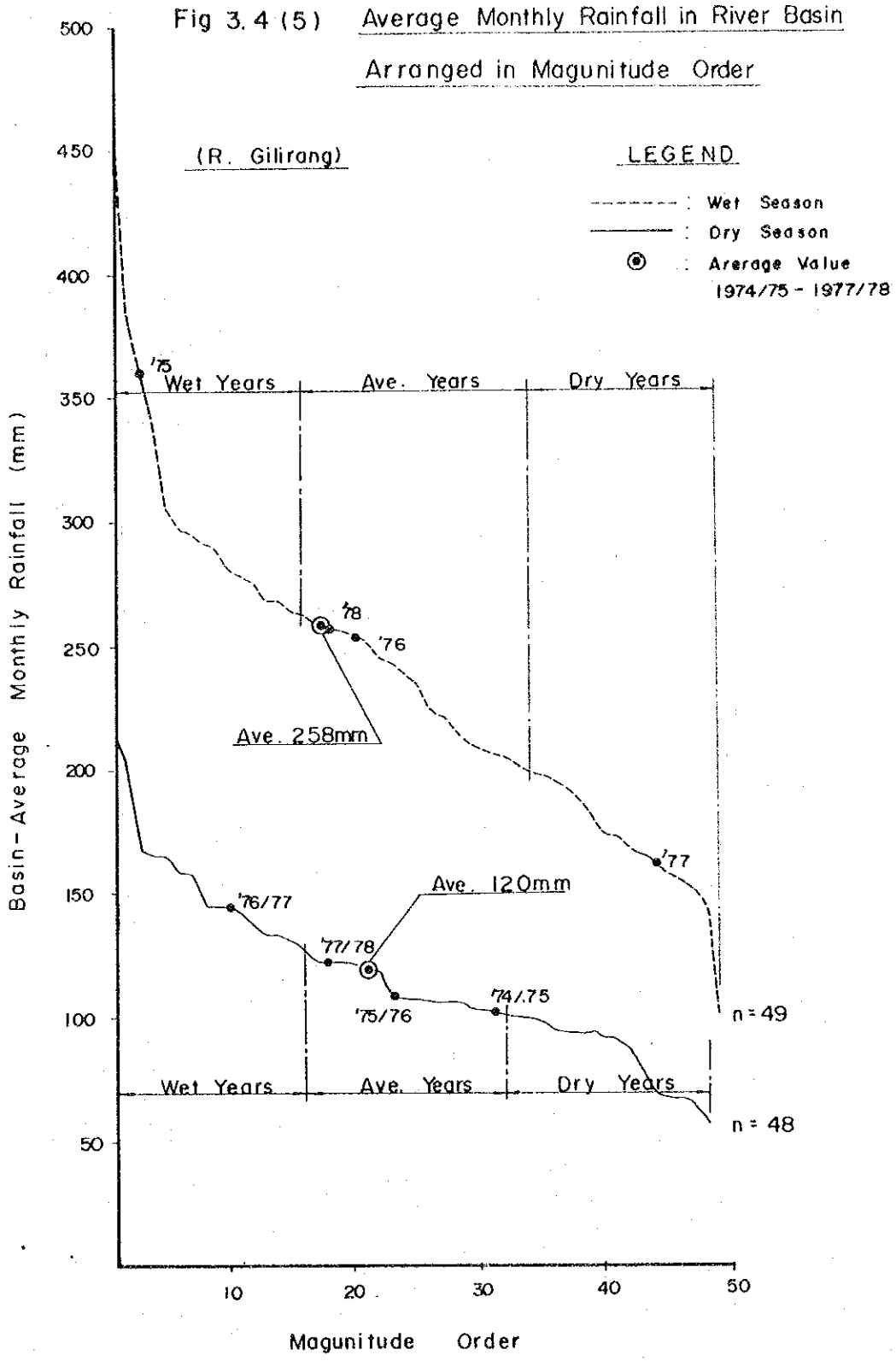


Fig 3.4 (5) Average Monthly Rainfall in River Basin
Arranged in Magunitude Order
(R. Gilirang)
LEGEND
: Wet Season
: Dry Season
: Arerage Value
1974/75 - 1977/78
Wet Years
Ave. Years
Dry Years
'75
'78
'76
'77
Ave. 258mm
Ave. 120mm
'76/77
'77/78
'75/76
'74/75
n = 49
n = 48
Basin-Average Monthly Rainfall (mm)
500
450
400
350
300
250
200
150
100
50
10
20
30
40
50
Magunitude Order

Fig. 3.5 Quantities of Imported Rice in Indonesia

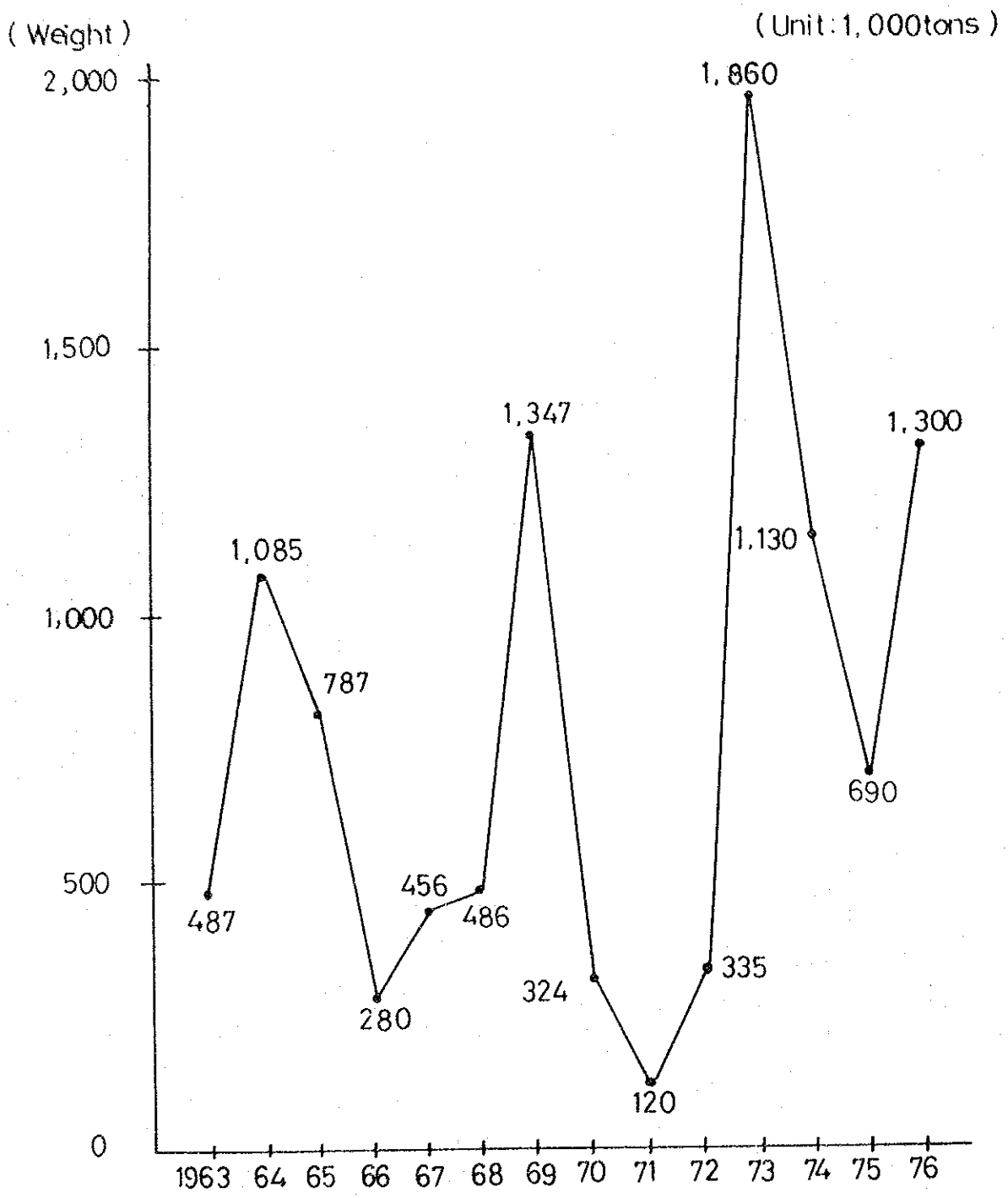


Fig. 3. 6 Balance of Supply and Demand of Rice(Sr) in Whole Indonesia (1976)

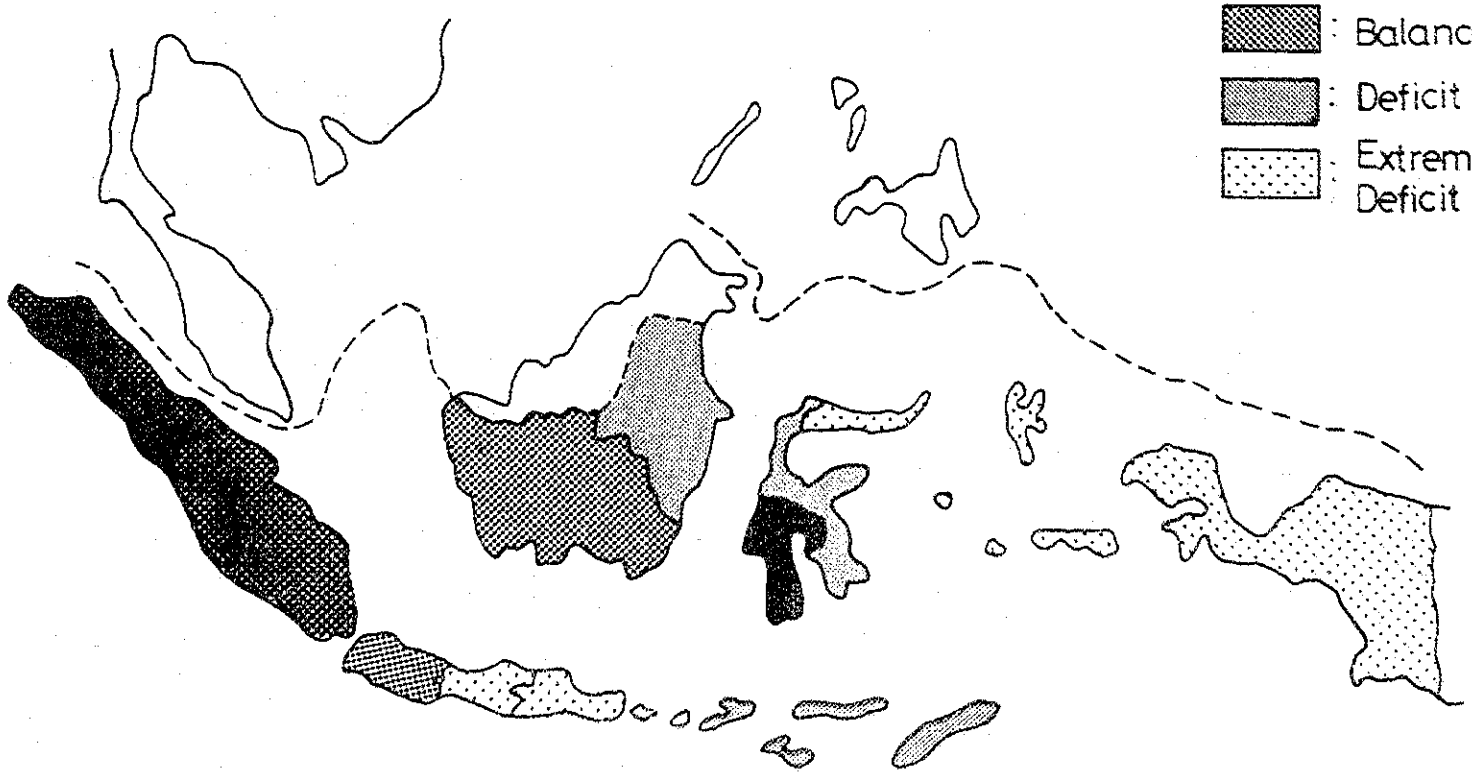


Fig. 3.7 Flow and Quantities of Rice from DOLOG of South Sulawesi in Interinsuler Trade

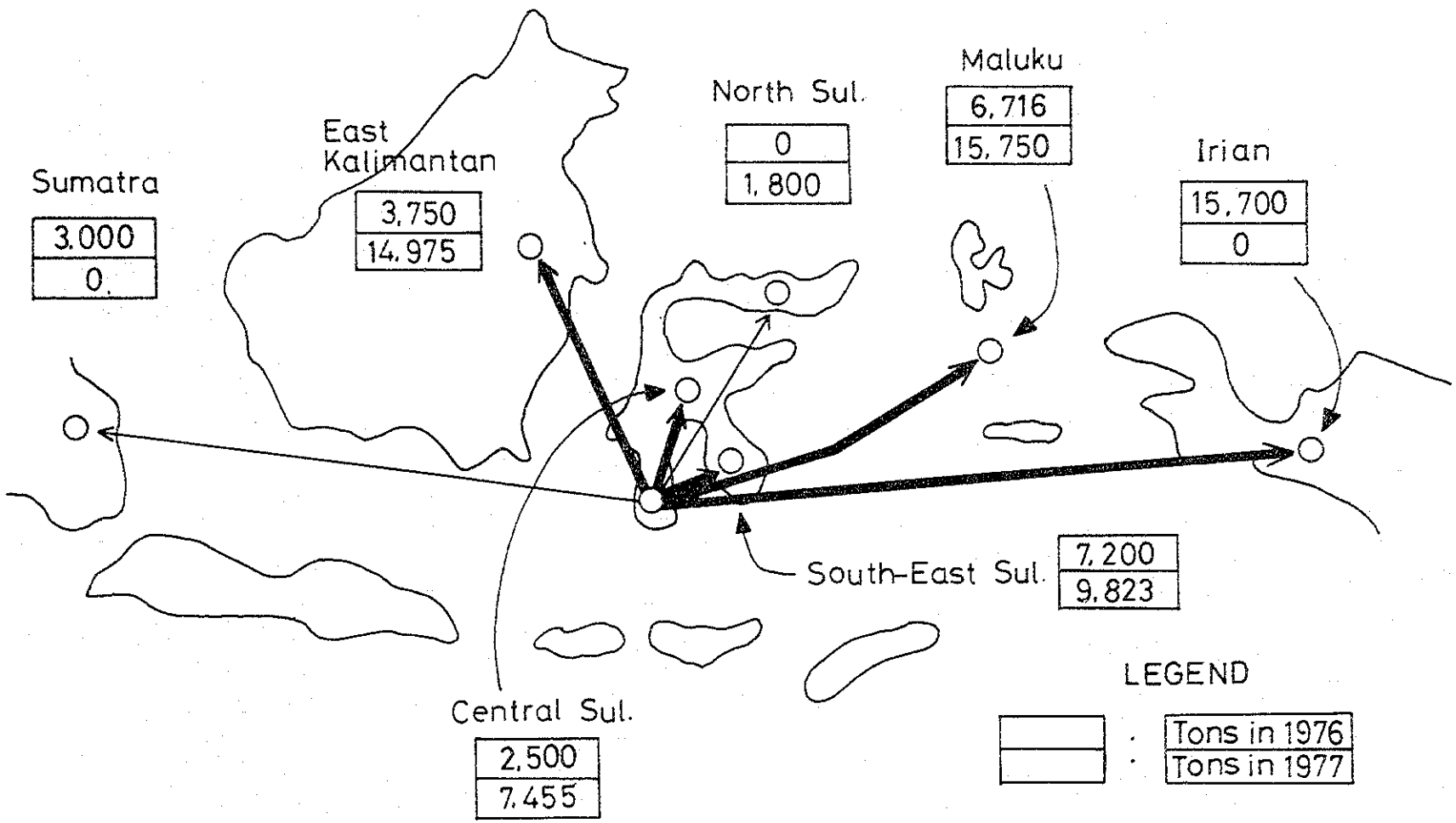
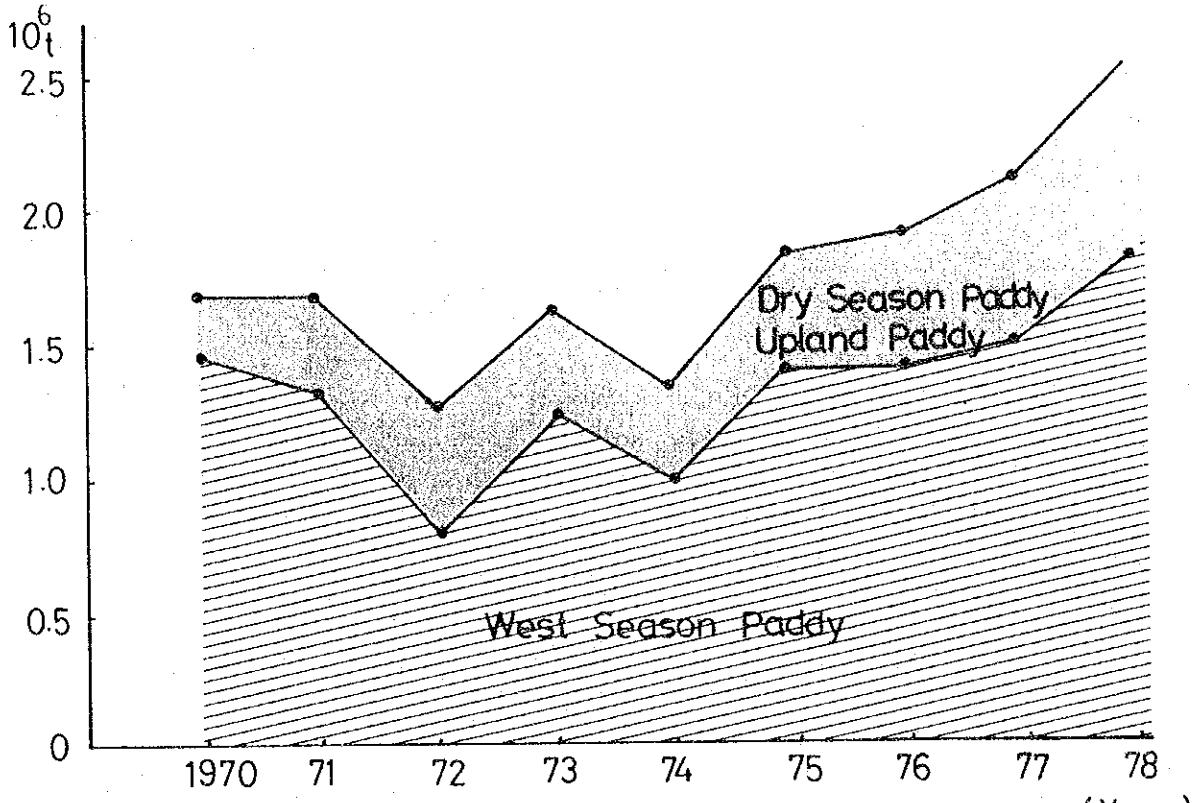
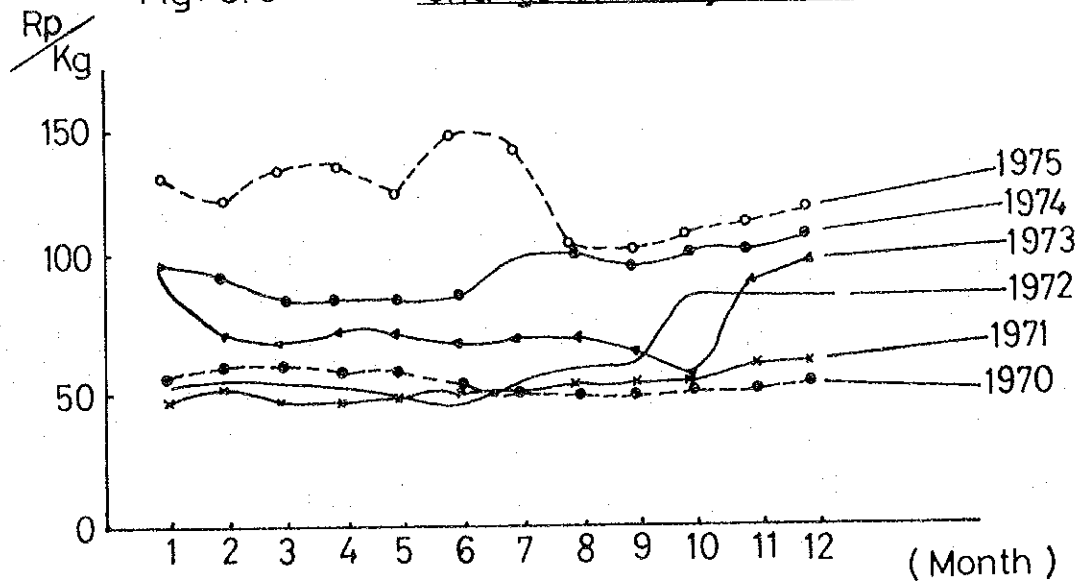


Fig. 3. 8 Change of Paddy Production



Source: DIPERTA Prov. Sulawesi Selatan

Fig. 3. 9 Change of Paddy Price



Source: Dinas Pertanian Rakjat Sulawesi Selatan

Fig. 3.10 Location of the Objective Area

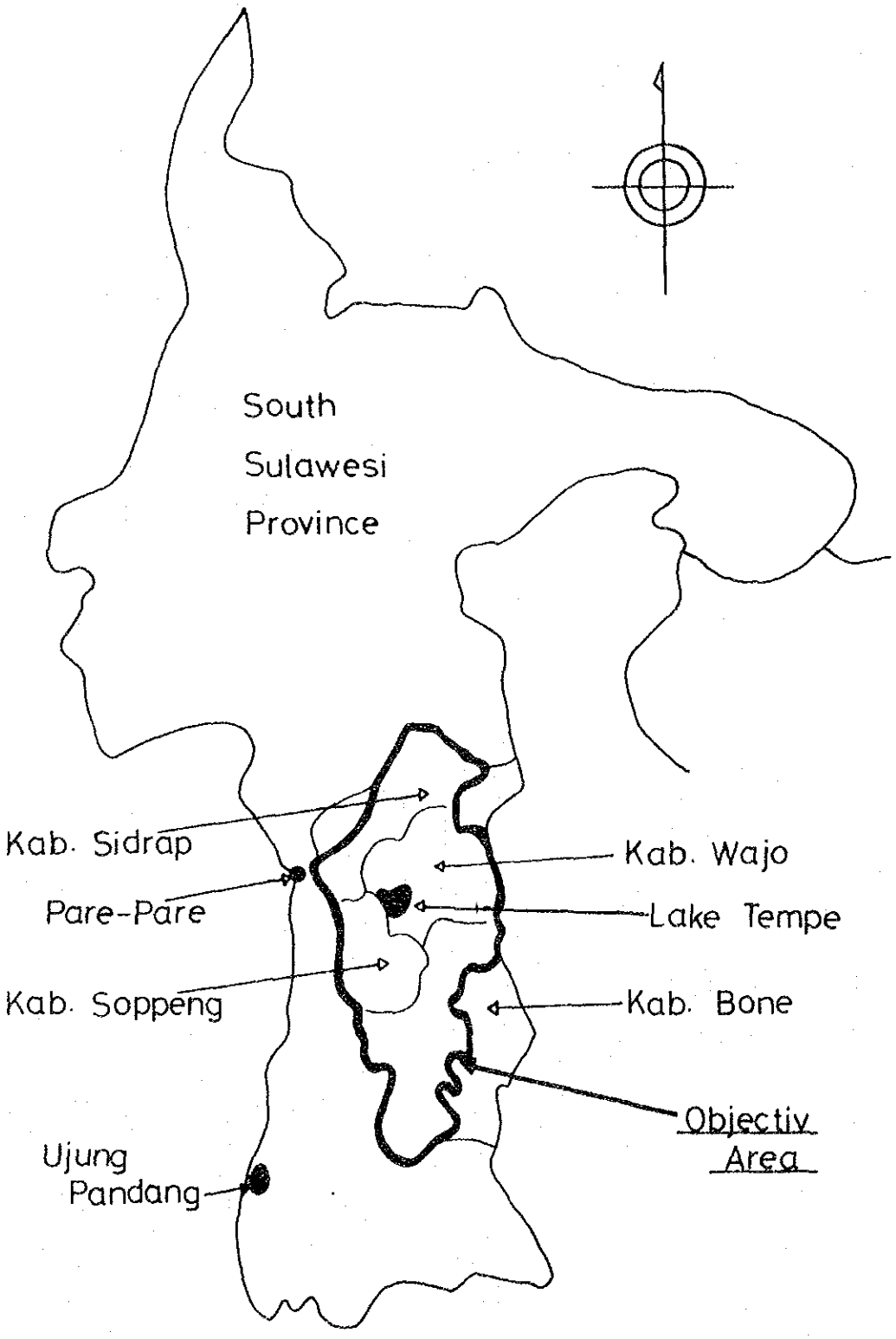


Fig. 3.11 Tendency of Consumption Pattern for Main Foodstuff in South Sulawesi

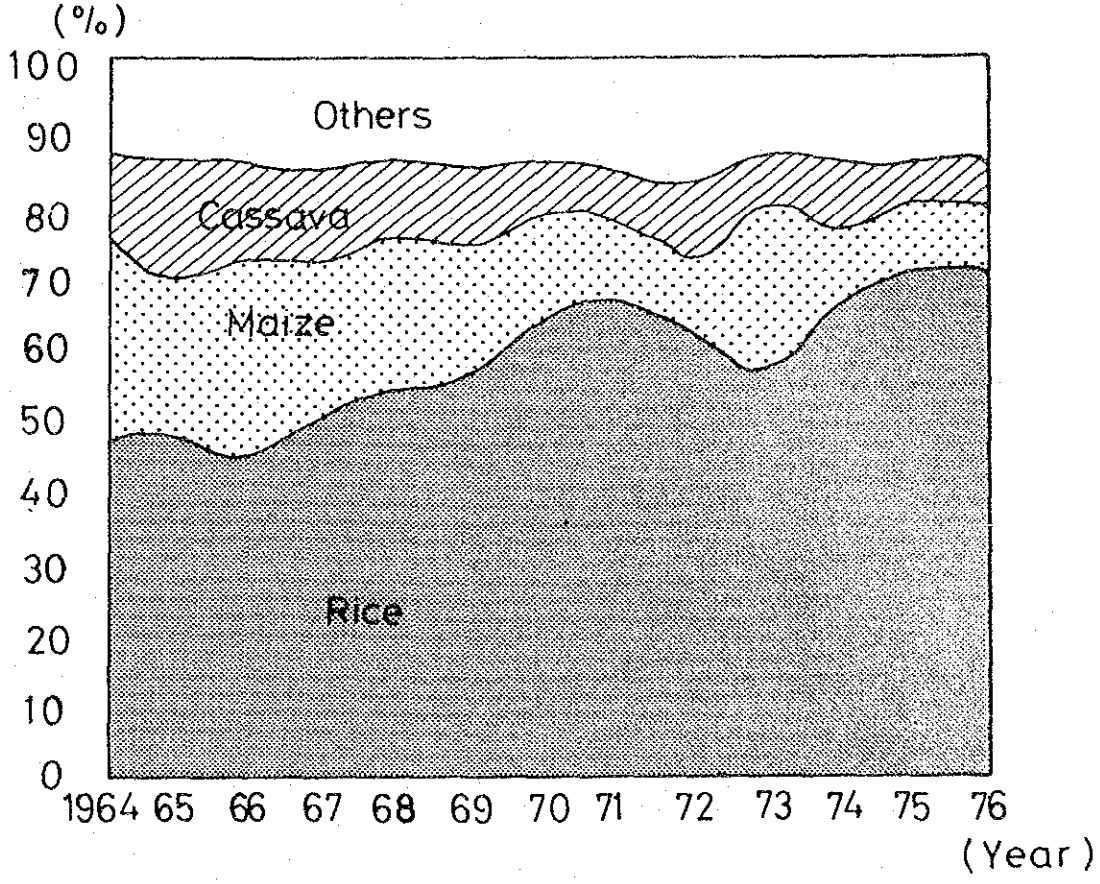


Fig. 3.12 Boundary Map of Kecamatans in Kab. Wajo, Bone, Soppeng, and Sidrap

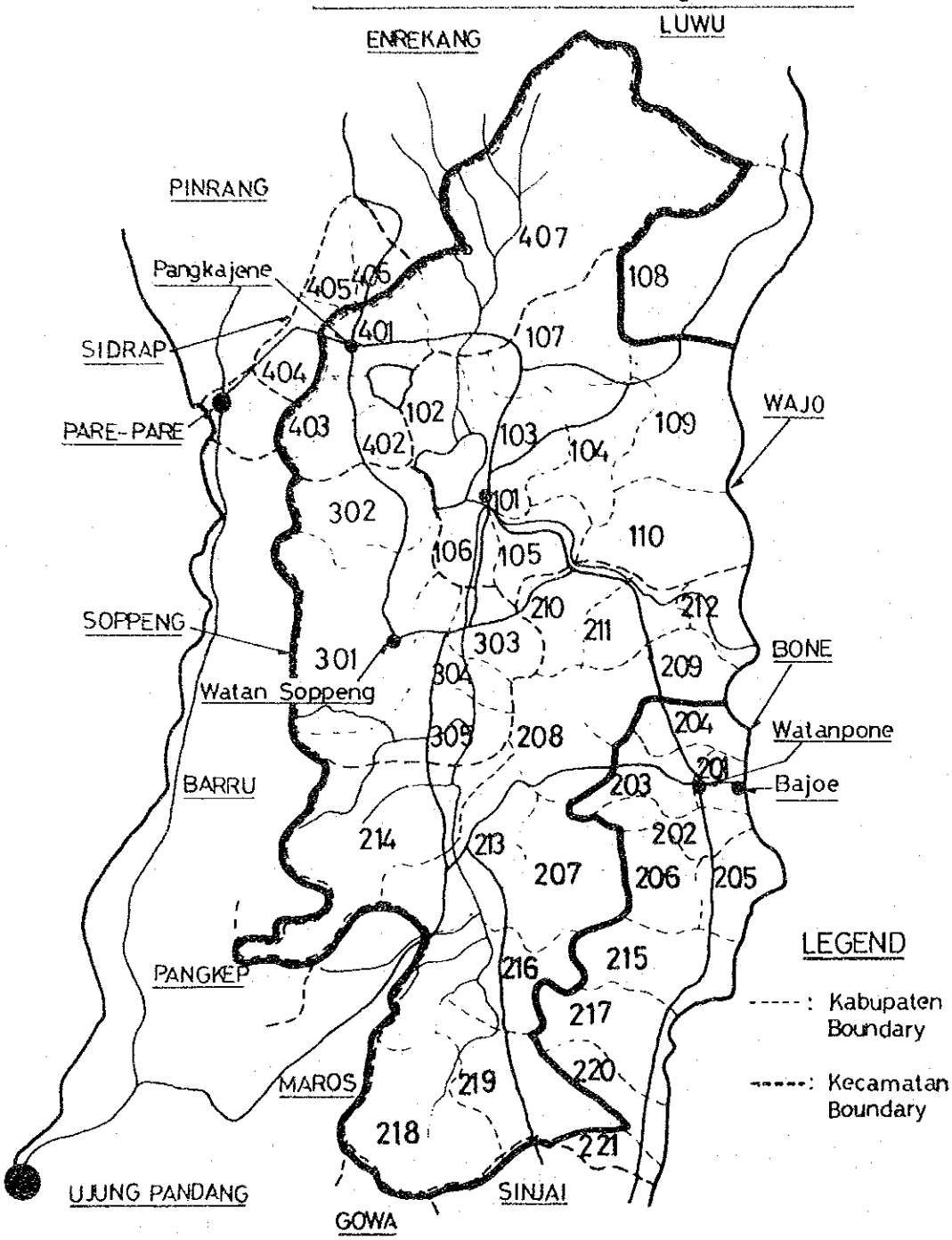


Fig. 3.13 Population Density (P.D.) 1977

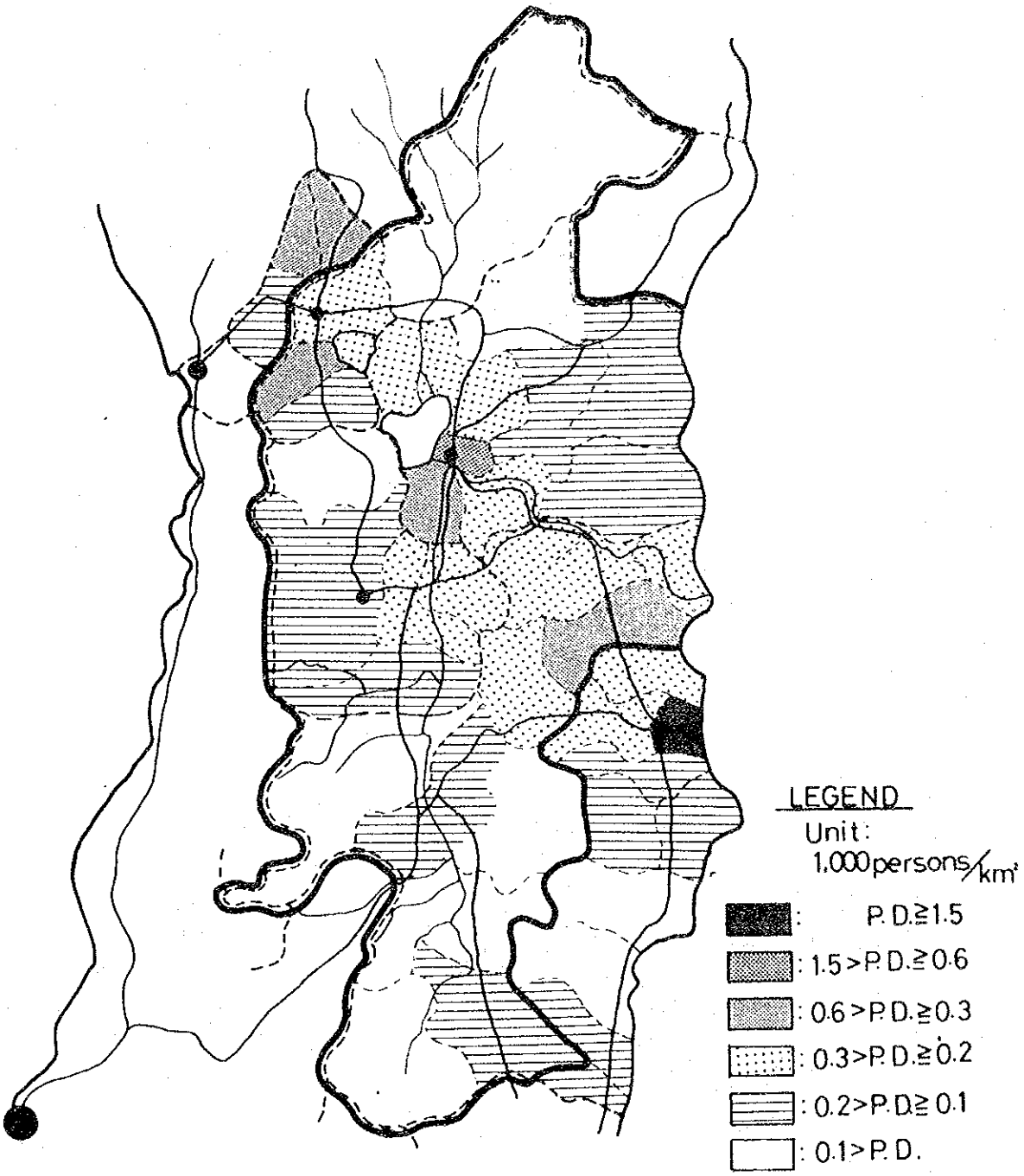


Fig. 3.14 Production of Wet Season Paddy(Y)
1977

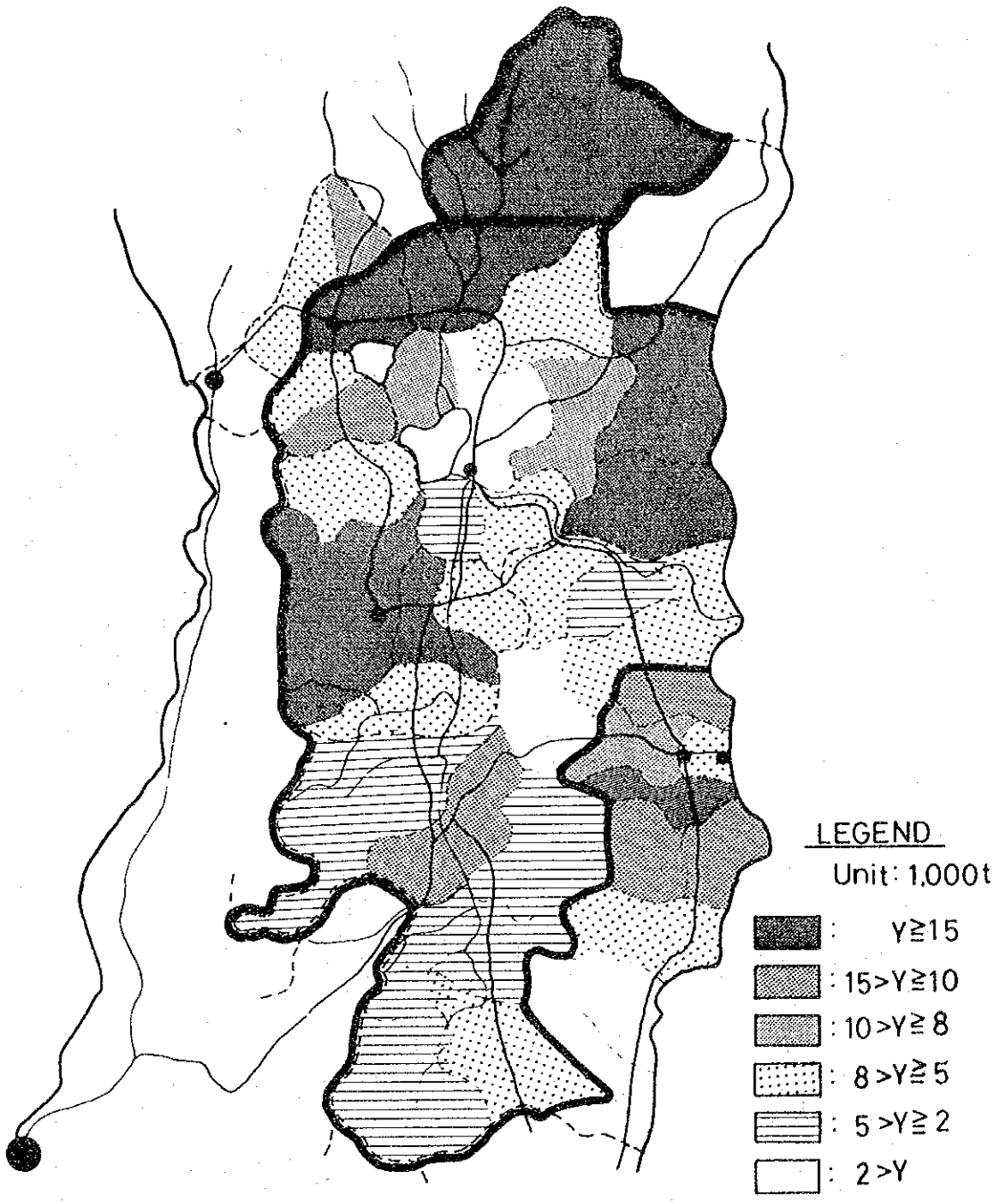


Fig. 3.15 Production of Dry Season Paddy(Y')
1977

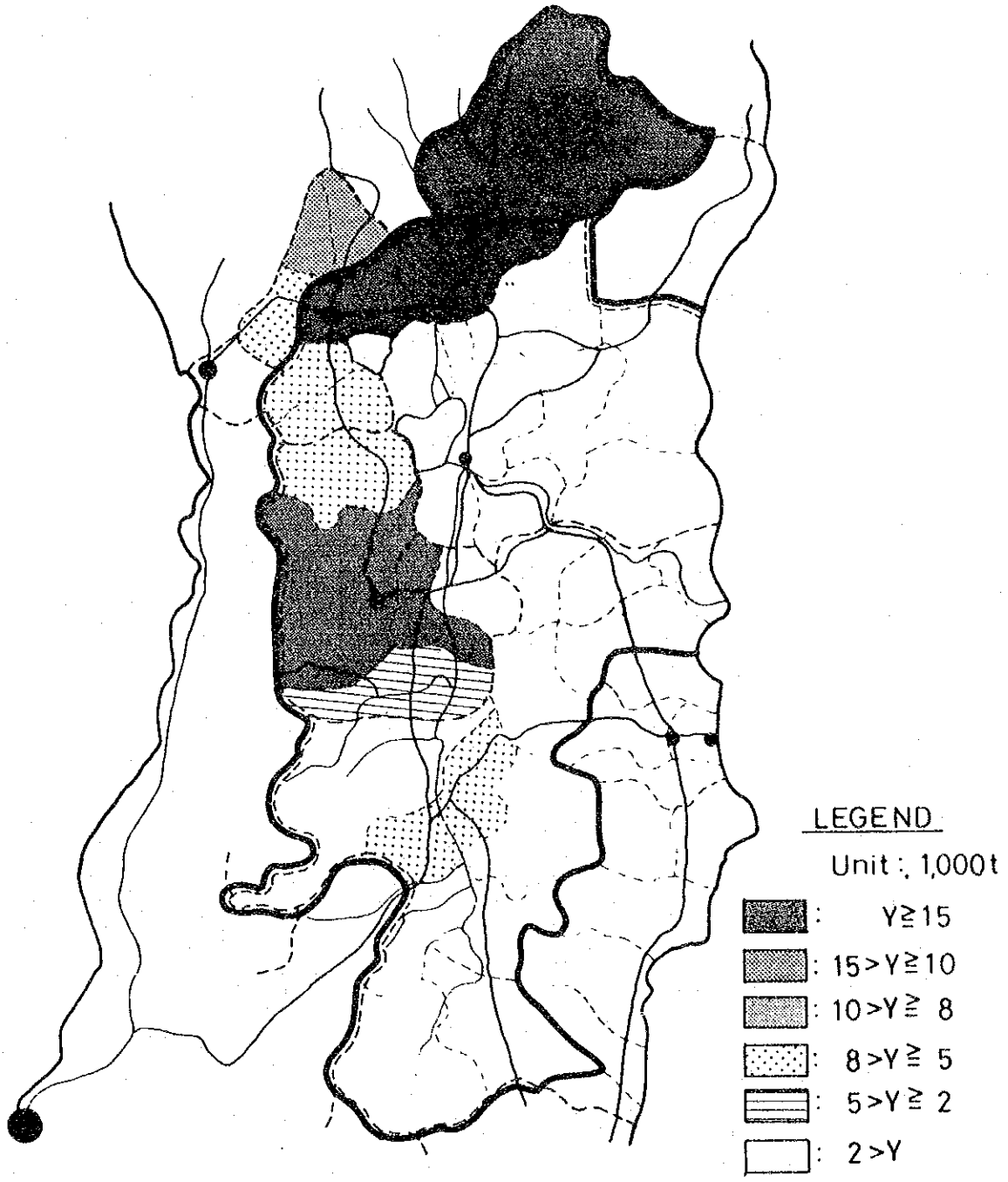


Fig. 3.16 Present Irrigated Paddy Field (IA)

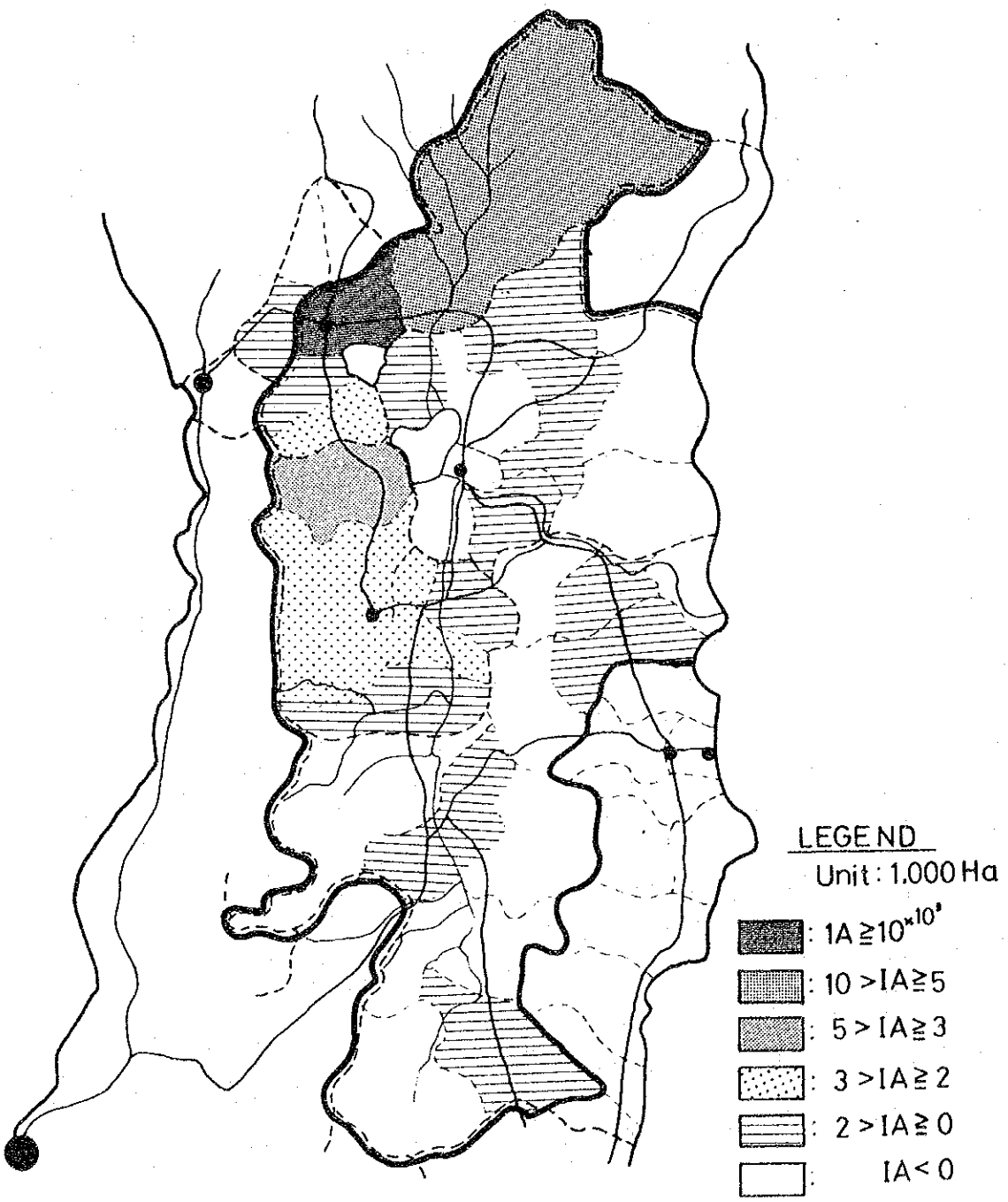


Fig. 3.17 Productivity of Wet Season Paddy (1977) Production per Ha of Harvested Area (∂)

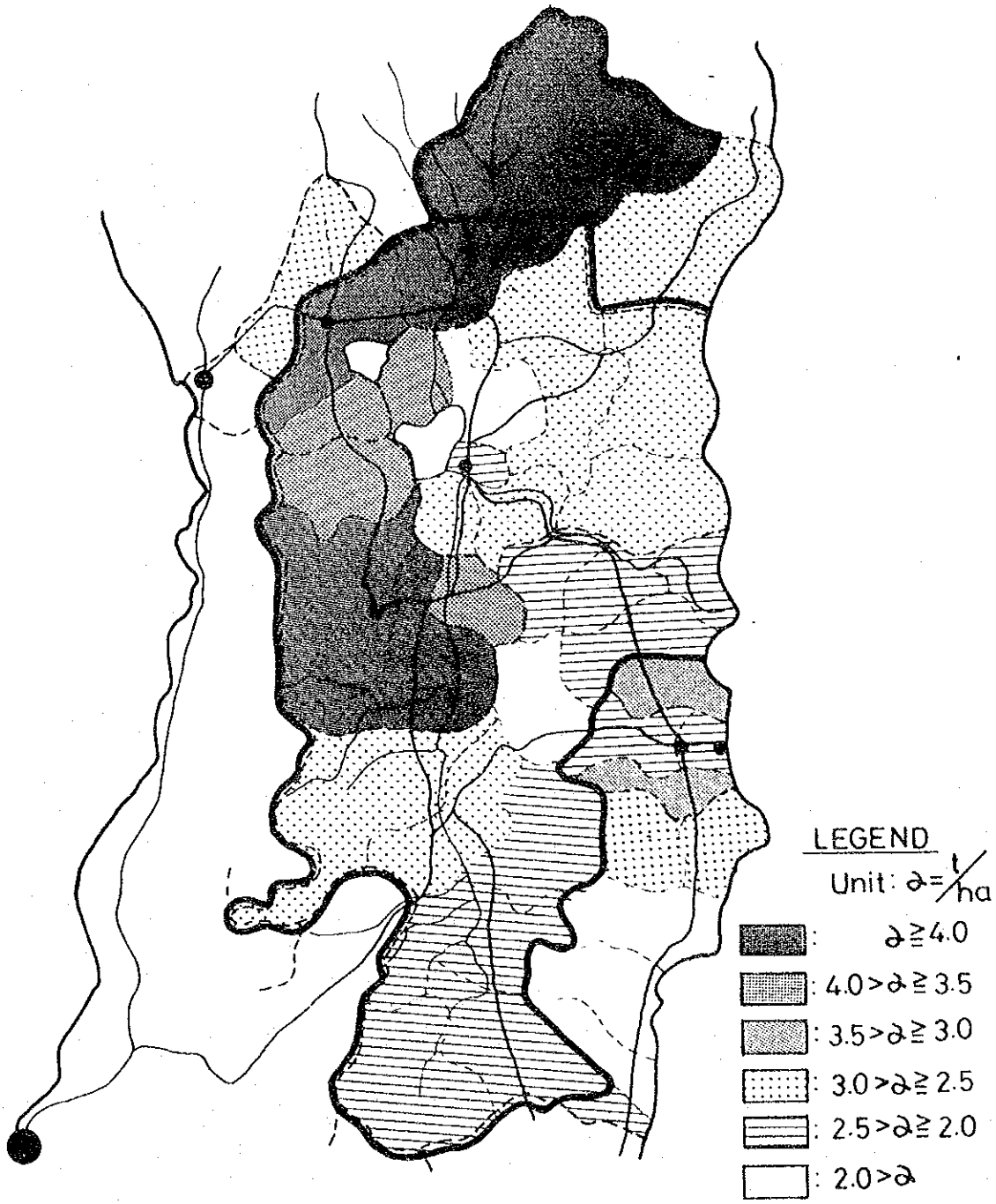


Fig. 3.18 Change of Production of Wet Season Paddy (1974-1977)

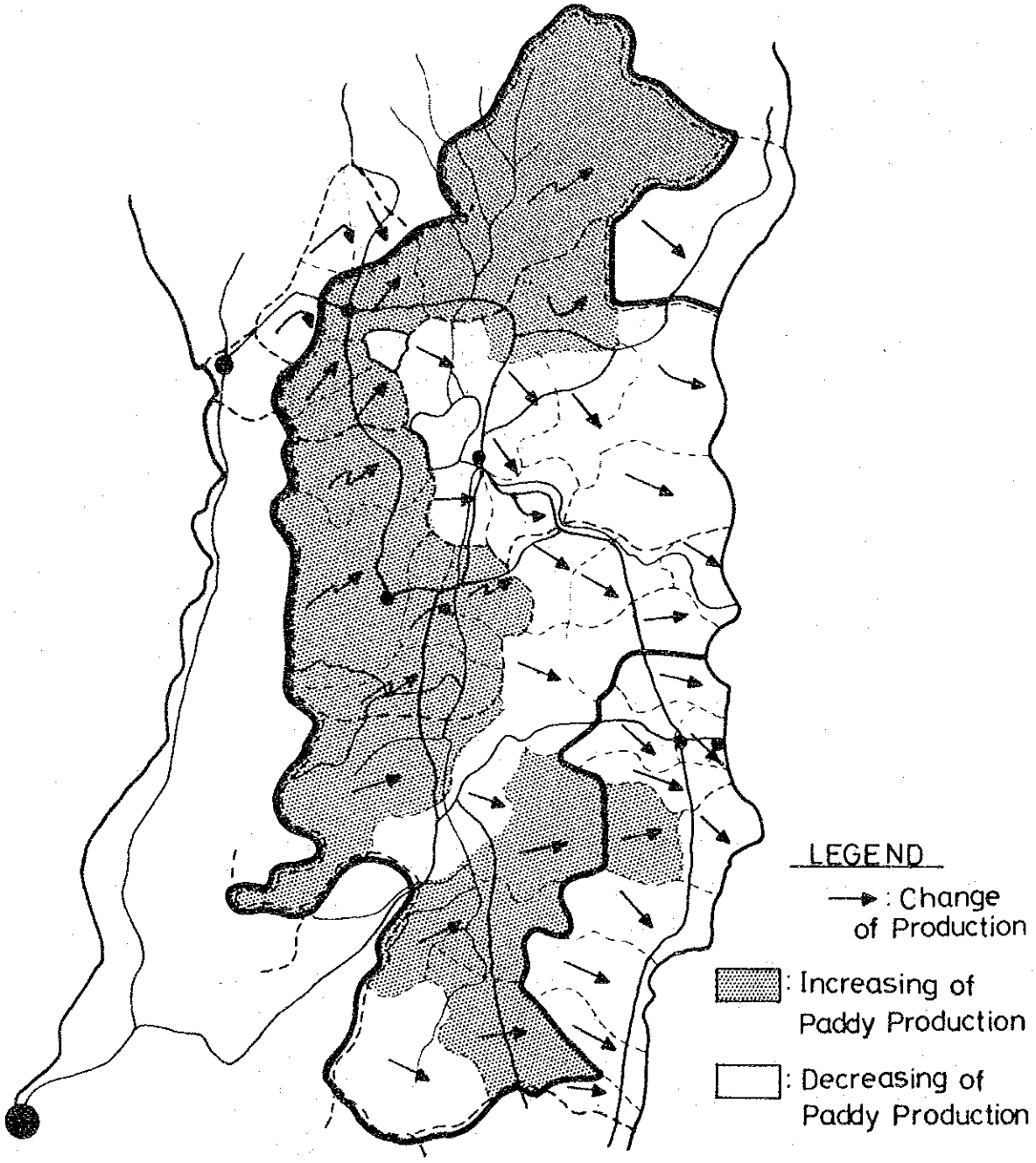


Fig. 3.19 Damaged Ratio of Wet Season Paddy (1977) d.r.=Damaged Area/Planted Area

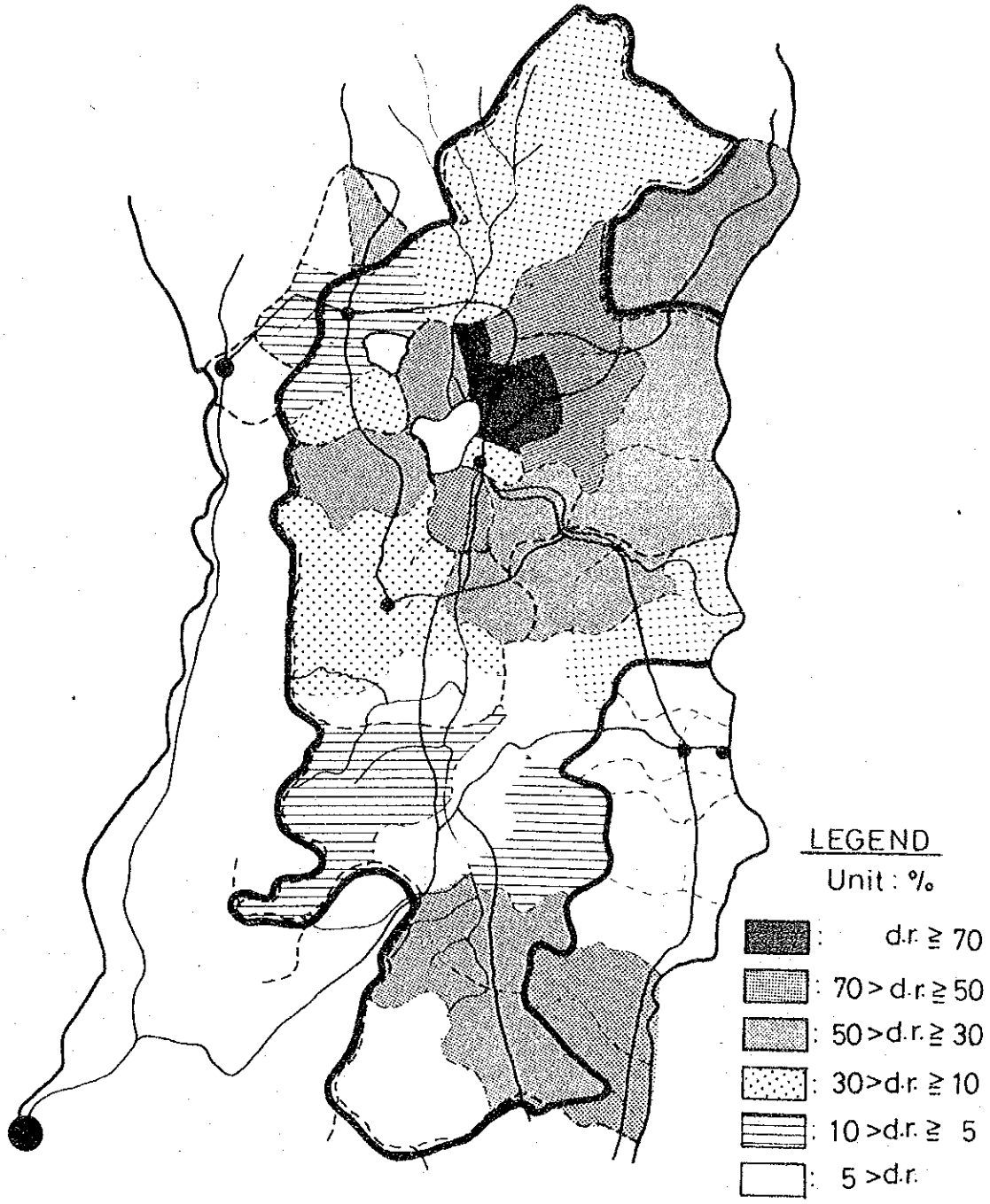


Fig. 3. 20 Cause of Damage of Wet Season Paddy (1977)

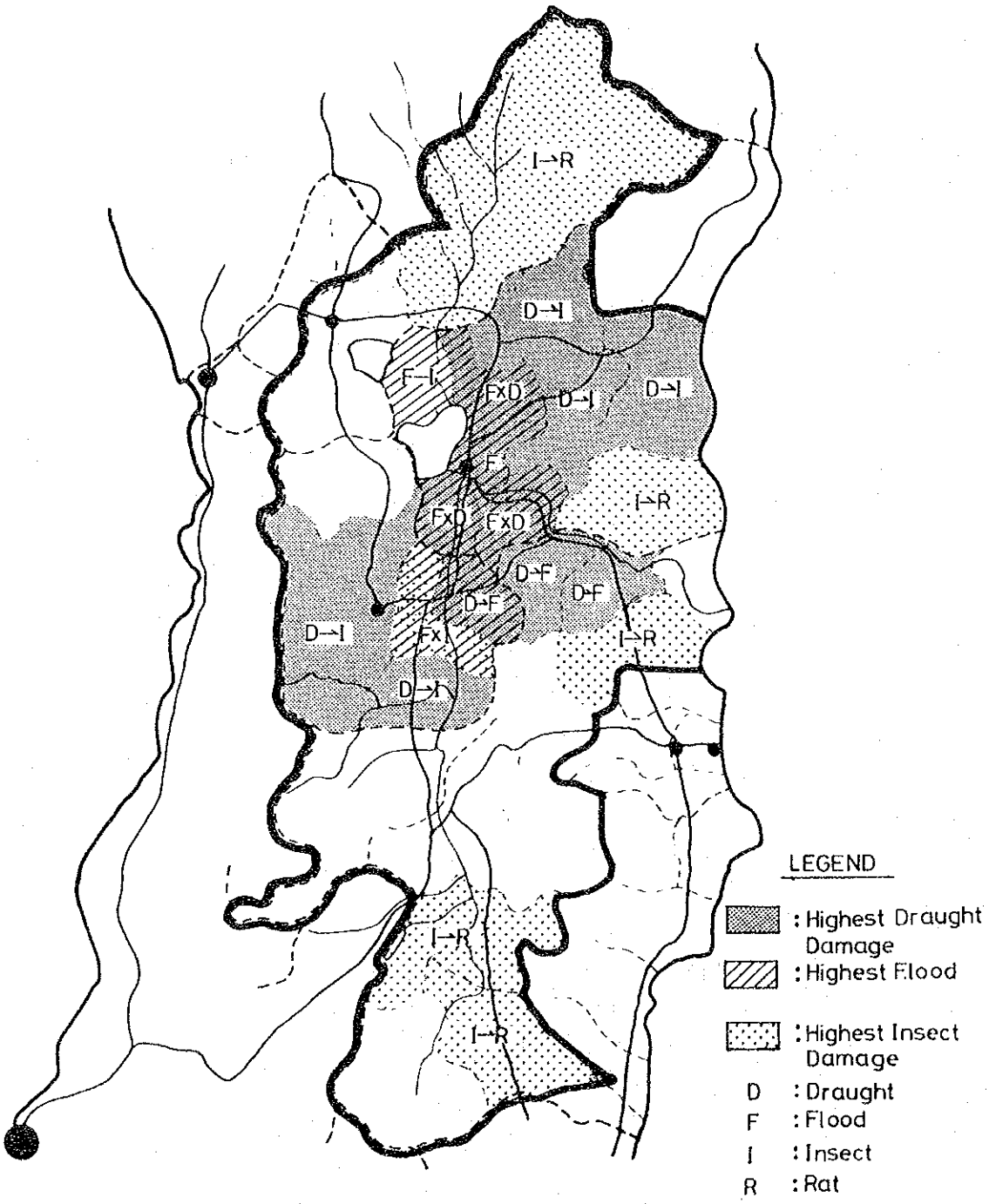


Fig. 3.21 Present Farm Income of Average Size Farm of Each Kecamatan in the Obj. Area (Net Fam Incom)

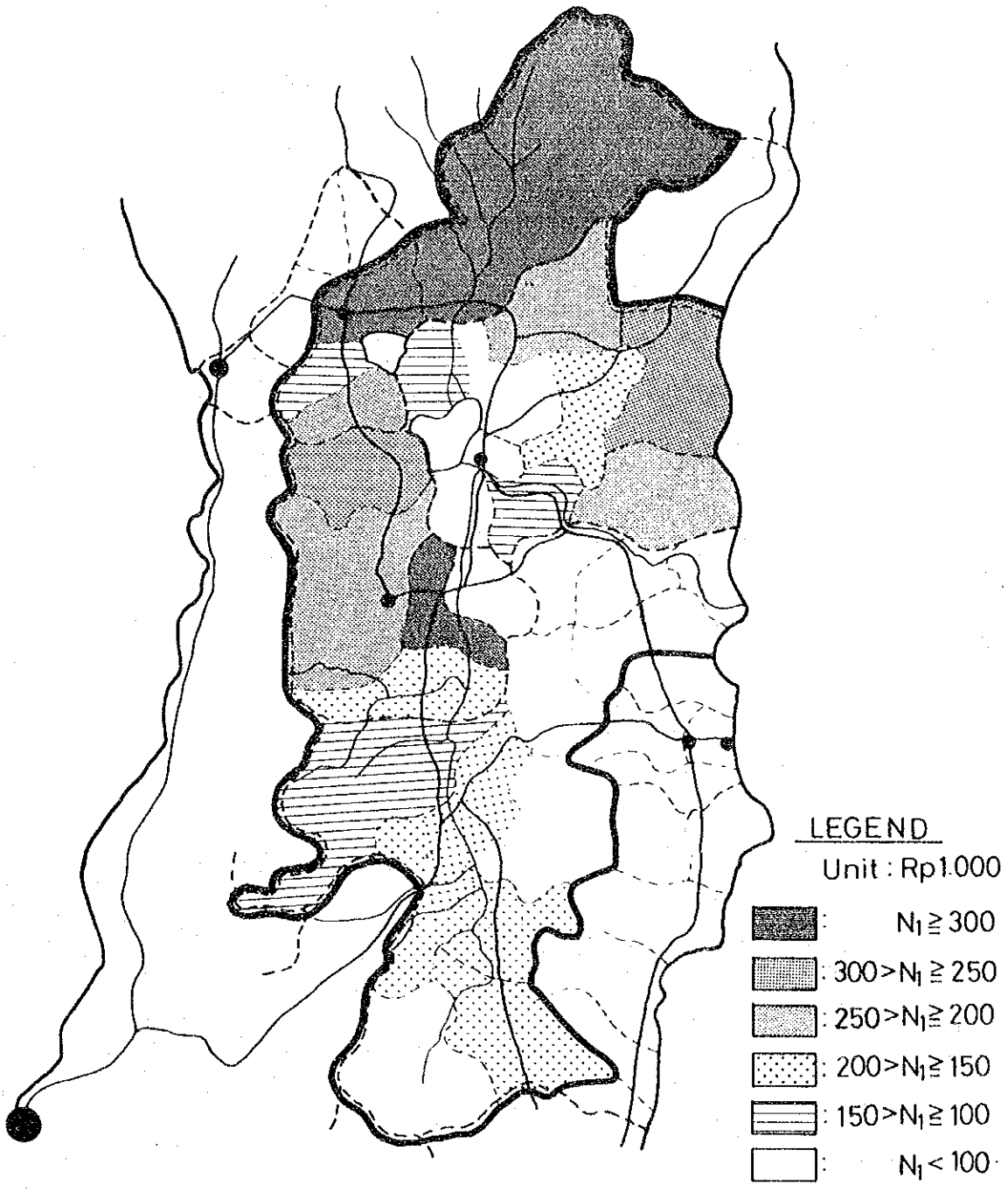


Fig. 3.22(1) Manpower (M_1) Population per Ha of Planted Area of Wet Season Paddy (1977)

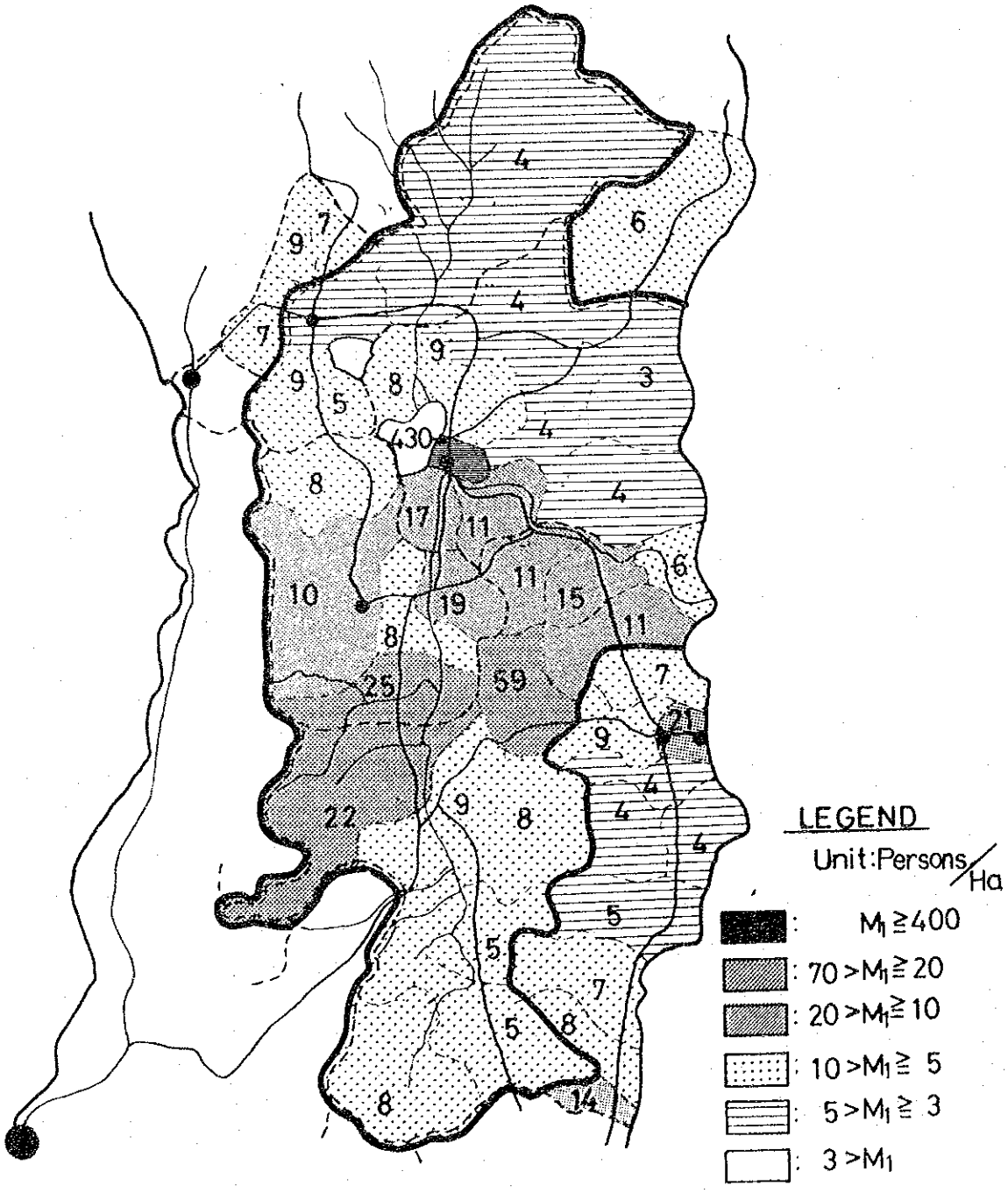


Fig. 3.22(2) Manpower(M_2): Population per Ha of Harvested Area of Wet Season Paddy (1977)

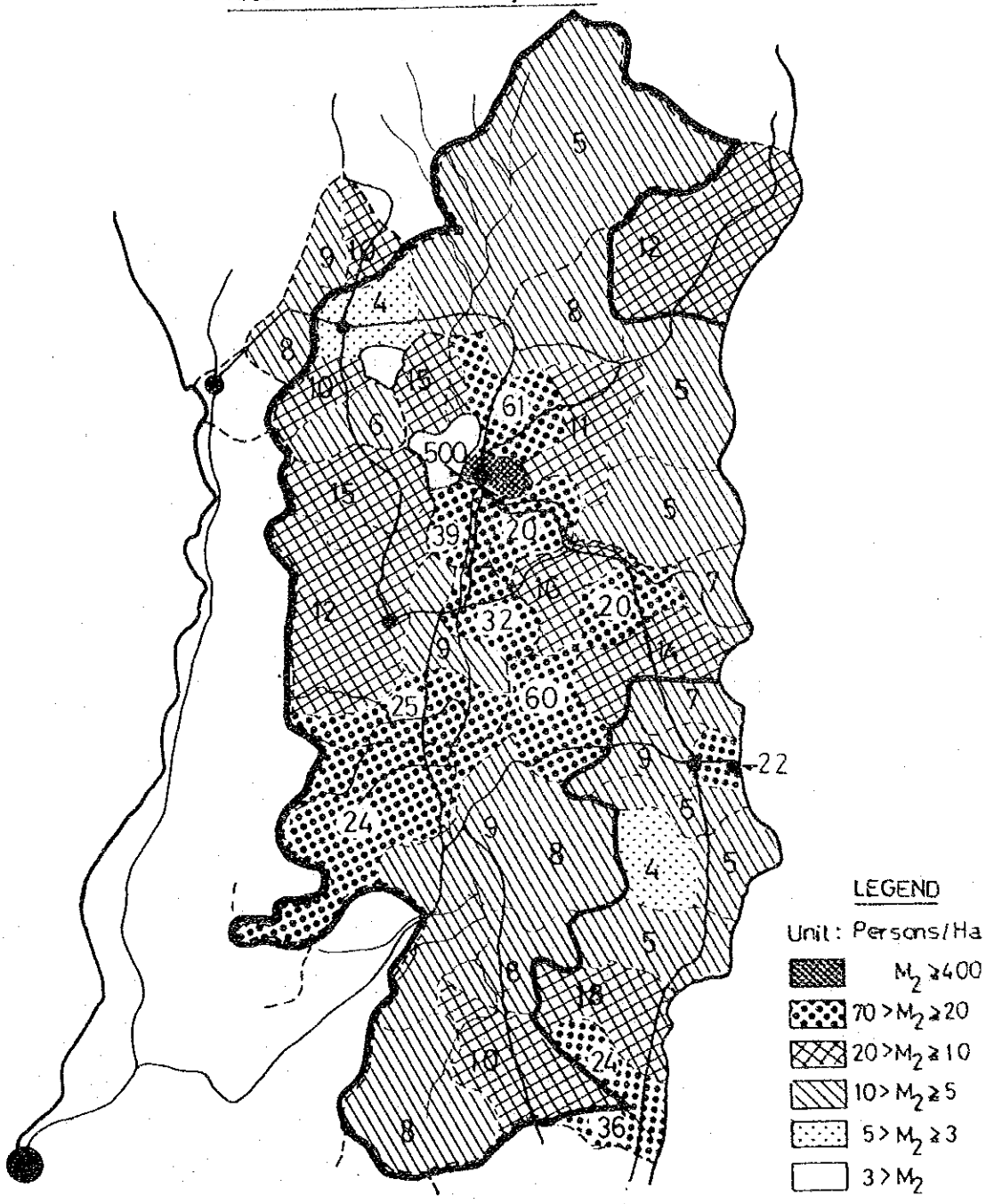


Fig. 3.23 Surplus and Deficit of Paddy(Sr), 1977

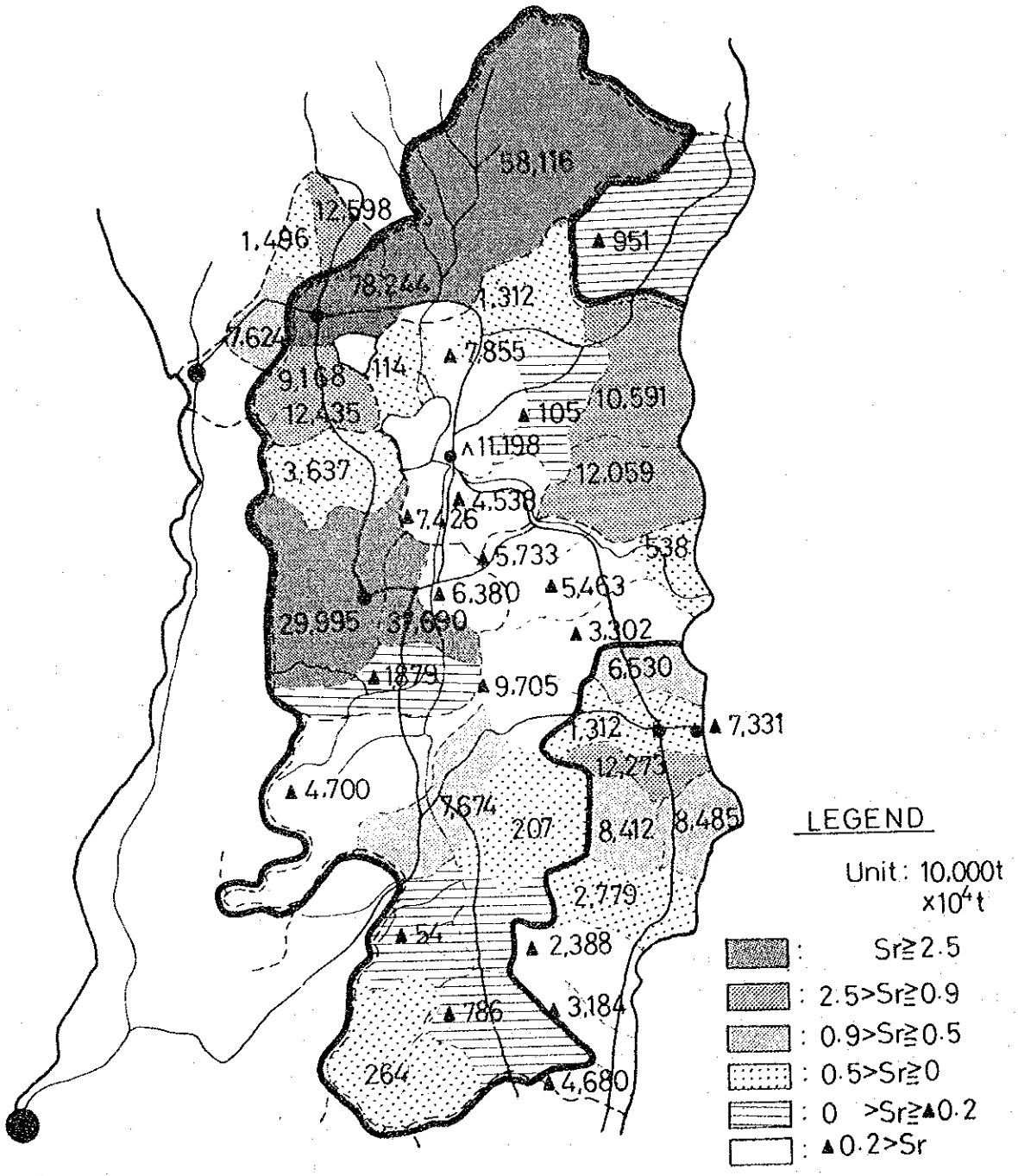


Fig. 3. 24 Present Road Network in the Objective Area

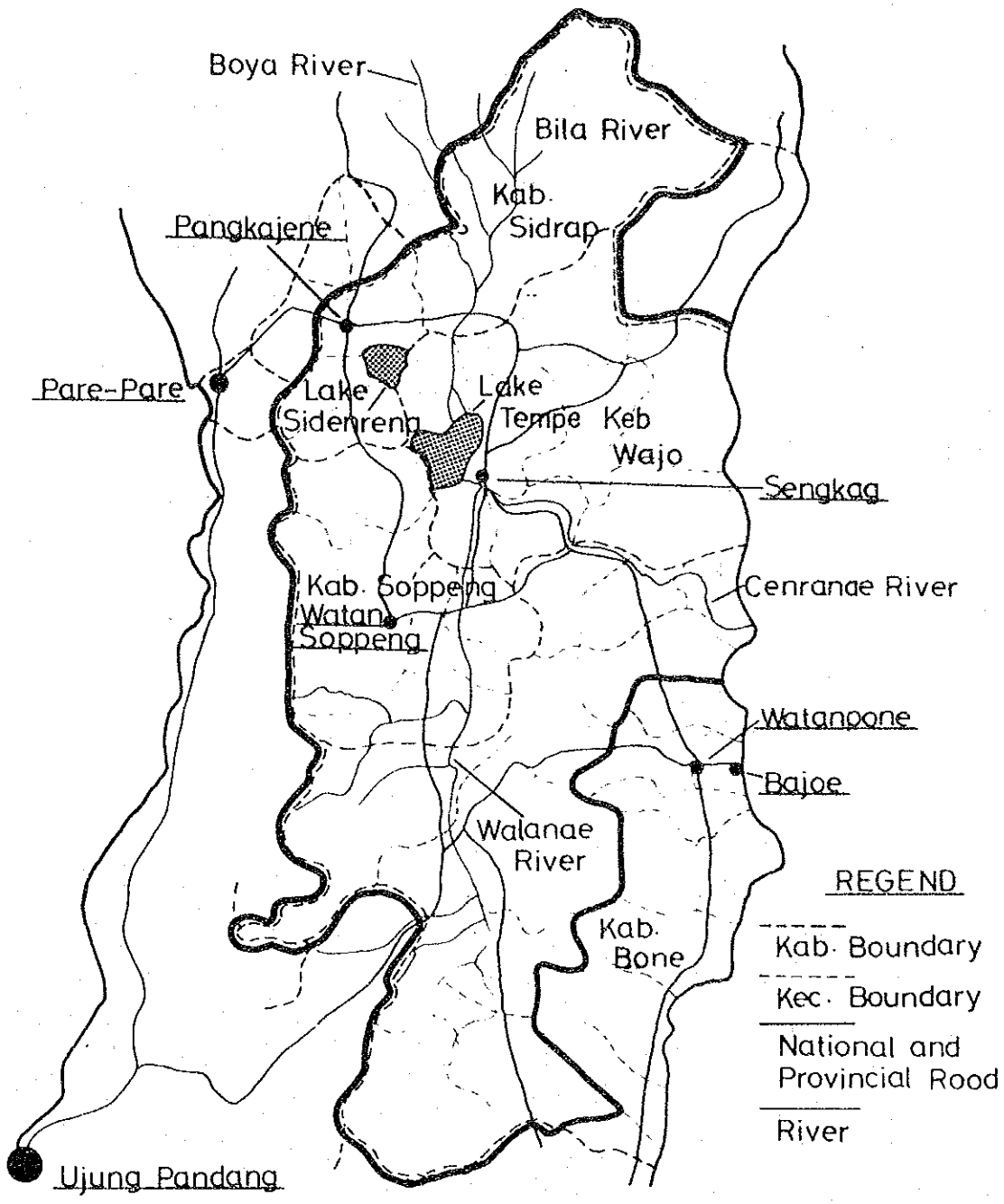


Fig. 3. 25 Time and Length from Each Kecamatan to Ujung Pandang or Pare Pare

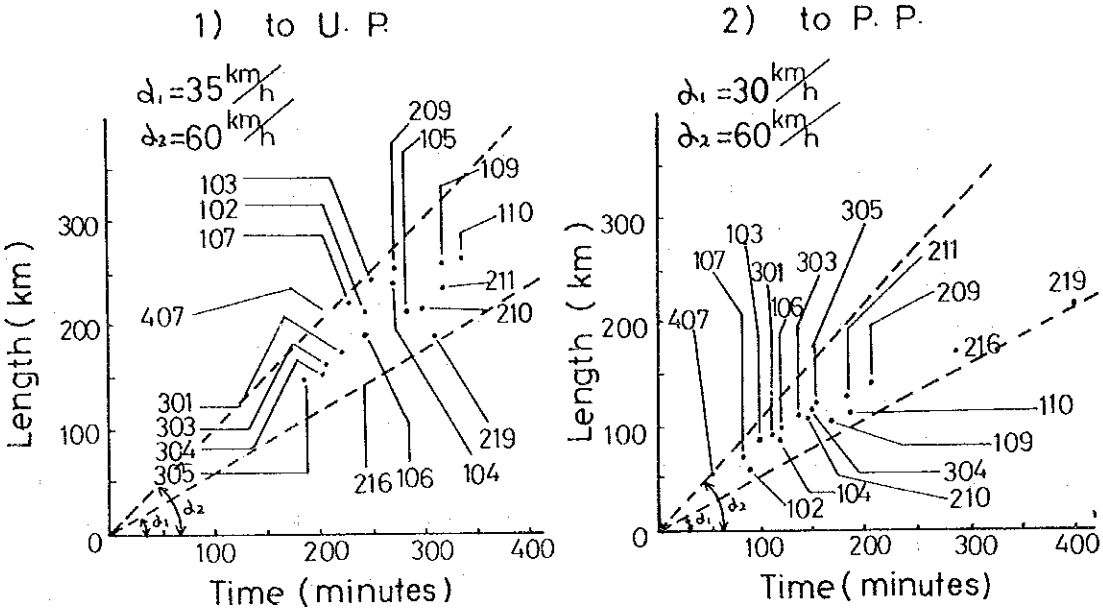


Fig. 3.26 Comparison Accessibility from Each Kecamatan to U. P. and P. P.

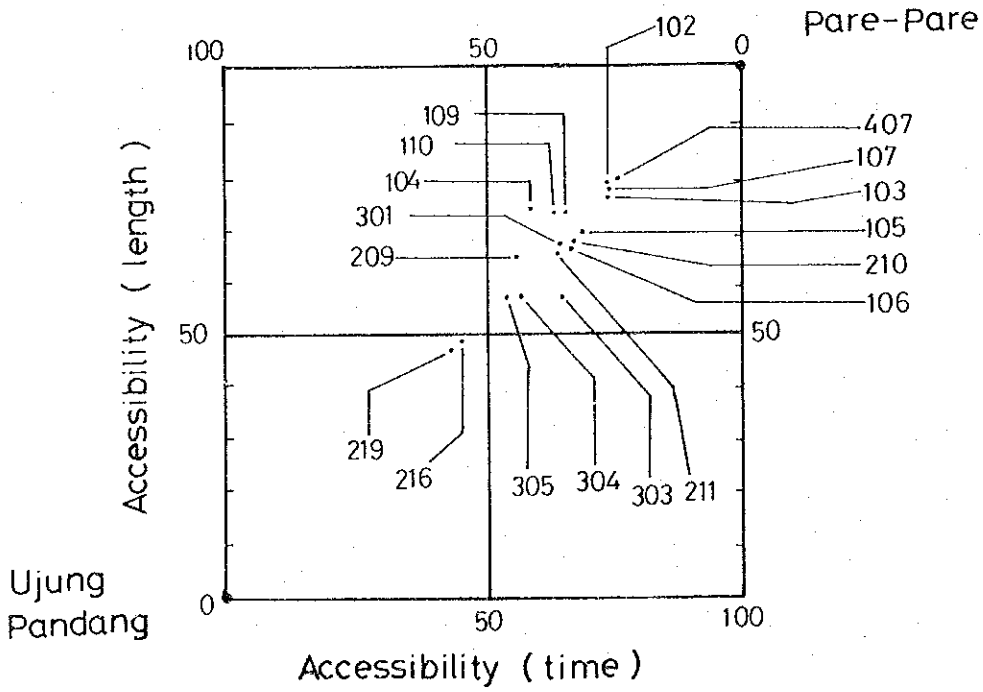
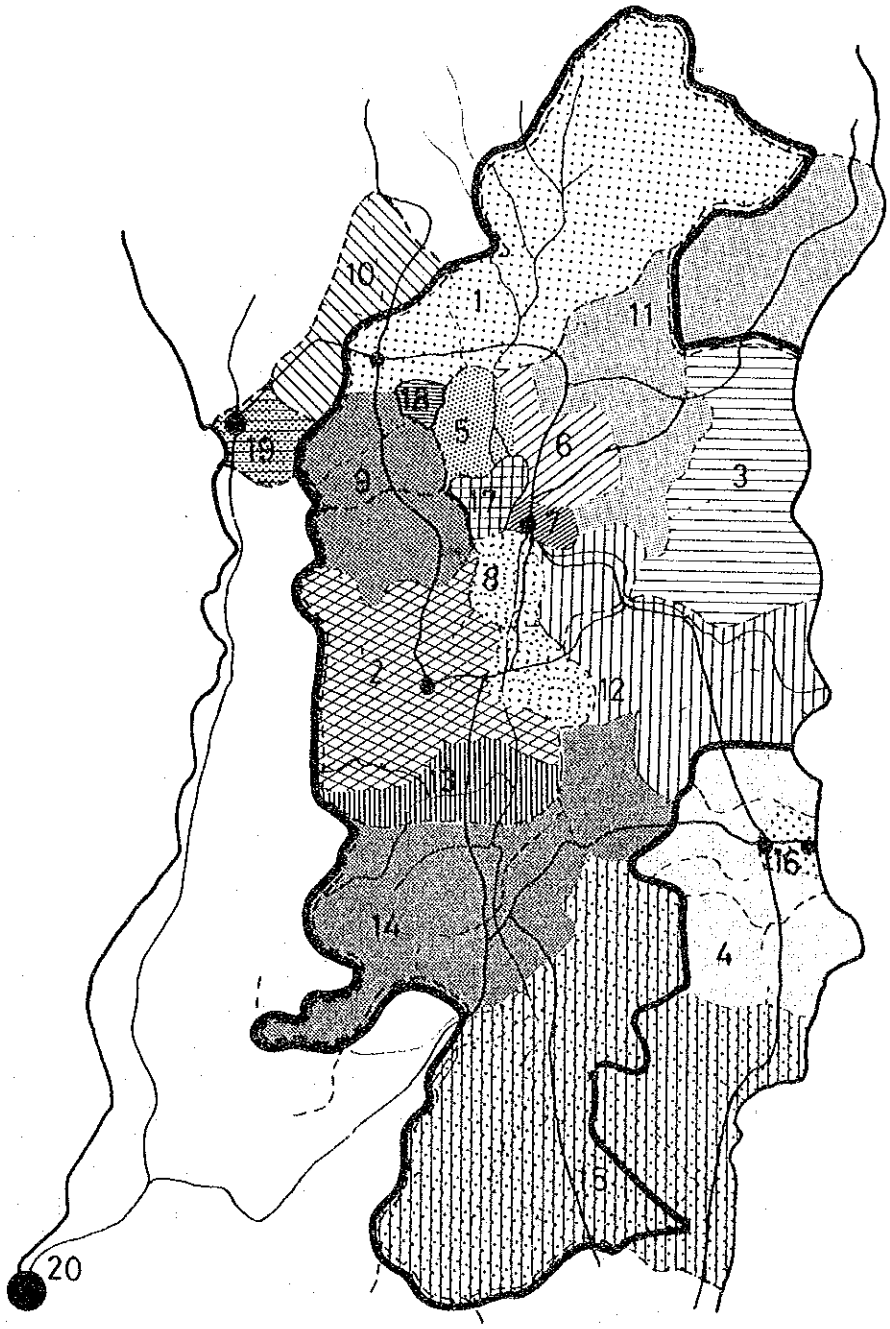


Fig. 3.27 Zoning



Remark: The meaning of each zone is described in page 39-43

Fig. 3.28 Geological Map

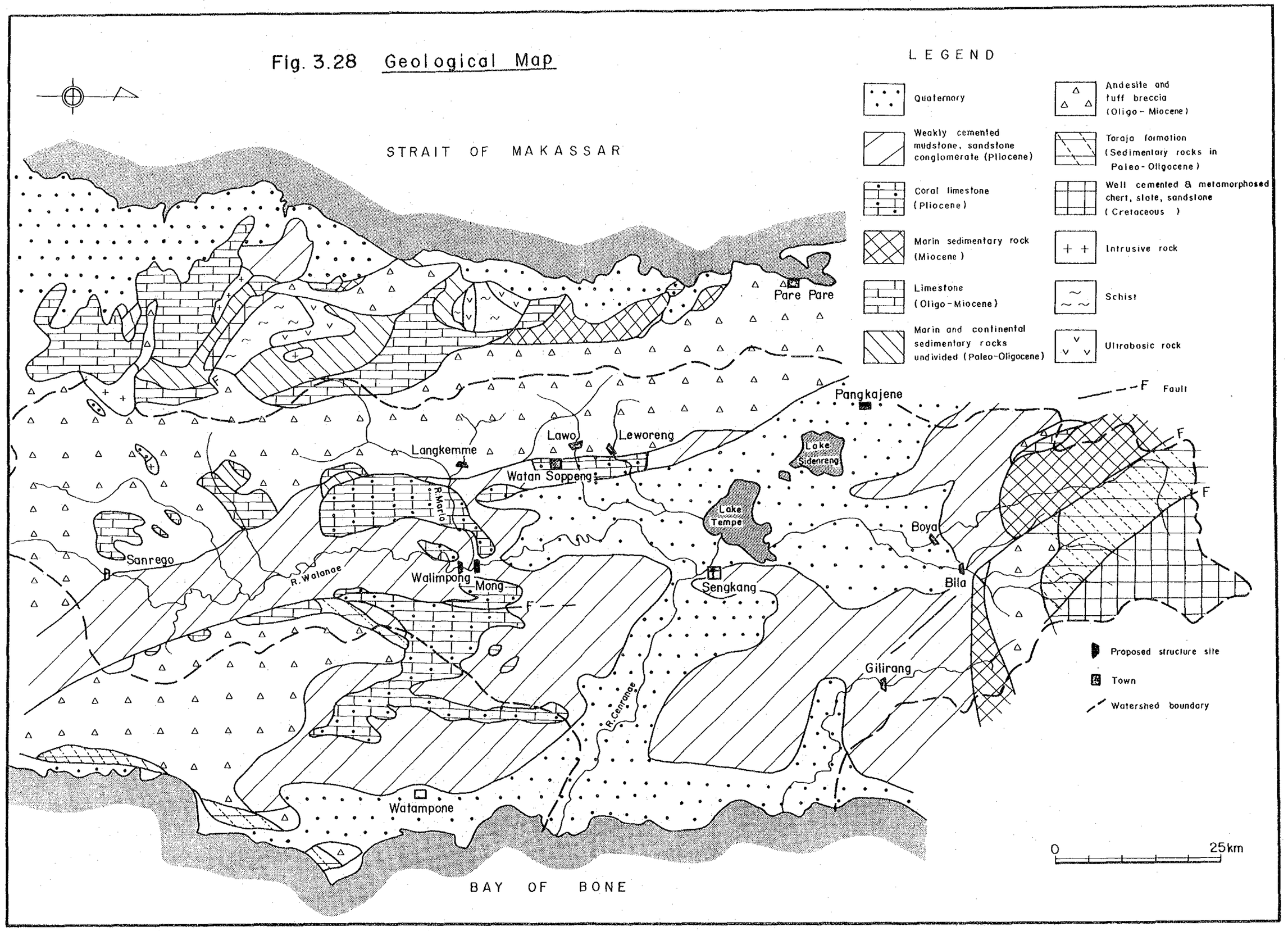


Fig. 3.29 Location Map of Existing Irrigation System.

NO	NAME OF SYSTEM	CLASS	LOCATION	IRR AREA IN OBJ. AREA
I	NORTH OF L. TEMPE			
1	BULU CENRANA	TECHNIC	SIDRAP	6.261 HA
2	LANCIRANG	S. TECH.	SIDRAP	417 HA 1/
3	BELAWA	S. TECH	WAJO	1.500 HA
4	SALO DUA	S. TECH	WAJO	524 HA
II	NORTH & WEST OF L. SIDENRENG.			
5	BULU TIMORANG	TECHNIC	SIDRAP	5.337 HA.
6	SADANG	TECHNIC	SIDRAP	8.050 HA.
7	BILOKKA	S. TECH.	SIDRAP	931 HA.
8	WETTEE	S. TECH	SIDRAP	510 HA
III	WEST & SOUTH OF L. TEMPE			
9	LATENRENG	S. TECH	SOPPENG	800 HA 2/
10	LAJAROKO	TECHNIC	SOPPENG	1.250 HA
11.	SALO BUNNE	TECHNIC	SOPPENG	2.100 HA.
12	TOWELENG	S. TECH.	SOPPENG	450 HA
13	LEWORENG KANAN	S. TECH	SOPPENG	708 HA.
14	LEWORENG KIRI	S. TECH.	SOPPENG	1.192 HA.
15	TENCO	S. TECH.	SOPPENG	500 HA.
16	TALUMAE	S. TECH	SOPPENG	340 HA
17	AKAMPENG	S. TECH.	SOPPENG	1.100 HA
18	LALANGE	S. TECH	SOPPENG	1.000 HA
19.	LAGARIGI	S. TECH.	SOPPENG	200 HA.
20	CENNAE	S. TECH	SOPPENG	214 HA.
21.	PAROTO	S. TECH	SOPPENG	270 HA.
22.	TAKKU	S. TECH.	SOPPENG	460 HA
IV	HILLY INLAND			
23	MARADDA	S. TECH	BONE	430 HA.
24	BONGO	S. TECH	BONE	500 HA
25	TODANG JOMPI	S. TECH.	BONE	240 HA.
V	EAST AREA			
26	BULU PATILA	S. TECH	WAJO	240 HA
27	UNYI	S. TECH	BONE	1.700 HA

NOTE 1/ CONSISTING OF 292 HA IN KAB. SIDRAP AND 125 HA IN KAB WAJO

2/ PROPOSED IRRIGABLE AREA

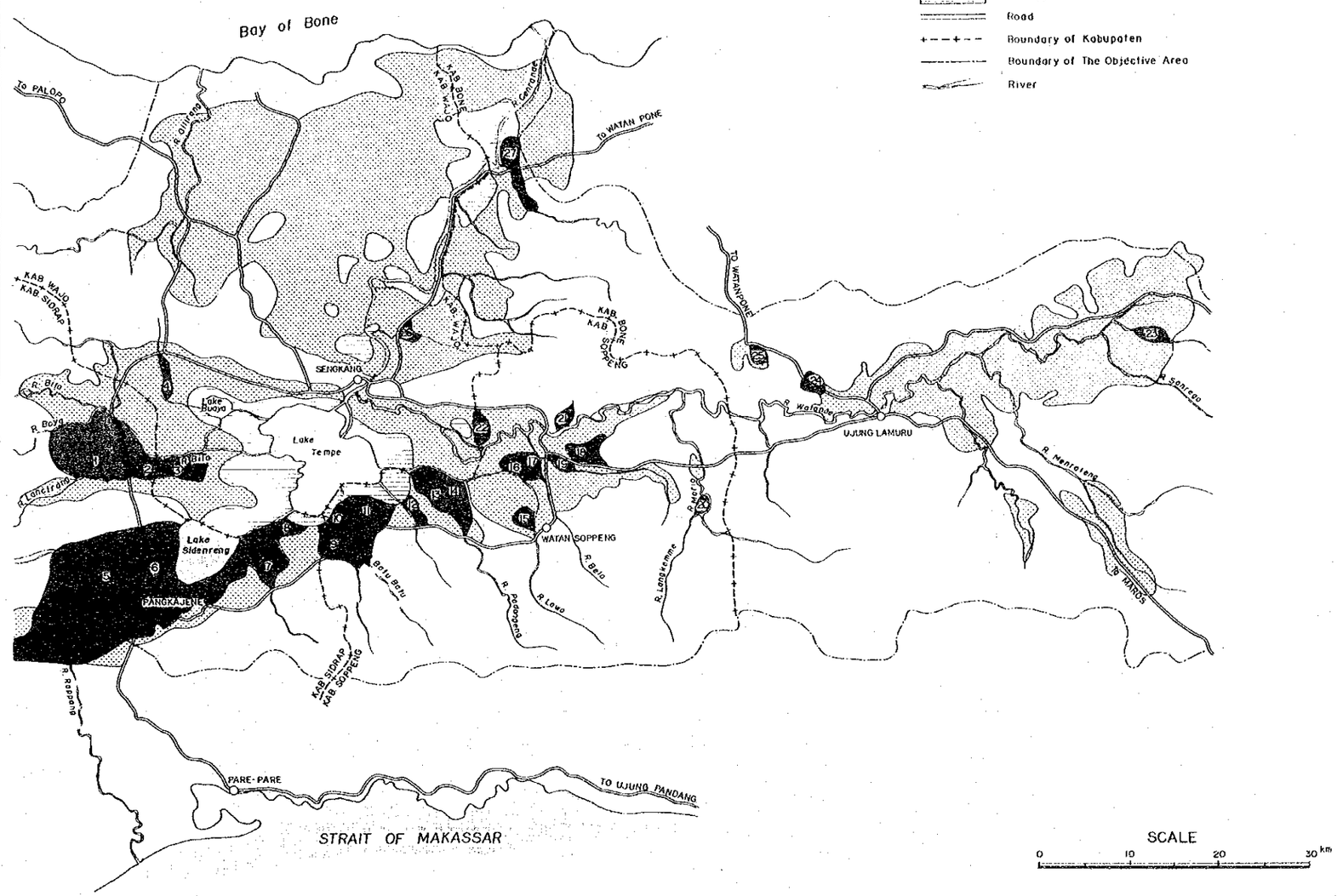


Fig. 3.30 River System of the Objective Area.

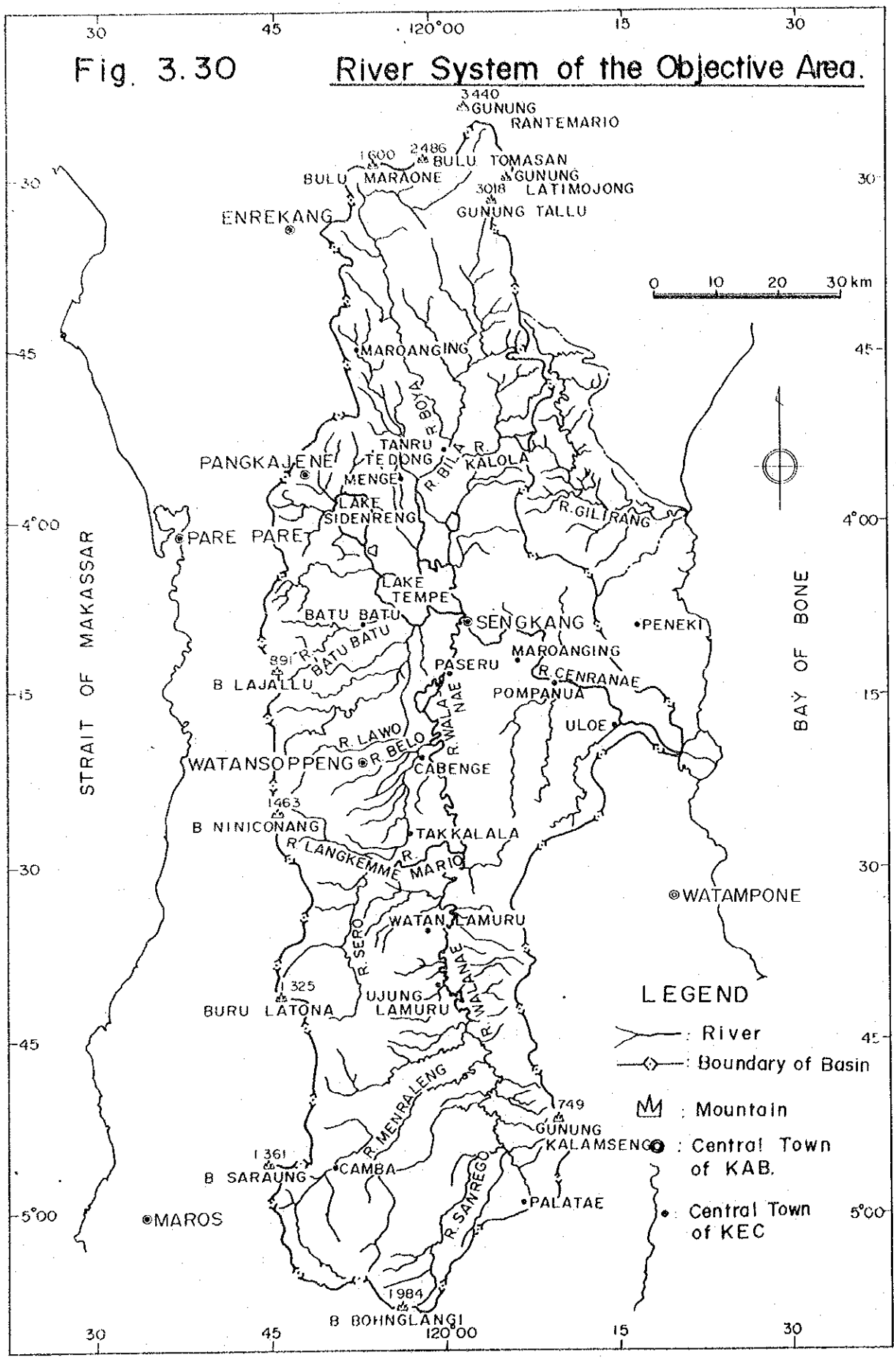
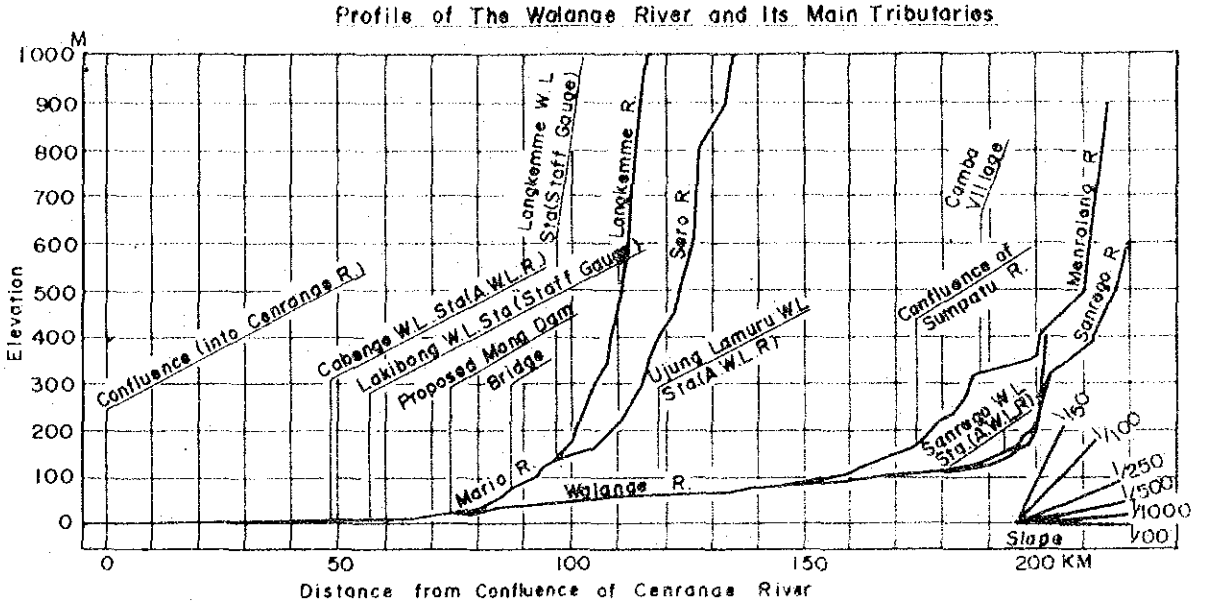
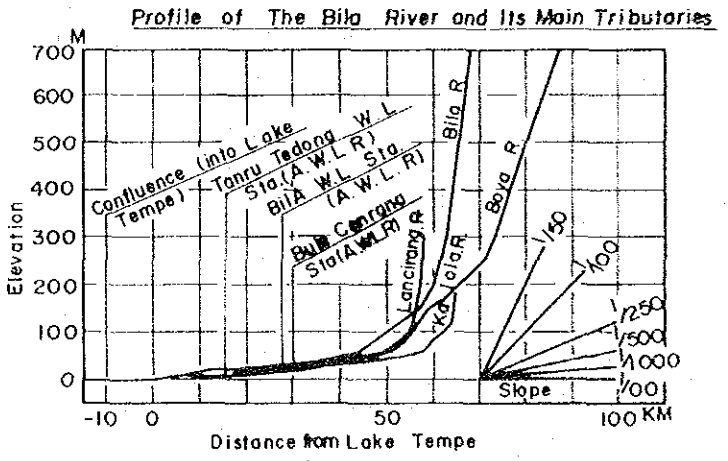
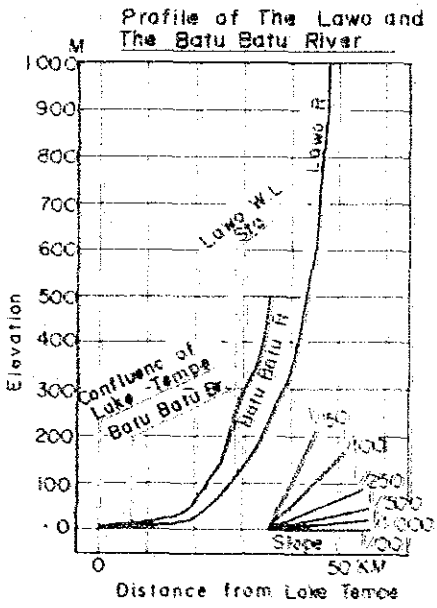


Fig. 3.31 Profiles of Rivers







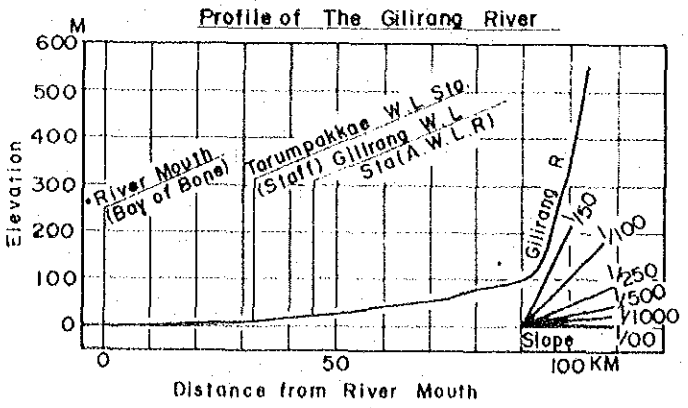


Fig. 3.32 Contour Map of Lake Tempe

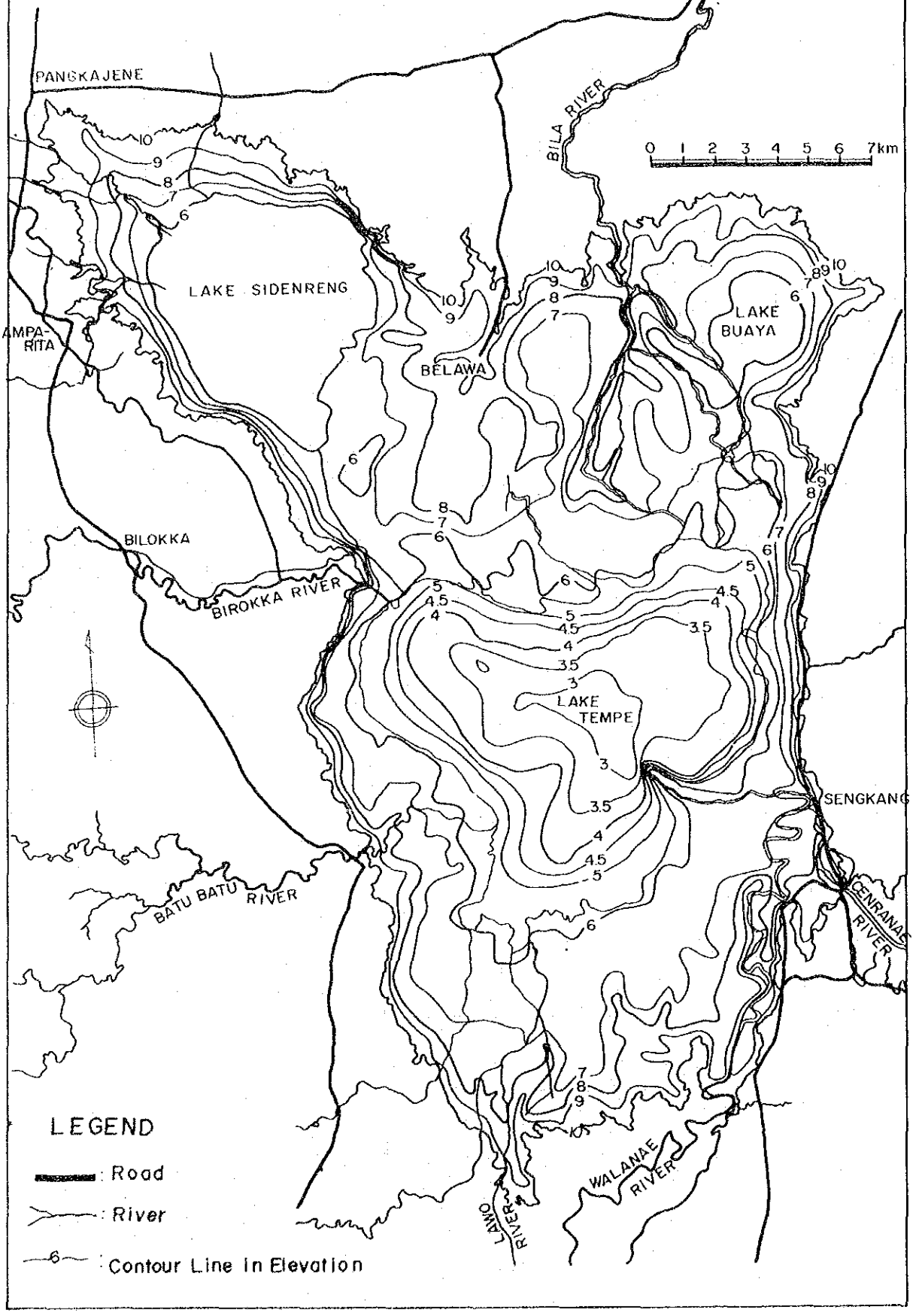
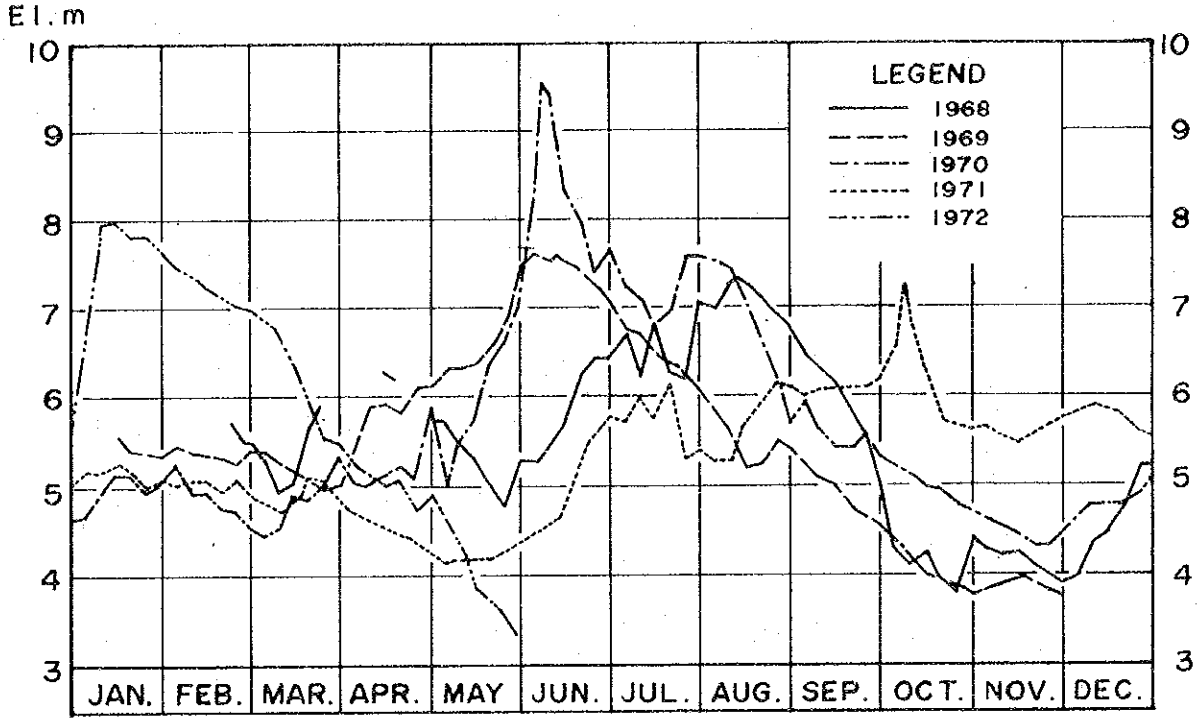
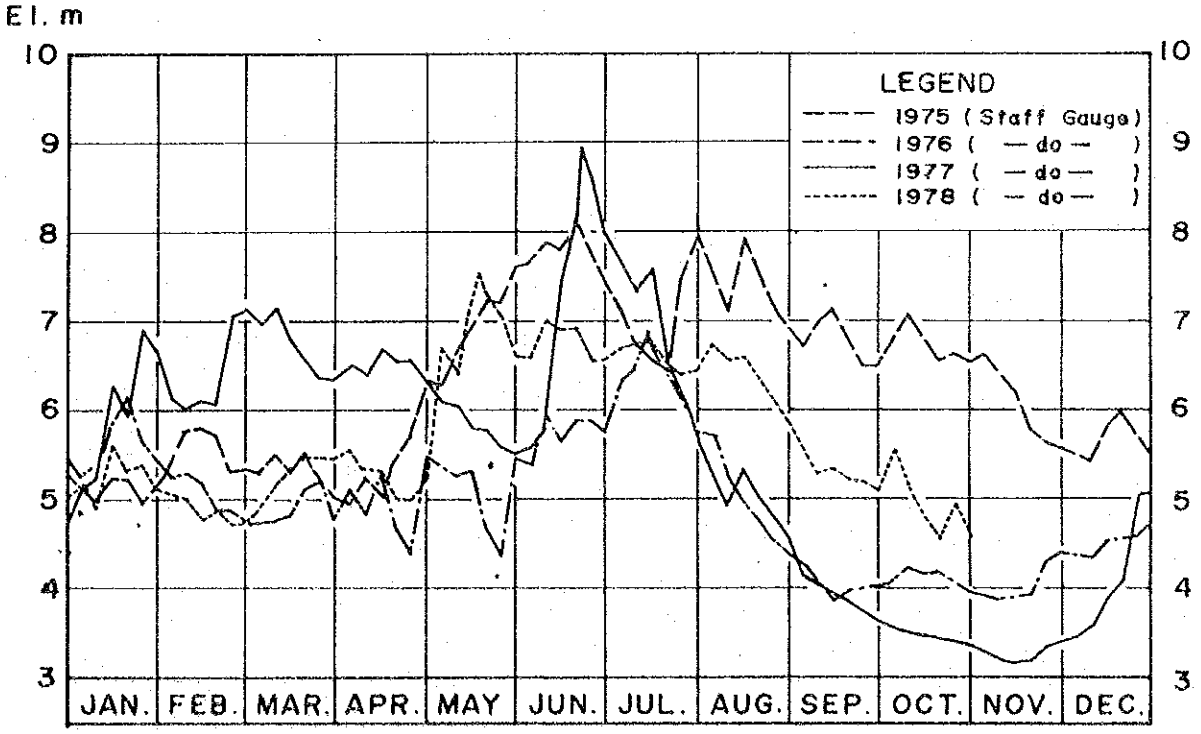


Fig. 3.33 Water Level Hydrograph of Lake Tempe

(1968 — 1971 observed by Dinas Perikanan)



(1975 — 1978 observed by P3SA)



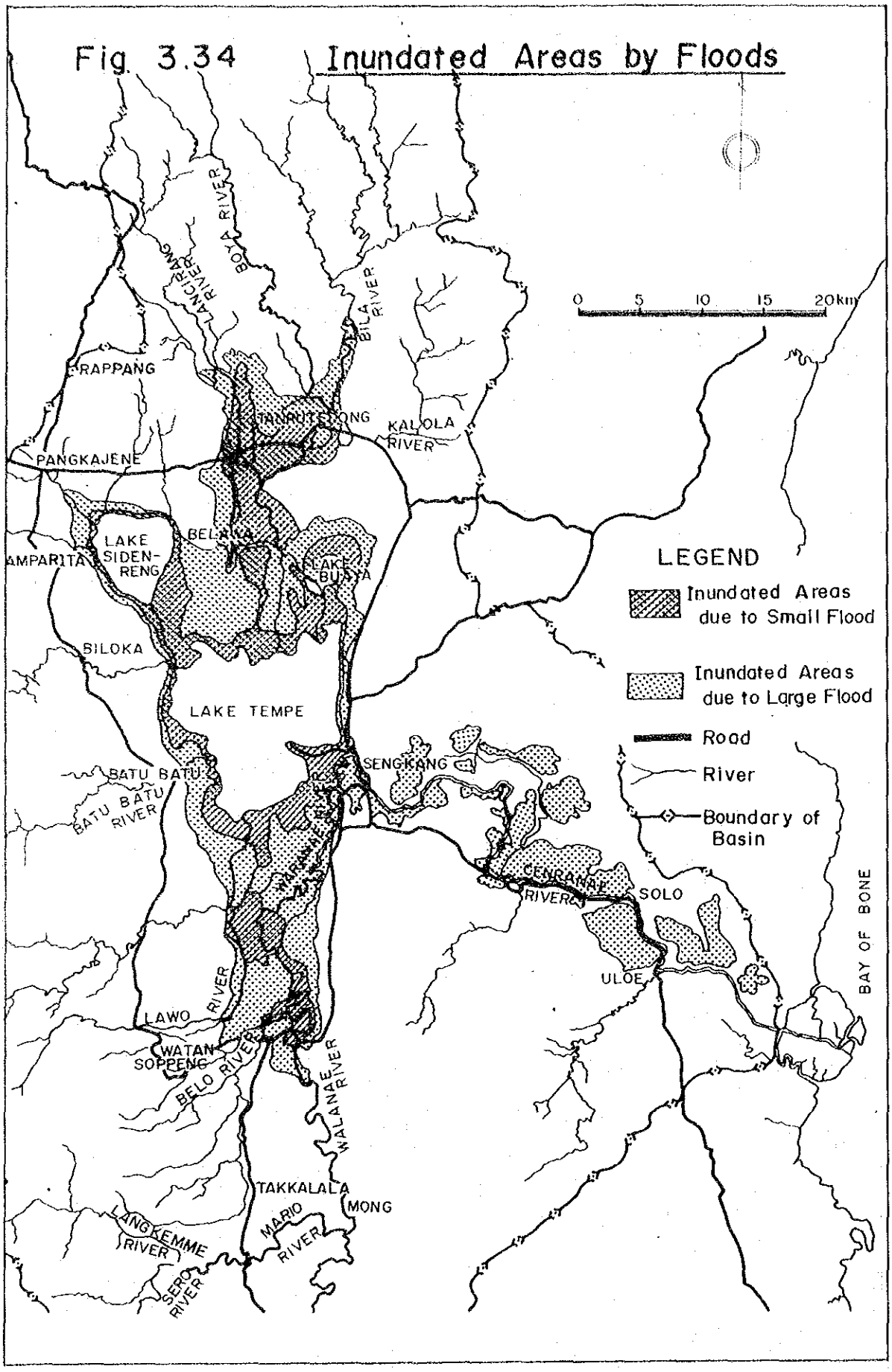
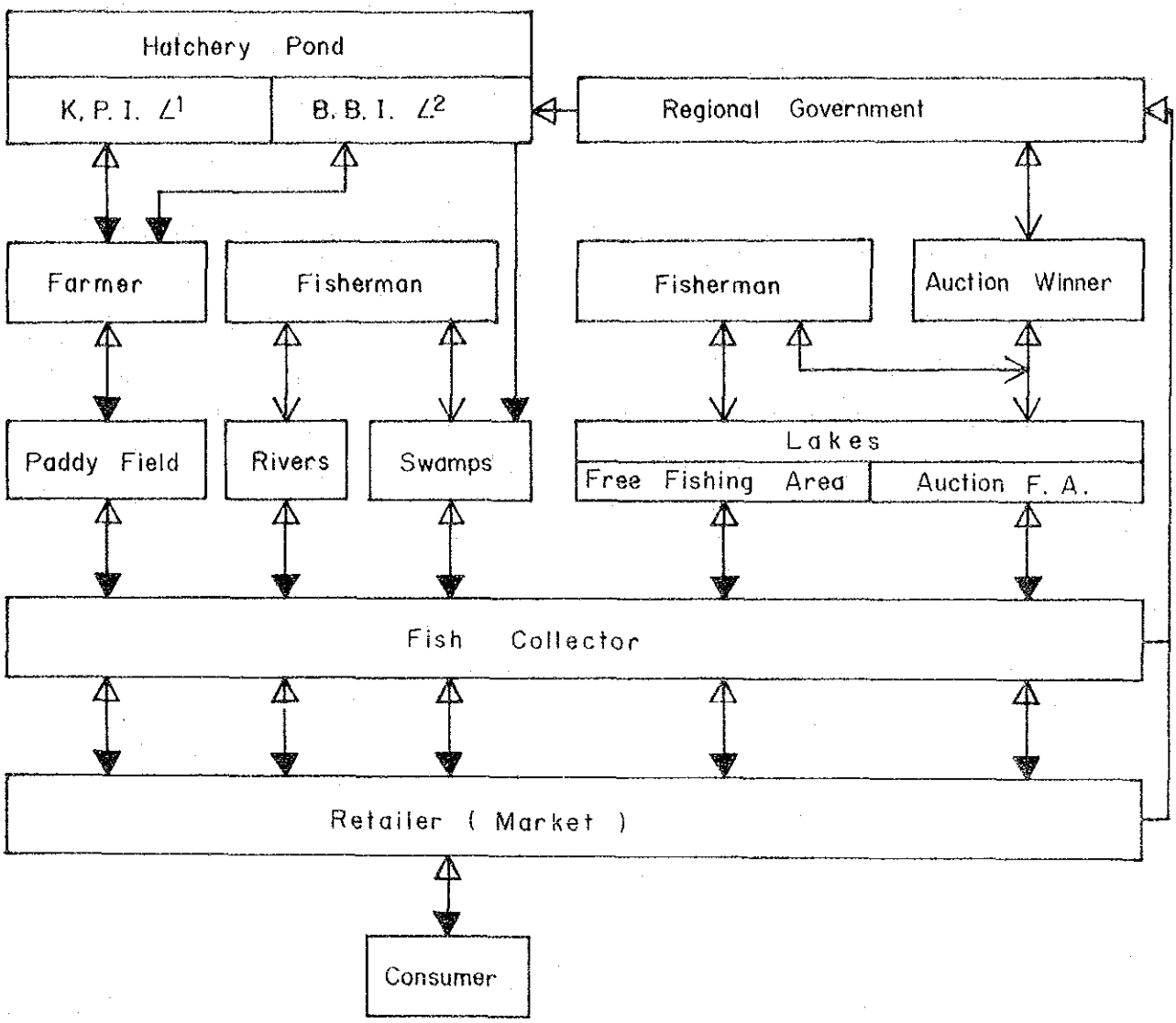


Fig. 3.34 Inundated Areas by Floods
0 5 10 15 20km
LEGEND
Inundated Areas due to Small Flood
Inundated Areas due to Large Flood
Road
River
Boundary of Basin
RANCIAGANG
BOYA RIVER
BILA RIVER
RAPPANG
TANRUTEDONG
KALOLA RIVER
PANGKAJENE
LAKE SIDEN-RENG
BELAWA
LAKE BUSSA
AMPARITA
SILOKA
LAKE TEMPE
SENGKANG
BATU BATU
BATU BATU RIVER
CENRANA RIVER
SOLO
ULOE
BAY OF BONE
LAWO RIVER
WATAN-SOPPENG
BELO RIVER
WALANAE RIVER
TAKKALALA
MONG
MARIO RIVER
LANGKEMME RIVER
SERO RIVER

Fig. 3.35 Existing Inland Fisheries System in the Objective Area



∠1 : K. P. I. = Private hatchery Pond

∠2 : B. B. I. = Public hatchery Pond

LEGEND

⟶ : Relation with each item

⟶ : Streams of fish

⟶ : Streams of money

Fig.4.1 Proposed Cropping Patterns

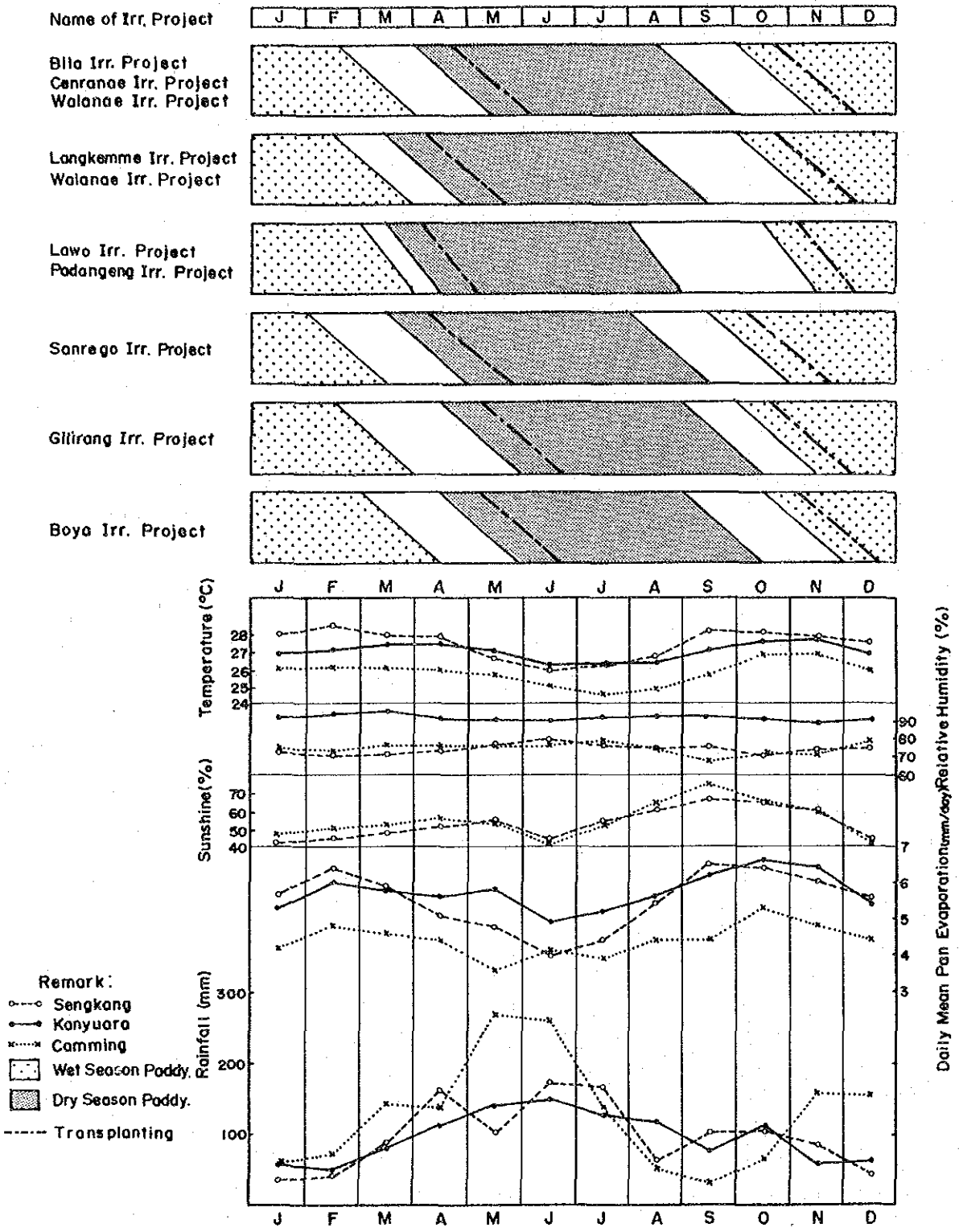


Fig. 4.2 Location Map of Proposed Irrigation Project.

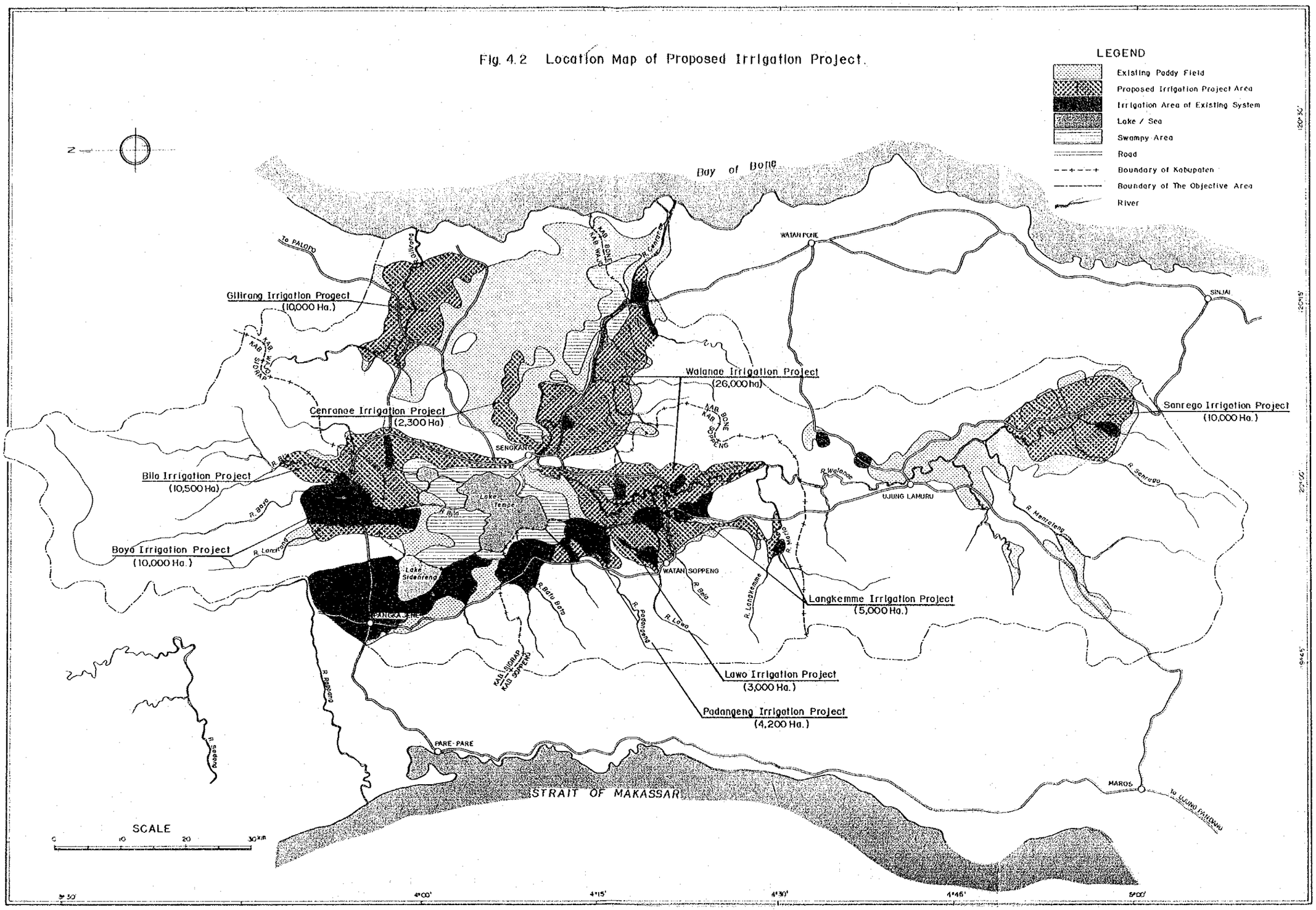
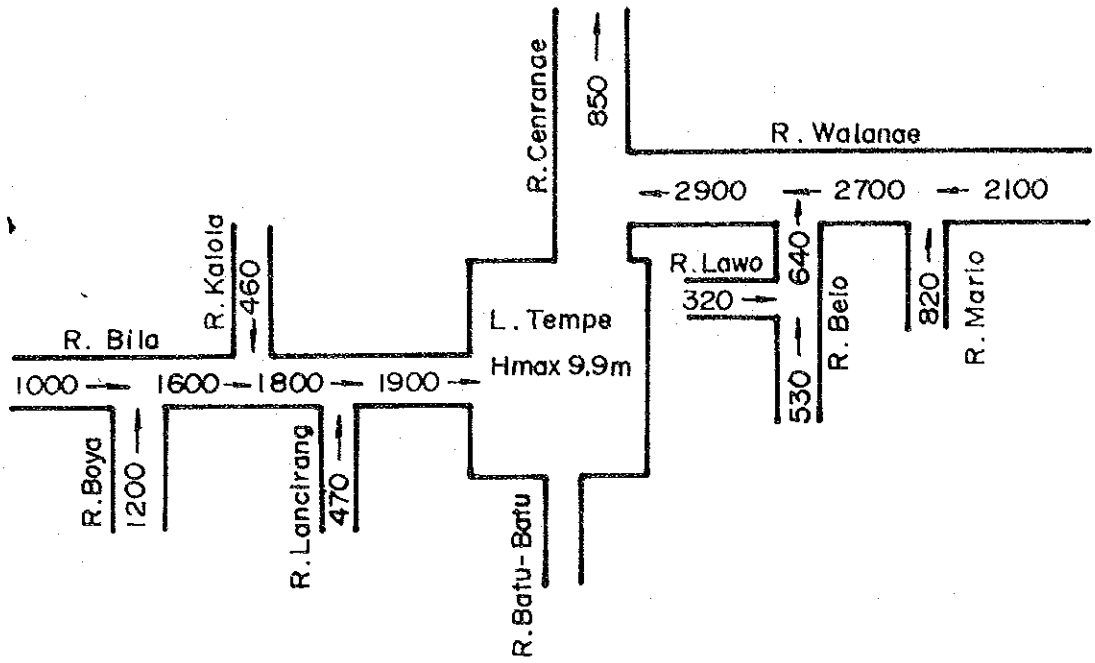


Fig 4·3 Design Flood Discharge Distribution

(Unit : m^3/sec)

(a). Without Floodway and Dam



(b). With Floodway and Dam

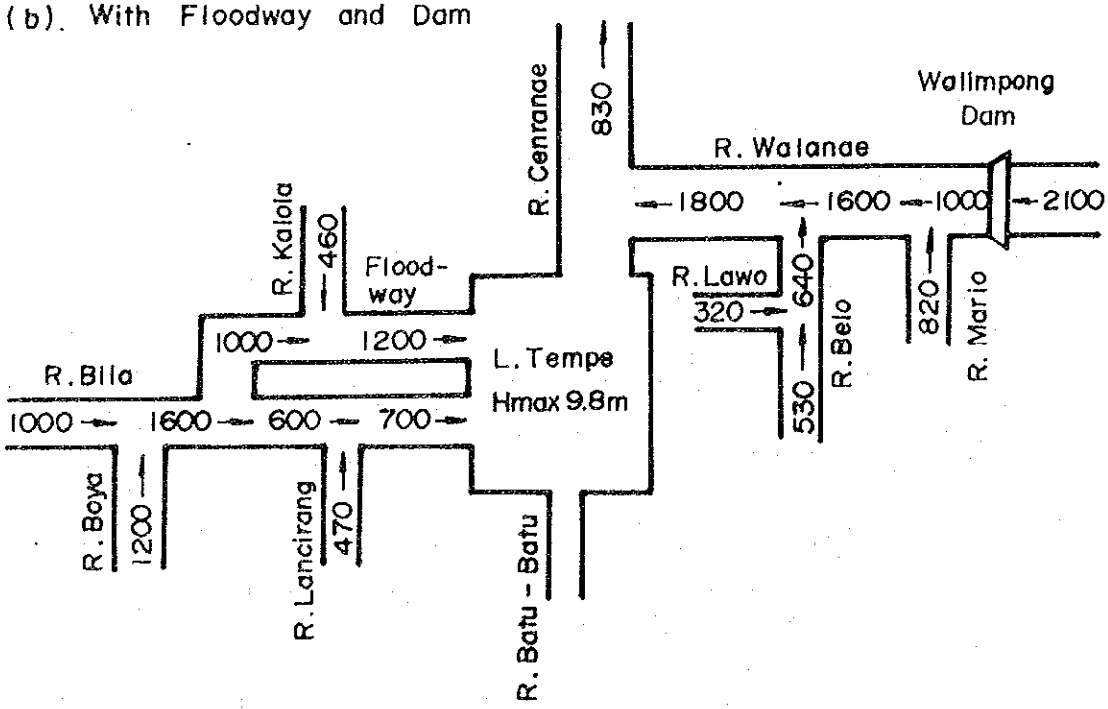


Fig. 4.4 Flood Discharge Distribution of Walanae River With Dam (20yr – Flood)

(Unit: m^3/s)

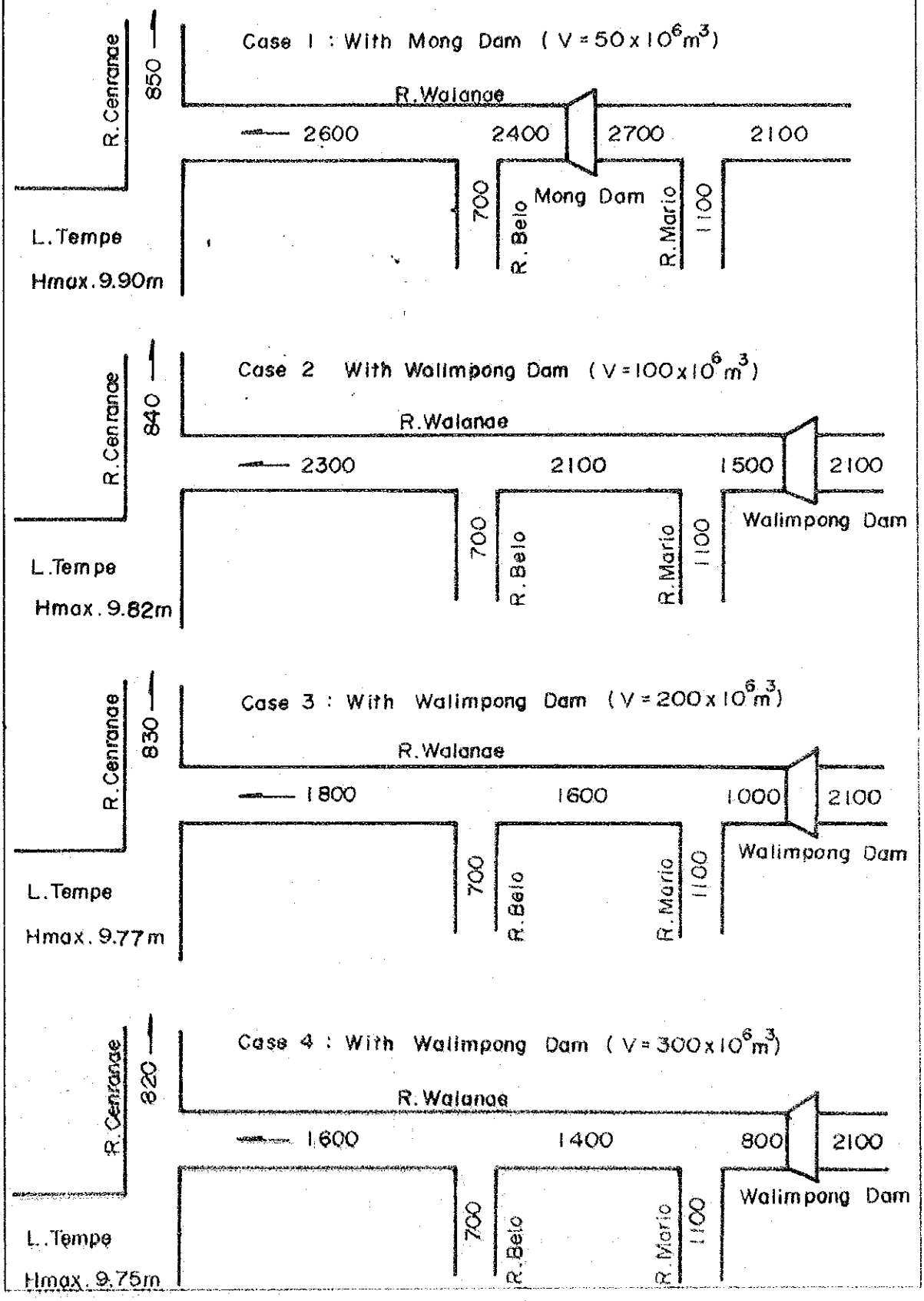


Fig. 4.5 Location of Proposed Flood Control Projects

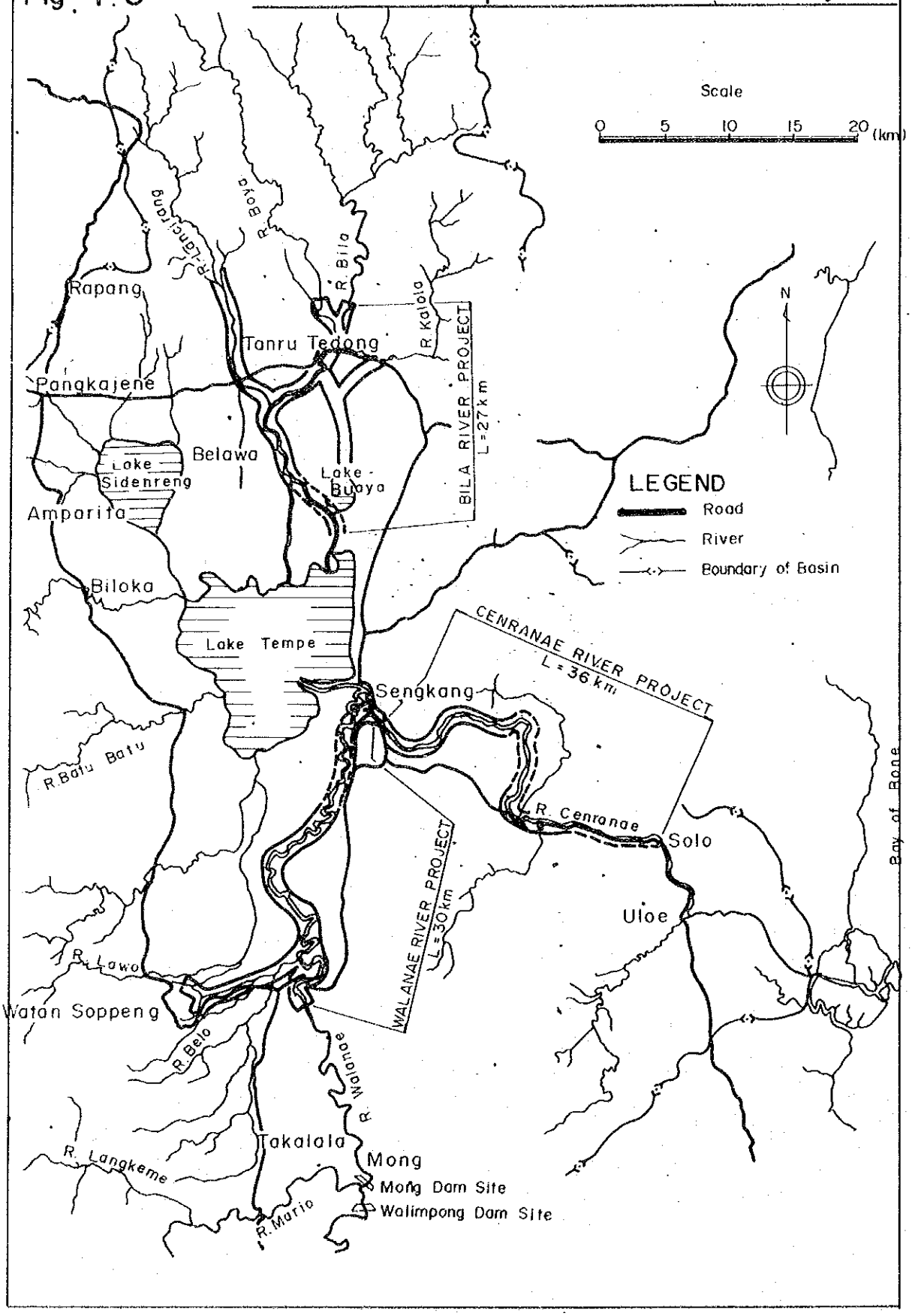
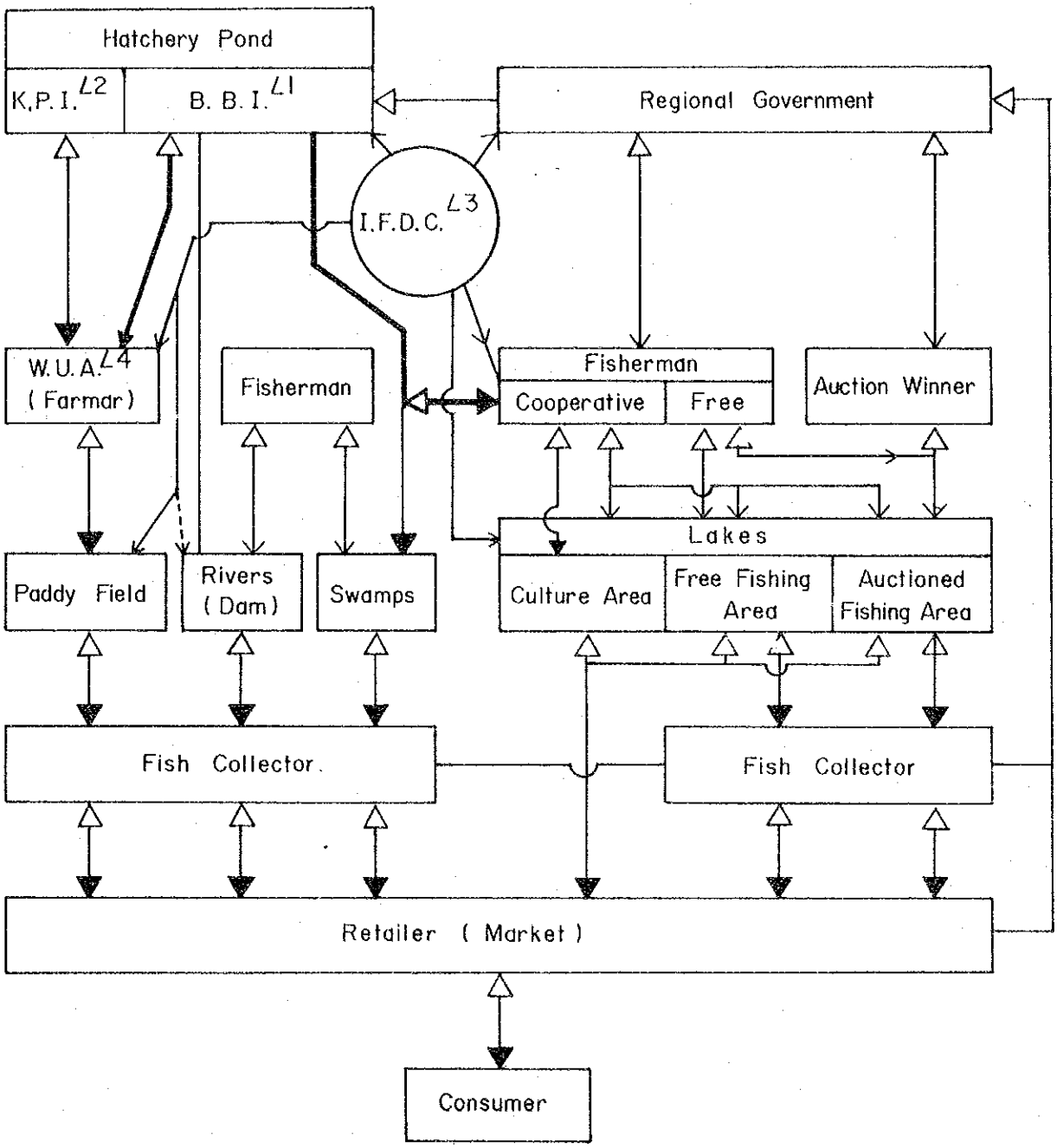


Fig. 4.6 Proposed InLand Fisheries Development System



∠1 : B.B.I. = Public hatchery Pond

∠2 : K.P.I. = Private hatchery Pond

∠3 : W.U.A. = Water User's Association

∠4 : I.F.D.C. = Inland Fisheries Development Center

LEGEND

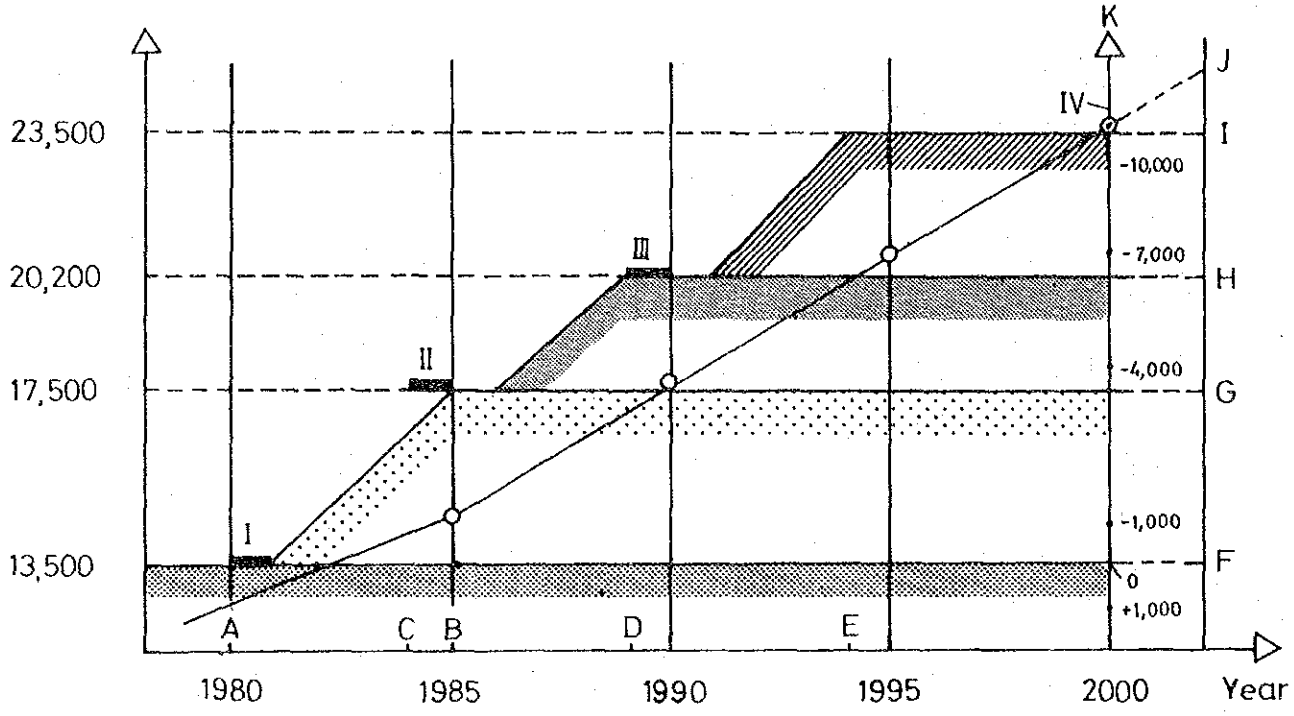
→ : Relation with each item

→ : Streams of fish

→ : Higher priority stream of fish

→ : Streams of Money

Fig. 4.7 Time Schedule of Inland Fisheries Development Plan∠1



LEGEND

I : Construction period of protection area
II : Construction period of hatchery pond and 1 year of technical transfer ∠2
III : Preparation and testing' period of lake culture ∠2
IV : Target year
A-B : 4 years to reach target production by fishing
C-D : 4 years to reach target production by paddy culture
D-E : 5 years to reach target production by lake culture
F : Max. production by fishing without plan
G : Max. production by fishing with plan
H : Max. production by paddy culture with plan
I : Max. production by lake culture with plan
J : Curve of deficient amount of inland fish
K : *Total dificient amount of inland fish production (t)*

∠1 : Production amount in earch is intended to keep about 2,000 3,000 tons bigger than the deficient amount

∠2 : Period of technical transferring is secured

Fig. 4.8 Discharge Mass Curve for Walimpong Dam (Case - 2)

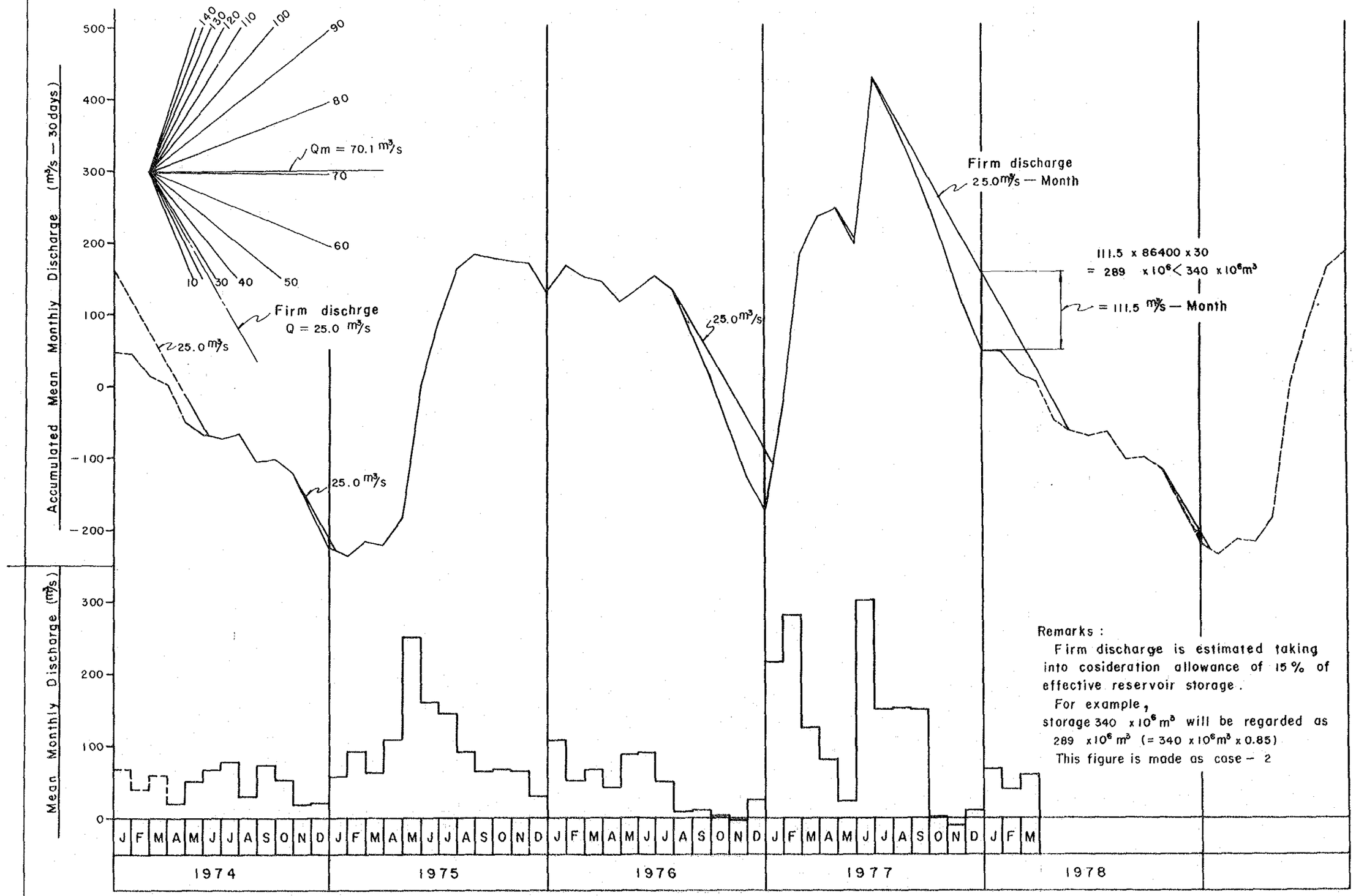


Fig.4.9 Water Utilization Plan for Walimpong Dam (Case - 2)

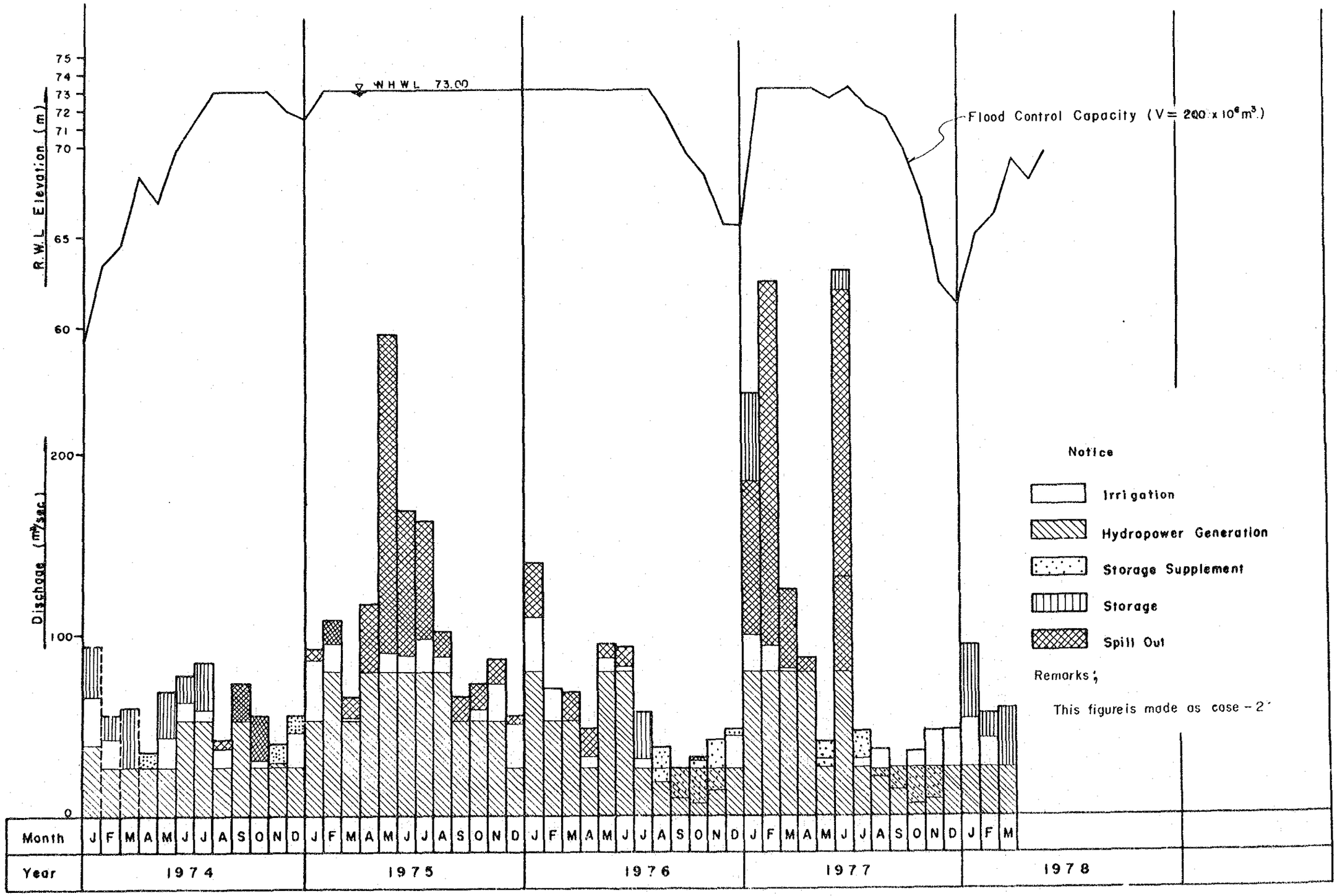


Fig.4.10 Storage Capacity and Reservoir Area of Walimpong Dam (Case - 2)

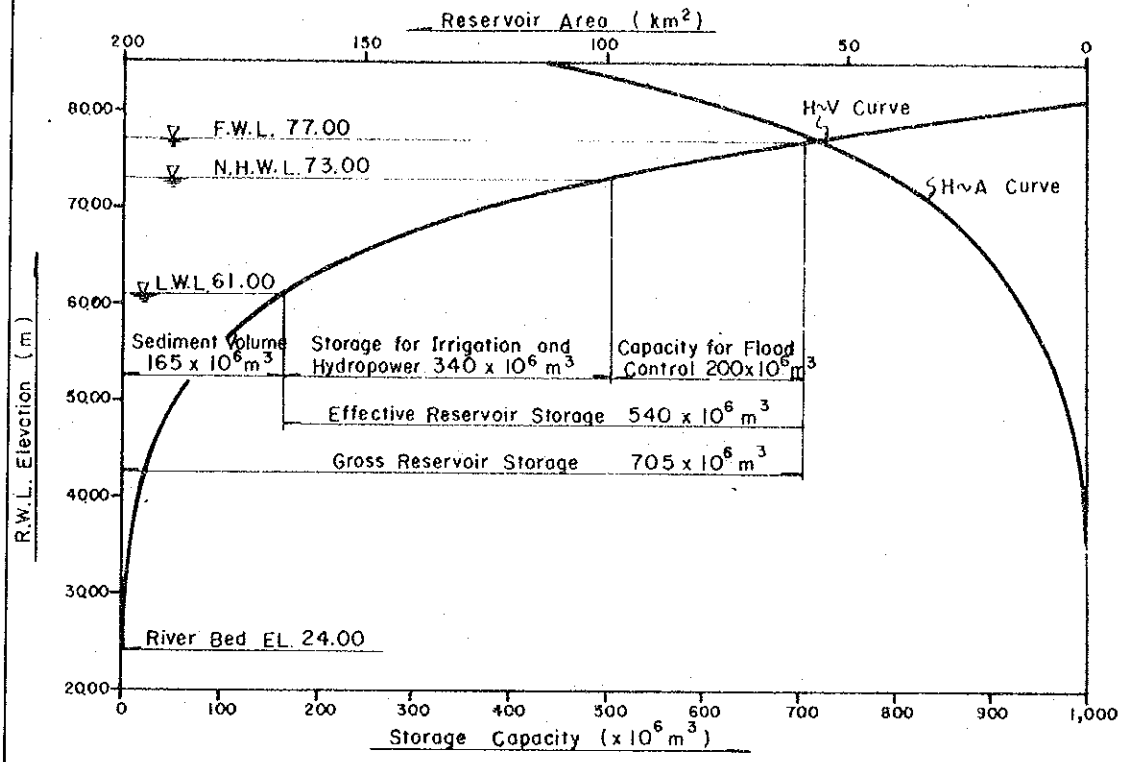


Fig.4.11 Design Flood Hydrograph for Walimpong Dam. (Case - 2)

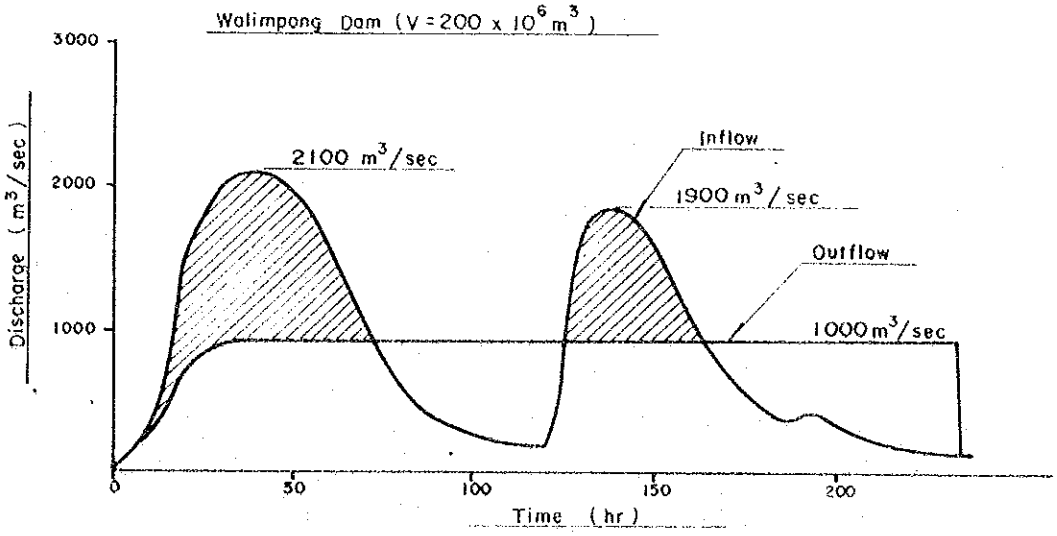


Fig. 4.12 General Plan of Walimpong Dam Scale 1: 5,000

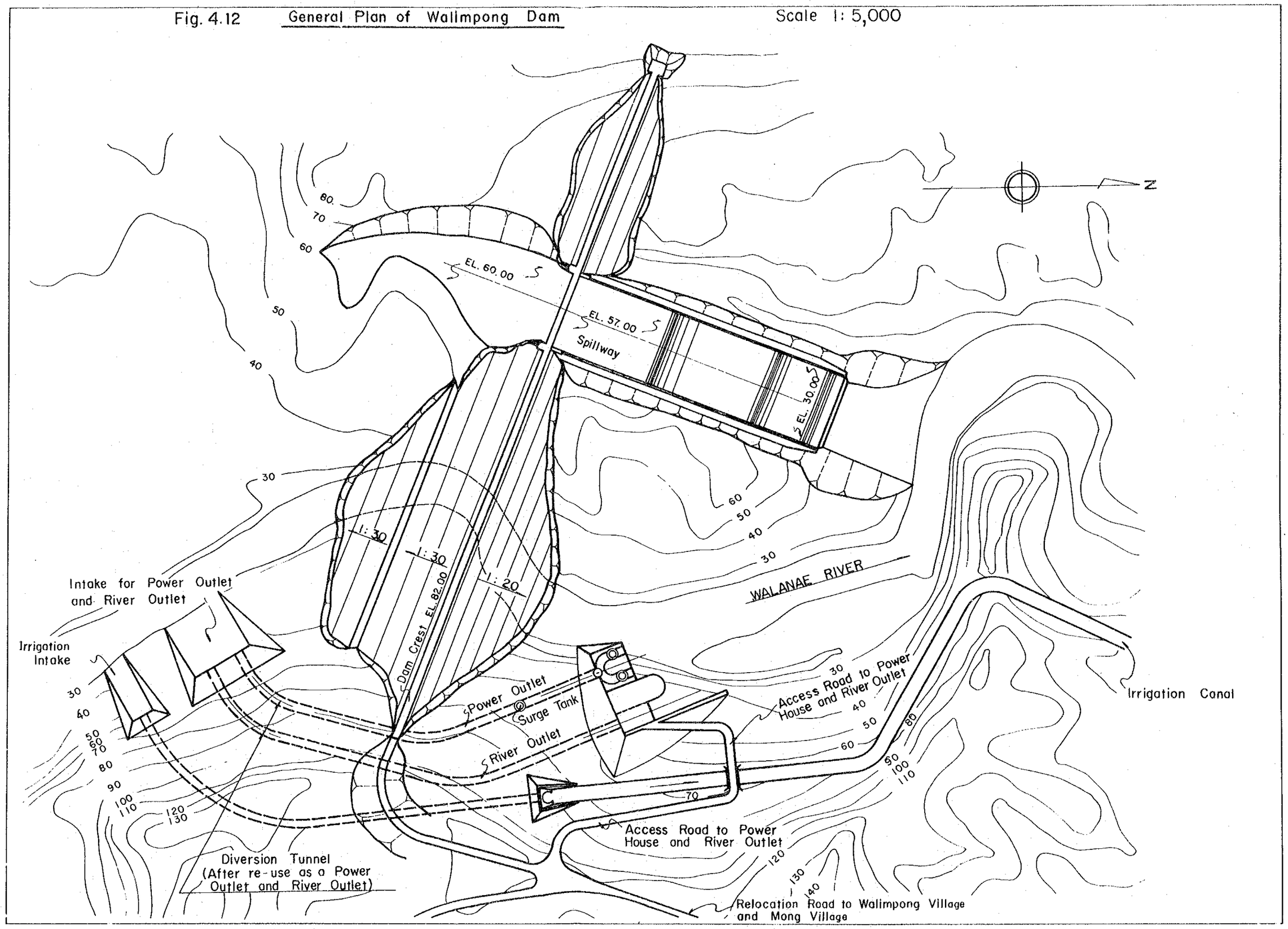


Fig. 4.13 Front View of Walimpong Dam

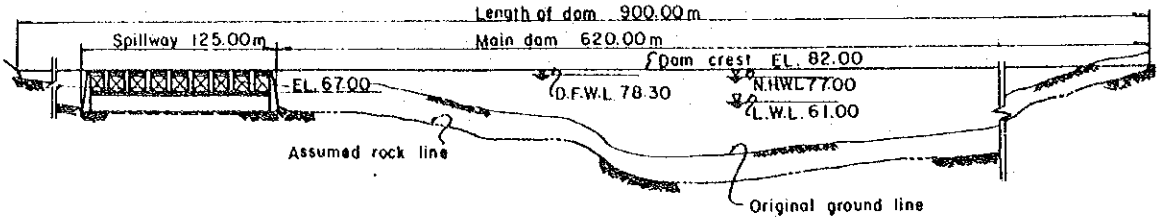


Fig. 4.14 Cross Section of Walimpong Dam

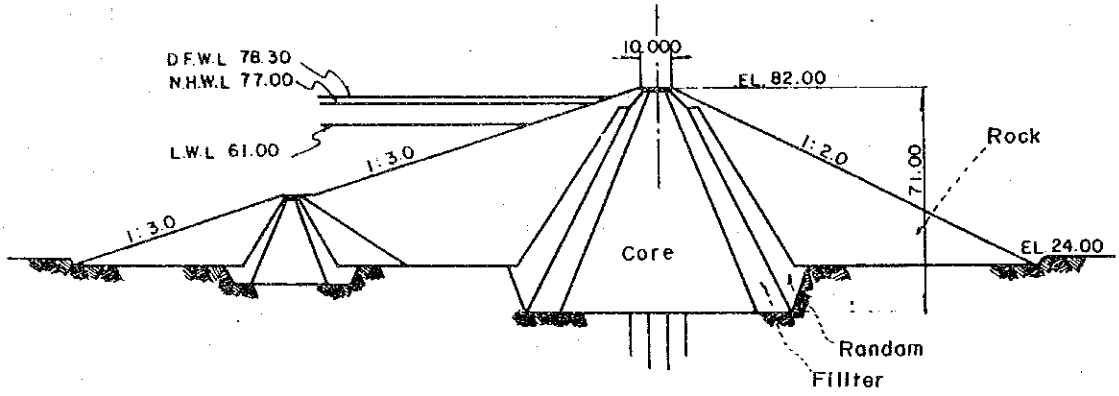


Fig.4.15 Location Map of Regions Required for Sand Prevention Works

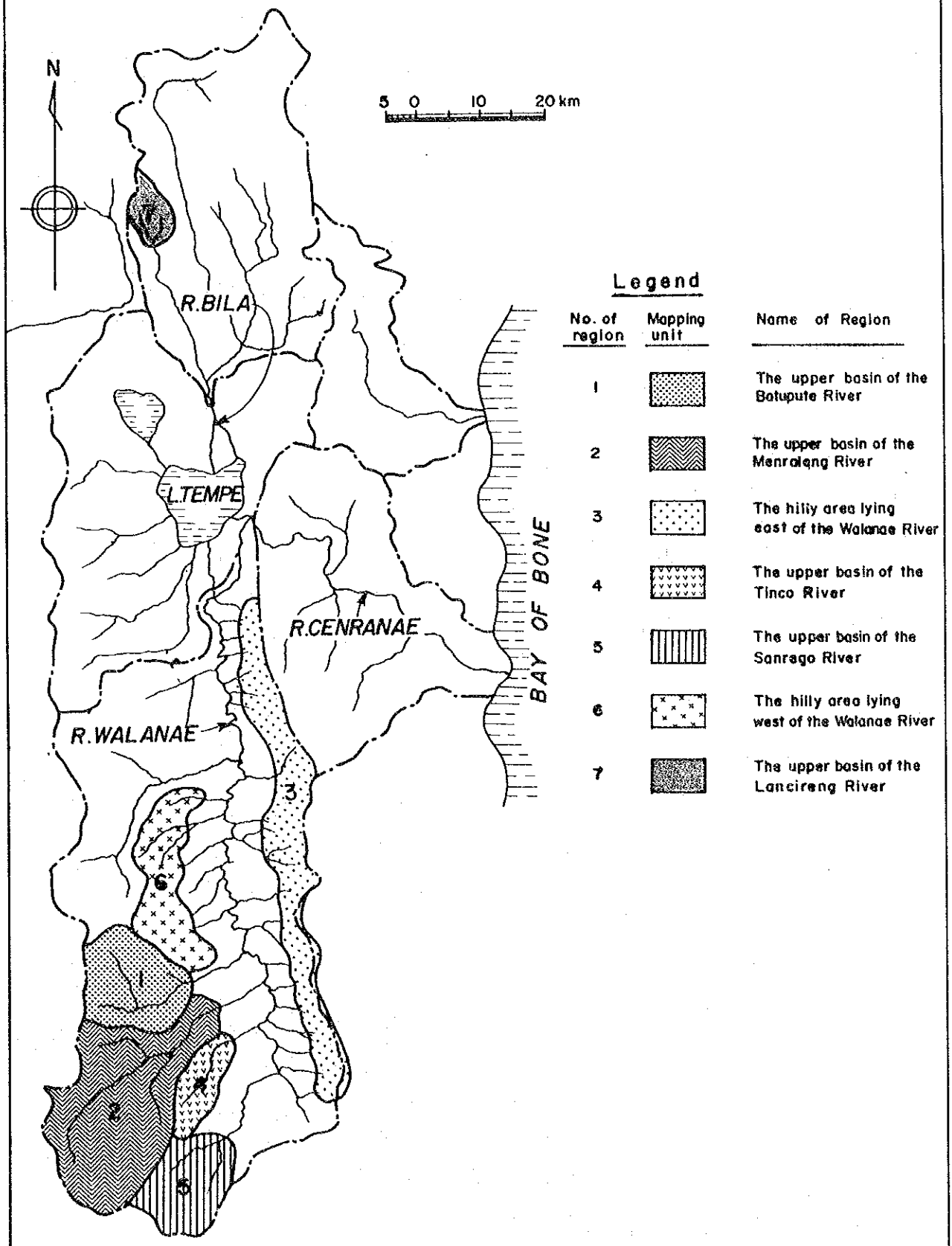


Fig. 4.16 Location Map of Transmission Line

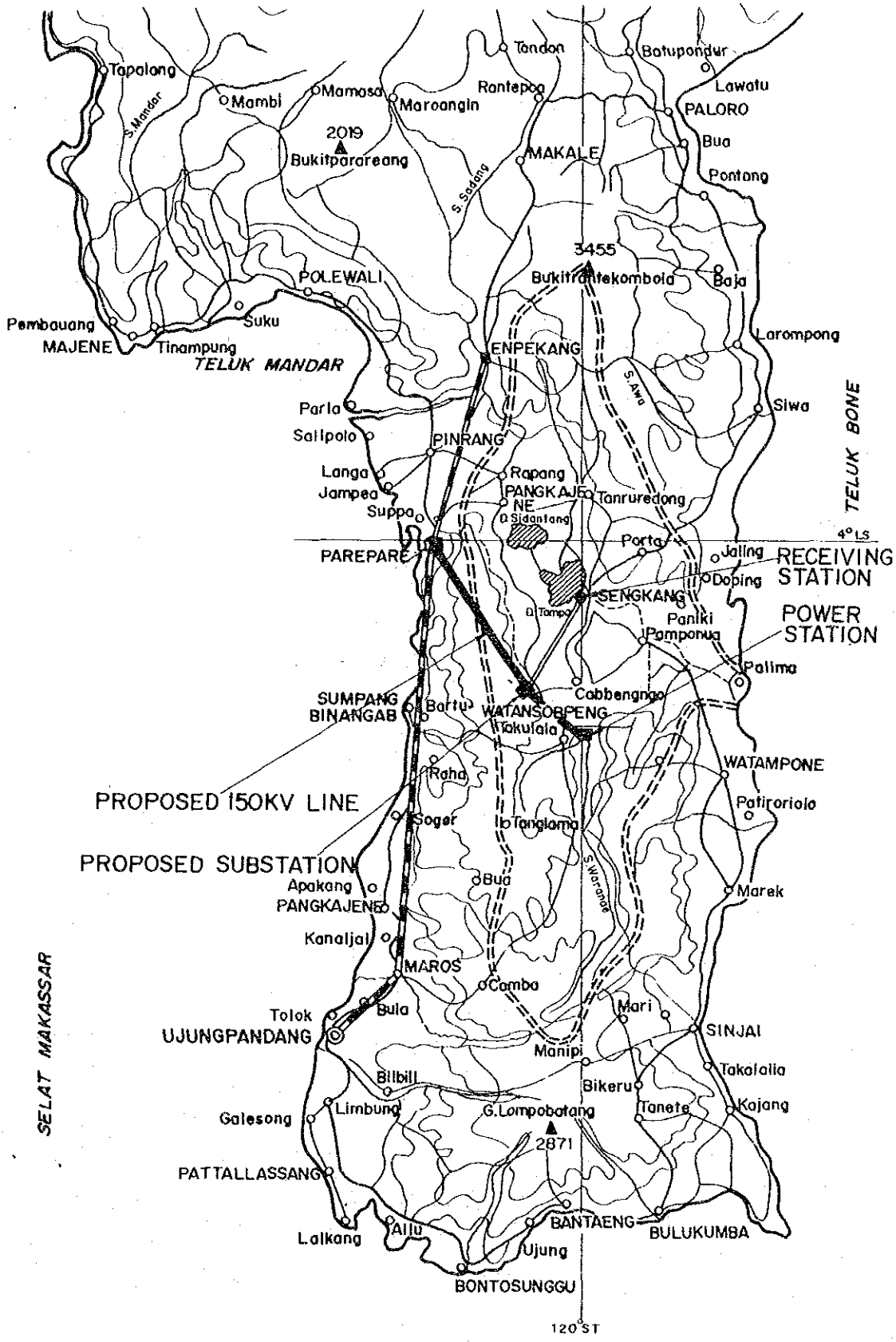
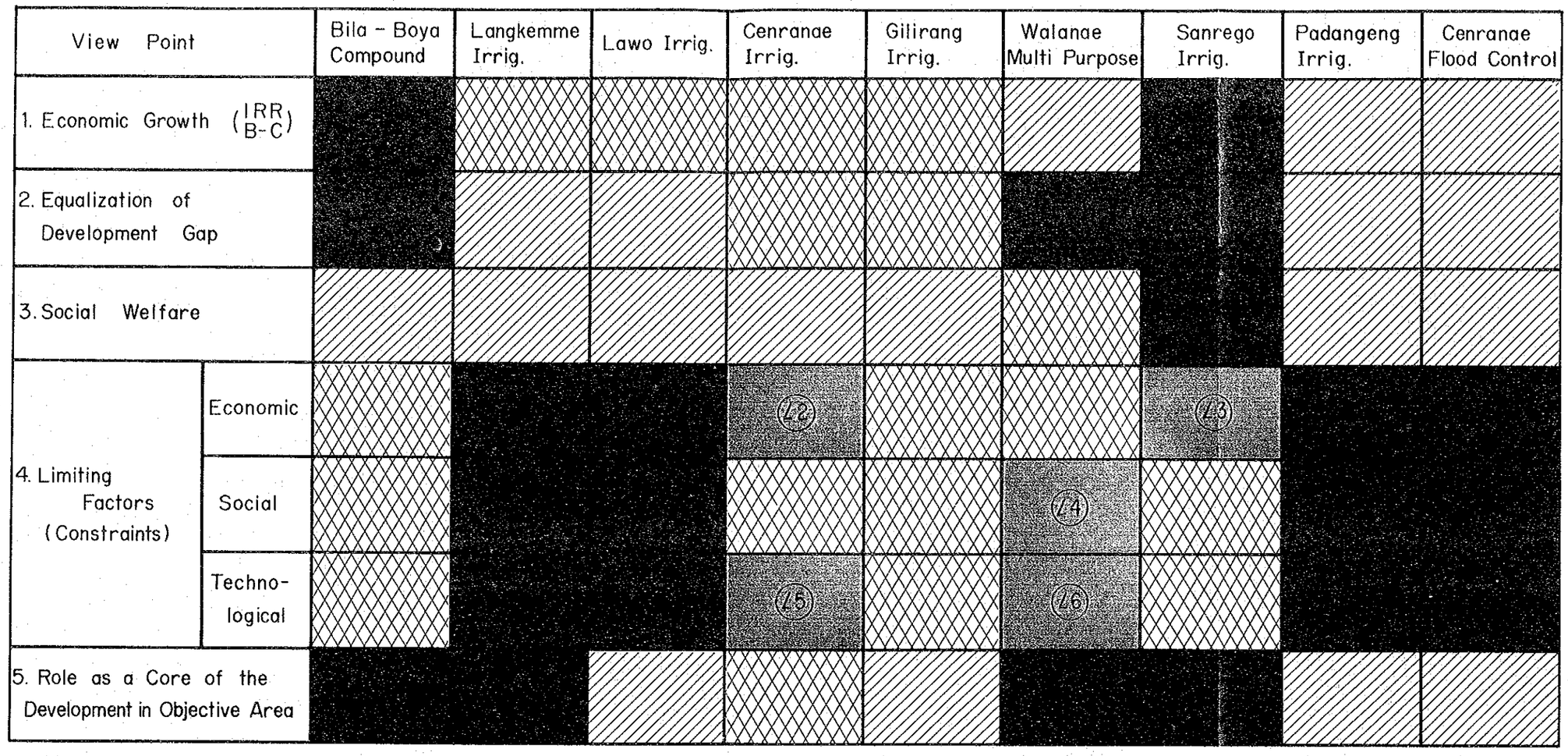


Fig. 5.1 Project Assessment for the Determination of the Project Priority



1) Basic theory of project priority
   - View Point 1 : High IRR = High priority
   - View Point 2 : More depressed = High priority
   - View Point 3 : Worse conditioned = High priority
   - View Point 4 : Less constraints = High priority
   - View Point 5 : Area in the optimum location for the technological transfer (in the advanced region or in the depressed region) = High priority

2) ∠1 : Isolated
   ∠2 : Power
   ∠3 : Road
   ∠4 : Resettlement
   ∠5 : Pump
   ∠6 : Dam

LEGEND

- First project priority in each view point
- Second pro. priority
- Third pro. priority
- Fourth pro. priority

Ranking by the color indicates project priority among proposed development projects to each view point.

SUMMARY OF DISCUSSION

OF

SCOPE OF WORK

FOR

MASTER PLAN OF THE CENTRAL

SOUTH SULAWESI WATER

RESOURCES DEVELOPMENT PROJECT

The Japanese Team (JICA) and the Directorate of Planning and Programming, the Directorate General of Water Resources Development, Ministry of Public Works and Electric Power, the Government of the Republic of Indonesia, exchanged their views concerning the draft of the Scope of Work for Master Plan of the Central South Sulawesi Water Resources Development Project (hereinafter called "the Master Plan) prepared by the Japanese Team (refer to the attachment I and II).

Both sides agreed with some minor changes in the draft of the Scope of Work and with the following understanding.

On-the-job Training of Indonesian Counterparts

Every individual expert shall prepare technical note on the subject matter he will perform. This technical note will be used as teaching materials for everybody.

Transfoer of Knowledge and Technical Know-how to the Indonesian Counterparts in the Course of the Main Works in Japan

The detail training program will be arranged during the masin field survey of the Master Plan.

The Government of the Republic of Indonesia requested the main works (the review, compilation and analysis of survey data) would be carried out in Indonesia according to the current policy.

Report

In one month advance of the commencement of the main field survey work of the Master Plan, the JICA will submit the "Experts Assignment Schedule" to the Government of Indonesia.

Progress Report

Progress report will include the formulation of recommended Terms of Reference for selected individual project and the formulation of recommended activities for further study.

Main Field Survey

The main field survey will be finished by the end of February, 1979 except the inland fisheries survey.

If the survey of inland fisheries will be completed before the end of May 1979, the review, compilation and analysis of surveys in Japan will be commenced earlier than scheduled.

Monthly Report

During the field survey of the Master Plan, the survey team has to submit the monthly report to the Directorate of Planning and Programing, the Directorate General of Water Resources Development, Ministry of Public Works and Electric Power.

Terrestrial and Geological Survey, Material and Soil Test

Detail lists of above-mentioned survey and test will be indicated in Inception Report.

The boring machine for geological survey will be provided by the JICA if necessary.

Jakarta, December 9, 1977

Signature	Signature
Mr. Y. Kunihiro Team Leader of the Japanese Team	Ir. Boesono Boedidarmo Director of the Directorate of Planning and Programing

ATTACHMENT I

DATE : Wednesday, December 7, 1977
Thursday, December 8, 1977

TIME : Wednesday : 9:30 - 13:30 WIST.
Thursday : 9:15 - 10:30 WIST.

ATTENDANTS:

Indonesia	Japan
Ir. Boesono Boedidarmo	Yasuhiko Kunihiro
Ir. Mardjono	Yoshiaki Tsukamoto
Drs. Attamimi	Mizuho Imamura
Ir. S.P. Kuntjoro Jakti	Tetsuro Miyazato
Ir. Hutomi	Yuji Okazaki
Ir. Djoko Sarjono	
Ir. Sudiyanto	
Drs. Azis Bocking	Embassy of Japan
Ir. Rusbini	Shigeru Tamesue
Ir. Syamsul Arida	
Ir. Hilman Kosasih	
Ir. Widadi Wahyu	
Dr. A. Masumoto	
M. Watanabe	
M. Nakehiro	
A. Noda	

ATTACHMENT II

SCOPE OF WORK ON MASTER PLAN STUDY FOR THE CENTRAL SOUTH SULAWESI WATER RESOURCES DEVELOPMENT PROJECT IN THE REPUBLIC OF INDONESIA

I. INTRODUCTION

In response to the request made by the Government of Indonesia for technical cooperation in conducting a master plan study for Central South Sulawesi Water Resources Development Project, the Government of Japan agreed to offer the service of the Japanese Experts Team for the Master Plan study to be carried out in the project site and the training of local staff of the Indonesian Government in the course of the works and the Japan International Cooperation Agency (JICA) will conduct the study.

The present document sets forth the Scope of Work in regard to the above-mentioned works to be conducted in close cooperation with the Government of Indonesia.

II. OUTLINE OF THE STUDY

II-1 Objective of the Study

The objective of the study are; to conduct survey and study for preparing a master plan for Central South Sulawesi Water Resources Development.

II-2 The Survey Area

The survey area is an area of about 8,000 km^2 along the Walanae, the Bila and the Cenranae River which flow into or out of Lake Tempe. The activities undertaken in the survey and study are devided into two main programs namely; Main Works Program, Transfer of Knowledge Program.

1. Main Works Program is specified as follows:

1-1 Mapping and Surveyings

Necessary surveyings will be conducted by use of the 1:25,000 topographic map prepared by JICA.

1-2 Data Collection

a) Additional data of hydrology and hydraulics
b) Meteorology
c) Geology
d) Agriculture
e) Agro-economy
f) Regional economy
g) Inland fishery
h) Forestry
i) Others

1-3 Hydrological and Hydraulic Survey

a) River water discharge
b) Rainfall and evaporation
c) Water bakabce - demand and supply of water
d) Analysis of runoff mechanism and high water discharge
e) Sediment and siltation
f) Salinity intrusion on the coast line

1-4 Soil Survey

a) Soil map
b) Land classification map
c) Land use map

1-5 Geological Survey

a) Geological survey for necessary sites

1-6 Construction Material Study

a) Study on construction materials for necessary sites

1-7 Regional Economic Survey

1-8 Agriculture

a) Land use
b) Land ownership
c) Cropping pattern
d) Productivities
e) Labor forces
f) Input materials
g) Farming method
h) Others

1-9 Agro-economic Survey

a) Processing
b) Agricultural price and products
c) Distribution system
d) Farmer's way of life and farming
e) Agricultural economic index
f) Marketing
g) Extension services
h) Crediting

1-10 Irrigation and Drainage Study

a) Existing irrigation and drainage system
b) Existing irrigation and drainage facilities
c) Quantities of intake water
d) Water management
e) Estimation of irrigation water requirement
f) Formulation of extension plan of paddy field

1-11 Flood Control Study

a) Survey and study of inundated area and flood damage

b) Carrying capacity of river channel

c) Design high water level

d) Formulation of the basic layout of flood control structures

1-12 Land Conservation Study

a) Erosion and sand control

b) Reforestation

1-13 Inland Fishery Survey and Study

1-14 Optimum Utilization Studies of Available Water Resources

1-15 Economic Analysis and Evaluation

a) Estimation of construction costs and benefits of each project

b) Economic evaluation of the project

1-16 Formulation of Master Plan

a) Study on technical and economic priority order of individual project

2. Transfer of Knowledge Program is as follows:

2-1 On-the-job Training of Indonesian Counterparts

2-2 Transfer of Knowledge and Technical Know-how to the Indonesian Counterpart in the Course of the Main Works in Japan