表 5. 6 — 1　調査地域の家畜飼育現況

Classification 2/	Milk Animal		Draft-animal			Meat Purpose		Total	Poultry 5/
Items	Cow	Buffaloe	Bull	Donkey	Others	Goat	Sheep		
Total No. of Animals	24,090	11,200	15,580	1,560	890	25,300	5,680	84,300	96,400
%	29	13	18	2	1	30	7	100	-
Adult Stocks 3/	16,860	8,400	7,790	1,170	180	18,970	4,260	57,630	-
Young Stocks 3/	7,230	2,800	7,790	390	710	6,330	1,420	26,670	-
Adult Cow Units 4/	19,270	13,530	10,390	460	420	3,690	830	48,590	-

1/ Based on livestock census, 1980, conducted by Livestock and Dairy Development Dept., IA, "Status of Livestock Production and Heatlh in the District of Islamabad, PARC" and livestock census conducted by LGRD, 1985.

2/ Classification: classification based on major purposes of stocking animals.

3/ Number of adult and young stocks: based on following assumptions; ratio of adult stocks to young stocks; cow-7:3, bull-1:1, buffaloe, donkey, goat & sheep-3:1, others-1:4

4/ Calculated based on the following conversion factors:

No. of animals equivalent to one adult cow unit

	Adult Stock (head)	Young Stock (head)
Cow	1	3
Buffaloe	2/3	3
Goat & Sheep	6	12
Donkey	3	6
Others	1	3

5/ Not including poultry farms.

表 5. 6 －2　地域畜産の主要指標

Total No. of Households	20,800	①
No. of Farm Households2/	14,190	②
No. of Farm Households Holding Livestock	12,830	③
No. of Landless Livestock Holders	2,070	④
No. of Households Holding Poultry	15,590	⑤
Total No. of Livestock	84,300	⑥
Total No. of Livestock (Adult Cow Units)	48,590	⑦
Total No. of Poultry	96,400	⑧
Total Cultivated Area (ha)	23,120	⑨
-Percent of Farm Households Stocking Livestock to Total Households (%)	③÷①	62
-Percent of Farm Households Stocking Livestock to Total Farm Households (%)	③÷②	90
-Percent of Households Holding Poultry to Total Households (%)	⑤÷①	75
-Average No. of Livestock per Farm Household Holding Livestock (head/household)	⑥÷③	6.6
-Average No. of Livestock (Adult Cow Units) per Farm Household Holding Livestock (head/household)	⑦÷③	3.8
-Average No. of Poultry per Household Holding Poultry (birds/household)	⑧÷⑤	6.2
-Cultivated Area per Adult Cow Unit (ha/head)	⑨÷⑦	0.48

1/ Based on TABLE 5.6-1 and livestock census conducted by LGRD, 1985.

2/ Cultivator + Landless livestock holders.

表 5.6－3 ラワルピンディ地区の畜産指標

1. Livestock Holdings

Animals	No. of Holdings	No. of Farm Households 1/	% 2/
Cow	391,000	121,400	77
Buffaloe	126,000	64,800	41
Goat	335,000	100,000	63
Sheep	52,000	7,500	5
Draft Animals	145,000	72,500	46

Animals	Average No. of Holdings (head/household)	
	No. of Holdings 3/	Adult Cow Unit
Cow	3.2 (2.1)	2.4
Buffaloe	1.9 (2.3)	2.1
Goat	3.3 (3.0)	0.3
Sheep	6.9 (3.8)	1.0
Draft Animals	2.0 -	-

2. Number of Draft-animals by Farm Size

Farm size (ha)	less than 1	1-2	2-5	5-10	larger than 10
No. of Draft-animals per Household (head)	1.5	1.6	2.1	2.5	3.0

3. Livestock Holding Size

Holding Size/Household (head)	Percent of Livestock Holders by Holding Size	
	Milk ls 4/	Goat & Sheep
1 - 2	77	80
3 - 4	20	17
5 - 6	2	2
More than 7	1	1

1/ Include landless livestock holders

2/ Percent of farm households holding livestock to estimated total farm households in Rawalpindi District (158,000 households)

3/ ( ): average holding size of landless livestock holders

4/ Adult cow & buffaloe cow

Source: Pakistan Census of Agriculture, 1980

表 5. 6 － 4　成牛維持に必要な乾物量と地域の乾物供給量の概算

1. Nutrient Requirements for Maintenance of Livestock in the Study Area

Daily maintenance requirement of dry matter/adult cow unit	6.1kg 1/
Daily maintenance requirement of TDN/adult cow unit	2.7kg 1/
Daily maintenance requirement of DCP/adult cow unit	0.24kg 1/

Annual requirement of nutrition;

Dry matter: 6.1 kg/day x 365 days x 48,590 2/ ≒ 108,000 t

TDN: 2.7 kg/day x 365 days x 48,590 2/ ≒ 47,900 t

DCP: 0.24 kg/day x 365 days x 48,590 2/ ≒ 4,260 t

2. Annual Supplies of Dry Forages and Their Nutritional Value

Annual supplies of dry forages from cultivated area 3/

= 2 t/ha x 23,120 ha(total cultivated area) x 0.9 4/

≒ 41,600 t/year

Nutritional values of dry forages supplied from cultivated area 5/:

Dry matter = 41,600 t x 0.75 ≒ 31,200 t

TDN = 41,600 t x 0.35 ≒ 14,600t

DCP = 41,600 t x 0.015 ≒ 620 t

4. Supplies of Nutrient Requirements for Maintenance from Cultivated Area

Dry matter: 31,200t/108,000t x 100 ≒ 29%

TDN : 14,600t/47,900t x 100 ≒ 30%

DCP : 620t/4,260t x 100 ≒ 15%

1/ Based on : "Nutrient Requirement of Ruminants in Developing Countries, International Feedstuffs Institute, Utah State University, U.S.A."

2/ Number of livestocks in adult cow units in the Study Area

3/ Assuming that 2 t/ha of dry forages could be produced annually in cultivated area.

4/ Assuming about 90% of dry forages produced could be used for animal feeds.

5/ Average nutritional values of dry forages are assumed as follows; dry matter 75%, TDN 35% and DCP 1.5%

表 5. 7 − 1　単位当たり農業収益

	Wheat	Maize	Pulses	Sorghum (grain)	Cow	Buffaloe Cow	Goat
1. Yield/Production 2/	1.02	0.70	0.45	0.49	300	1,350	25
2. Unit Price (Rs) 3/	1,950	1,900	5,700	2,200	3.0	4.0	380
3. Gross Return (Rs/ha or head)	1,989	1,330	2,565	1,078	900	5,400	380
4. Production Cost (Rs/ha or head) 4/	1,926	1,218	1,008	1,016	1,460	2,190	110
5. Return from by-product (Rs/ha)	750	700	250	1,000	-	-	-
6. Net Return (Rs)	813	812	1,807	1,062	-560	3,210	270

1/ Estimated production cost and return per ha or per head of animal. Details are presented in Additional Information and Data Book.
2/ Unit: ton/ha for crops, milk production per year in kg for cow and buffaloe, annual weightgain in kg for goat.
3/ Estimated farm gate prices. Rs/ton for crops, Rs/kg for milk and Rs/head for goat of 25 kg weight.
4/ Without costing labour. Costs of farm machinery and draft animal are estimated on hiring basis. Only cost for feeds is included in production cost of livestock products.

表 5. 7 －2　農業経営収益

	Farm Size 1.0 ha	Farm Size 2.0 ha
1. Income from Crop Sector (Rs)2/		
Wheat	447	894
Maize	162	325
Pulses	361	723
Sorghum	106	212
Total	1,076	2,154
2. Income from Livestock Sector (Rs)3/		
Cow (1 head	-560	-560
Buffaloe (1 head)	3,210	3,210
Goat (3 heads)	810	810
Total (Income)	3,460	3,460
Cost of Feeding Young Animal (Rs)	1,100	1,100
Net Income	2,360	2,360
3. Farm Income from Agriculture Sector (Rs)	3,436	4,514

1/ Farm income from agriculture sector of owner farm household.Estimated based on TABLE 5.7-1. Details are presented in Annex.

2/ Assuming cropping intensity of 105% and cropping pattern of 55:20:20:10 to wheat: maize:pulses:sorghum, for all farm size.

3/ Assuming farm household stocking 1 adult cow, 1 adult buffaloe, 3 goats and 1 young stock of large milk animal, irrespect of farm size.

表 5. 7 －3　農家経営収支

	Farm Size (1.0 ha)
1. Gross Income (Rs)	12,123
Gross Farm Income	10,123
Crop Sector	2,683
Livestock Sector	7,440
Other Income	2,000
2. Expenditures (Rs)	11,687
Farming Expenditures	6,687
Crop Sector	1,607
Livestock Sector	5,080
Living Expenses2/	5,000
3. Net Income (Capacity to pay)	436

1/ Farm budget of owner farm household

表 5.10 －1　パンジャブ州協同組合銀行による農作物ローンの貸出状況

(AS OF 23 MARCH, 1985)

Crop Season		Total Advance	Total Recovery	Balance/Recovery Ratio
		Rs.	Rs.	Rs. %
Rabi	1981-82	1,497,180	1,497,180	- /100.0
Kharif	1982	-	-	- / -
Rabi	1982-83	1,009,497	1,009,497	- /100.0
Karif	1983	1,476,903	1,476,903	- /100.0
Rabi	1983-84	2,719,230	2,709,807	9,423/ 99.7
Kharif	1984	2,370,200	2,310,200	60,000/ 97.5
Rabi	1984-85	3,950,664	123,066	3,827,598/ -

Source: Punjab Provincial Cooperative Bank, Rawalpindi Zonal Office

表 5.10 －2　協同組合の種類別分布

Class of Coop. Society	Tarlai Markaz	Sihala Markaz	Bhara Kau Markaz	Total
Thrift & Credit	33	14	16	63
Coop. Farming	-	2	-	2
M.P. Villlage Farmers 1/	3	1	-	4
Vegetable Growers	3	-	-	3
Poultry Breeding	1	-	-	1
Dairy Farming	-	1	-	1
Irrigation	1	-	3	4
Markaz Federation	1	1	-	2
Religious School	-	1	-	1
Total	42	20	19	81

1/ Multipurpose village farmers cooperative society, data are as of June, 1985

Source: Registration of Cooperative Sciety, Dept. of Cooperatives, IA

表 5.10 －3　首都圏における各種協同組合

Class of Society	Urban Area	Rural Area	Total
1. Agriculture Related Societies			
1) Thrift & Credit	16	63	79
2) Coop. Farming	2	2	4
3) M.P. Village Farmers[1/]	-	4	4
4) Vegetable Growers	1	3	4
5) Poultry Breeding	-	1	1
6) Dairy Farming	-	1	1
7) Markaz Federation	-	2	2
Sub-Total	20	80	100
2. Non-agricultural Societies			
1) Housing	152	-	152
2) Multipurpose	7	-	7
3) Thrift and Saving	1	-	1
4) Finance	1	-	1
5) Religious School	1	1	2
6) Welfare	1	-	1
7) Muslim Development	2	-	2
Sub-Total	165	1	166
Total	185	81	266

1/ Multipurpose village farmers cooperative society, data are as of June, 1985

Source: Registration of Cooperative Society, Dept. of Cooperatives, IA

表 6. 1 －1　パンジャブ・バラニ地帯の特徴

1. Geographical Area (in million ha)

Punjab Barani Tract	7.53 (36.5% of Punjab)
Livestock Range	4.02 (53.4% of Tract)
Cultivated Area	3.20 (42.5% ")
Forest	0.31 (4.1% ")
Punjab Province	20.63
Pakistan	79.61

2. Population (1981 Census, in million)

Punjab Barani Tract	14.89 (31.6% of Punjab)
Urban Populaiton	3.46 (23.3% of Tract)
Rural Population	11.43 (76.7% ")
Punjab Province	47.12
Pakistan	83.78
Population Density (persons/km^2)	
Punjab Barani Tract	198
Punjab Province	228
Pakistan	105

3. Livestock Population (in 1980, in thousand heads)

	Cattle	Buffalo	Sheep	Goat
Punjab Barani Tract	3,091	1,630	2,063	2,854
(% of Punjab)	(33)	(19)	(33)	(39)
Punjab Province	9,254	8,687	6,309	7,305

4. Educational Institutions (in 1980-81, in numbers)

	Primary School	Middle School	High School
Panjab Barani Tract	11,532	1,212	728
(% of Punjab)	(33)	(37)	(41)
Punjab Province 1/	34,692	3,311	1,767

5. Health Institutions (in 1982, in number)

	Hospitals	Dispensary	Rural Health Center
Punjab Barani Tract	68	342	53
(% of Punjab)	(33)	(28)	(46)
Punjab Province 1/	203	1,212	114

1/ Data from Punjab Development Statistics, 1981
Source: Punjab Barani Tract in Figures, ABAD, 1984

表 6.4－1 パンチャヤット別ニーズ分布

UC \ ITEMS#/	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Others
TAMAIR					D	e	A.B		E			c				e					
CHARAH	B	A	c	C.D	E								e								
KIRPA																					
Eastern	A	a	B	D	d			e		C											
Rockey zone	A	a	B.c	D.E								C.e									
Along Lehtrar Road	a.B	A	c	d						c	C	d.e	d.e	d.e				e		d.e	
Southern	A		a.B.c	C.D	E					b		C.e			e						
PHULGRAN																					
Northern	A.b	b		C.d.e	a		d	b	e					c.d.e							
Southern	A.B	E		C	A	D		B.e		d											Bridge Health Center
BHARA KAU																					
Mt. Area	A	*	B	C		E									D						*Reservoir
Plain	A		b	b.C.e	d			b						e	c						Veterinary Center
SHAH ALLAH DITTA																					
Northen Valley		c	d.e	B	A	c		d													Vehicles for Patients
Piedment	a.c		d	e	a.c	B				e					d						
TARLAI KALAN	a.B.c	A	b.C.d	c.D.e				d	e				e			c.d			e		Vegetable, Fruits, Flower
SOHAN	c				a	a.e	b	b	b		a	c		d			e	c		d	Bio-gas Plant
KORAL	A.b	d.e		b.c					e		a	b		C.d	c.d.e					e	
SIHALA																					
North of Soan R.	e					A		B	d				e			c			d		Bulldozer
South of Soan R.	A.B	d	C	e				b.c	b.c				d.c		E		E		b.c.D*		*Orchard Pasture Land
RAWAT	a.c.e	A.b	a.B.d			c	c		E	b	c		d				e	d		e	Seedling of Fodder-trees

#/ 1. Well & Water Supply, 2. Irrigation, 3. Machinery, 4. Livestock, 5. Road, 6. Electricity, 7. Seedlings, 8. School, 9. Post & Telephone, 10. Agr. Technical Guidance, 11. Vinyl House, 12. Suzuki Truck, 13. Sewage Works, 14. Coop. Poultry Farm, 15. Coop. Work Shop, 16. Fish Pond, 17. Community Center, 18. Flower Mill, 19. Land Consolidation, 20. Marketing Facility See Annex for further explanation.

表 9. 2 －1　多目的水利用

RIVER BASIN	LOCATION	NO.	POSSIBILITY OF WATER USE						NECESSITY OF ASSOCIATED WORKS					
			Irrigation	Livestock	Washing	Fishery	Minihydro	Forestry	Road (km)	Bridge (m)	Pump	Park	Blowoff	Gate
STORAGE DAM														
Kurang River	Sikrila	K-1	○	○	x	○	x	○	L=0.5	x	x	x	x	x
	Sikrila	K-2	○	x	x	△	○	x	x	○ L=90	○	x	○	○
Gumreh Kas	Athal	G-1	○	○	○	○	○	○	x	x	○	○	○	○
	Athal	G-2	△	x	x	x	x	x	x	x	○	x	○	x
	Siali	G-3	○	○	○	○	x	○	○ L=2.0	x	x	x	x	x
	Pind Begwal	G-4	○	○	○	x	x	○	○ L=3.0	○ L=20	○	○	x	x
	Muhrian	G-5	○	○	○	○	x	○	○ L=1.0	○ L=25	○	○	x	○
Malal Kas	Tamair	M-1	○	○	○	○	○	○	x	○ L=45	○	○	x	○
	Jhang Sayaddan	M-2	○	○	○	○	○	○	△ L=1.0	○ L=55	○	○	○	○
Hills and Mountains	Shah Allah Ditta	H-1	○	x	x	x	x	x	L=1.5	x	x	x	x	x
	Shah Darah	H-2	△	○	○	○	○	x	x	L=40	○	○	x	x
	Shah Darah	H-3	○	x	○	x	x	x	△ L=1.5	x	x	x	x	x
	Subhan	H-4	△	○	○	x	x	x	△ L=2.0	L=25	x	x	x	x
Soan River	Charah	S-1	○	○	○	○	○	x	L=1.5	x	○	○	○	○
CHANNEL STORAGE														
Kurang River	Khana Dak	Kc-1	○	○	○	x	x	○	x	○	x	x	○	○
	Dhok Ali Muhammad	Kc-2	○	○	○	○	○	○	○ L=0.1	○ L=50	○	○	○	x
Gumreh Kas	Kuri	Gc-1	○	○	○	x	x	○	x	○ L=50	○	x	○	○
	Tarlai Khurd	Gc-2	○	○	○	x	x	○	○ L=0.2	x	○	x	○	○
Nilan N.	Gokina	Nc-1	△	x	○	x	○	x	x	○ L=25	○	x	○	x
	Gokina	Nc-2	△	x	○	x	○	x	x	○ L=25	○	x	○	x

Note: Water use　○ Possible　△ Difficult　x Impossible
Associated works　○ Construction　△ Improvement　x Unnecessary

表 9. 2 － 2　ダム諸元

Demarcation	Mark	Location	Catchment Area (km^2)	Total Capacity (m^3)	Design Flood Discharge (m^3/s)	Surcharge Head (m)	Water Depth (m)	Free Board (m)	Height of Dam (m)	Type
Kurang river	K-1	Sikrila	2.3	2,500,000	51	1.5	22	1.5	25.0	A
	K-2	Sikrila	137.0	11,000,000	1,875	6	34	2.0	37.0	B
Gumreh kas	G-1	Athal	5.7	80,000	129	2	10.5	1	12.0	C
	G-2	Athal	6.5	240,000	147	2	14	1	17.0	A
	G-3	Siali	13.2	1,200,000	298	2	18.5	1.5	22.0	A
	G-4	Pind Begwal	1.6	240,000	36	1	10	1	12.0	A
	G-5	Muhrian	2.0	135,000	45	1	8.7	1	10.0	C
Malal Kas	M-1	Tamair	10.9	300,000	246	3	11	1	15.0	A
	M-2	Jhang Sayaddan	55.0	500,00	833	4	13.5	1	15.0	C
Hills and Mountains	H-1	Shah Allah Dita	1.3	286,000	29	1	11	1	13.0	A
	H-2	Shah Darah	25.0	1,750,000	564	4	21.5	1.5	27.0	A
	H-3	Shah Darah	3.6	620,000	81	2	23.5	1.5	27.0	A
	H-4	Subhan	5.9	950,000	133	2	23.5	1.5	26.5	A
Soan River	S-1	Charah	175.0	7,500,000	1,752	6	30.5	1.5	32.0	B

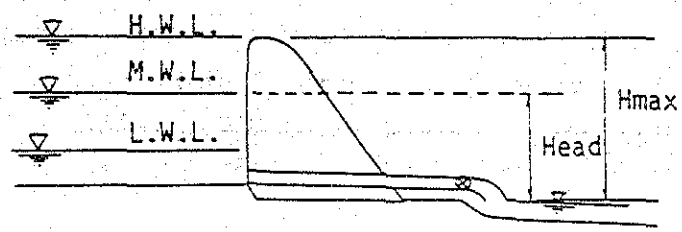
表 9. 2 －3　セキ諸元

River's Name	Mark	Location	Catchment Area (km^2)	Length of Weir (m)	Height of Weir (m)	Storage Capacity	Weir type	Remarks
Kurang River	Kc-1	Khana Dak	300	100	2.5	40,000	Gated weir	Automatic
	Kc-2	Dhok Ali Muhammad	443	50	5.0	100,000	Fixed weir	-
Gumreh kas	Gc-1	Kuri	91	80	3.5	24,000	Gated weir	Automatic
	Gc-2	Shak Rial	125	60	2.5	9,000	Gated weir	Automatic
Nala Nilan	Nc-1	Gokina	13	30	4.0	7,000	Fixed weir	-
	Nc-2	Gokina	20	30	4.0	7,000	Fixed weir	-

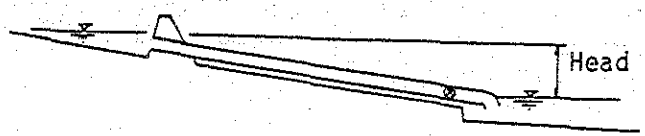
表 9. 2 －4　開発可能電力

Demarcation	Mark	Location	Head He (m)	Discharge Q (m^3/s)	Power P (kw)	Type	Catchment Area (km^2)
Kurang River	K-2	Sakrila	20	0.7	103	Type A	137.0
Gumreh Kas	G-1	Athal	8	0.03	1.8	- do -	5.7
Malal Kas	M-1	Tamair	10	0.05	3.7	- do -	10.9
	M-2	Jhang Sayaddan	10	0.28	21	- do -	55.0
Hills and Mountains	H-2	Shah Darah	15	0.13	14	- do -	25.0
Soan River	S-1	Charah	20	0.88	129	- do -	175.0
Kurang River	Kc-2	Dhok Ali Muhammad	10	2.2	162	Type B	443.0
Nala Nilan	Nc-1	Gokina	5	0.07	2.6	- do -	13.0
	Nc-2	Gokina	5	0.10	3.7	- do -	20.0

TYPE A (DAM)



TYPE B (WEIR)



$P = 9.8 \cdot He \cdot Q \cdot e$

Where P : Power (kw)
He: Hear 9m)
Q : Discharge (m^3/s)
e : Efficiency 0.75

$Q = q \times A$

q : Unit discharge ($m^3/s/km^2$)
0.005 $m^3/s/km^2$
A : Catchment Area (km^2)

表11. 4 － 1　CDA 消防局保有車輌

Vehicle	Brand	Year	Remarks
Fire Tender	Leyland	1964	Approved for Disposal
"	Ford	1964	Off road since 1983
"	FIAT 13	1970	Approved for Disposal
"	Bedford	1973	"
Water Tanker	Dodge	1966	Disposed off
"	"	"	"
Rescue Platform	Ford	1966	
Fire Tender	Bedford	1982	

Source: CDA Fire Brigade, 1985

表14. 1 －1　有効貯水池容量

Demarcation	Mark	Location	Effective Capacity (m^3)	Effective Capacity A.F
Kurang River	K - 1	Sikrila	2,000,000	1,621
	K - 2	Sikrila	8,800,000	7,134
Gumreh Kas	G - 1	Athal	64,000	52
	G - 2	Athal	192,000	156
	G - 3	Siali	960,000	778
	G - 4	Pind Begwal	192,000	
	G - 5	Muhrian	108,000	88
Malal Kas	M - 1	Tamair	240,000	195
	M - 2	Jhang Sayaddan	400,000	324
Hills and Mountains	H - 1	Shah Allah Ditta	228,000	185
	H - 2	Shah Darah	1,400,000	1,135
	H - 3	Shah Darah	496,000	402
	H - 4	Subhan	760,000	616
Soan River	S - 1	Charah	6,000,000	4,864
Total			21,840,000	17,706

Note: Effective Capacity = 0.8 x Total Capacity

表14. 1 －2　セキ地点の取水可能量

Mark	Contributory Area (km^2)	Discharge (m^3/s)	Possible Water Intake (m^3/s)
Kc - 1	300	1.5	1.28
Kc - 2	143 (443)	0.72	0.61
Gc - 1	91	0.46	0.39
Gc - 2	34 (125)	0.17	0.14
Nc - 1	13	0.065	0.055
Nc - 2	7 (20)	0.035	0.03

Note: See Annex for detailed discharging quantity of Rivers.

表14. 1 －3　受益地タイプ

	Mark	Place	Type
Reservoir by Dam	K - 1	Sikrila	C
	K - 2	Sikrila	C
	G - 1	Athal	A
	G - 2	Athal	C
	G - 3	Siali	C
	G - 4	Pind Begwal	A
	G - 5	Muhrian	A
	M - 1	Tamair	A
	M - 2	Jhang Sayaddan	C
	H - 1	Shah Allah Ditta	B
	H - 2	Shah Darah	B
	H - 3	Shah Darah	B
	H - 4	Shah Darah	B
	S - 1	Charah	C
Reservoir by Weir	Kc - 1	Khana Dak	A
	Kc - 2	Koral	A
	Gc - 1	Kuri	A
	Gc - 2	Tarlai Khurd	A
	Nc - 1	Gokina	B
	Nc - 2	Gokina	B

表14. 1 － 4　ペンマン法による作物蒸発散量計算表

Factor	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Note/Equation
T mean	°C	9.90	12.20	17.20	22.70	27.70	31.60	29.90	28.80	27.20	22.70	16.50	11.20	given data
RH mean	%	70.90	69.40	64.90	54.20	41.20	41.60	63.90	74.10	69.30	62.90	66.20	70.50	- do -
ea	mbar	12.30	14.20	19.60	27.60	37.20	46.50	42.20	39.60	36.10	27.60	18.80	13.30	
ed	mbar	8.70	9.90	12.70	15.00	15.30	19.30	27.00	29.30	25.00	17.40	12.40	9.40	ea x RH mean/100
(ea-ed)	mbar	3.60	4.30	6.90	12.60	21.90	27.20	15.20	10.30	11.10	10.20	6.40	3.90	(1)
u	km/day	102.00	137.00	160.00	160.00	164.00	156.00	147.00	111.00	93.00	80.00	75.00	80.00	
U_2	km/day	102.00	137.00	160.00	160.00	164.00	156.00	147.00	111.00	93.00	80.00	75.00	80.00	u at 2m Height
f (u)	-	0.55	0.64	0.70	0.70	0.71	0.69	0.67	0.57	0.52	0.49	0.47	0.49	0.27 (H u_2/100)
1-w	-	0.43	0.40	0.34	0.27	0.22	0.19	0.21	0.22	0.22	0.28	0.35	0.42	
(1-w)f(u)(ea-ed)	mm/day	0.85	1.10	1.64	2.38	3.42	3.57	2.14	1.29	1.27	1.40	0.90	0.80	(2)
Ra	mm/day	8.38	9.88	12.48	14.84	16.50	17.98	16.80	15.52	13.44	10.88	8.61	7.33	
n	hr/day	6.30	6.80	6.80	8.50	10.00	10.30	8.60	8.50	8.60	9.00	8.20	6.70	given data
N	hr/day	10.20	11.00	11.90	13.00	13.90	14.40	14.20	13.40	12.40	11.40	10.40	9.90	
Rs	mm/day	4.68	5.52	6.69	8.56	10.06	10.92	9.29	8.80	8.02	7.01	5.55	4.31	(0.25+0.50/N)Ra
Rns	mm/day	3.51	4.14	5.01	6.42	7.55	8.19	6.97	6.60	6.02	5.26	4.16	3.23	0.75Rs
f (T mean)	-	12.70	13.20	14.00	15.10	16.20	17.10	16.70	16.50	16.20	15.10	13.90	13.00	
f (ed)	-	0.21	0.20	0.18	0.17	0.17	0.15	0.11	0.10	0.12	0.16	0.19	0.21	$0.34-0.044\sqrt{ed}$
f (n/N)	-	0.66	0.66	0.61	0.69	0.75	0.74	0.65	0.67	0.72	0.81	0.81	0.71	0.1 + 0.9 n/N
Rnl	mm/day	1.76	1.74	1.54	1.77	2.07	1.90	1.19	1.11	1.40	1.96	2.14	1.85	f(T mean)·f(ed)·f(n/N)
Rn	mm/day	1.75	2.40	3.47	4.65	5.48	6.29	5.78	5.49	4.62	3.30	2.02	1.38	Rns - Rnl
W	-	0.57	0.60	0.66	0.73	0.78	0.81	0.79	0.78	0.78	0.72	0.65	0.58	1 - (1-w)
W·Rn	mm/day	1.00	1.44	2.29	3.39	4.27	5.09	4.57	4.28	3.60	2.38	1.31	0.80	(3)
ETo	mm/day	1.90	2.50	3.90	5.80	7.70	8.70	6.70	5.60	4.90	3.80	2.20	1.60	(2) + (3)

表14. 1 －5　ダムによるかんがい可能面積

Demarcation	Mark	Place	Effective Storage	Irrigable Area (ha)				Planned Crops	
				Wheat	Wheat	Vegetable	Fruit	Name of Crop	Irrigated Area
Kurang River	K - 1	Sikrila	2,000,000	240	481	144	130	Wheat (s)	481
	K - 2	Sikrila	8,800,000	1,059	2,118	635	572	Wheat (s)	2,118
Gumreh Kas	G - 1	Athal	64,000	8	15	5	4	Vegetable	5
	G - 2	Athal	192,000	23	46	14	12	Wheat (s)	46
	G - 3	Siali	960,000	116	231	69	62	Wheat (s)	231
	G - 4	Pind Begwal	192,000	23	46	13	12	Vegetable	14
	G - 5	Muhrian	108,000	13	26	8	7	Vegetable	8
Malal Kas	M - 1	Tamair	240,000	29	58	17	16	Vegetable	17
	M - 2	Jhang Sayaddan	400,000	48	96	29	26	Wheat (s)	96
Hills and Mountains	H - 1	Shah Allah Ditta	228,000	27	54	16	15	Fruit	15
	H - 2	Shah Darah	1,400,000	169	337	101	91	Fruit	91
	H - 3	Shah Darah	496,000	60	119	36	32	Fruit	32
	H - 4	Subhan	760,000	91	183	55	49	Fruit	49
Soan River	S - 1	Charah	6,000,000	722	1,444	433	390	Wheat (s)	1,444
Total			21,840,000	2,628	5,675	1,576	1,418	-	4,647

Note:

Wheat	3mm/day x 10,000m ÷ 0.65 x 6 month x 30 days =	8,307m^3/ha
Wheat (short)	3mm/day x 10,000m ÷ 0.65 x 10 month x 30 days =	4,154m^3/ha
Vegetable	3mm/day x 10,000m ÷ 0.65 x 10 month x 30 days =	13,846m^3/ha
Fruit	3.7mm/day x 10,000m ÷ 0.65 x 10 month x 30 days =	15,369m^3/ha

表14. 1 －6　セキによるかんがい可能面積

Mark	Contributary Area (km^2)	Nearby Farmland (1) (ha)	Possible Water-intake (2) (m^3/s)	Irrigable Area Based on (2) (ha)	Irrigable Area Based on (1) & (2) (ha)	Planned Crops
Kc - 1	300	3,700	1.28	2,415	2,415	Wheat
Kc - 2	143 (443)	1,430	0.61	1,150	1,150	Wheat
Gc - 1	91	100	0.39	735	100	Vegetable
Gc - 2	34 (125)	200	0.14	264	200	wheat
Nc - 1	13	20	0.055	104	20	Fruits
Nc - 2	7 (20)	20	0.03	57	20	Fruits

表14. 1 — 7 送水計画

Demarcation	Mark	Place	Irrigated Area (ha)	Design Discharge (m^3/s)	Canal Length (m)	Canal Diameter (m)	Pump Head	Pump Electric Power (kW)	Crops
Kurang River	K - 1	Sikrila	481	0.36	500	0.5	-	-	Wheat (s)
	K - 2	Sikrila	2,118	1.59	1,000	1.5	15	333.0	Wheat (s)
Gemreh Kas	G - 1	Athal	5	0.0075	200	0.1	20	2.1	Vegetable
	G - 2	Athal	46	0.035	2,000	0.25	-	-	Wheat (s)
	G - 3	Siali	231	0.173	1,500	0.5	-	-	Wheat (s)
	G - 4	Pind Begwal	14	0.021	-	-	10	2.9	Vegetable
	G - 5	Muhrian	8	0.012	-	-	25	4.2	Vegetable
Malal Kas	M - 1	Tamair	17	0.026	-	-	15	5.5	Vegetable
	M - 2	Jhang Sayaddan	96	0.072	-	-	10	10.0	Wheat (s)
Hills and Mountains	H - 1	Shah Allah Ditta	15	0.020	1,000	0.2	-	-	Fruit
	H - 2	Shah Darah	91	0.118	1,000	0.4	-	-	Fruit
	H - 3	Shah Darah	32	0.042	100	0.25	-	-	Fruit
	H - 4	Subhan	49	0.064	-	-	15	13.4	Fruit
Soan River	S - 1	Charah	500	0.375	-	-	15	78.0	Wheat (s)
			944	0.708	2,000	1.0	-	-	Wheat (s)
Kurang River	Kc - 1	Khana Dak	2,415	1.811	-	-	5	252.0	Wheat
	Kc - 2	Koral	1,150	0.86	-	-	5	121.0	Wheat
Gumreh Kas	Gc - 1	Kuri	100	0.15	-	-	2	4.2	Vegetable
	Gc - 2	Shak Rial	200	0.15	-	-	2	8.4	Wheat

Electric Power: $P = 0.233\ Q \cdot H \times 60$

Diamater : $D = \sqrt{\frac{4 \cdot Q}{\pi \cdot V}}$

Peak Water Requirement: Wheat = 0.126mm/month*30*86,400x10,000m^2*0.65
= 0.75ℓ/sec/ha

Vegetable = 0.259mm/month*30*86,400x10,000m^2*0.65
= 1.5ℓ/sec/ha

Fruit = 0.222mm/month*30*86,400x 10,000m^2*0.65
= 1.3ℓ/sec/ha

表14. 1 －8　かんがいに必要な電力

Mark	Location	Demand for Pump (kW)	Supply from Mini-hydro Power Station (kW)	Supply from Other Source (kW)
K-2	Sikrila	333.0	103.0	230.0
G-1	Athal	2.1	1.8	0.3
G-4	Pind Begwal	2.9	-	2.9
G-5	Muhrian	4.2	-	4.2
M-1	Tamair	5.5	3.7	1.8
M-2	Jhang Sayaddan	10.0	21.0	-
H-2	Shah Darah	13.4	14.0	-
S-1	Charah	78.0	129.0	-
Kc-1	Khana Dak	127.0	-	252.0
Kc-2	Koral	60.0	162.0	-
Gc-1	Kuri	4.2	-	4.2
Gc-2	Shak Rial	4.2	-	8.4

表14. 4 －1　想定される舗装道路及び関連構造物 －1

	Sihala			Bhara kau			Tarlai					
Union Council	Koral	Rawat	Sihala	Bhara kau	Phulgran	S.A. Ditta	Kirpa	Tarlai Kalan	Sohan	Tamair	Charah	Total
Metalled Road												
Road Construction (km)	4.6	6.5	9.2	17.5	5.1	1.8	29.8	6.9	-	19.9	17.7	119.0
Road Improvement (km)	1.6	6.3	2.1	8.0	15.9	4.6	16.2	5.8	5.6	8.5	6.4	81.0
Sub-total Road (km)	6.2	12.8	11.3	25.5	21.0	6.4	46.0	12.7	5.6	28.4	24.1	200.0
Other Structures												
Bridge (No.)	1	-	-	-	-	-	2	-	-	-	1	4
Causeway (No.)	2	4	8	11	6	2	9	2	1	12	6	63
Culvert (No.)	4	8	16	20	10	5	20	5	2	20	12	122
Retaining Wall (m)	80	160	320	400	200	100	400	100	40	400	240	2,440
Drain (km)	6	13	11	26	21	6	46	13	6	28	24	200
Afforestation (No.)	1,200	2,600	2,200	5,200	4,200	1,200	9,200	2,600	1,200	5,600	4,800	40,000
Existing Metalled Road (km)	9.8	27.7	28.6	7.0	16.0	13.9	14.3	19.3	41.1	25.2	26.5	229.4
Metalled Road of CDA Programme (km)	-	-	2.0	3.4	2.0	-	-	4.0	12.8	-	-	24.2
Metalled Road of LGRD Programme (km)	-	-	-	(4.0)	-	-	(7.5)	-	-	-	(10.0)	(21.5)
Total Metalled Road (km)	16.0	40.5	41.9	35.9	39.0	20.3	60.3	36.0	59.5	53.6	50.6	453.6
Existing Katcha Road (km)	1.0	12.4	7.6	9.3	3.9	1.4	9.9	4.4	9.6	10.1	11.0	80.6
Total Road (km)	17.0	52.9	49.5	45.2	42.9	21.7	70.2	40.4	69.1	63.7	61.6	534.2

Note: Numbers in brackets are included in road length of construction/improvement.

表14. 4 －1　想定される舗装道路及び関連構造物－2

	Sihala			Bhara kau			Tarlai					
Union Council	Koral	Rawat	Sihala	Bhara kau	Phulgran	S.A. Ditta	Kirpa	Tarlai Kalan	Sohan	Tamair	Charah	Total/ Average
(1) Total Road (km)	17.0	52.9	49.5	45.2	42.9	21.7	70.2	40.4	69.1	63.7	61.6	534.2
(2) Total Metalled Road (km)	16.0	40.5	41.9	35.9	39.0	20.3	60.3	36.0	59.5	53.6	50.6	453.6
(3) Proposed Road (km)	6.2	12.8	11.3	25.5	21.0	6.4	46.0	12.7	5.6	28.4	24.1	200.0
(4) Total Area (km^2)	19.0	48.6	49.8	59.8	48.7	85.2	66.9	24.8	30.7	103.7	57.8	595.0
(5) 2001 Estimate Total Populaiton	7,500 1/	18,800	26,300	17,400	18,400	12,400	31,900	20,100	21,600	22,300	29,200	225,900
(1)/(4) (km/km^2)	0.89	1.09	0.99	0.76	0.88	0.25	1.05	1.63	2.25	0.61	1.07	0.90
(2)/(4) (km/km^2)	0.84	0.83	0.84	0.60	0.80	0.24	0.90	1.45	1.94	0.52	0.88	0.76
(3)/(4) (km/km^2)	0.33	0.26	0.23	0.43	0.43	0.08	0.69	0.51	0.18	0.27	0.42	0.34
(1)/(5) (m/population)	2.27	2.81	1.88	2.60	2.33	1.75	2.20	2.01	3.20	2.86	2.11	2.36
(2)/(5) (m/population)	2.13	2.15	1.59	2.06	2.12	1.64	1.89	1.79	2.75	2.40	1.73	2.01
(3)/(5) (m/population)	0.83	0.68	0.43	1.47	1.14	0.52	1.44	0.63	0.26	1.27	0.83	0.88

1/ Rural population growth rate is estimated at 2.5%

表14. 5 －1　AMS の機械化体系

Work	Implement	
Fertilizing	Manure spreader, Broadcaster	
Plowing	Mould board plow, Disc plow	
Harrowing	Disc harrow, Rotary harrow	
Sowing	Drill seeder (Wheat)	Corn planter (Corn)
Inter-tilling	Cultivator	
Pest control	Knapsack sprayer	
Harvesting	Reaper (Wheat)	Manpower (Corn)
Threshing	Thresher	-
Transporting	Trailer	

表14. 5 －2　作業機計画台数

Implement	Nos. by Capacity	
Manure spreader	2t ---- 16 units	3t ---- 16 units
Broadcaster	260ℓ ---- 16 units	500ℓ ---- 16 units
Mould board plow	14" x 1 ---- 30 units	14" x 2 ---- 70 units
Disc harrow	18" x 16 ---- 30 units	18" x 20 ---- 70 units
Drill seeder	7 rows ---- 16 units	13 rows ---- 32 units
Corn planter	2 rows ---- 16 units	13 rows ---- 32 units
Cultivator	3 rows ---- 16 units	4 rows ---- 32 units
Sprayer	1.0 - 1.5HP	80 units
Reaper	cutting width 1200mm 42 units	
Trailer	2t ---- 16 units	3t ---- 32 units
Thiresher	300kg/H ---- 16 units	1200kg/H ---- 16 units

表14. 6 －1　畜産計画施設一覧

Particulars	Quantity		Remarks
Livestock Development Pilot Farm	per Farm	Total (3 Farms)	
1. Buildings			
Animal Sheds	5 sheds	15 sheds	Cattle shed, Goat shed, etc.
Office Building	1 building	3 buildings	Including laboratory, verterinary room etc.
Forage Store & Workshop	1 building	3 buildings	
Garage	1 shed	3 sheds	Garage & farm machinery workshop
Staff Quater	6 building	18 buildings	Dormitory
2. Facilities			
Water Supply Facilities	1 set	3 sets	Water Supply for building, field and range land
Irrigation System	1 set	3 sets	1ha/farm sprinkler irrigation
3. Vechicle & Equipment			
3-1. Vehicle			
Vehicle	3 units	9 units	Jeep, Truck
Tractor	1 set	3 sets	Inlcuding trailor & attachments
3-2. Equipment			
Feed Grinder-mixer	1 unit	3 units	Capacity 2.8 m^3, tractor P.T.O. operation
Veterinary Equipment	1 set	3 sets	
Workshop Equipment	1 set	3 sets	
Other Equipment	1 set	3 sets	

表14. 6 －1(2)

Particulars	Quantity		Remarks
4. Land & Field	per Farm	Total (3 Farms)	
4-1. Demonstration Field			
Demonstraion Field	2ha	6ha	Reclamation of wasteland
4-2. Range Land			
Range Land	20ha	60ha	Development of wasteland including fencing 2 km
4-3. Pilot Farm Site			
Pilot Farm Site	1.5ha	4.5ha	
5. Animals	44 heads	132 heads	Initial stage; cow, buffaloe, goat, etc
6. Land Requirements	23.5ha	70.5ha	Wasteland

Livestock Development Station	per Station	
1. Buildings		
Animal Sheds	10 sheds	Cattle shed, goat shed, etc.
Main Building	1 building	
AI & Veterinary Unit	1 building	Including laboratory & AI service room
Training Room	1 building	For 50 trainees
Store & Workshop	6 buildings	Forage store, garage, etc.
Trainee Quater	3 buildings	Dormitory, staff quarter, etc.

表14. 6 －1(3)

Particulars	Quantity	Remarks
	per Station	
2. Facilities		
2-1. Milking Parlour		
Milking Parlour	1 set	12 milker/set
Bulk Cooler	1 unit	Volume 2000 litter
2-2. Silo		
Steel Silo	2 units	Capacity 280m^3/unit
2-3. Other Faclilities		
Water Supply Facilities	1 set	
Irrigation System	1 set	2ha, sprinkler irrigaiton
3. Vechicle & Equipment		
3-1. Equipment		
Workshop Equipment	1 set	
Veterinary Equipment	1 set	Including laboratory equipment
AI Equipment	1 set	
Feed Grinder-mixer	1 unit	Capacity 2.8m^3/unit
Weighing Equipment	1 set	
Other Equipment	1 set	
3-2. Vehicle		
Vehicle	16 units	AI servicecar, truck, micro bus, etc.
Tractor	2 set	Including trailor & working machinery
Front Loader	1 unit	
Silage Wagon	1 unit	

14. 6 - 1 (4)

Particulars	Quantity	Remarks
	per Station	
4. Land & Field		
4.1. Demonstration Field		
Demonstration Field	5ha	Reclamation of wasteland
4.2. Range Land		
Range Land	50ha	Development of wasteland, including fencing 75km
4.3. Station Site		
Station Site	6ha	Reclamation of wasteland
5. Animals		Initial stage
Cow	110 heads	
Bull	7 heads	
Goat (Female)	110 heads	
Goat (Male)	10 heads	
Buffaloe Cow	10 heads	
Buffaloe	2 heads	
6. Land Requirements	61ha	Wasteland

Veterinary Hospital	per Hospital	Total (4 Hospitals)	
1. Buildings			
Hospital Building	1 building	4 buildings	
Animal Shed	1 shed	4 sheds	
Staff Quarter	1 building	4 buildings	Dormitory

表14. 6 －1(5)

Particulars	Quantity		Remarks
	per Hospital	Total (4 Hospitals)	
2. Other Facilities			
Water Supply Facilities	1 set	4 sets	
Cattle Crash	1 unit	4 units	
3. Equipment & Vechicle			
Veterinary Equipment	1 set	4 sets	Including loboratory
AI Equipment	1 set	4 sets	
Other Equipment	1 set	4 sets	
Vehicle	2 units	8 units	Mobile veterinary unit, etc.
4. Hospital Site	2,000m^2	8,000m^2	
5. Land Requipments	0.2ha	0.8ha	
Veterinary Dispensary	per Dispensary	Total (5 Dispensaries)	
1. Buildings			
Dispensary Building	1 building	5 buildings	
Staff Quarter	1 building	5 buildings	Dormitory
2. Other Facilities			
Water Supply Facilities	1 set	5 sets	
Cattle Crash	1 unit	5 units	

表14. 6 − 1 (6)

Particulars	Quantity		Remarks
	per Dispensary	Total (5 Dispensaries)	
3. Equipment & Vehicle			
Veterinary Equipment	1 set	5 sets	
Suzuki Van	1 unit	5 units	
Other Equipment	1 set	5 sets	
4. Dispensary Site	1,200m^2	6,000m^2	
5. Land Requirements	0.12ha	0.6ha	

表14. 7 －1　内水面漁業開発施設・設備一覧

Particulars	Quantity	Remarks
Fish Hatchery		
1. Pond/Tanks Complex		
1-1. Hatchery Pond Complex		
Brooder Fattening Tank	3 tanks	60m x 30m, depth 1.8m, unlined
Nursery Tank	2 tanks	ø7.5m, depth 1.5m, concrete lining
Nursery Tank	2 tanks	ø3.6m, depth 1.5m
Batch-lining Collectin Tank	2 tanks	9m x 6m, depth 1.8m
Raceway tank	1 tank	45m x 24m, depth 1.5m
1-2. Demonstration Ponds		
Large Size Pond	1 pond 0.4ha	
Medium Size Pond	1 pond 0.1ha	
Mini Size Pond	4 ponds $20m^2$ x 4	
2. Buildings		
Hatchery Office	1 building	Office-cum-laboratory
Overtank Shed	1 shed	
Single Room Hut	2 buildings	
Staff Quarter	2 buildings	Dormitory
3. Water Supply Facilities		
Water Supply Facilities	1 set	

表14. 7 − 1 (2)

Particulars	Quantity	Remarks
4. Equipment & Vechicle		
Fishing Boat	5 units	
Mobile pumps	2 sets	
Hatchery Equipment	1 set	
Laboratory Equipment	1 set	
Other Equipment	1 set	
Vechicle	5 units	Fish seed transportation van, etc.
Jeep	1 unit	
5. Hatchery Site	3ha	
6. Land Requirements	3ha	

Village Community Pond	per Pond	Total (11 Ponds)	
Community Pond	1 pond 0.4 ha	11 ponds 4.4ha	80m x 50m, depth 1.5m
Water Supply Facilities	1 set	11sets	
Equipment & Tools	1 set	11 sets	

表14. 9 －1　苗木ステーション施設一覧

Particulars	Quantity		Remarks
	per Station	Total (4 Stations)	
1. Nursery			
Nursery	0.5ha	2.0ha	
Irrigation System	1 set	4 sets	Sprinkler irrigation
2. Buildings & Others			
Station Office	1 building	4 buildings	
Work shop	1 shed	4 sheds	
Water Supply Facility	1 set	4 sets	
Tractor	1 set	4 sets	Include trailor & attachement

表15. 2 －1　計画別事業費内訳

Project Description	Amount mln. Rs	Amount mln. Yen
1.Irrigation Scheme	792.31	10918.05
(a) Upper Kurang Irrigation Project	(293.41)	(4043.25)
K-1 area: 481 ha		
K-2 area: 2118 ha		
Kc-1 area: 2415 ha		
Kc-2 area: 1150 ha		
Gc-2 area: 200 ha		
Total: 6364 ha		
(b) Other Irrigation Schemes	(498.90)	(6874.80)
i) first priority sites (Component of MIRAD Project)		
G-3: 231 ha		
G-5: 8 ha		
M-1: 17 ha		
M-2: 96 ha		
Gc-1: 100 ha		
ii) second priority sites		
G-1: 5 ha		
G-2: 46 ha		
H-1: 15 ha		
H-3: 32 ha		
Nc-1: 20 ha		
Nc-2: 20 ha		
iii) other sites		
G-4: 14 ha		
H-2: 91 ha		
H-4: 49 ha		
S-1: 1444 ha		

(cont'd)

表15. 2 − 1(2)

Project Description	Amount mln. Rs	Amount mln. Yen
2. Ground Water Multipurpose Development Scheme	251.46	3465.00
- 7 tubewells for irrigation and for water supply		
- 45 shallow wells for irrigation and water supply		
- 1 water catchment system in spring area (Shall Allah Ditta)		
- improvement of 200 existing wells		
3. Intensive Horticulture Promotion Scheme	254.01	3500.25
- construction of 5 units of farms and provision of farm machinery, solar pumps, irrigation system, etc.		
4. Transportation and Communication Improvement Scheme	310.16	4274.25
(a) Rural Transportation	(288.41)	(3974.25)
- construction and improvement of rural roads		
- construction of structure works such as bridges, causeways, culverts, retaining walls, side gutters and others		
(b) Rural Communication	(21.75)	(300.0)
- installation of telephone lines in Sihala, Humak and Bhara Kau stations		
5. Agricultural Machinery Station Scheme	207.41	2858.25
- construction of 1 main station, 2 substations, 10 tractor sheds and provision of agricultural machinery and equipment		

(cont'd)

表15. 2 − 1(3)

Project Description	Amount mln. Rs	Amount mln. Yen
6. Livestock Development Promotion Scheme	195.56	2694.75
- construction of 3 pilot farms, 1 livestock station, 4 veterinary hospitals and 5 veterinary dispensaries, and provision of relevant machinery and equipment		
7. Inland Fishery Development Scheme	18.51	255.06
(a) Fish Hatchery	(14.79)	(203.91)
- construction of an office and fish hatchery facilities, and provision of relevant machinery and equipment including fishing boats, mobile pumps, vehicles and others		
(b) Village Community Ponds	(3.72)	(51.15)
- construction of 11 village community ponds and provision of facility, equipment and tools		
8. Village Environmental Improvement Scheme	633.92	8735.40
- improvement of access roads, inner-village roads and roads to fuel wood forest		
- development of fuel wood forest		
- pond and tree planting		
- recreation park development		
9. Land and Water Conservation Scheme	686.90	9465.30
- control of soil erosion from cultivated land		
- prevention of encroachment		
- conservation and utilization of culturable and unculturable wasteland		
- construction of 4 nursery stations		

(cont'd)

表15. 2 － 1(4)

Project Description	Amount mln. Rs	Amount mln. Yen
10. Medical and Health Services Improvement Scheme	69.21	953.55
- construction of 3 rural health stations with maternity clinic, and provision of ambulance cars and medical equipment		
11. Manpower Development Scheme	887.84	12234.45
(a) Vocational School	(113.34)	(1561.95)
- construction of a vocational school and provision of related machinery and equipment		
(b) Primary Education Facility Improvement	(774.50)	(10672.50)
- construction of 46 two-room schools and 68 four-room schools and provision of educational equipment		
12. Small-scale Industry Development Scheme	51.00	702.90
(a) Gabion Factory	(23.42)	(322.80)
- construction of factory building and provision of machinery and equipment		
(b) Livestock Feed Factory		
- construction of factory building and provision of machinery and equipment		
(c) Match Factory	(18.61)	(256.50)
- building, machinery and equipment		
13. Rural Development Supporting Services Scheme	176.61	2433.60
- construction of 13 rural development stations		
Grand Total of 13 Development Schemes:	4534.89	62490.81

表17. 2 － 1　代表農家の経営収支（Cタイプ地区――1.0ha 規模）

	Present Condition (Rs)	Future Conditions: Without Project (Rs)	Future Conditions: With Project (Rs)
1. Gross Income	12,123	13,203	24,896
Farm income			
Wheat	1,094	1,641	4,680
Fodder	-	-	1,400
Vegetables	-	-	-
Maize	266	399	950
Pulses	513	513	1,283
Sorghum	108	108	1,283
By-product	702	702	2,350
Livestock income	7,440	7,440	12,450
Other income 1/	2,000	2,400	500
2. Expenditures	11,687	12,687	20,304
Farming expenditures			
Wheat	1,059	1,059	2,106
Fodder	-	-	420
Vegetables	-	-	-
Maize	244	244	475
Pulses	202	202	513
Sorghum	102	102	-
Livestock income	5,080	5,080	6,790
Living expenses	5,000	6,000	10,000
3. Net Income	436	516	4,592

Note: 1/ including non-farm income such as wages, trade profits, remittance from abroad, etc.

表17. 2 -2　代表農家の経営収支（Aタイプ地区——1.0ha 規模）

	Present Condition (Rs)	Future Conditions: Without Project (Rs)	Future Conditions: With Project (Rs)
1. Gross Income	12,123	13,203	43,766
Farm income			
Wheat	1,094	1,641	1,706
Fodder	-	-	3,000
Vegetables	-	-	25,485
Maize	266	399	
Pulses	513	513	-
Sorghum	108	108	-
By-product	702	702	625
Livestock income	7,440	7,440	12,450
Other income 1/	2,000	2,400	500
2. Expenditures	11,687	12,687	31,240
Farming expenditures			
Wheat	1,059	1,059	682
Fodder	-	-	1,025
Vegetables	-	-	12,743
Maize	244	244	-
Pulses	202	202	-
Sorghum	102	102	-
Livestock expenditure	5,080	5,080	6,790
Living expenses	5,000	6,000	10,000
3. Net Income	436	516	12,526

Note: 1/ including non-farm income such as wages, trade profits, remittance from abroad, etc.

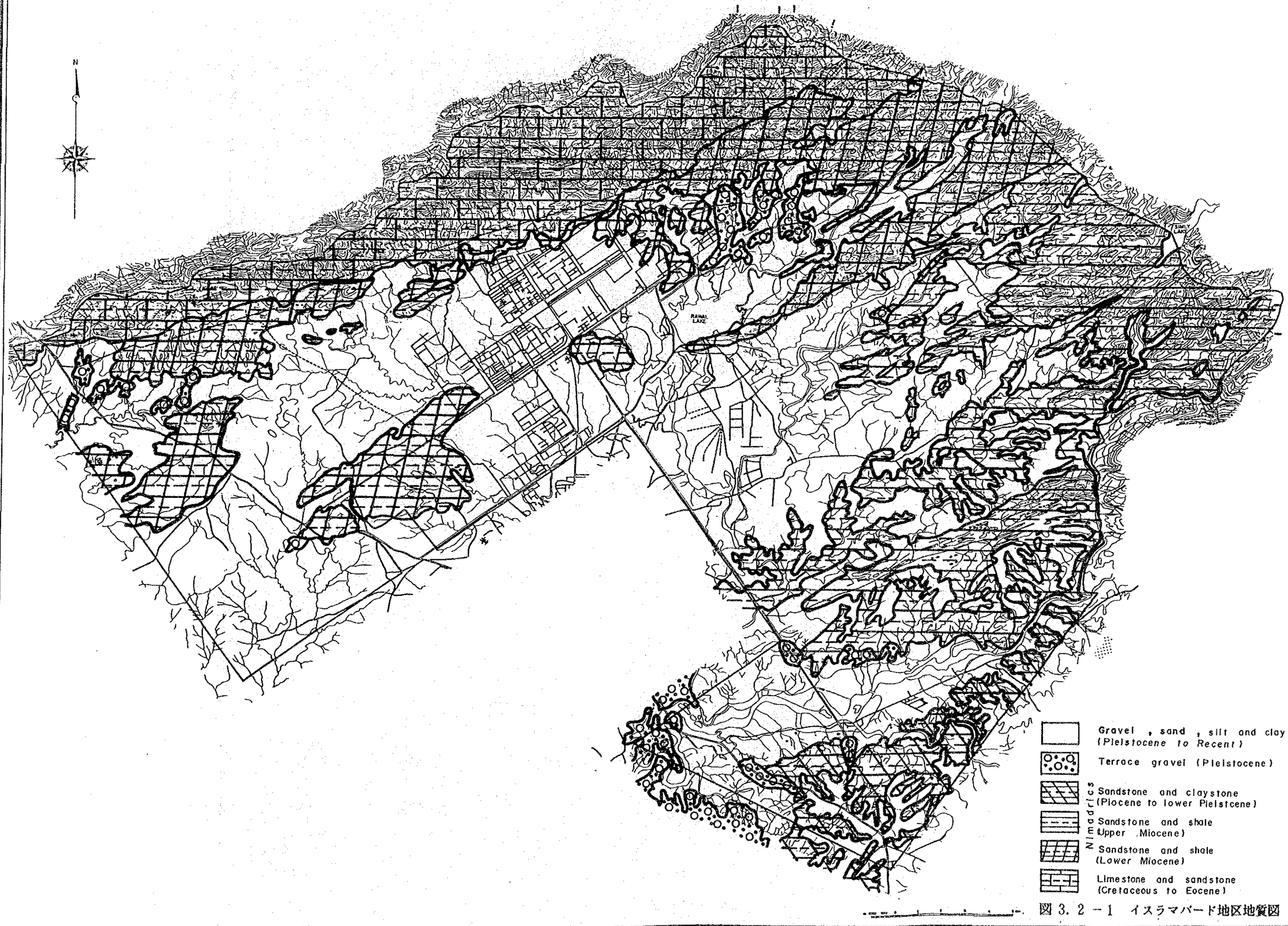


図 3. 2 －1　イスラマバード地区地質図

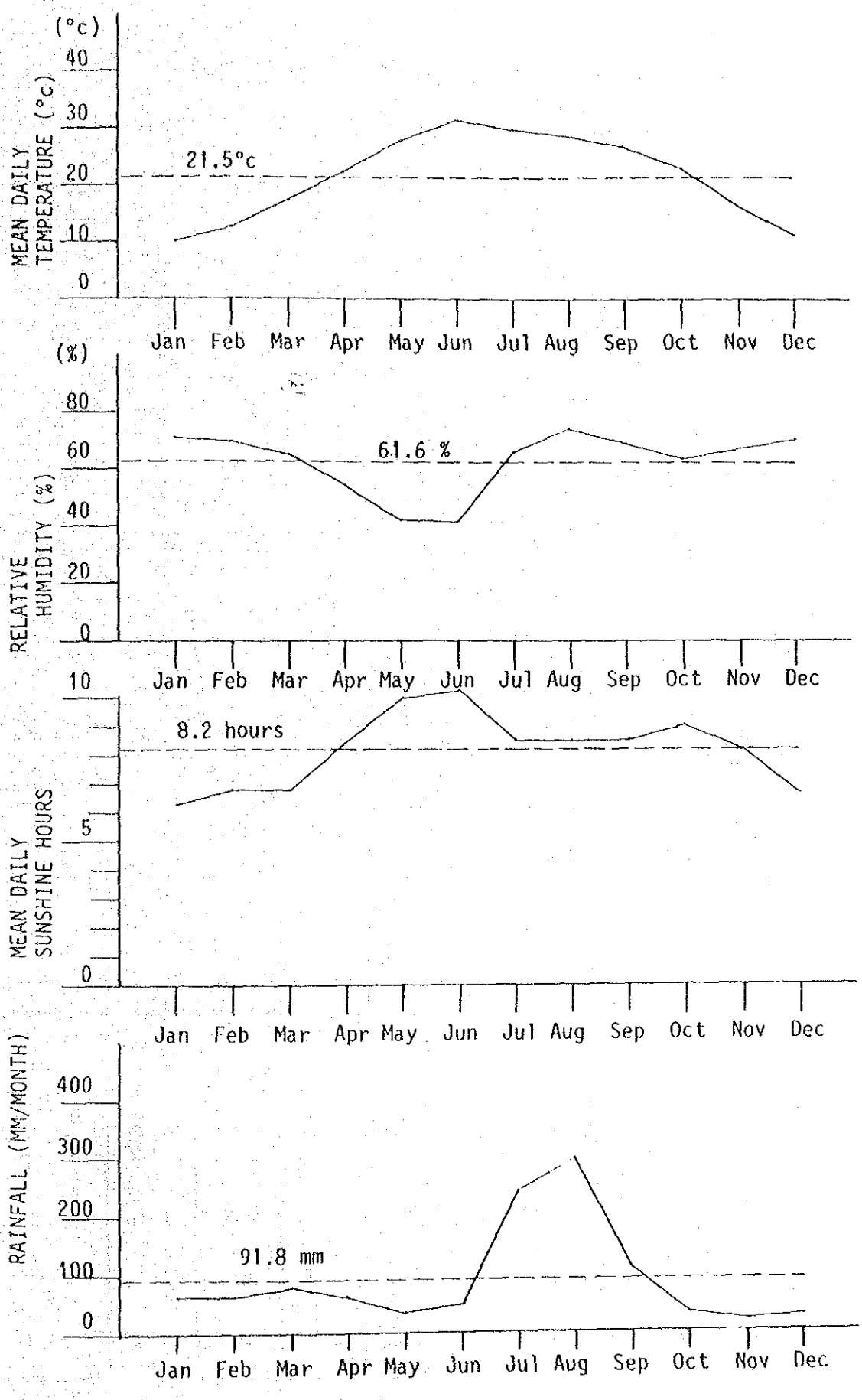
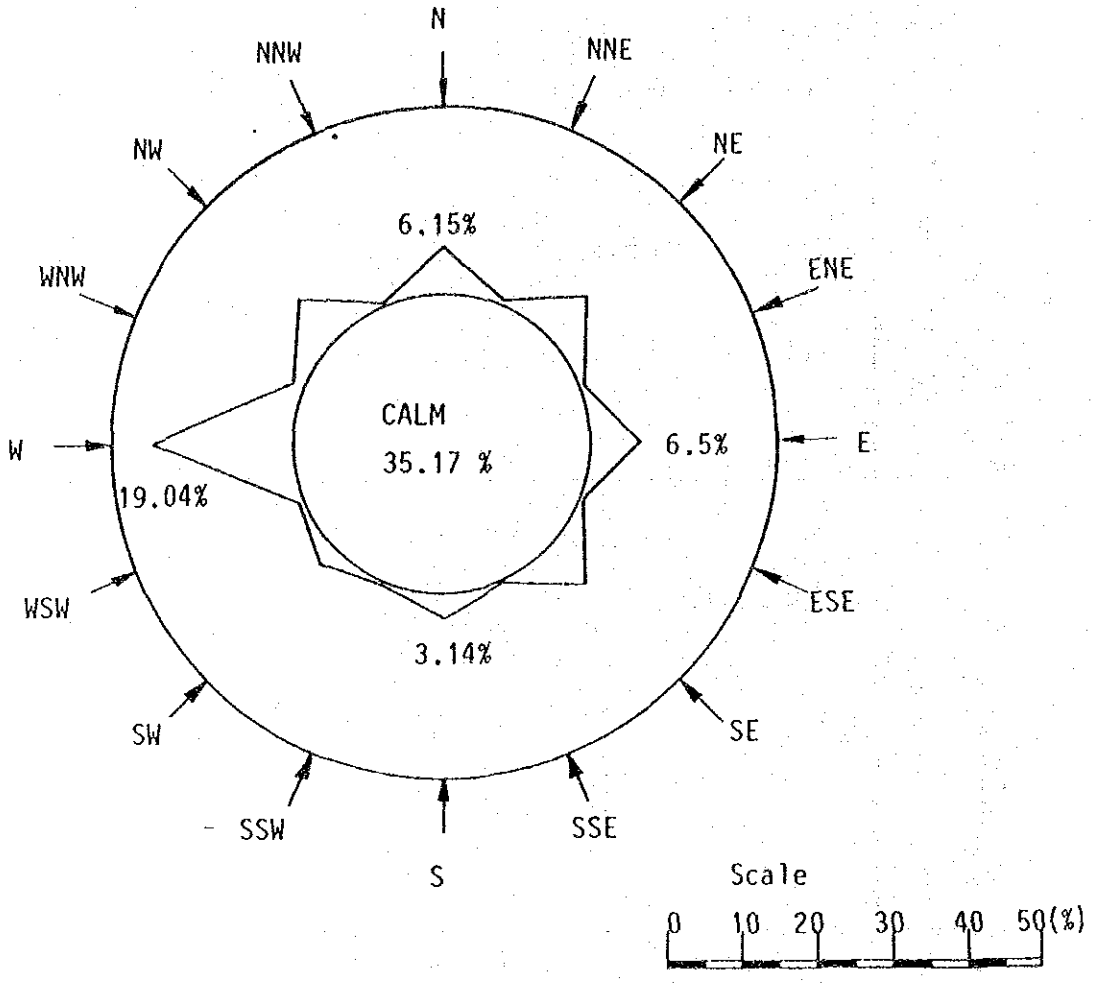

(°c)
MEAN DAILY TEMPERATURE (°c)
40
30
20
10
0
21.5°c
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(%)
RELATIVE HUMIDITY (%)
80
60
40
20
0
61.6 %
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
10
MEAN DAILY SUNSHINE HOURS
5
0
8.2 hours
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
RAINFALL (MM/MONTH)
400
300
200
100
0
91.8 mm
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

図 3. 5 －1　月別気温変化

(Observation for the year 1954 - 1965)



	(%)		(%)		(%)		(%)
N	6.15	E	6.5	S	3.14	W	19.04
NNE	0.71	ESE	0.77	SSW	0.14	WNW	1.26
NE	7.45	SE	7.21	SW	2.9	NW	7.24
ENE	0.54	SSE	0.46	WSW	0.59	NNW	0.53

図 3. 5 － 2　風向分布

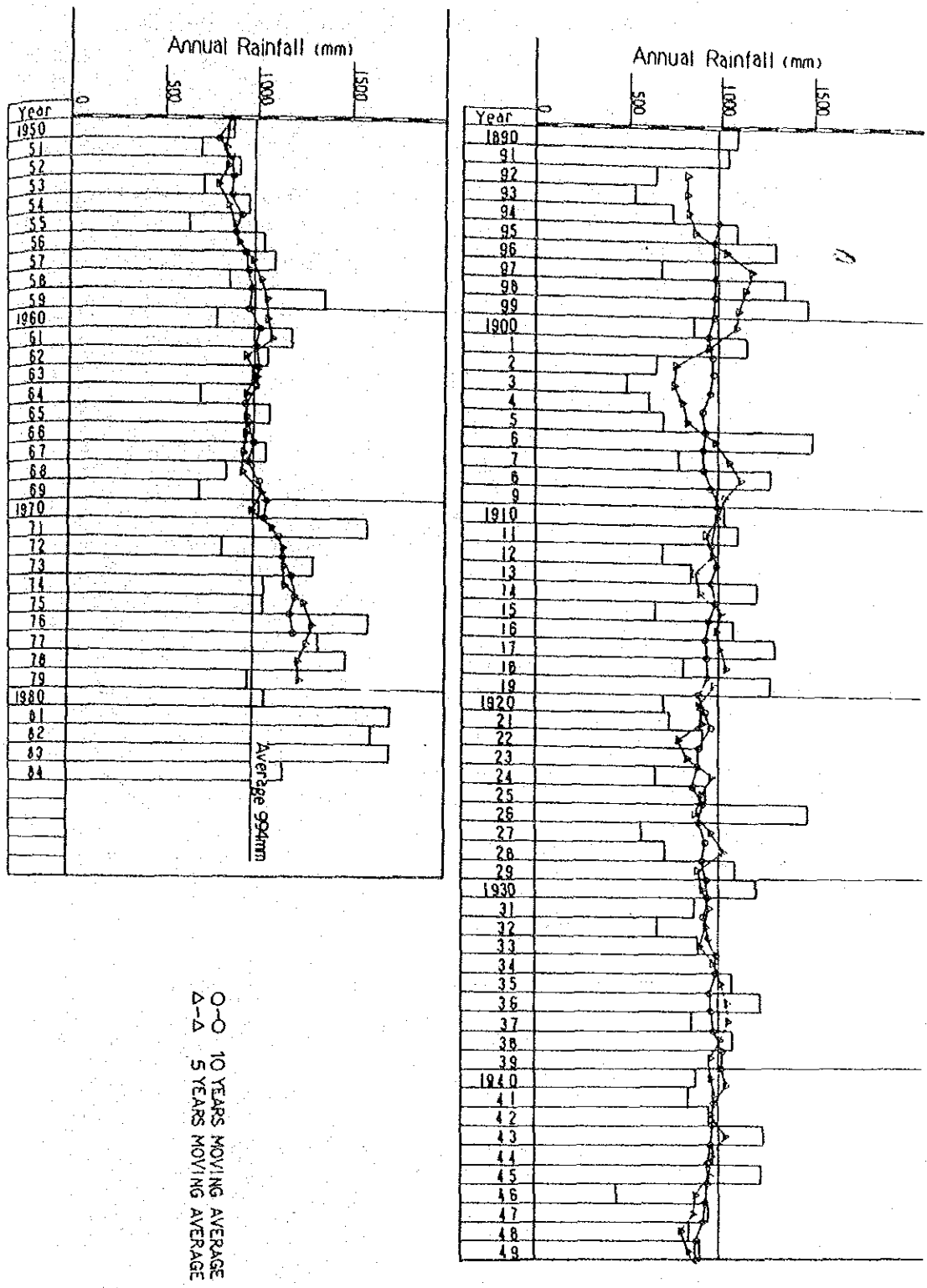


図 3. 6 －1　年降水量の経年変化（1890～1984、Lai Nullah-Rawalpindi）

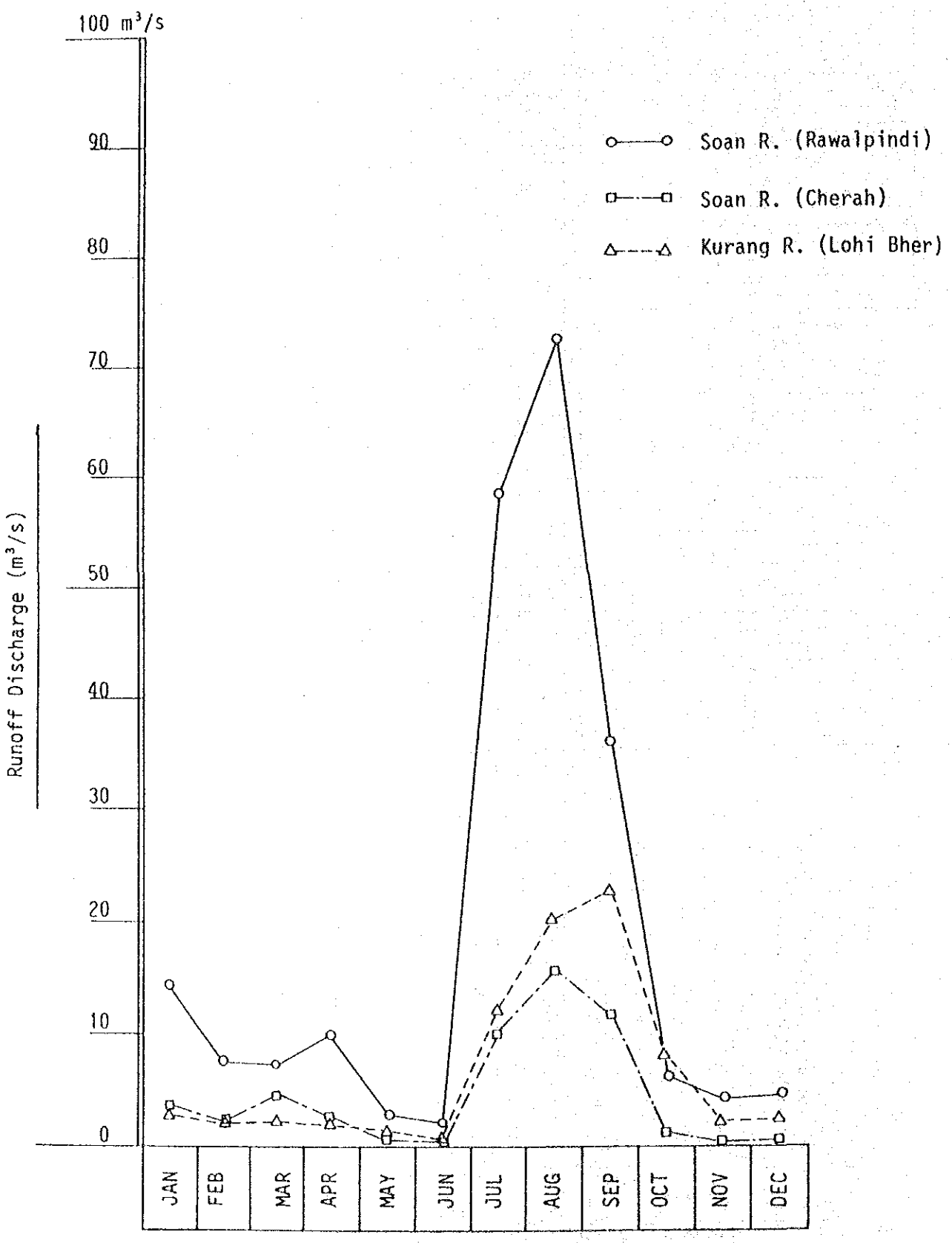

100 m³/s
90
80
70
60
50
40
30
20
10
0
Runoff Discharge (m³/s)
Soan R. (Rawalpindi)
Soan R. (Cherah)
Kurang R. (Lohi Bher)
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

図 3. 6 － 2　月別流出量

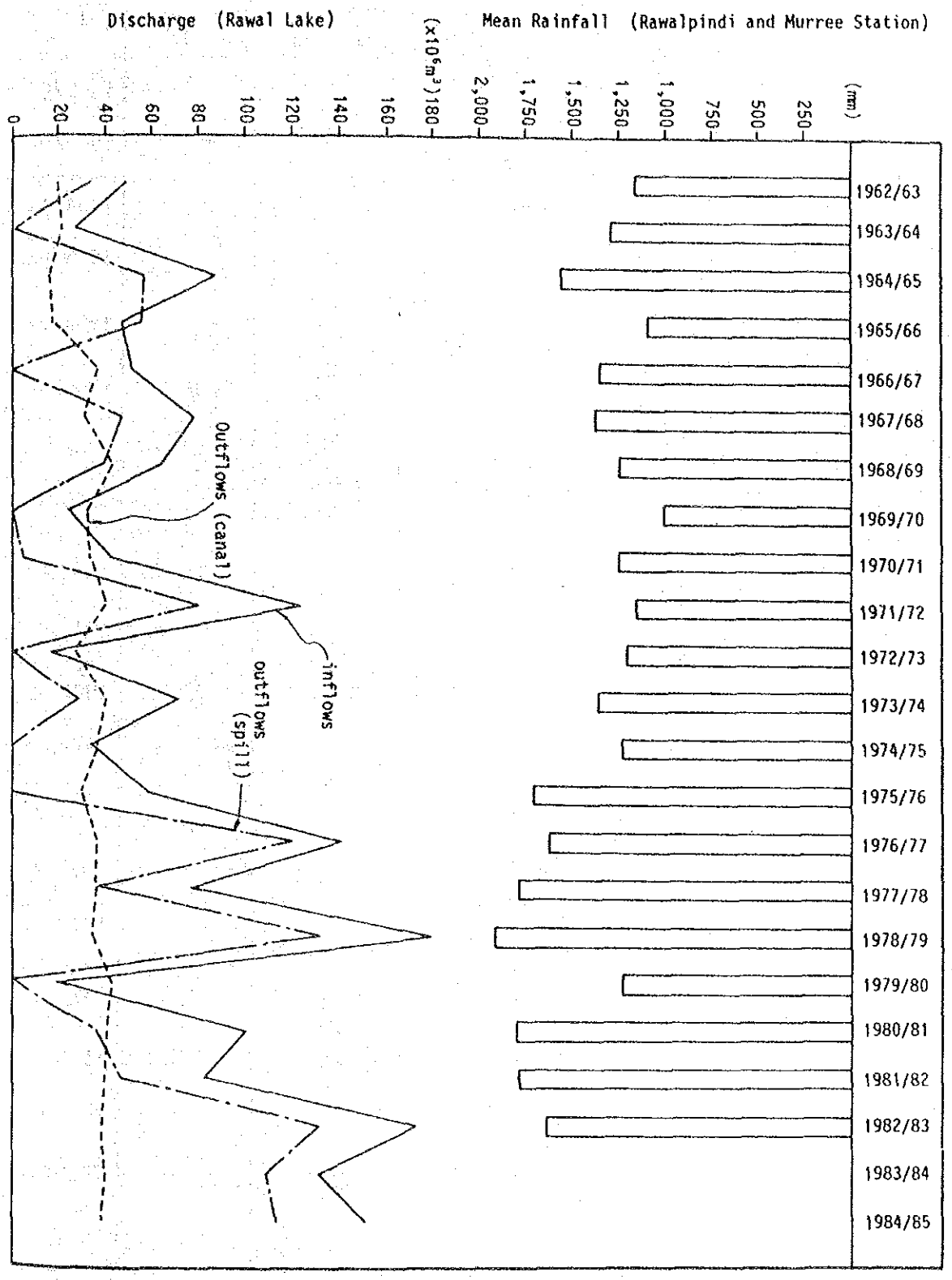


図 3. 6 － 3　流出量と平均降水量の比較

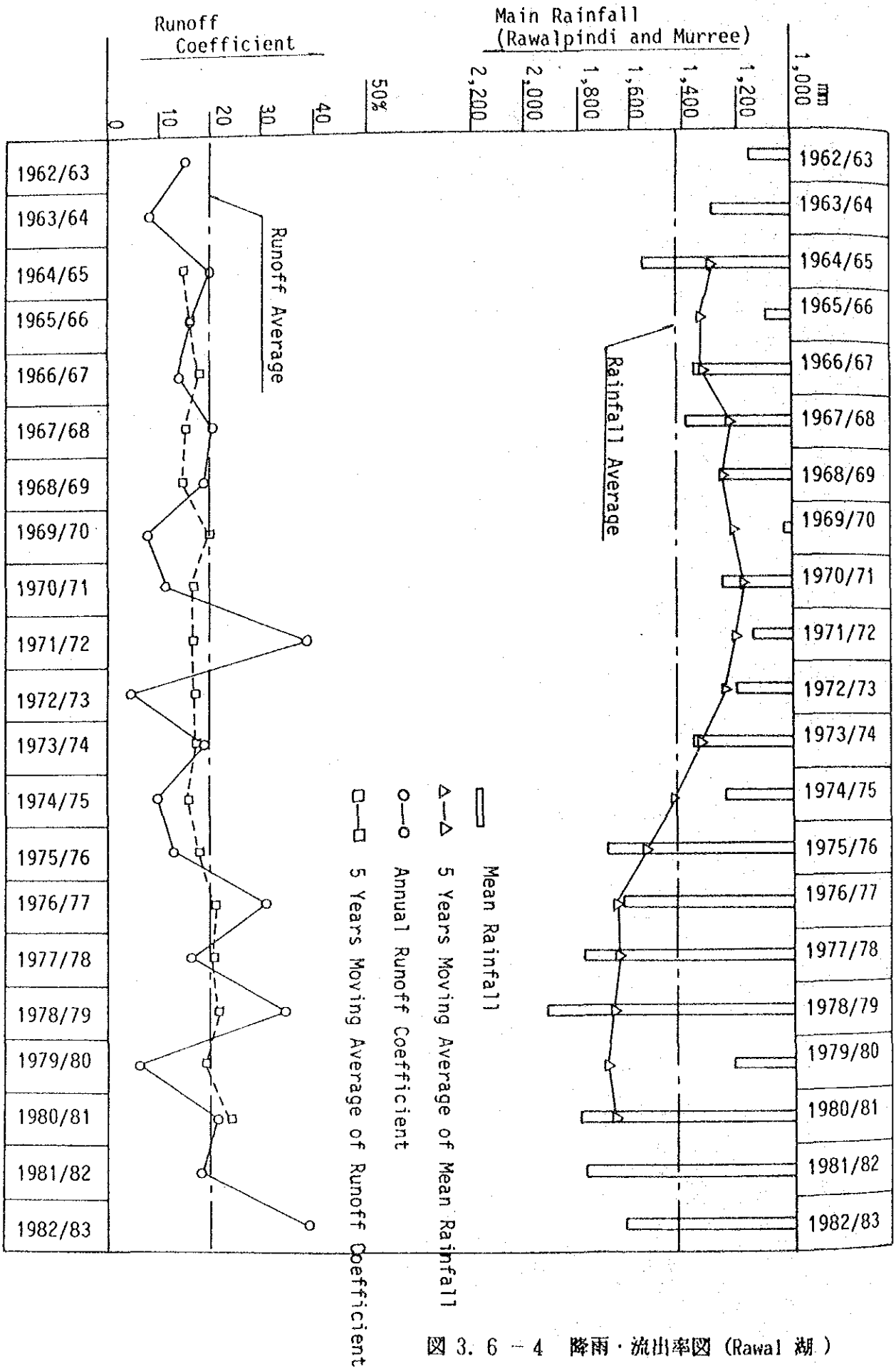


図 3. 6 － 4　降雨・流出率図 (Rawal 湖)

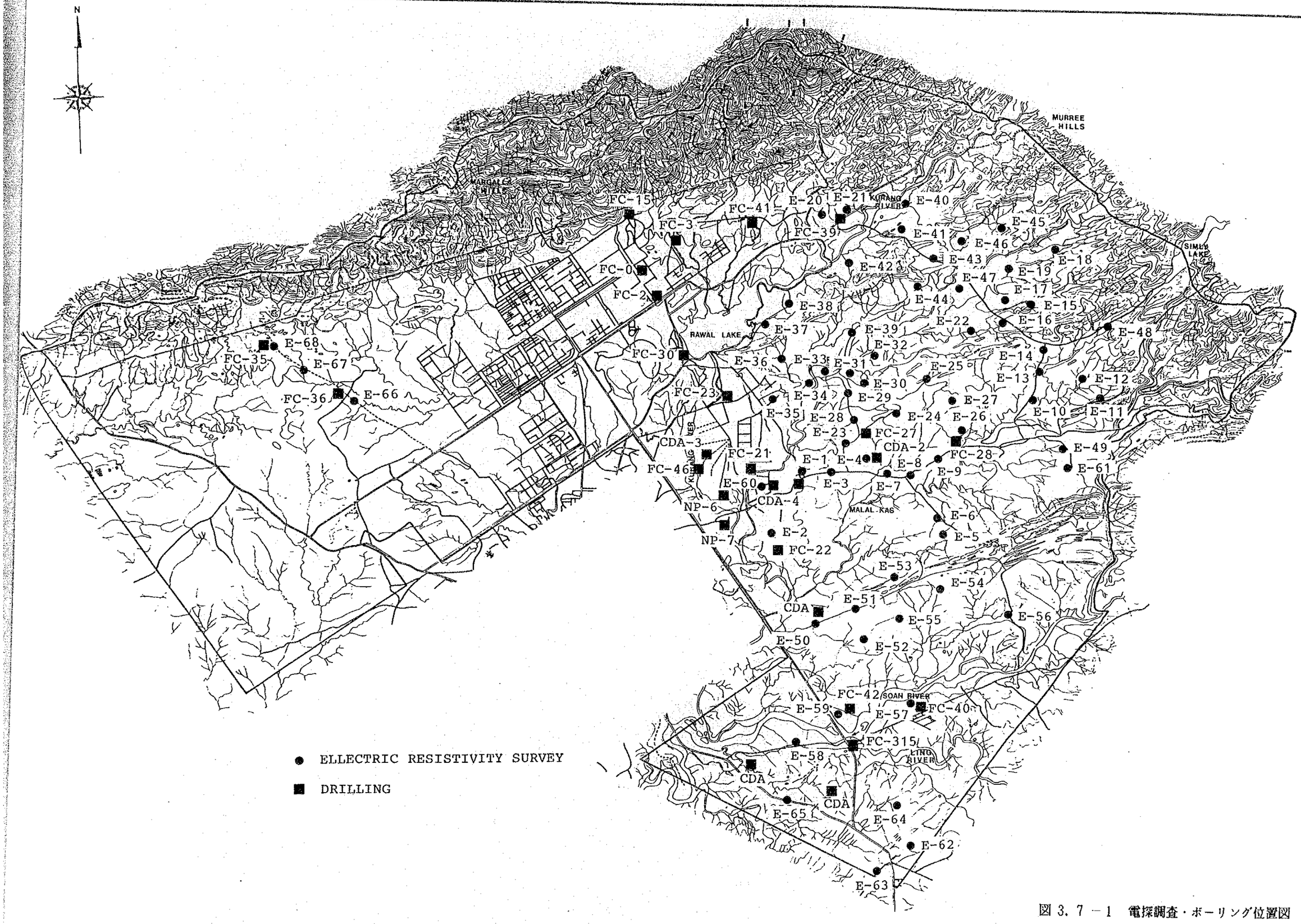


図 3. 7 − 1　電探調査・ボーリング位置図

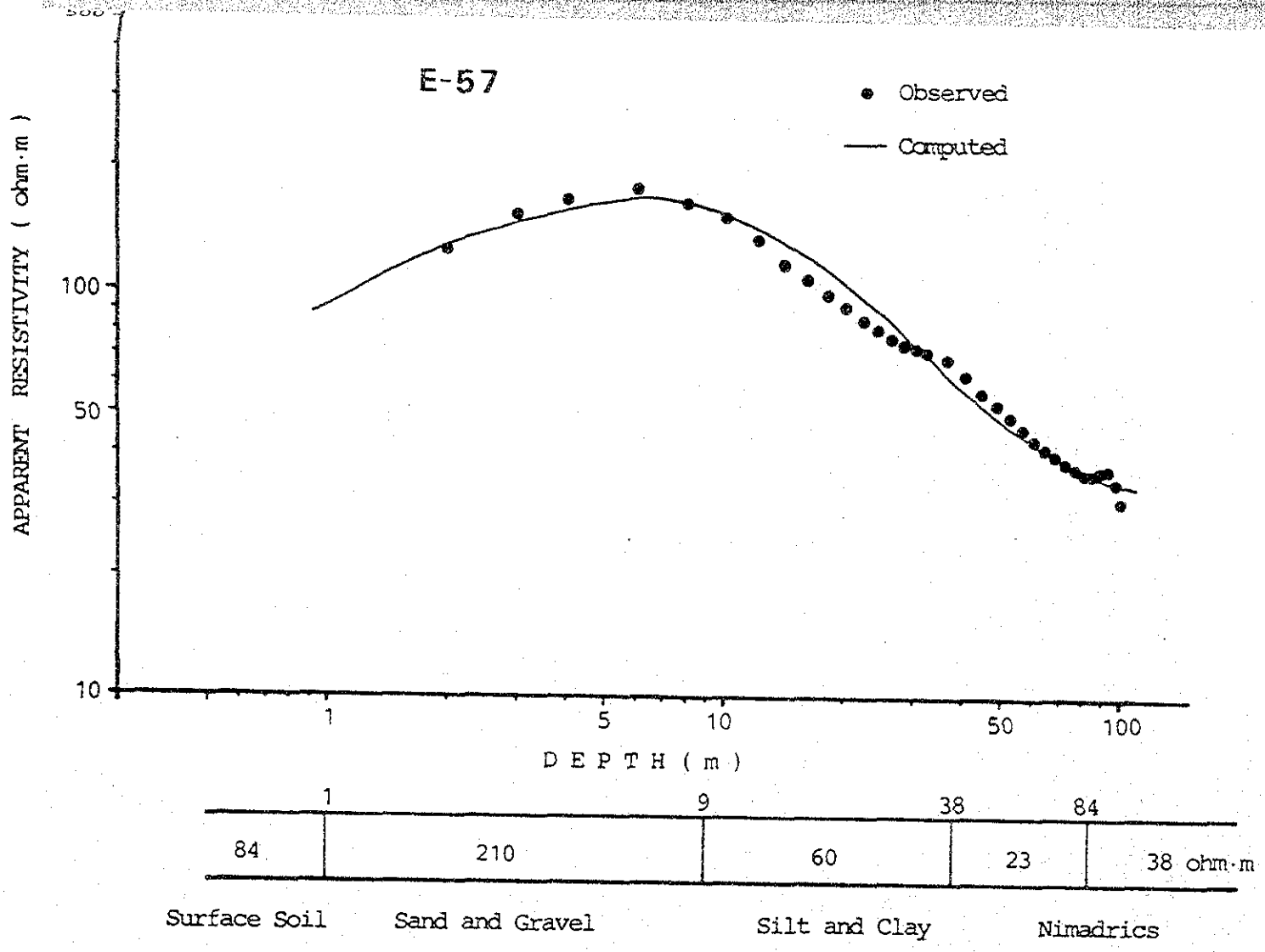


図 3. 7 － 2　電気探査解析結果

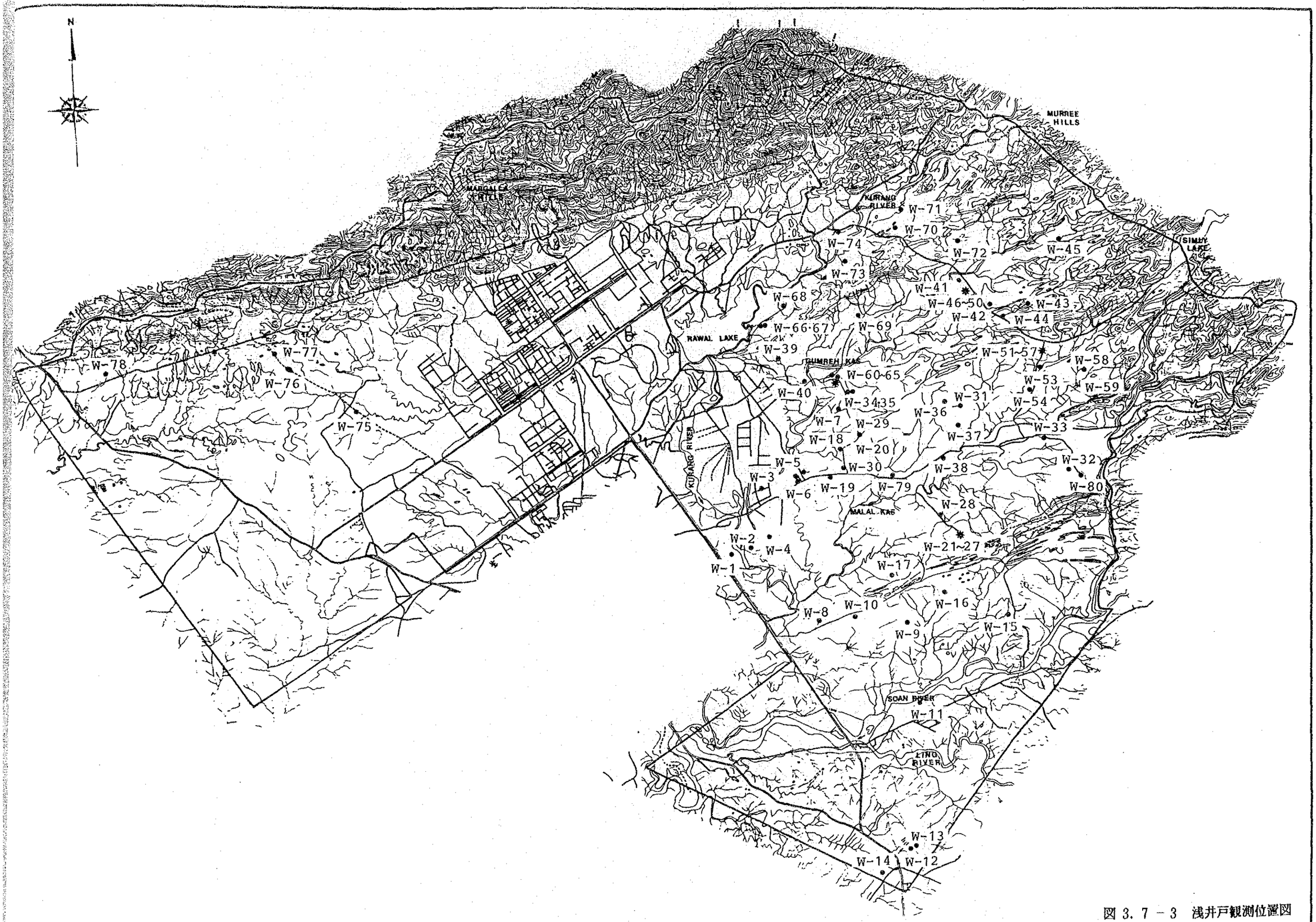


図 3. 7 − 3　浅井戸観測位置図

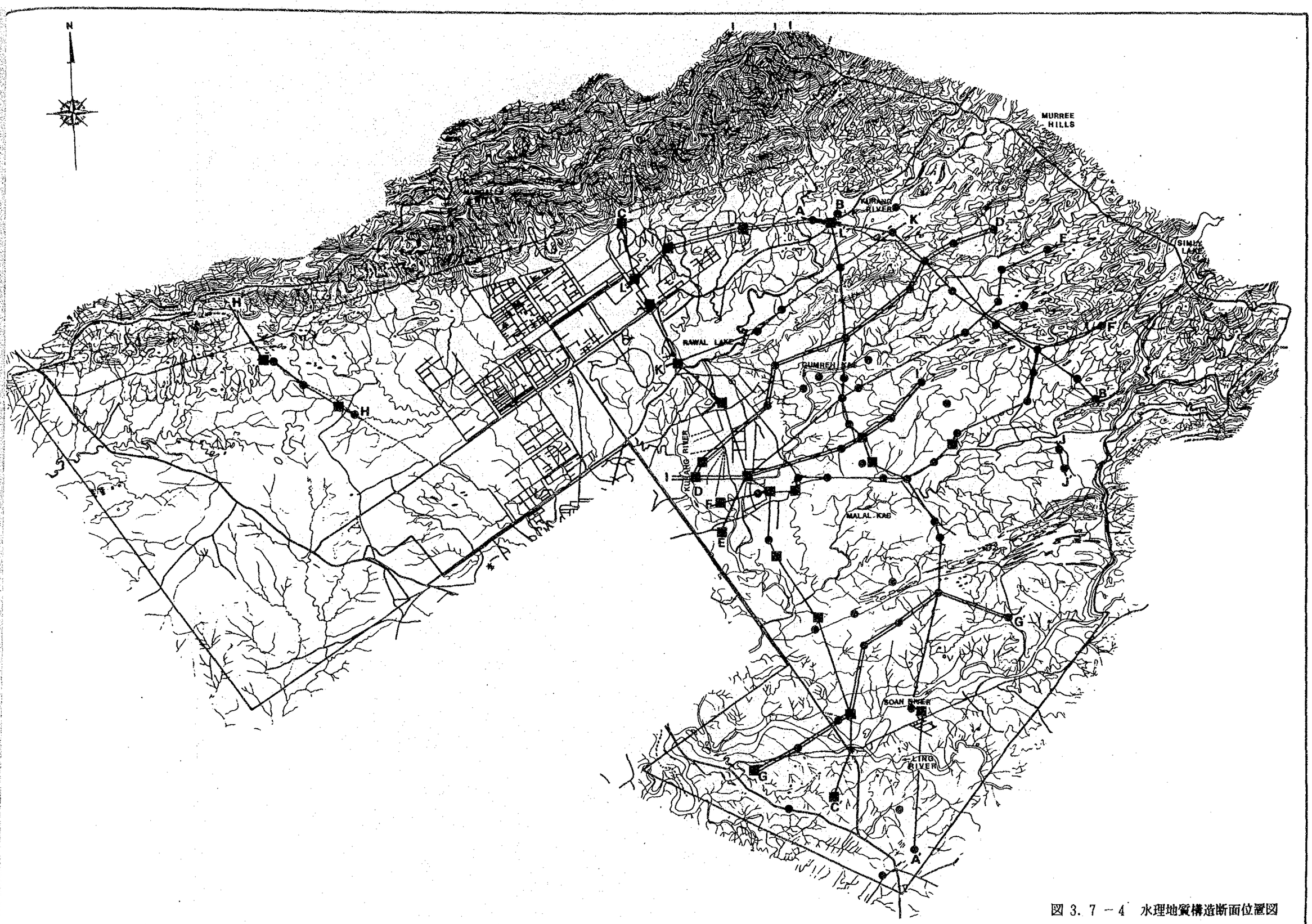


図 3. 7 － 4　水理地質構造断面位置図

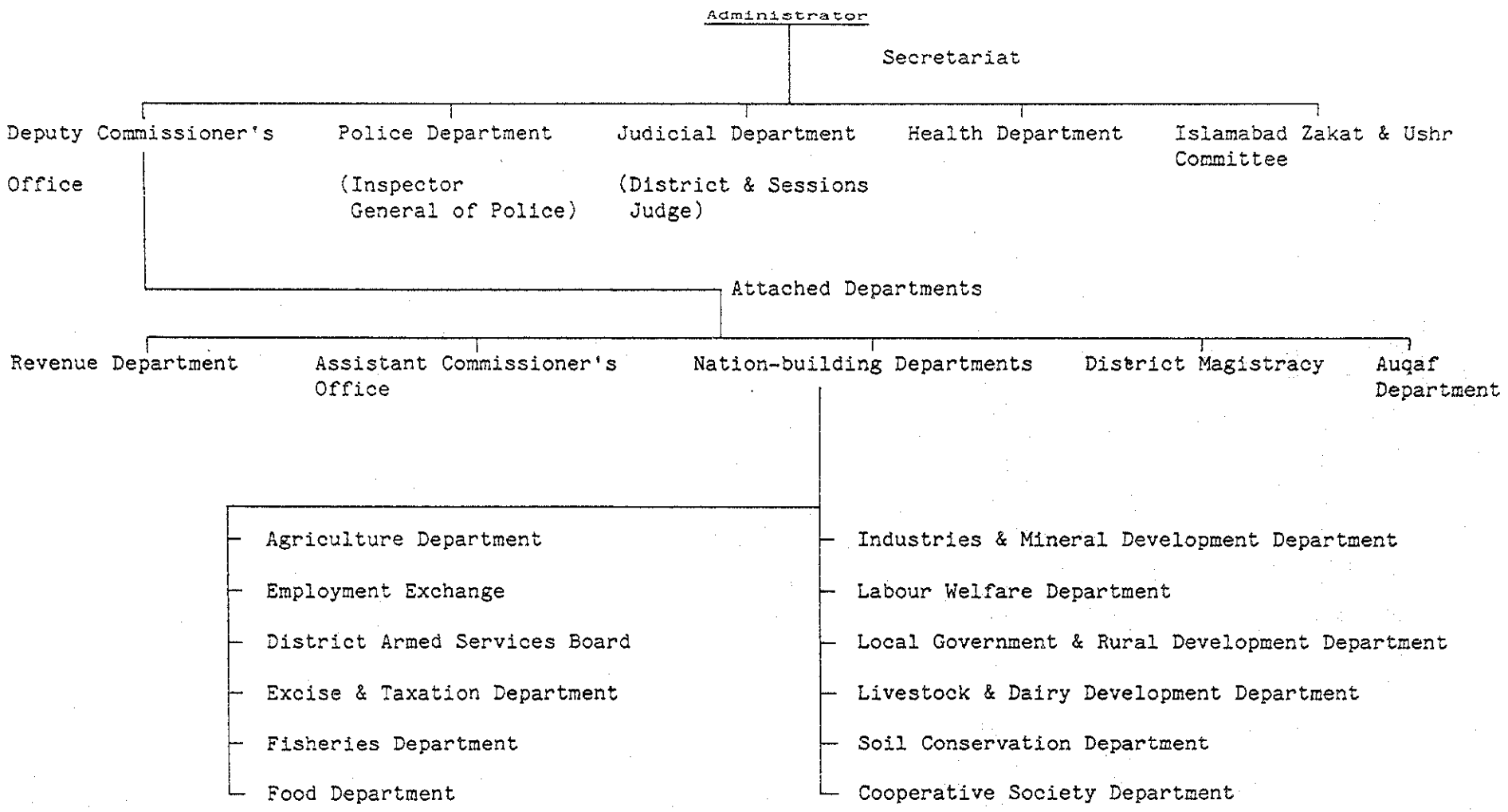


図 4. 1 －1　イスラマバード首都圏庁組織図

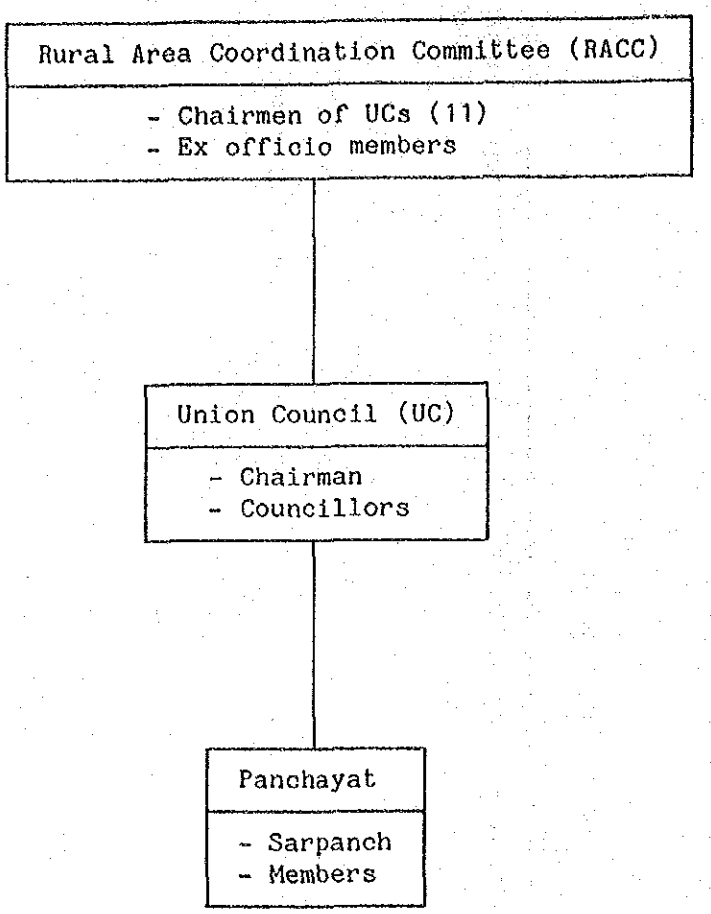


図 4. 1 － 2　首都圏の地方自治体系

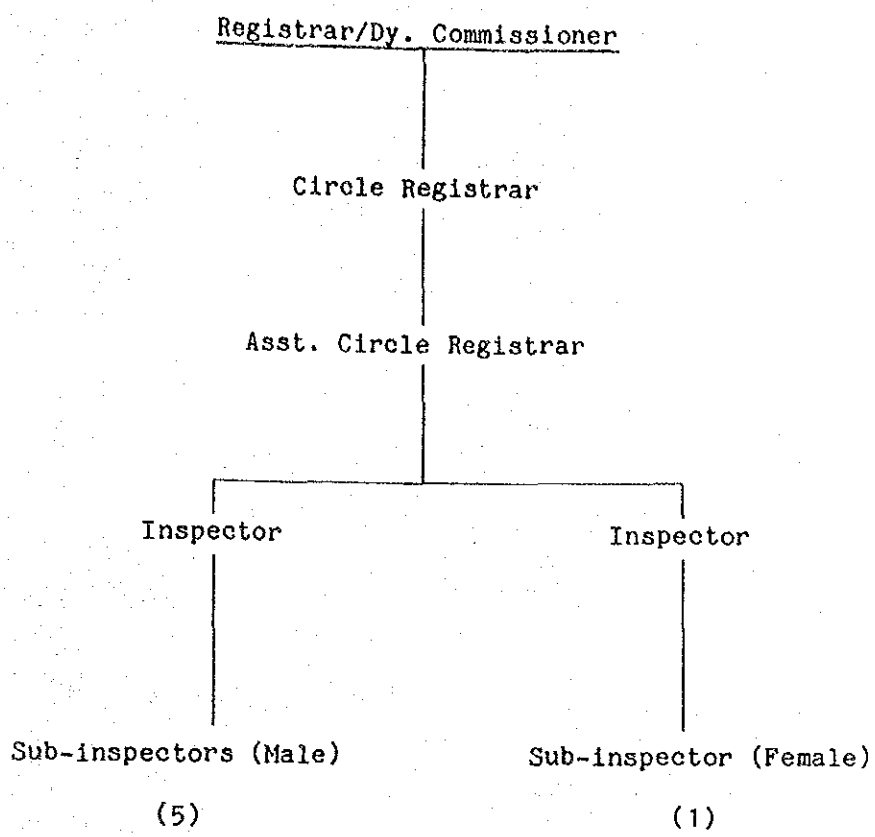


図 4. 2 − 1　共同組合局組織図

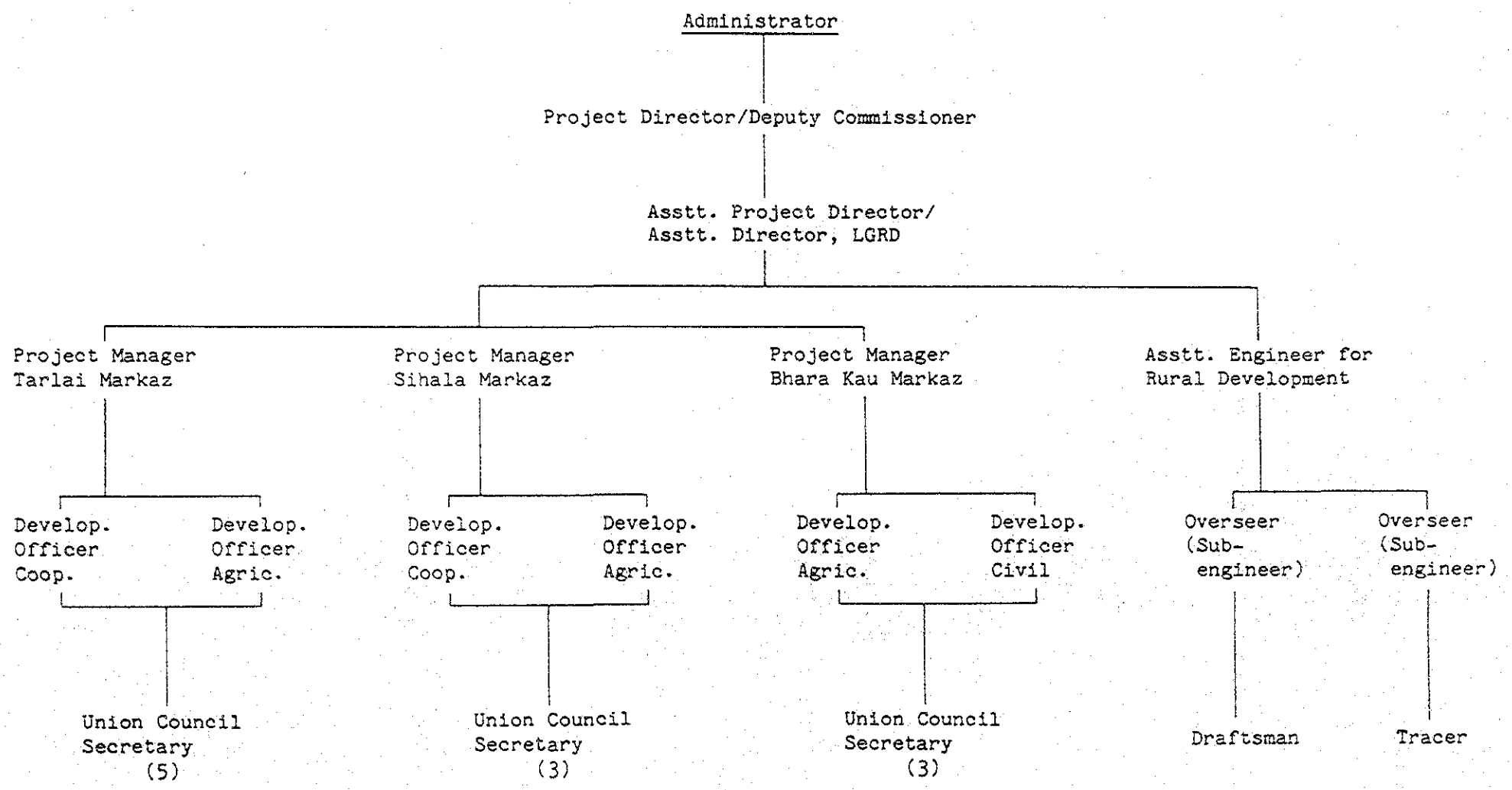


図 4. 2 − 2　地方自治農村開発局 (LGRD) 組織図

INDEX	
	District Boundary
	Study Area
	Roads
	Raiways
	Rivers and Kas

LEGEND				
CLASSIFICATION	AREA ha	AREA %	SYMBOL	REMARKS
Cultivated Land	23,120	38.9		
Rough Broken Land & Stony Land	12,710	21.4		cultivable wasteland & uncultivable wasteland in the plains.
Mountain & Hilly Area	18,370	30.9		include reserved forests.
Others	5,300	8.9	—	
Institutional & Industrial Area	—	—		NARC, PINSTEC industrial area etc.
Right-of-way	—	—	—	rivers, roads, villages etc.
Total	59,500	100.0		

図 4. 4 − 1　現況土地利用図

THE ISLAMIC REPUBLIC OF PAKISTAN MASTER PLAN STUDY FOR INTEGRATED RURAL DEVELOPMENT PROJECT	
Fig. 4.4-1	
Present Land Use	
DATE DECEMBER 1985	SHEET NO.
JAPAN INTERNATIONAL COOPERATION AGENCY	

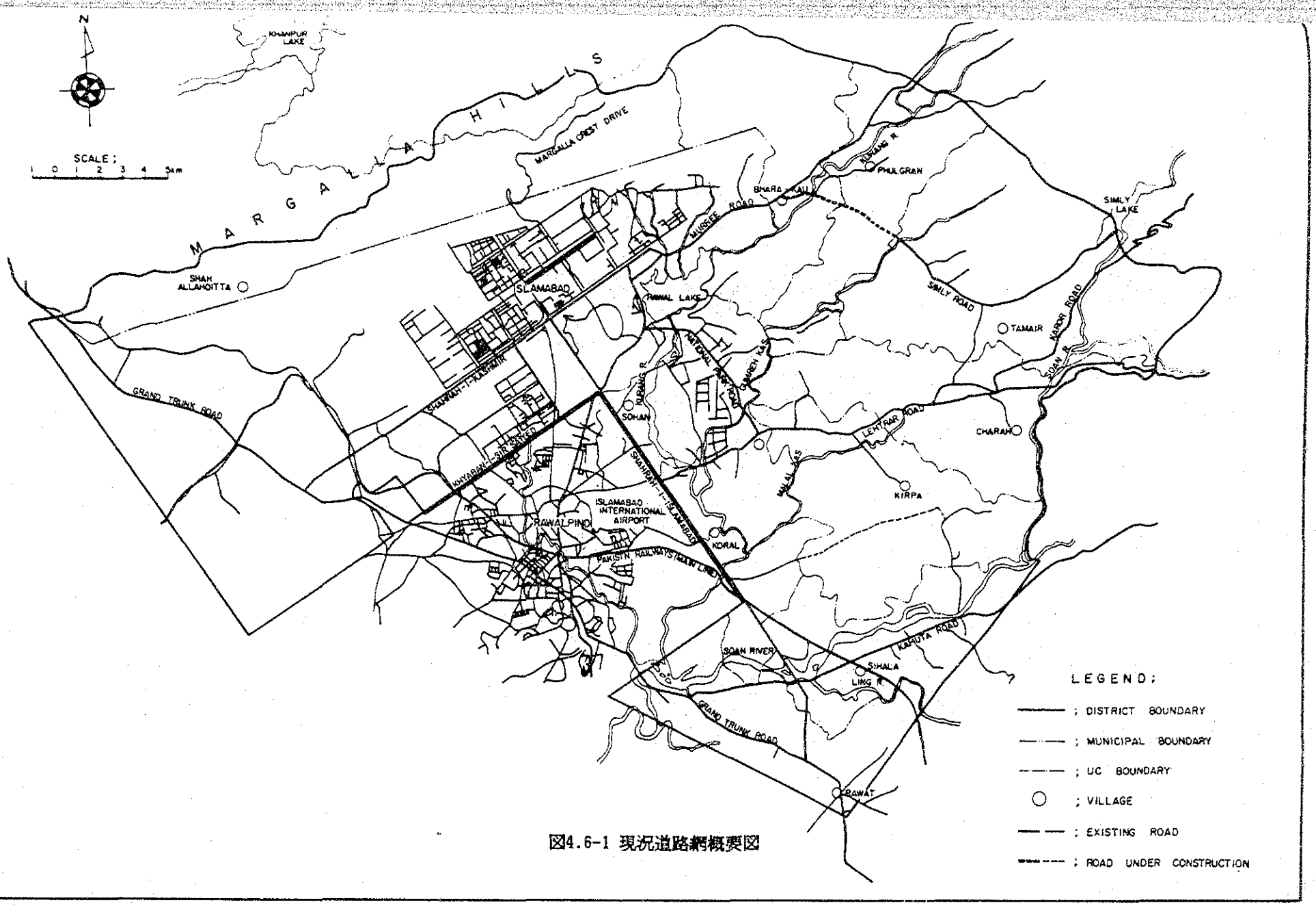


図4.6-1 現況道路網概要図

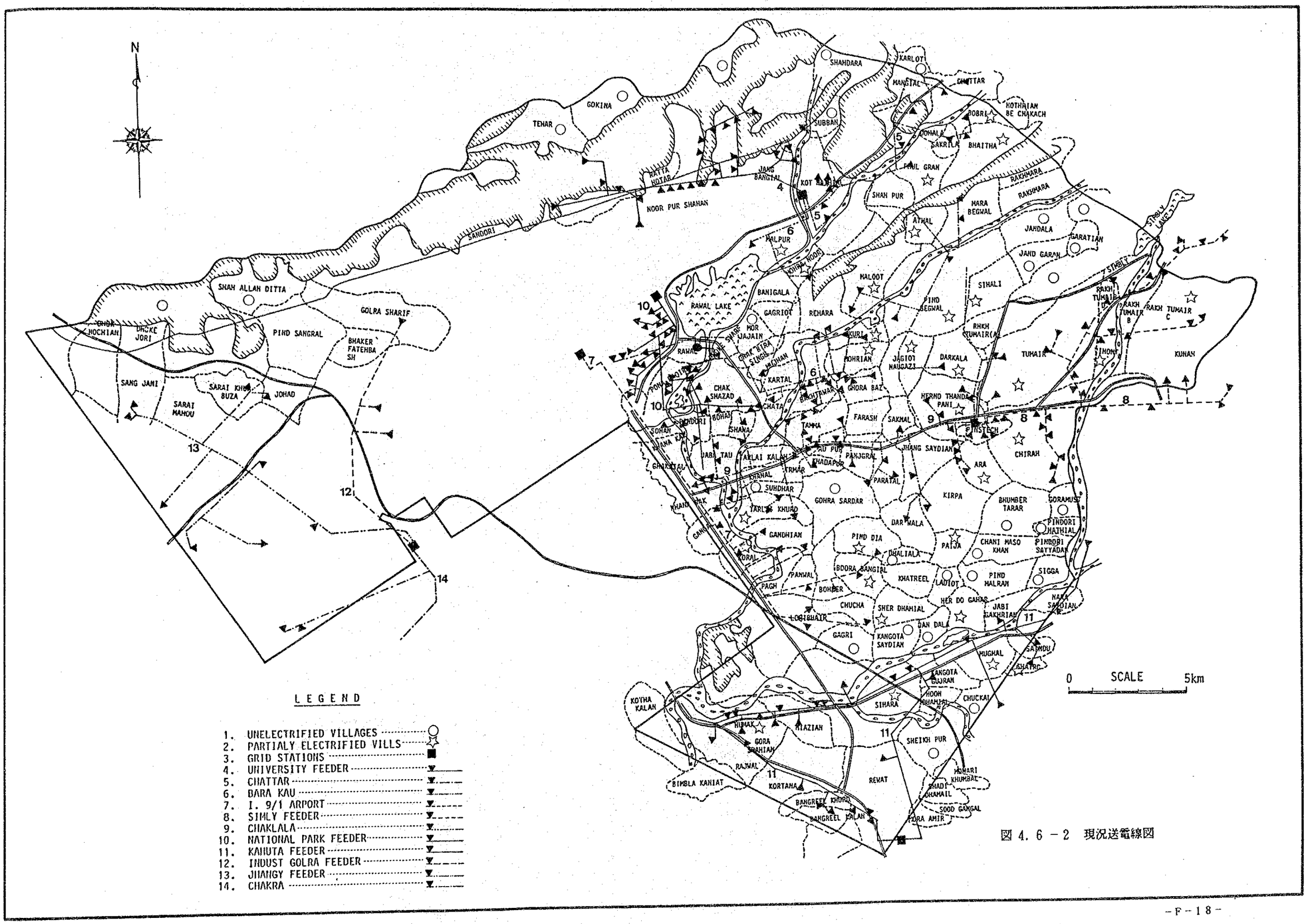
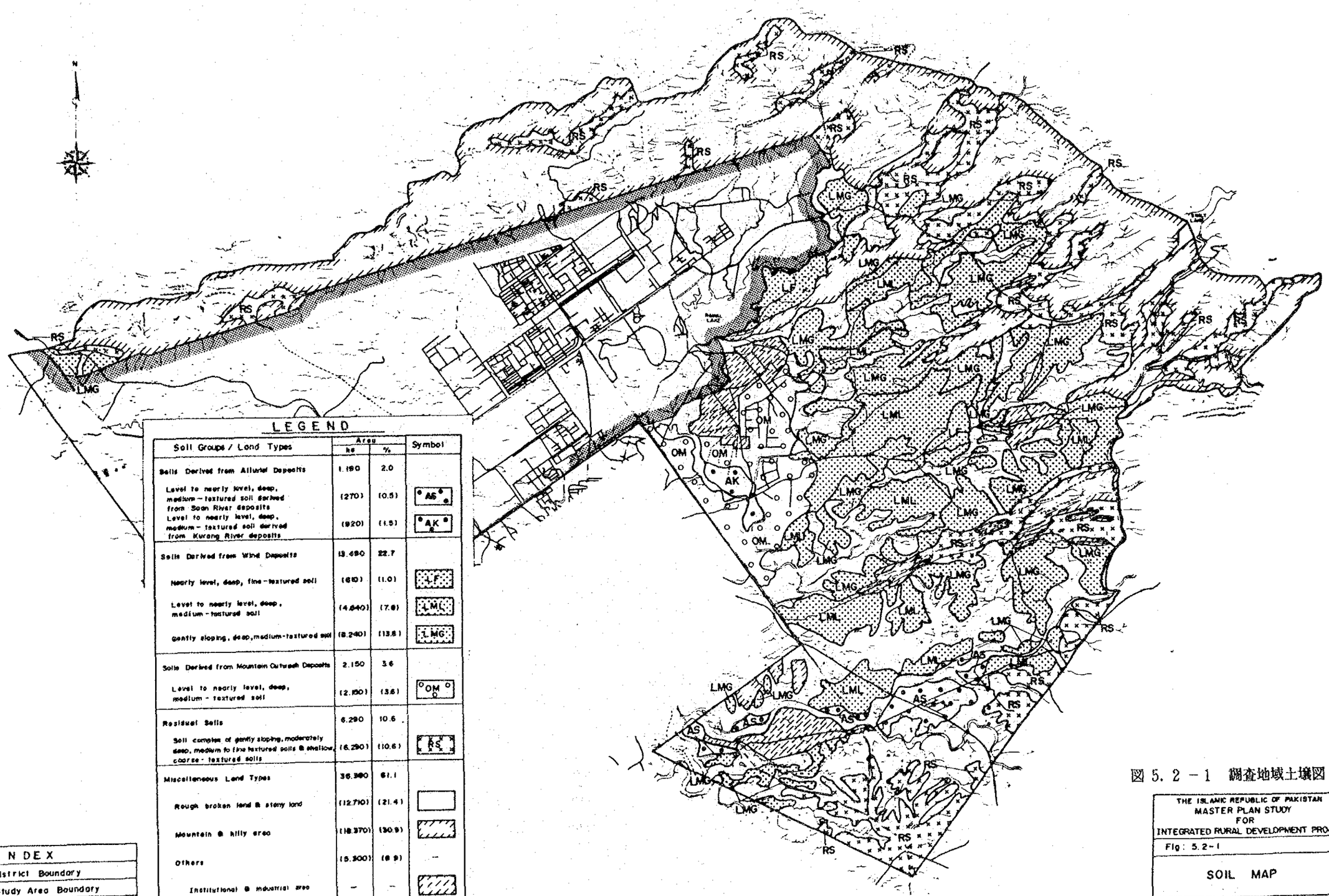

N
LEGEND
1. UNELECTRIFIED VILLAGES
2. PARTIALY ELECTRIFIED VILLS
3. GRID STATIONS
4. UNIVERSITY FEEDER
5. CHATTAR
6. BARA KAU
7. I. 9/1 ARPORT
8. SIMLY FEEDER
9. CHAKLALA
10. NATIONAL PARK FEEDER
11. KAHUTA FEEDER
12. INDUST GOLRA FEEDER
13. JHANGY FEEDER
14. CHAKRA
0 SCALE 5km
TEHAR
GOKINA
SHAHDARA
KARLOT
MANGTAL
CHATTAR
SUBBAN
DOBRI
KOTHAIAN BE CHAKACH
DOHALA
SAKRILA
BHAITHA
PHUL GRAN
RATTA HOTAR
JANG BANGTAL
KOT
NOOR PUR SHAHAN
SHAH PUR
RAKHMARA
HARA BEGWAL
ATHAL
JANDALA
GARATIAN
JAND GARAN
SIMBLY LAKE
SANDORI
SHAH ALLAH DITTA
GOLRA SHARIF
PIND SANGRAL
BHAKER FATEHBA SH
SANG JANI
SARAI MAHOU
SARAI KHAN BUZA
JOHAD
HALPUR
JOHAR NOOR
MALOOT
SIHALI
BANIGALA
RAWAL LAKE
GAGRIOT
REHARA
PIND BEGWAL
RAKH TUMAIR A
RAKH TUMAIR B
RAKH TUMAIR C
TUHAIR
KUNAH
RAWAL
MOR JAJAIN
KURI
MOHRIAN
JAGIOT NAUGAZI
DARKALA
CHAK SHAZAD
KARTAL
GHORA BAZ
HERNO THANDA PANI
CHATA
FARASH
SAKNAL
BOHAI
SHANA
TAMKA
CHITTA KALAH
CHADAPUR
PANJGRAL
JHANG SAYDIAN
CHIRAH
ARA
SUHDHAR
PARATAL
GOHRA SARDAR
KIRPA
BHUMBER TARAR
GORAMUST
TARLA KHURD
DAR WALA
PINDORI MATHIAL
GANDHIAN
PIND DIA
PAIJA
CHANI MASO KHAN
PINDORI SAYYADAN
DHALIALA
BOORA BANGTAL
KHATREEL
LADIOT
PIND MALRAM
SIGGA
PANWAL
PAGH
BOHBER
CHUCHA
SHER DHAMIAL
HER DO GAHAS
JABI GAKHRIAN
NARA SAYDIAN
LOTIBHAIR
GAGRI
KANGOTA SAYDIAN
JAN DALA
HUGHAL
SAGHDU
KANGOTA GUJRAN
KO'THA KALAN
SIHARA
HOON KHAMIAL
CHUCKAI
HUMAK
MIAZIAN
GORA SHAHIAN
SHEIKH PUR
RAJWAL
BIMBLA KANIAT
KORTANA
REWAT
HUMARI KHUMBAL
SHADI KHAMAIL
BANGREEL KHURD
BANGREEL KALAN
SOOD GANGAL
TORA AMIR

図 4. 6 − 2　現況送電線図



LEGEND

Soil Groups / Land Types	Area ha	Area %	Symbol
Soils Derived from Alluvial Deposits	1,190	2.0	
Level to nearly level, deep, medium-textured soil derived from Soan River deposits	(270)	(0.5)	AS
Level to nearly level, deep, medium-textured soil derived from Kurang River deposits	(920)	(1.5)	AK
Soils Derived from Wind Deposits	13,490	22.7	
Nearly level, deep, fine-textured soil	(610)	(1.0)	LF
Level to nearly level, deep, medium-textured soil	(4,640)	(7.8)	LML
gently sloping, deep, medium-textured soil	(8,240)	(13.8)	LMG
Soils Derived from Mountain Outwash Deposits	2,150	3.6	
Level to nearly level, deep, medium-textured soil	(2,150)	(3.6)	OM
Residual Soils	6,290	10.6	
Soil complex of gently sloping, moderately deep, medium to fine textured soils & shallow, coarse-textured soils	(6,290)	(10.6)	RS
Miscellaneous Land Types	36,380	61.1	
Rough broken land & stony land	(12,710)	(21.4)	
Mountain & hilly area	(18,370)	(30.9)	
Others	(5,300)	(8.9)	–
Institutional & industrial area	–	–	
Rivers, roads, villages etc	–	–	–
Study Area	59,800	100.0	

INDEX

- District Boundary
- Study Area Boundary
- Roads
- Railways
- Rivers or Kas

図 5. 2 − 1　調査地域土壌図

THE ISLAMIC REPUBLIC OF PAKISTAN
MASTER PLAN STUDY
FOR
INTEGRATED RURAL DEVELOPMENT PROJECT

Fig: 5.2-1

SOIL MAP

DATE DECEMBER 1985 SHEET No.

JAPAN INTERNATIONAL COOPERATION AGENCY

図 5. 2 － 2　Mini Dam位置図

No.	Location
1	Lubana
2	Morian
3	Sakrilla
4	Cherah
5	Chak
6	Sihala
7	Kunjan
8	Kokina
9	Noru Syidam
10	Barghial
11	Shahdara

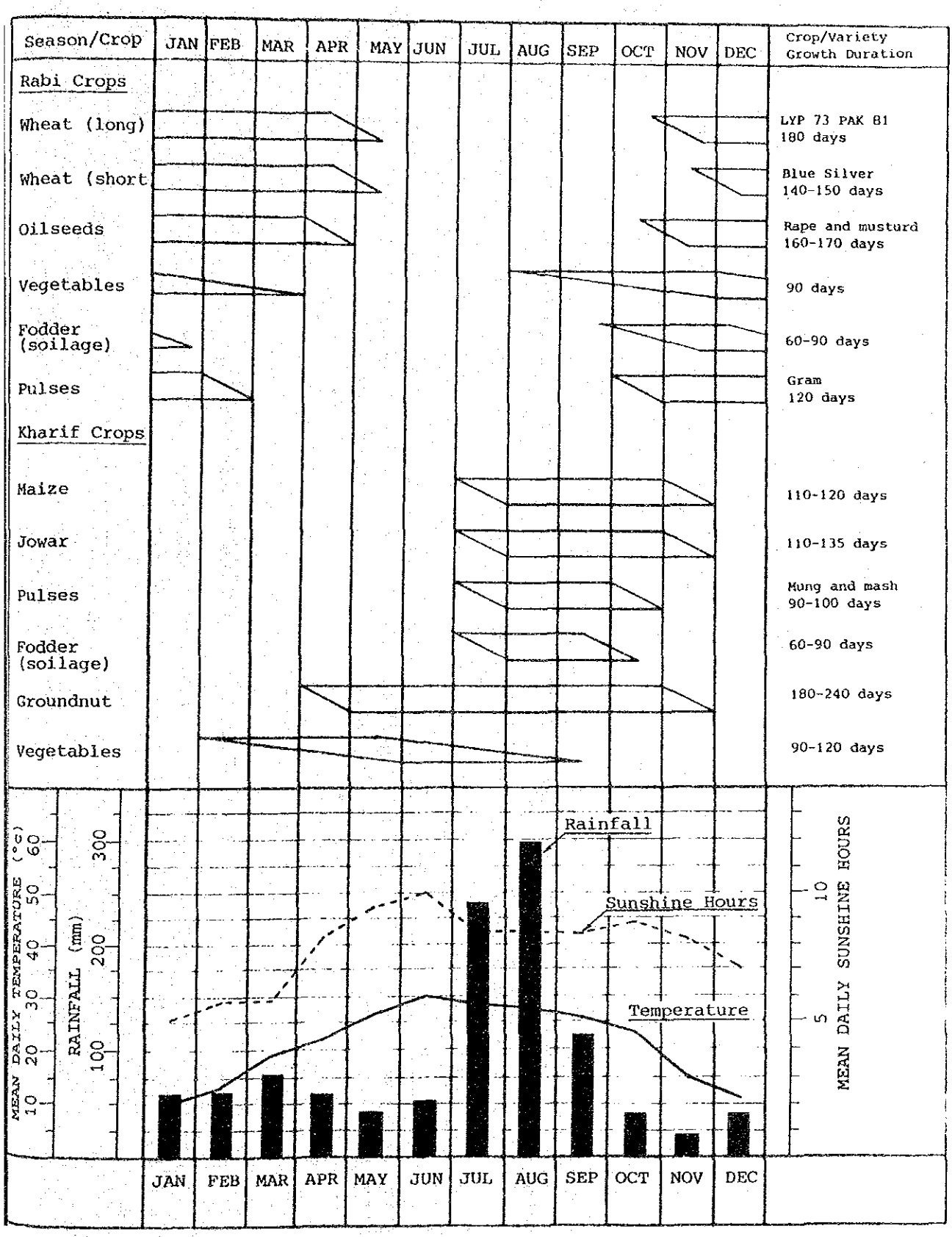


図 5. 4 － 1　主要作物の作期（現況）

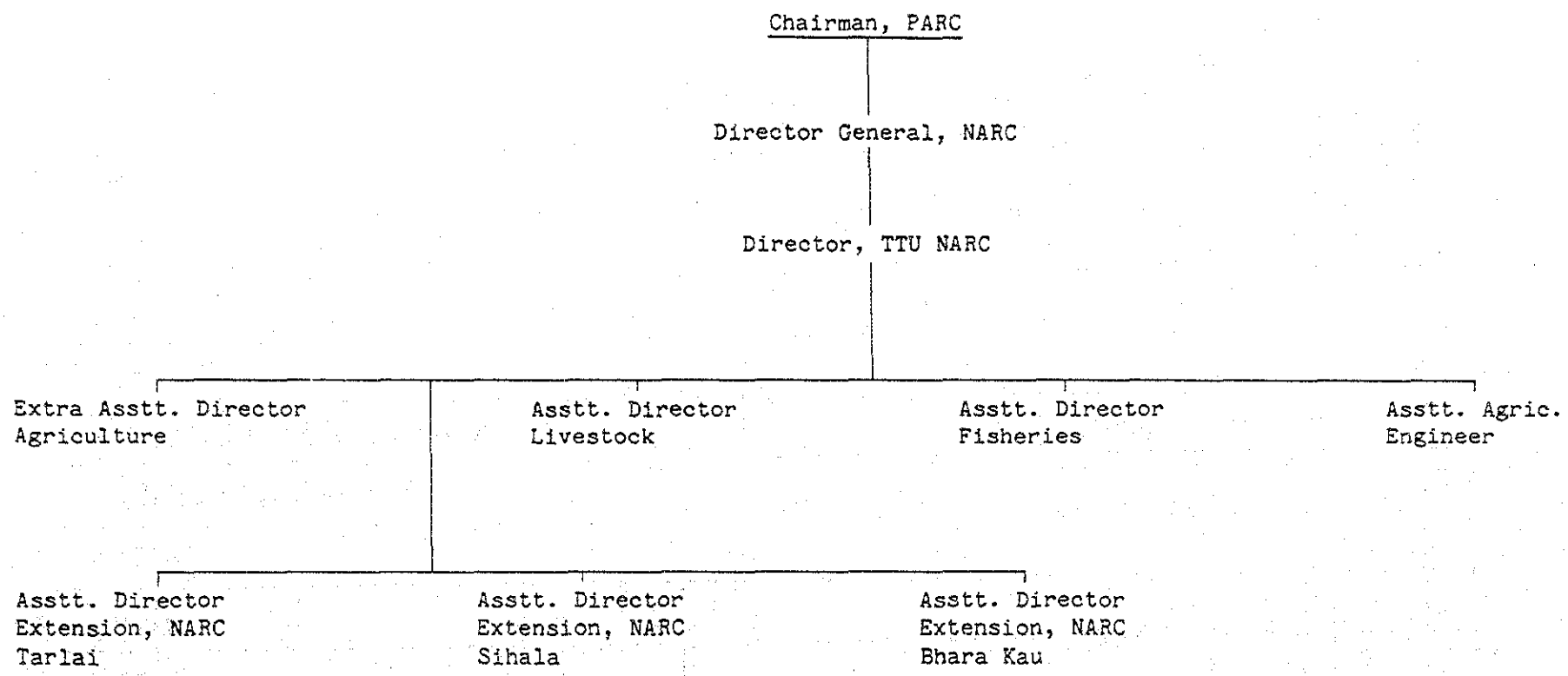


図 5.10 －1　首都圏農業普及関連機構図

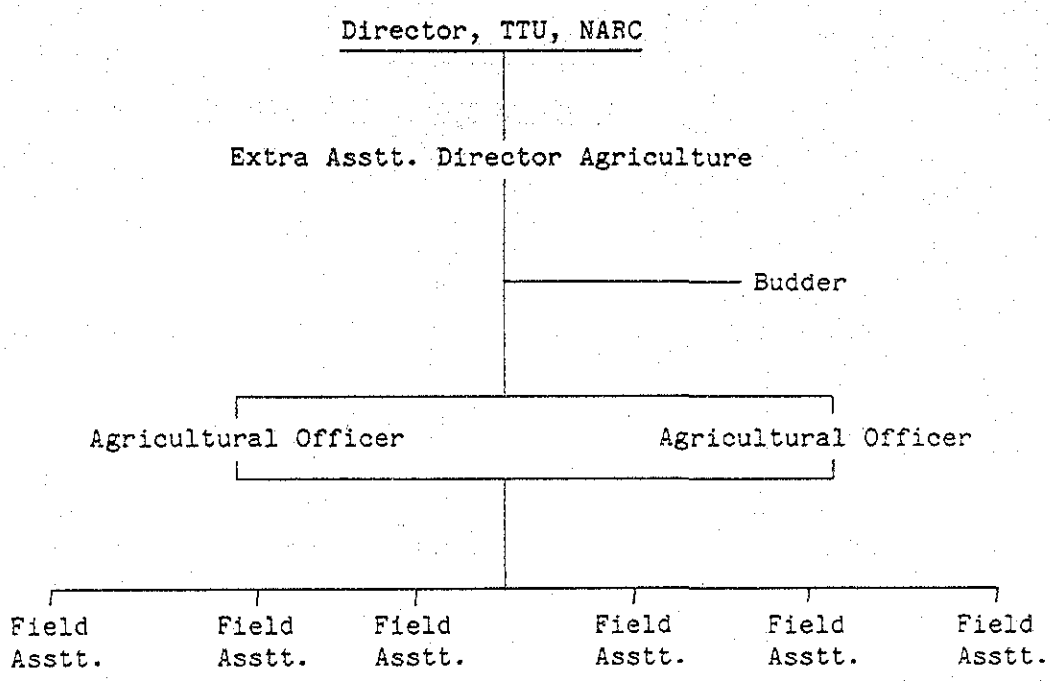


図 5.10 －2　農業部組織図

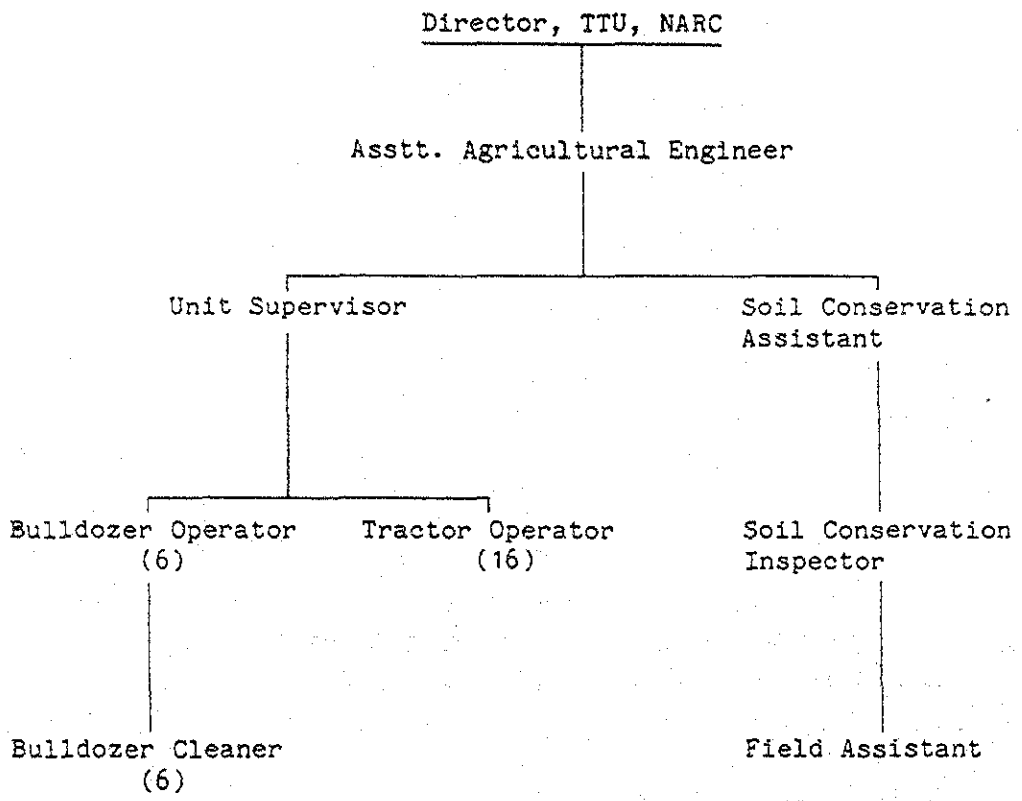


図 5.10 －3　土壌保全部組織図

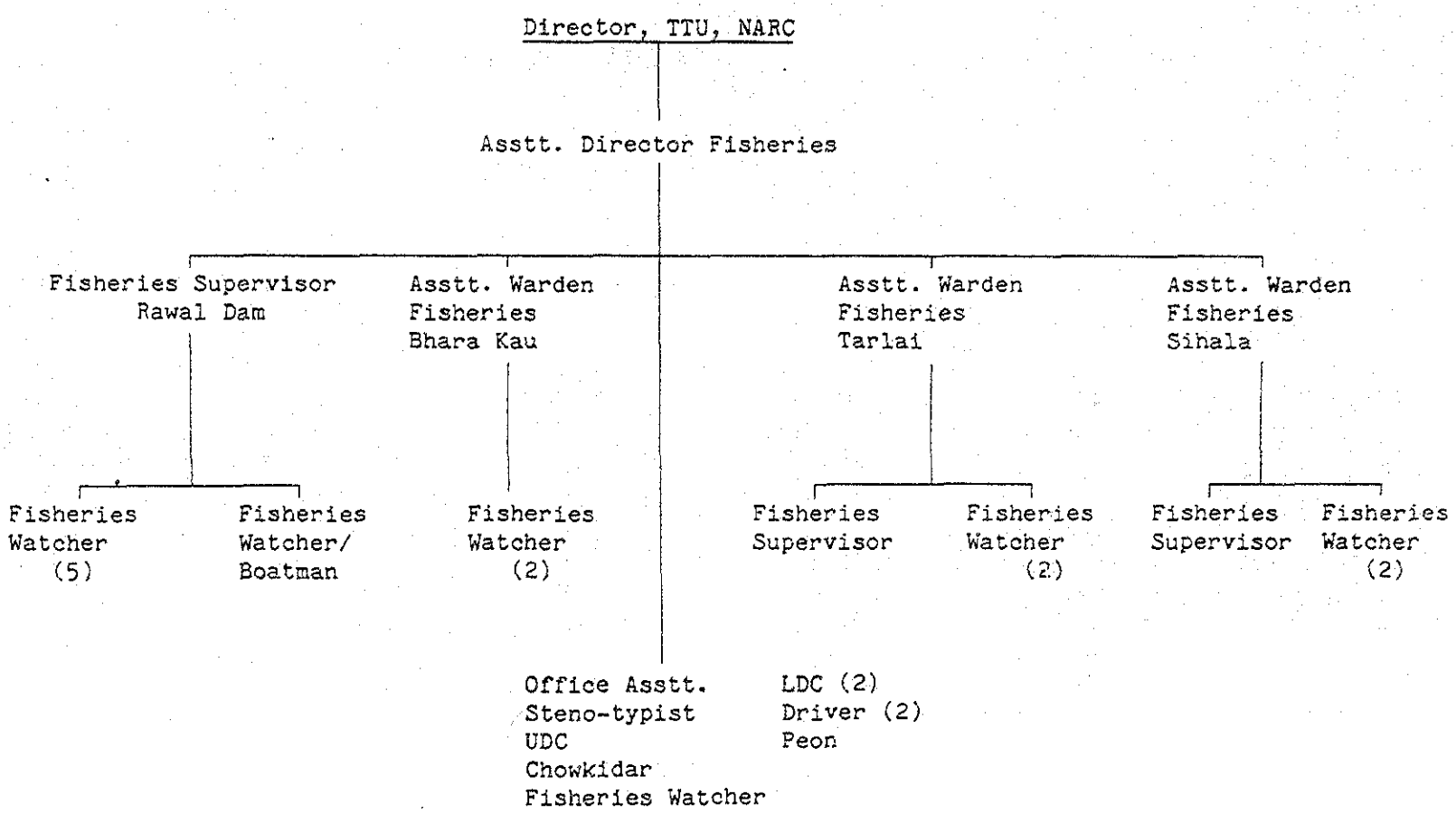


図 5.10 －4　水産部組織図

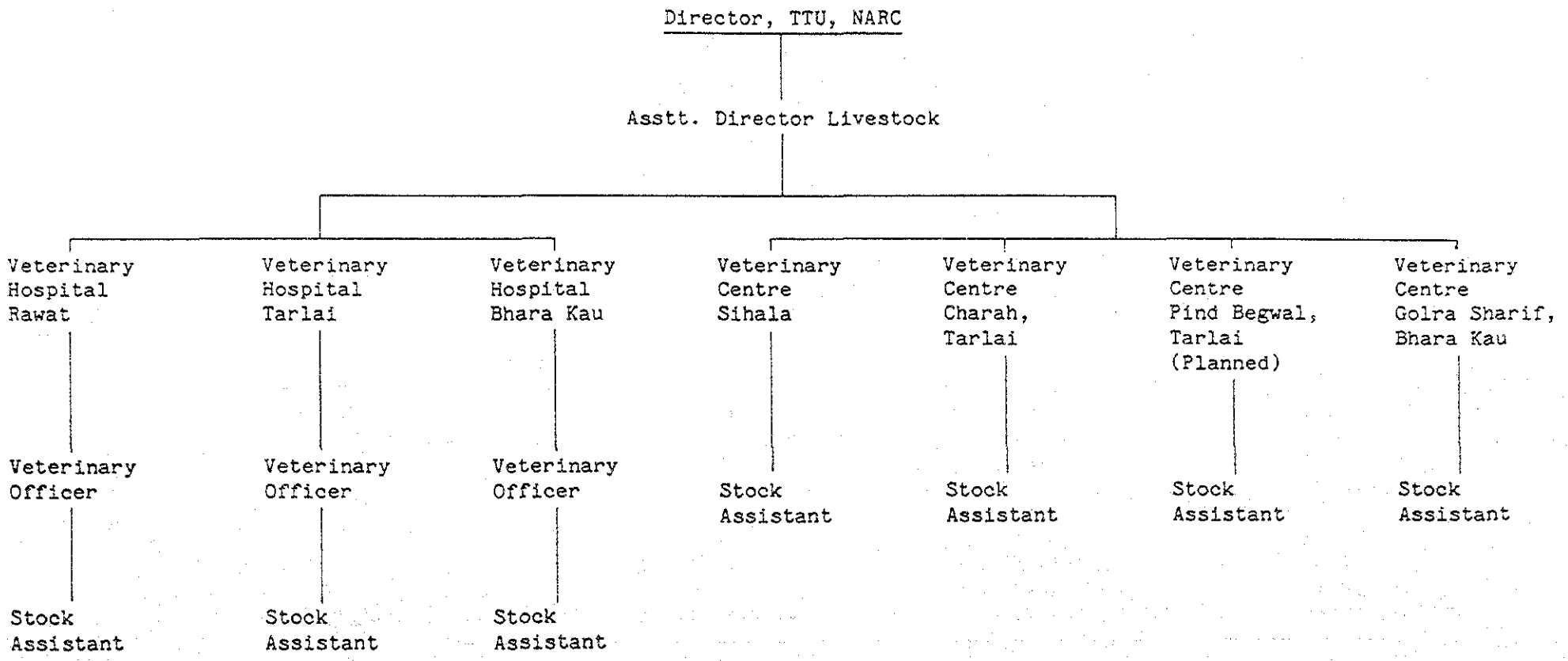


図 5.10 － 5　畜産部組織図

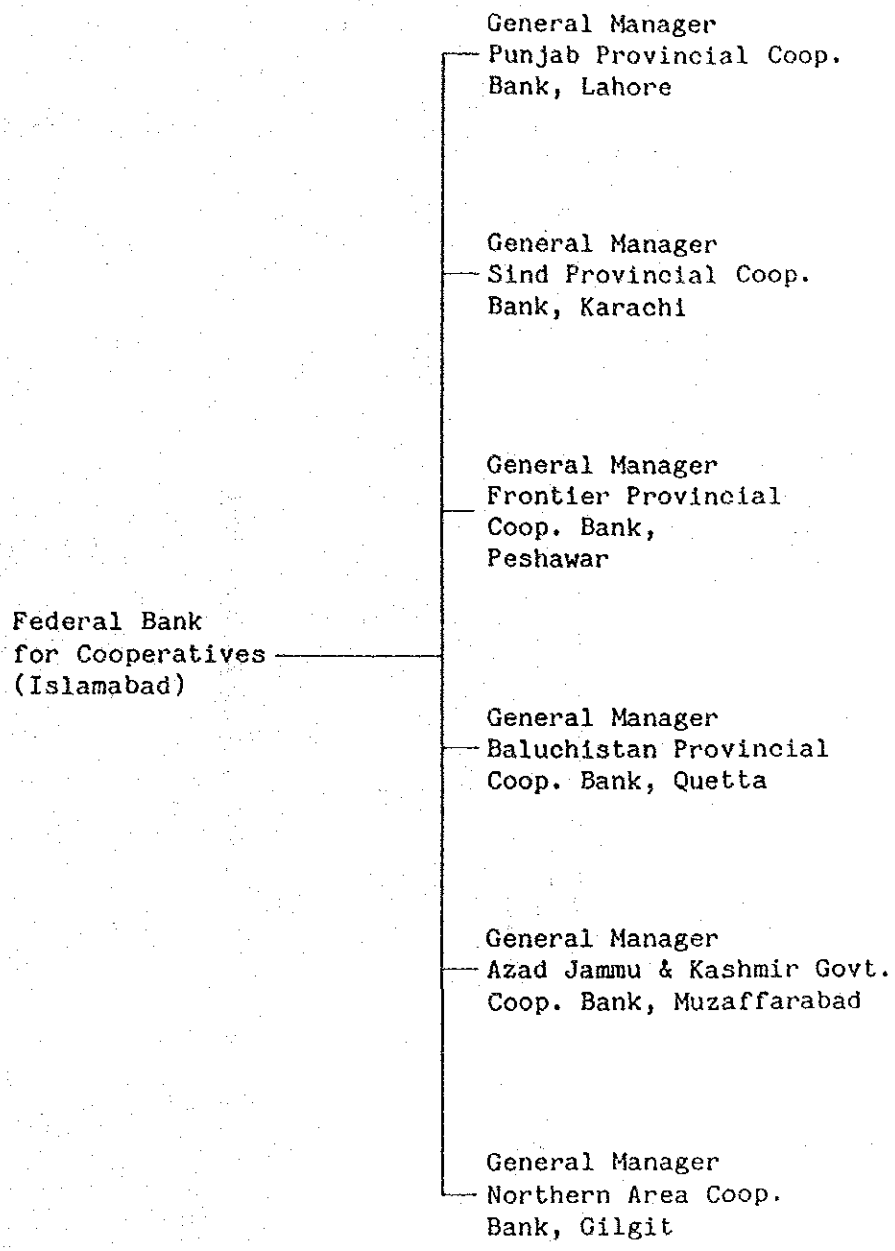


図 5.10 －6　連邦・州協同組合銀行組織図

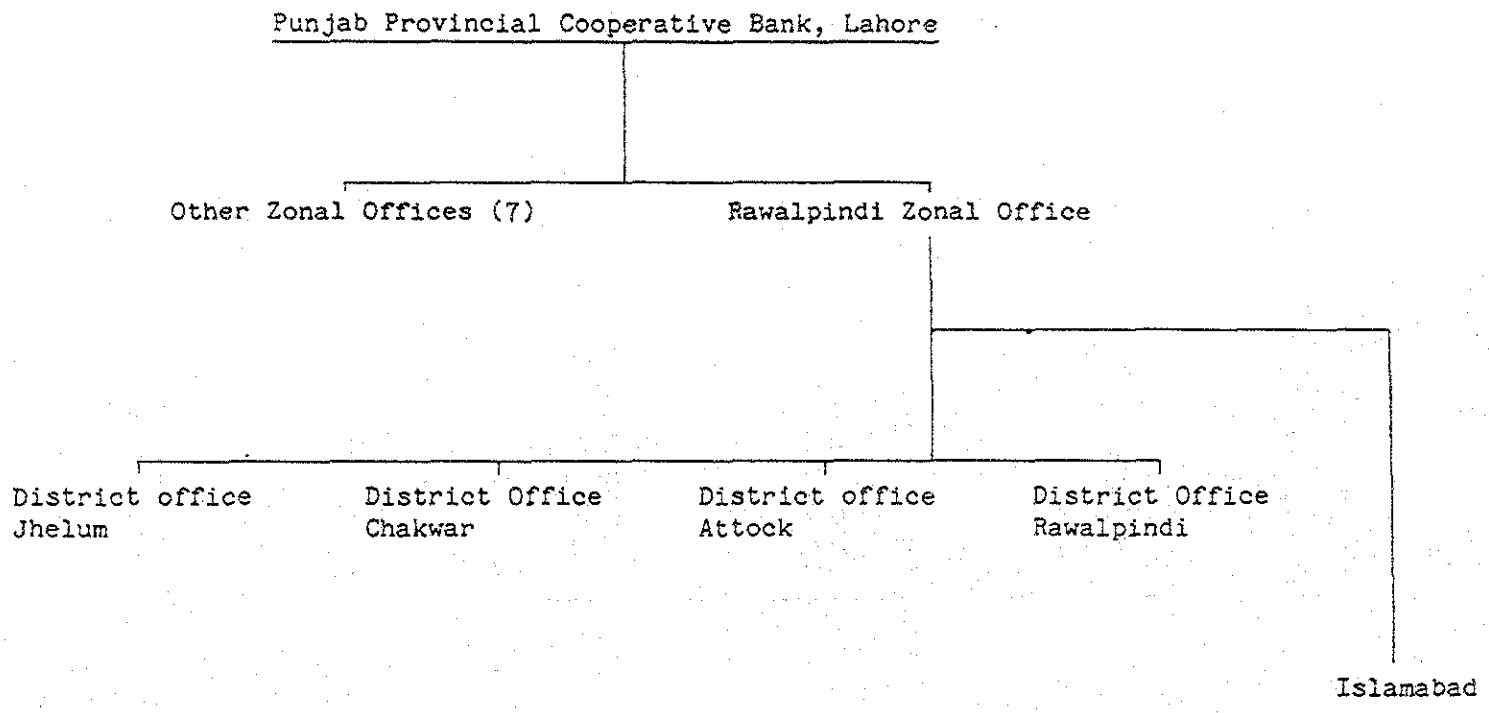


図 5.10 －7　パンジャブ州協同組合銀行組織図

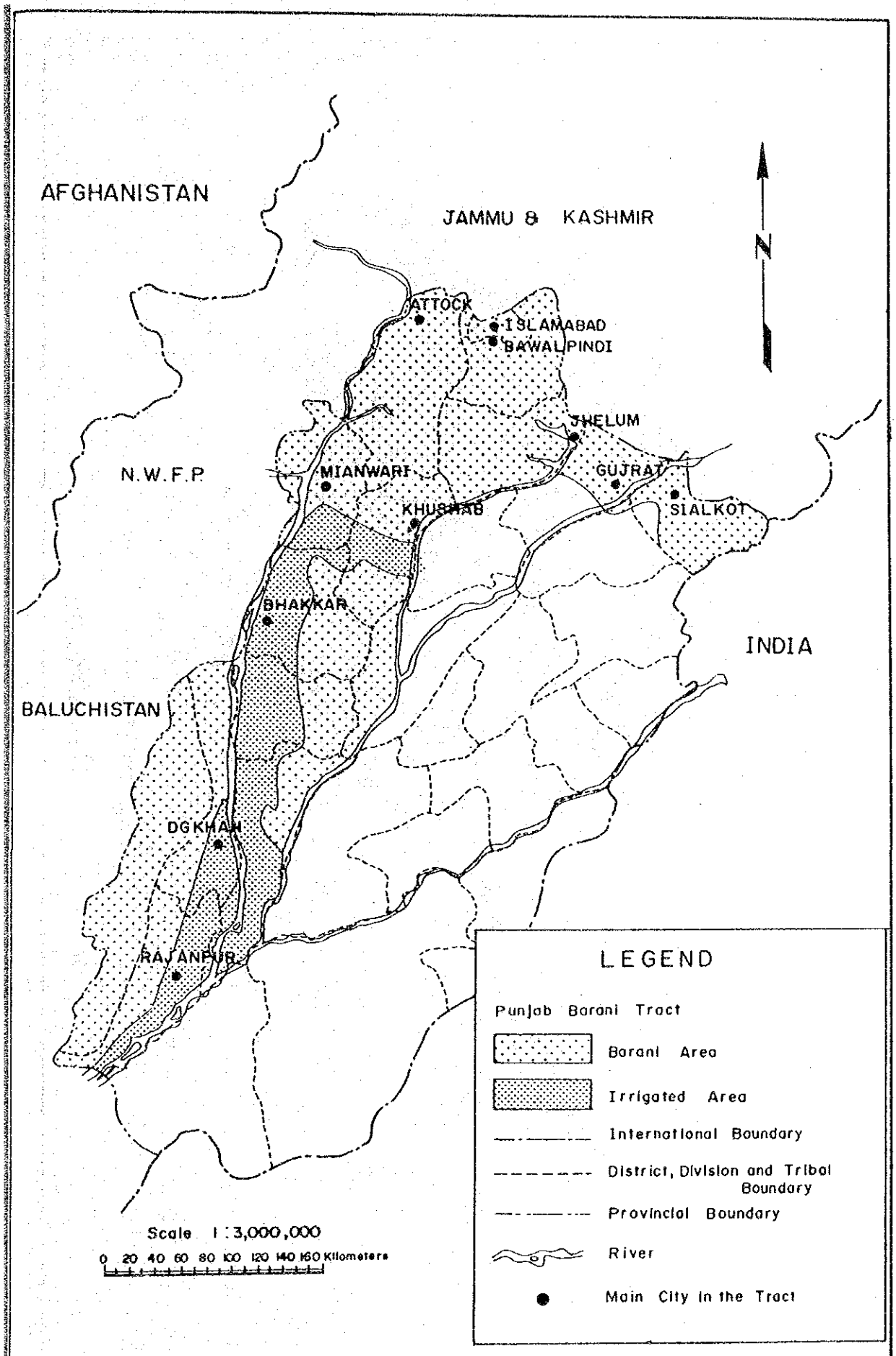


図 6. 1 －1　パンジャブ・バラニ地帯

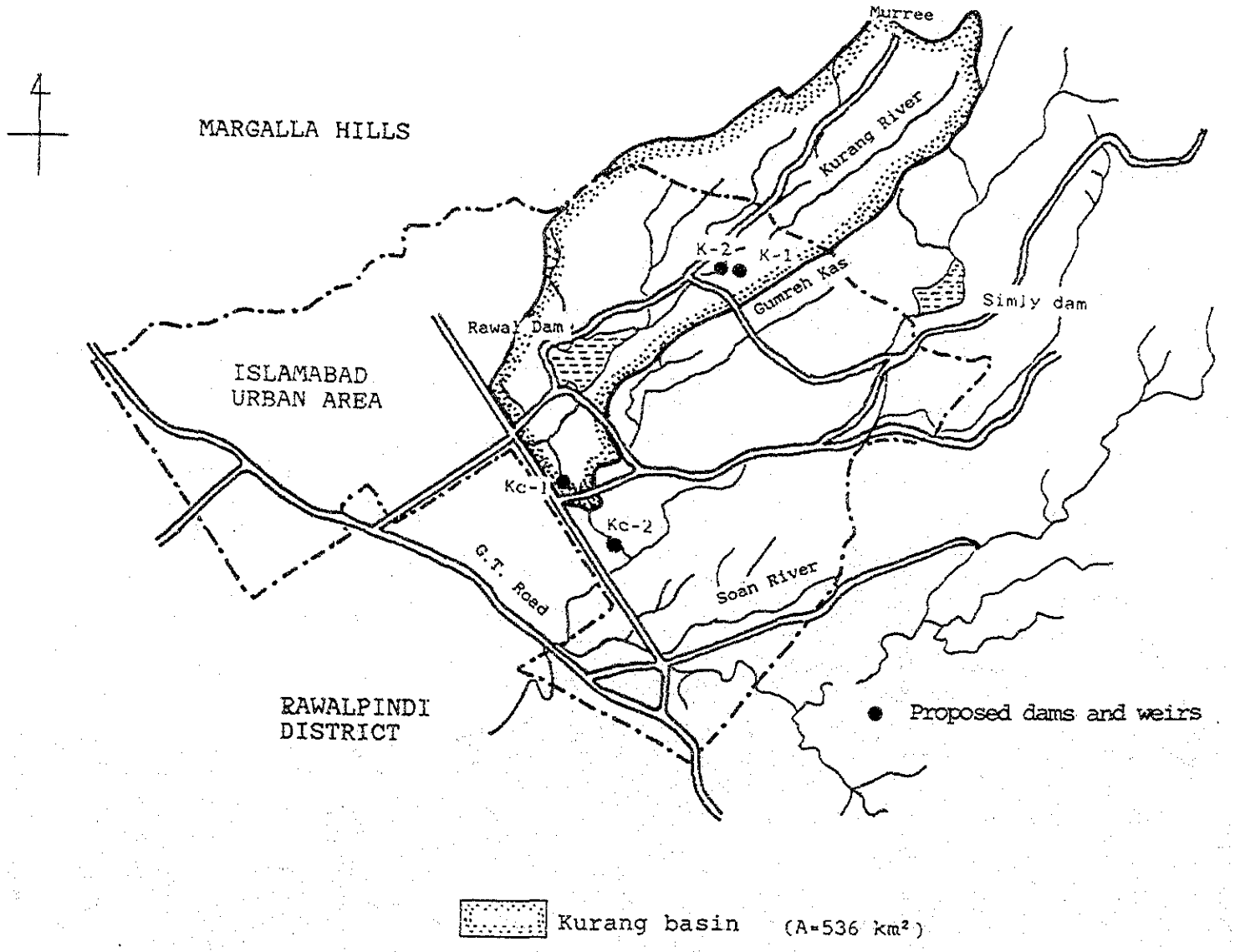


図 9. 2 － 1　Kurang川水資源開発位置図

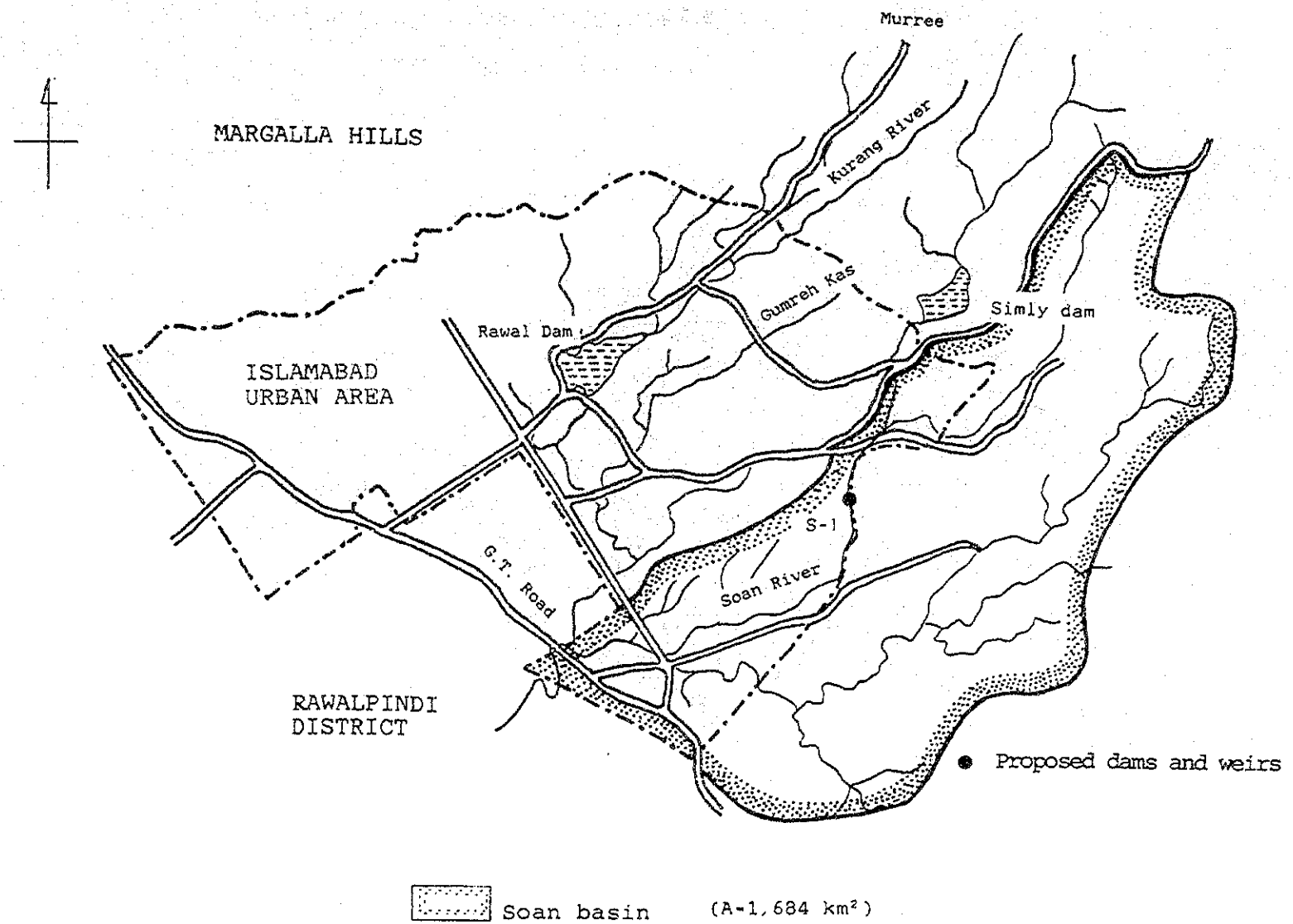


図 9. 2 － 2　Soan川水資源開発位置図

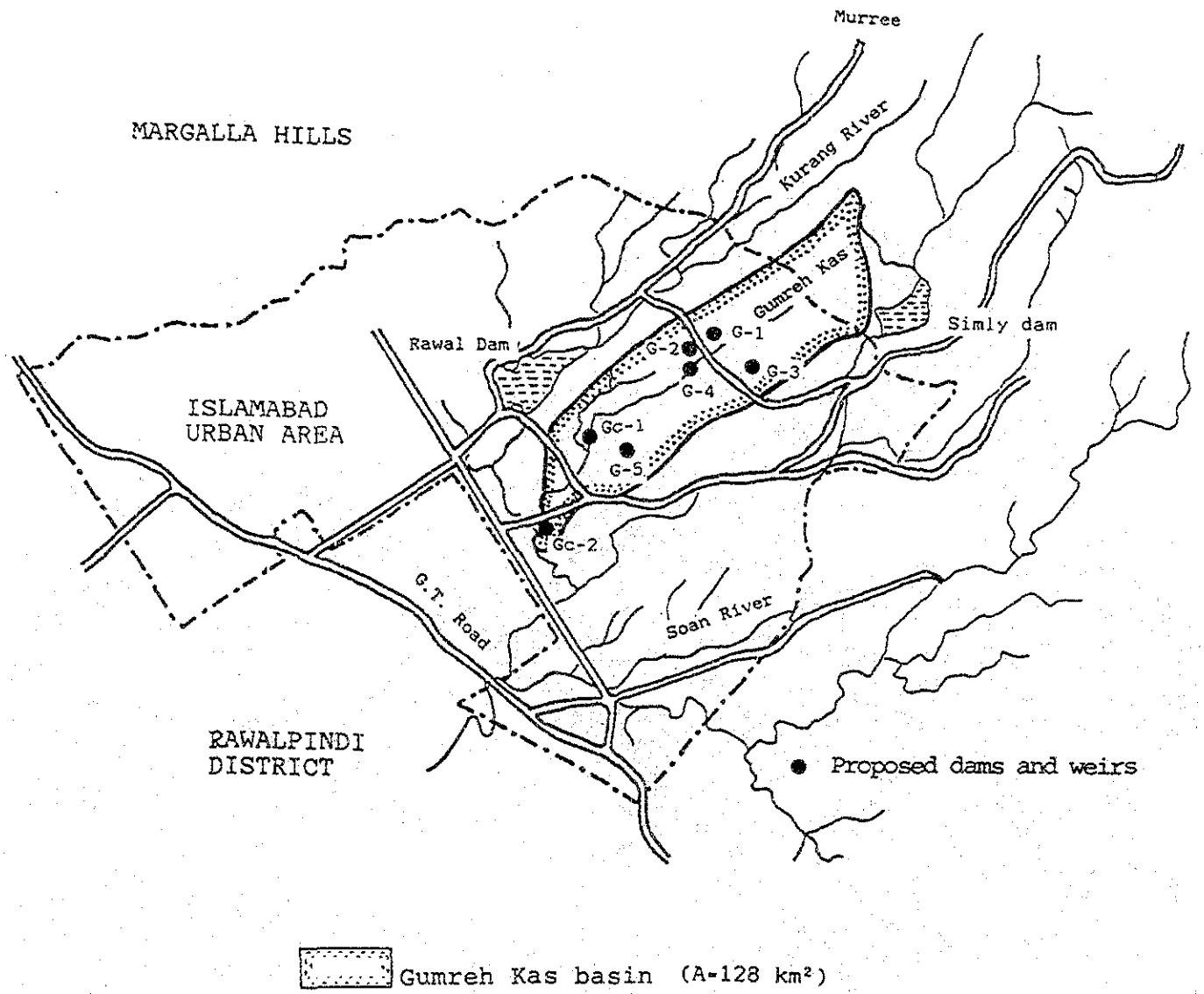
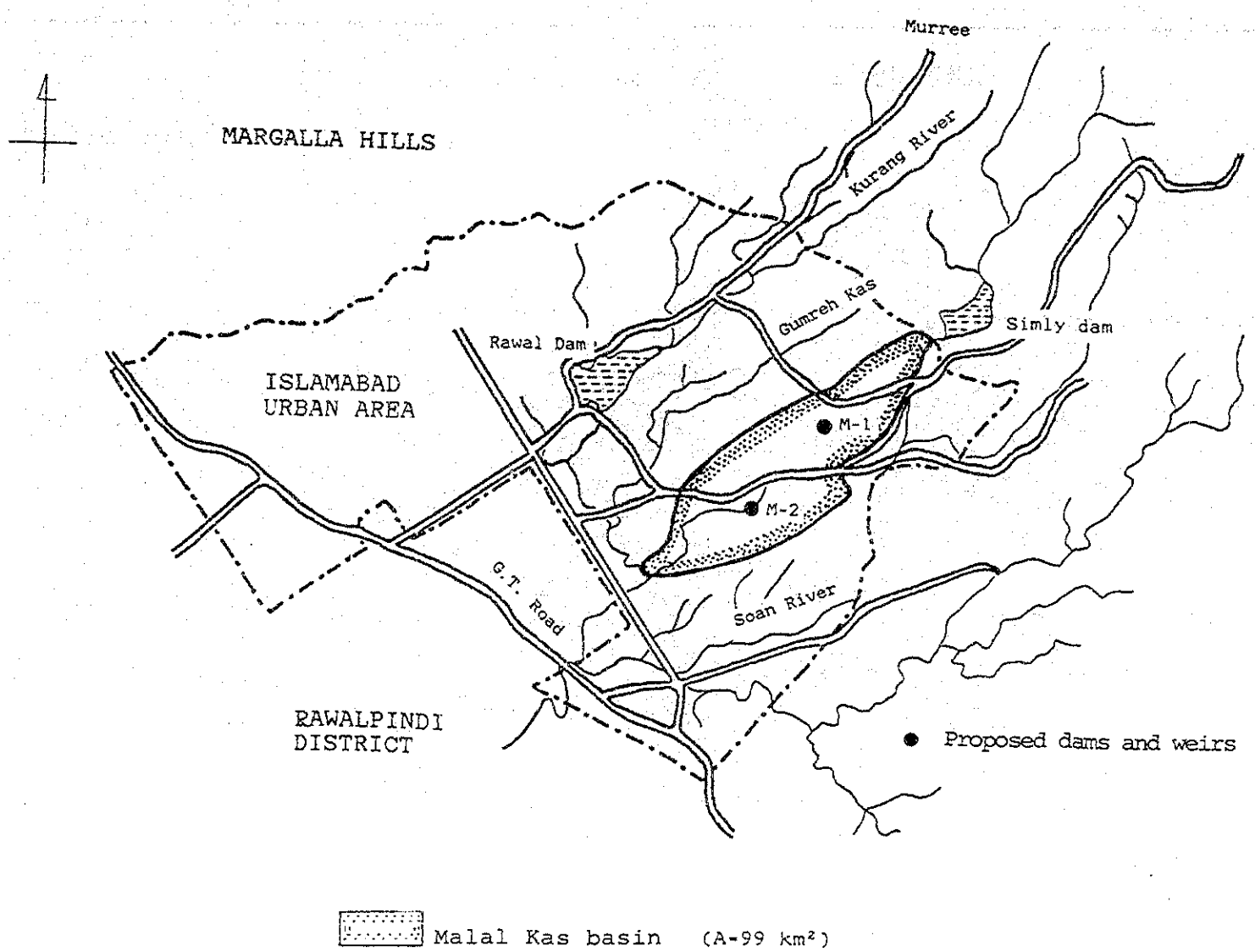
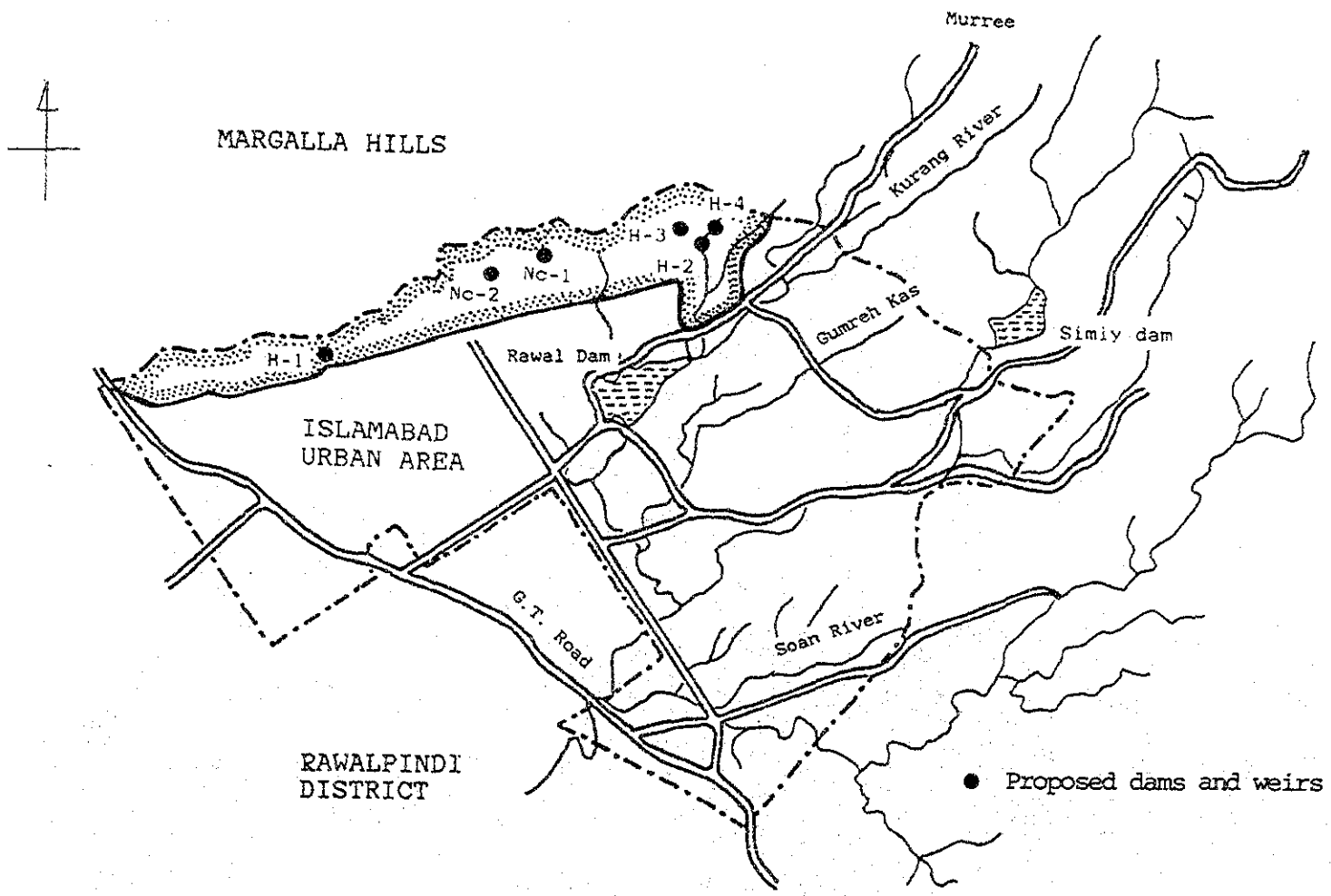


図 9. 2 － 3　Gumreh Kas水資源開発位置図



Malal Kas basin (A=99 km²)

図 9. 2 －4 Malal Kas 水資源開発位置図



Hills

図 9. 2 －5　山地・丘陵における水資源開発位置図

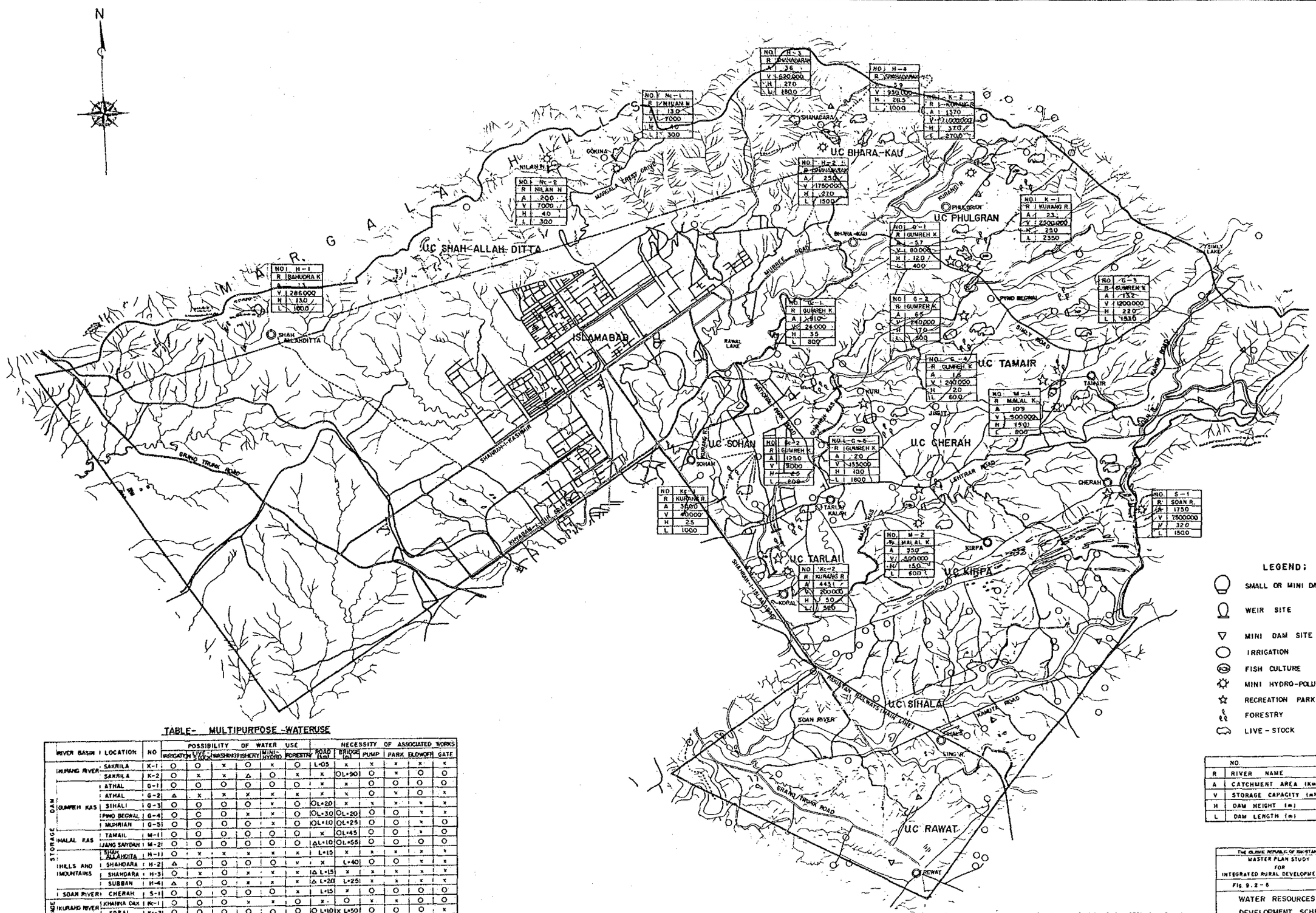


TABLE- MULTIPURPOSE -WATERUSE

	RIVER BASIN	LOCATION	NO	POSSIBILITY OF WATER USE: IRRIGATION	LIVE-STOCK	WASHING	FISHERY	MINI-HYDRO	FORESTRY	NECESSITY OF ASSOCIATED WORKS: ROAD (km)	BRIDGE (m)	PUMP	PARK	ELBOWOFF	GATE
STORAGE DAM	KURANG RIVER	SAKRILA	K-1	○	○	×	○	×	○	L=05	×	×	×	×	×
		SAKRILA	K-2	○	×	×	△	○	×	×	○L=90	○	×	○	○
	GUMREH KAS	ATHAL	G-1	○	○	○	○	○	○	×	×	○	○	○	○
		ATHAL	G-2	△	×	×	×	×	×	×	×	○	×	○	×
		SIHALI	G-3	○	○	○	○	×	○	○L=20	×	×	×	×	×
		PIND BEGWAL	G-4	○	○	○	×	×	○	○L=30	○L=20	○	○	×	×
		MUHRIAN	G-5	○	○	○	○	×	○	○L=10	○L=25	○	○	×	○
	MALAL KAS	TAMAIL	M-1	○	○	○	○	○	○	×	○L=45	○	○	×	○
		JANG SAYDAH	M-2	○	○	○	○	○	○	△L=10	○L=55	○	○	○	○
	HILLS AND MOUNTAINS	SHAH ALLAHDITA	H-1	○	×	×	×	×	×	L=15	×	×	×	×	×
		SHAHDARA	H-2	△	○	○	○	○	×	×	L=40	○	○	×	×
		SHAHDARA	H-3	○	×	○	×	×	×	△ L=15	×	×	×	×	×
		SUBBAN	H-4	△	○	○	×	×	×	△ L=20	L=25	×	×	×	×
	SOAN RIVER	CHERAH	S-1	○	○	○	○	○	×	L=15	×	○	○	○	○
CHANNEL STORAGE	KURANG RIVER	KHARKA DAM	Kc-1	○	○	○	×	×	○	×	○	×	×	○	○
		KORAL	Kc-2	○	○	○	○	○	○	○ L=10	× L=50	○	○	○	×
	GUMREH KAS	KURI	Gc-1	○	○	○	×	×	○	×	○ L=50	○	×	○	○
		TARLAI KHURD	Gc-2	○	○	○	×	×	○	○ L=02	×	○	×	○	○
	NILAH N	GOKINA	Hc-1	△	×	○	×	○	×	×	○ L=25	○	×	○	×
		GOKINA	Hc-2	△	×	○	×	○	×	×	○ L=25	○	×	○	×

図 9. 2 − 6 水資源（表流水）開発計画

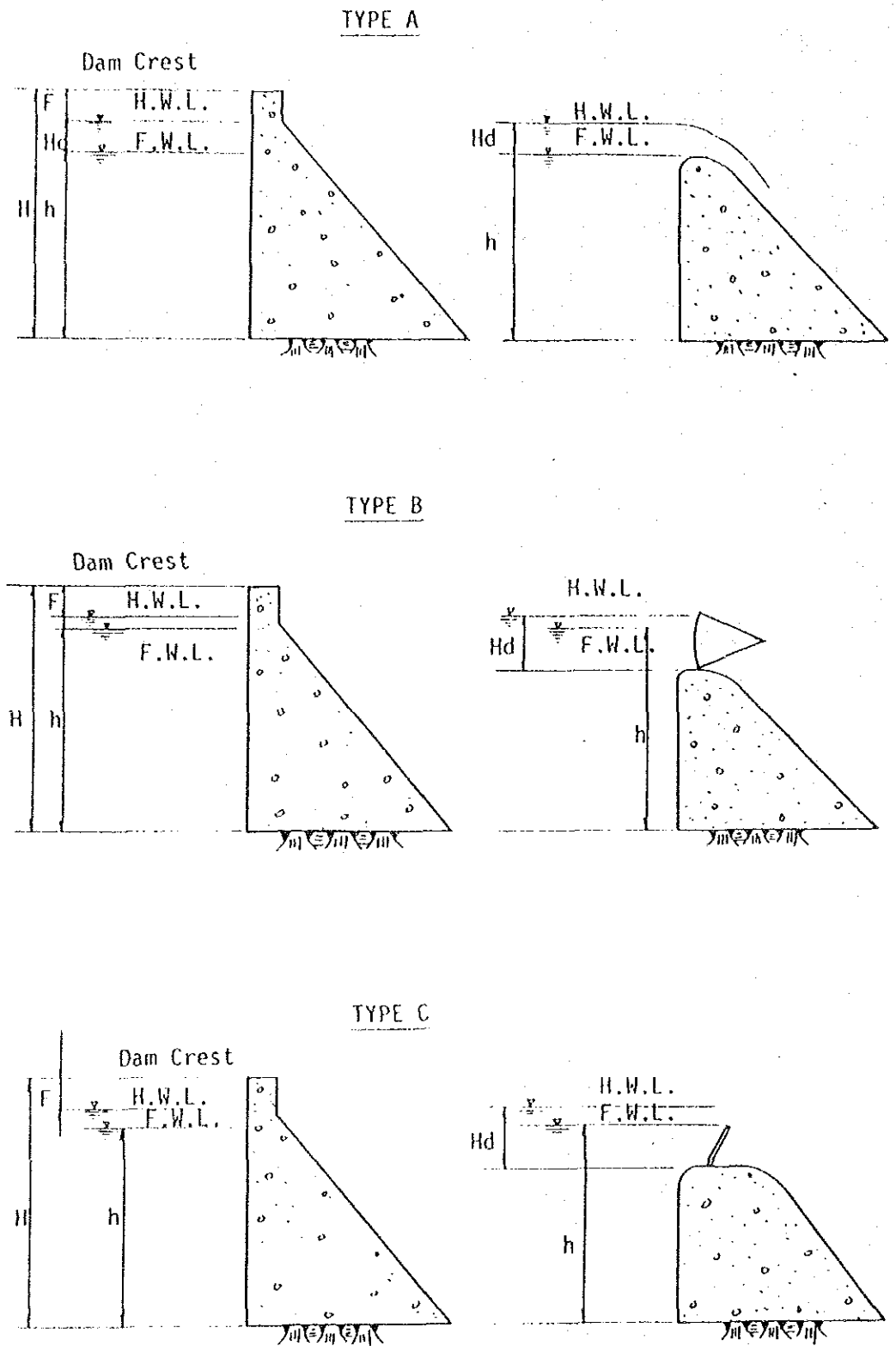

TYPE A
Dam Crest
F
H.W.L.
Hd
F.W.L.
H
h
H.W.L.
Hd
F.W.L.
h
TYPE B
Dam Crest
F
H.W.L.
F.W.L.
H
h
H.W.L.
Hd
F.W.L.
h
TYPE C
Dam Crest
F
H.W.L.
F.W.L.
H
h
H.W.L.
F.W.L.
Hd
h

図 9. 2 －7　ダム　タイプ

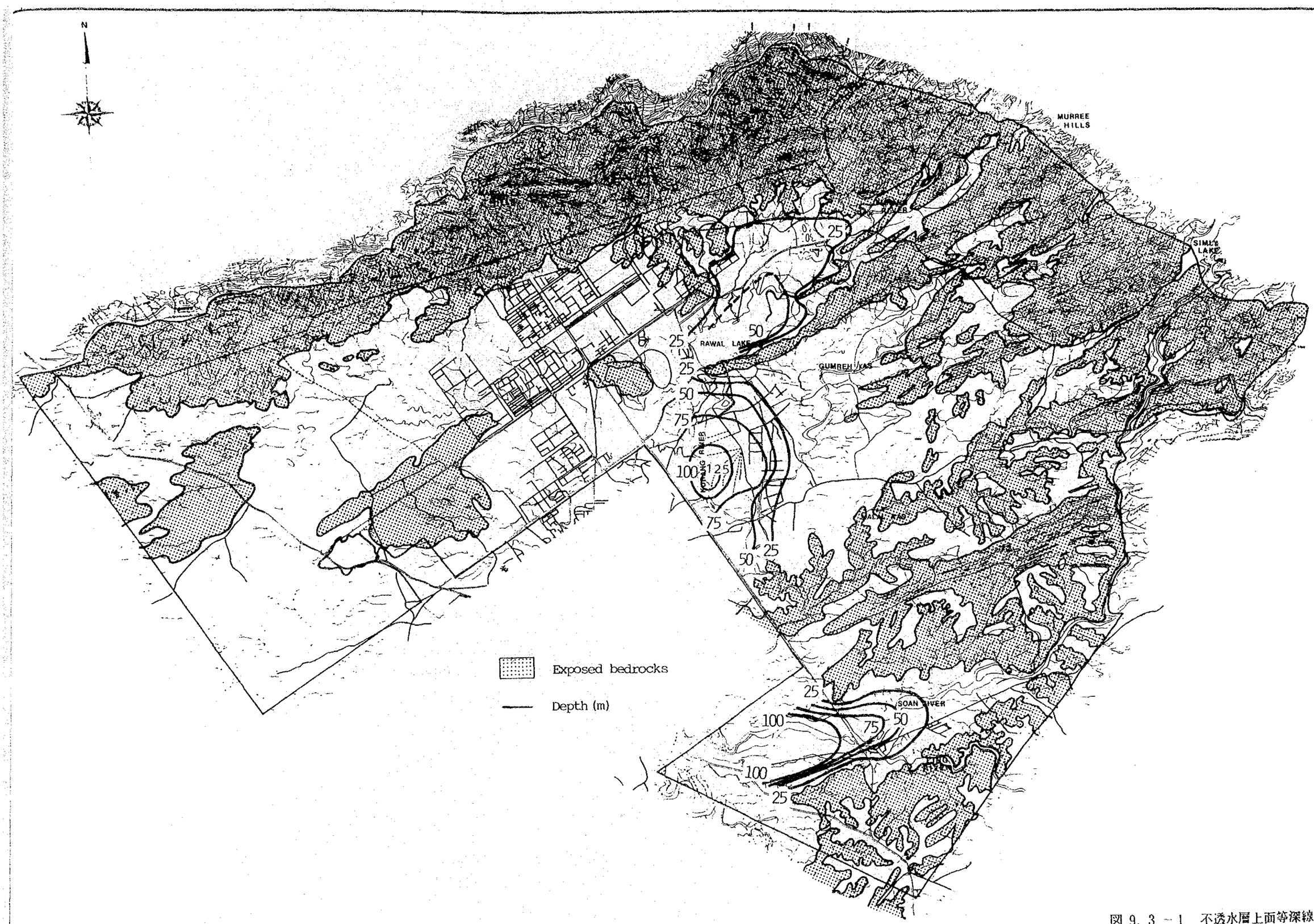
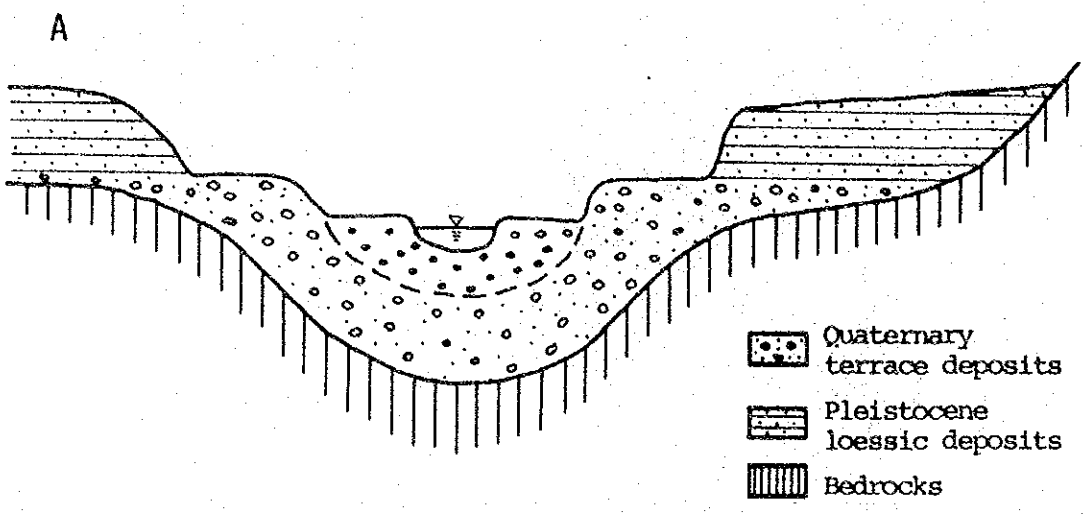


図 9. 3 － 1　不透水層上面等深線図



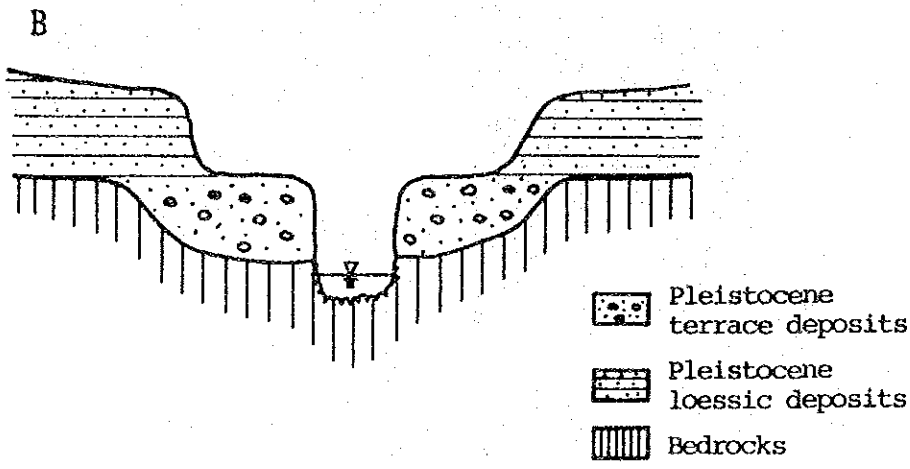


図 9. 3 － 2　河川と地下水との相互関係