CHAPTER II. AGRICULTURAL PLAN

2.1. Target Yield and Fertilizer Inputs

Table G-32 shown the target yield and its estimated amount of fertilizers by crop.

2.2. Cropping Guide of Vegetable

Figure G-3 to G-8 shows the cropping guide of proposed vegetables in the Project Area.

Rabi Vegetable	-	Cabbage
	-	Radish
	-	Peas
Kharif Vegetable	-	Tomato
	-	Cucumber
	-	Cauliflower

2.3. Number of Proposed Livestock

Table G-33 shows the proposed production of feed and the number of possible feeding.

2.4. Labor Balance with Project

Table G-35 shows monthly labor balance with Project, and Table G-36 to G-47 show monthly labor requirement by proposed crops.

TABLE G-32. Estimated Amount of Fertilizers to be Applied Amount

(unit: kg/ha)

	Crops	Target Yield (A) (kg)	Element for Produce per ton (B) (kg)	Element for Target Yield (C)=(A)x(B) (kg)	Natural Supply (D) (kg)	Elemet to Supply (E)=(C)-(D) (kg)	Absorled Rate of Fertilizer (F) (%)	Elemet to Fertilizer (G)=(E)/(F) (kg)	Correction Term (H) (kg)
Rabi	Wheat	5	N 29.8	149	50	99	50	198	120
			P 12.0	60	23	37	20	185	100
			K 23.0	120	60	60	60	100	-
	Calbage	25	N 4.45	111	43	68	40	170	160
			P 1.25	31	20	11	15	73	70
			K 5.15	129	52	77	50	154	50
	Radish	20	N 3.05	61	28	33	40	83	80
			P 1.05	21	13	8	15	53	50
			K 3.95	79	34	45	50	90	-
	Peas	12	N 5.7	68	36	32	40	80	50
			P 2.19	26	17	9	15	63	40
			K 6.46	73	30	35	50	70	-
Kharif	Maize	2.5	N 24.0	60	36	24	50	48	50
			P 11.4	29	17	12	20	58	60
			K 29.1	73	43	30	60	50	-
	Tomato	20	N 2.95	59	21	38	40	95	90
			P 0.85	17	10	7	15	47	50
			K 5.00	100	26	70	50	148	40
	Cucumber	20	N 2.72	54	21	33	40	82	50
			P 0.85	17	10	7	15	49	20
			K 4.00	80	26	54	50	108	-
	Cauliflower	20	N 4.85	97	50	47	40	118	120
			P 1.75	35	23	12	15	80	80
			K 5.15	103	60	43	50	86	-
Peach		20	N 4.9	98	50	48	50	96	100
			P 2.1	42	30	12	20	60	60
			K 6.5	130	80	50	60	83	-

FIGURE G-3. CROPPING GUIDE OF CABBAGE
- Rabi -

(Unit: per Hectare)

1.	Sowing Time	Sep.
2.	Transplanting Time	Oct.
3.	Seed Rate	1 - 1.25 kg (400 - 500 g/acre)
4.	Land Preparation	- Land leveling and pulverization with deep plowing (30 - 40 cm) - 2 - 3 times of harrowing - Ridging
5.	Fertilizers' Inputs	(1) Before planting - Manure ..... 20 - 25 ton (8 - 10 ton/acre) - Superphosphate ..... 200 - 400 kg (80 - 160 kg/acre) - Ammonium sulfate ... 300 - 400 kg (120 - 160 kg/acre) - Potassium sulfate .. 100 kg (40 kg/acre) (2) Head of formation - Ammonium sulfate ... 300 - 400 kg (120 - 160 kg/acre)
6.	Row Space	75cm (30 inch)
7.	Intrarow Space	40 - 50cm (15 - 20 inch)
8.	Irrigation Interval	10 days
9.	Thinning or Weeding	3 - 4 times
10.	Harvesting Time	Dec. to Feb.
11.	Average Production per hectare	20 - 30 ton (8 - 12 ton/acre)

FIGURE G-4. CROPPING GUIDE OF RADISH
- Rabi -

(Unit: per Hectare)

1.	Sowing Time	Aug. to Sep.
2.	Transplanting Time	-
3.	Seed Rate	7.5 kg (3 kg/acre)
4.	Land Preparation	- Land leveling and pulverization with deep plowing (30 - 40 cm) - 2 - 3 times of harrowing - Ridging
5.	Fertilizers' Inputs	(1) Before sowing - Manure ..... 20 ton (8 ton/acre) - Superphosphate ..... 250 - 300 kg (100 - 120 kg/acre) - Ammonium sulfate ... 150 - 200 kg (60 - 80 kg/acre) (2) At the time of earthing up - Ammonium sulfate ... 150 - 200 kg (60 - 80 kg/acre)
6.	Row Space	75cm (30 inch)
7.	Intrarow Space	20 - 30cm (8 - 12 inch)
8.	Irrigation Interval	10 days
9.	Thinning or Weeding	1 - 2 times
10.	Harvesting Time	Oct. to Feb.
11.	Average Production per hectare	20 - 25 ton (8 - 10 ton/acre)

FIGURE G-5. CROPPING GUIDE OF PEAS
- Rabi -

(Unit: per Hectare)

1.	Sowing Time	Sep. to Nov.
2.	Transplanting Time	-
3.	Seed Rate	30 - 40 kg (12 - 16 kg/acre)
4.	Land Preparation	- Land leveling and pulverization with deep plowing (30 - 40 cm) - 2 - 3 times of harrowing - Ridging
5.	Fertilizers' Inputs	(1) Before sowing - Manure ..... 12 ton (5 ton/acre) - Superphosphate ..... 200 - 250 kg (80 - 100 kg/acre) - Ammonium sulfate ... 200 - 250 kg (80 - 100 kg/acre)
6.	Row Space	75cm (30 inch)
7.	Intrarow Space	25 - 30cm (10 - 12 inch)
8.	Irrigation Interval	Every fortnight
9.	Thinning or Weeding	1 - 2 times
10.	Harvesting Time	Dec. to Feb.
11.	Average Production per hectare	10 - 15 ton (4 - 6 ton/acre)

FIGURE G-6. CROPPING GUIDE OF TOMATO
- Kharif -

(Unit: per Hectare)

1.	Sowing Time	Jan. to Feb., Jul. to Aug.
2.	Transplanting Time	Feb. to Mar., Aug. to Sep.
3.	Seed Rate	350 - 500 g (140 - 200 g/acre)
4.	Land Preparation	- Land leveling and pulverization with deep plowing (30 - 40 cm) - 2 - 3 times of harrowing - Ridging
5.	Fertilizers' Inputs	(1) Before planting - Manure ..... 20 - 25 ton (8 - 10 ton/acre) - Superphosphate ..... 250 - 300 kg (100 - 120 kg/acre) - Ammonium sulfate ... 200 - 250 kg (80 - 100 kg/acre) - Potassium sulfate .. 50 - 100 kg (20 - 40 kg/acre) (2) Stage of full bloon - Ammonium sulfate ... 200 - 250 kg (80 - 100 kg/acre) - Potassium sulfate .. 50 - 100 kg (20 - 40 kg/acre)
6.	Row Space	75 - 90 cm (30 - 35 inch)
7.	Intrarow Space	30 - 50 cm (12 - 20 inch)
8.	Irrigation Interval	First irrigation before plowing, one week
9.	Thinning or Weeding	2 times
10.	Harvesting Time	Apr. last to Jun.
11.	Average Production per hectare	20 - 30 ton (8 - 12 ton/acre)

FIGURE G-7. CROPPING GUIDE OF CUCUMBER
- Kharif -

(Unit: per Hectare)

1.	Sowing Time	Feb. to Mar., Aug. to Sep.
2.	Transplanting Time	-
3.	Seed Rate	3 - 5 kg (1.2 - 2 kg/acre)
4.	Land Preparation	- Land leveling and pulverization with deep plowing (30 - 40 cm) - 2 - 3 times of harrowing - Ridging
5.	Fertilizers' Inputs	(1) Before sowing - Manure ..... 10 - 20 ton (4 - 8 ton/acre) - Superphosphate ..... 300 kg (120 kg/acre) - Ammonium sulfate ... 150 - 200 kg (60 - 80 kg/acre) (2) Flowering stage - Ammonium sulfate ... 150 - 200 kg (60 - 80 kg/acre)
6.	Row Space	1 - 1.5 m (39 - 59 inch)
7.	Intrarow Space	50 - 70 cm (20 - 28 inch)
8.	Irrigation Interval	First irrigation before plowing, one week
9.	Thinning or Weeding	2 times
10.	Harvesting Time	Apr. to Jun.
11.	Average Production per hectare	15 - 25 ton (6 - 10 ton/acre)

FIGURE G-8. CROPPING GUIDE OF CAULIFLOWER
- Kharif -

(Unit: per Hectare)

1.	Sowing Time	(1st Planting) ... beginning Jun. to middle of Jun. (2nd Planting) ... beginning Jul. to middle of Jul.
2.	Transplanting Time	(1st Planting) ... beginning Jul. to middle of Jul. (2nd Planting) ... beginning Aug. to middle of Aug.
3.	Seed Rate	1 - 1.25 kg (400 - 500 g/acre)
4.	Land Preparation	- Land leveling and pulverization with deep plowing (30 - 40 cm) - 2 - 3 times of harrowing - Ridging
5.	Fertilizers' Inputs	(1) Before sowing - Manure ..... 15 - 25 ton (6 - 10 ton/acre) - Superphosphate ..... 400 - 450 kg (160 - 180 kg/acre) - Ammonium sulfate ... 350 kg (140 kg/acre) (2) Flower-bud-appearing stage - Ammonium sulfate ... 200 - 300 kg (80 - 120 kg/acre)
6.	Row Space	75 - 90 cm (30 - 35 inch)
7.	Intrarow Space	40 - 50 cm (16 - 20 inch)
8.	Irrigation Interval	First irrigation before plowing, one week
9.	Thinning or Weeding	3 - 4 times
10.	Harvesting Time	(1st Harvesting) ... Sep. to Oct. (2nd Harvesting) ... Nov. to Jan.
11.	Average Production per hectare	15 - 25 ton (6 - 12 ton/acre)

TABLE G-33. NUTRITIONAL VALUE OF FRESH FORAGE FROM CULTIVATED AREA

Items	DM	DCP	TDN
1. Total Supply with Project			
1-1. Fodders			
a) Rabi Season			
Production (tons)	59,500	59,500	59,500
Constituent Rate (%)	22.1	2.1	14.3
Constituent Amount (tons)	13,150	1,250	8,510
b) First Crops of Kharif Season (Sorghum)			
Production (tons)	25,500	25,500	25,500
Constituent Rate (%)	23.1	1.3	16.5
Constituent Amount (tons)	5,891	332	4,208
c) Second Crop of Kharif Season (Alfalfa)			
Production (tons)	25,500	25,500	25,500
Constituent Rate (%)	19.9	2.5	12.1
Constituent Amount (tons)	5,075	638	3,086
Sub-Total of Constituent Amount	10,966	970	7,294
1-2. Wheat Straw			
Production (tons)	15,000	15,000	15,000
Constituent Rate (%)	89.1	3.0	39.4
Constituent Amount (tons)	13,365	450	5,910
1-3. Vegetable			
Production (tons)	20,000	20,000	20,000
Constituent Rate (%)	10.1	1.6	6.6
Constituent Amount (tons)	2,020	320	1,320
Total of Constituent Amount	39,501	2,990	23,034
2. Annual Requirement of Nutrition (kg/head)	3,504	157	1,686
3. Number of Possible Feeding (head)	11,300	19,000	13,700

TABLE G-34. NUTRIENT REQUIREMENT OF LIVESTOCK

(unit: kg/head)

Items	DM	DCP	TDN
1. Nutrient Requirement for Weight per Day (Weight = 400 kg)	*	0.25	3.4
2. Nutrient Requirement for Milk Production per Day1/	9.6 (400kgx2.4%)	0.18 (4.0kgx45g/kg)	1.22 (4.0kgx305g/kg)
3. Total Nutrient Requirement per Day	9.6	0.43	4.62
4. Nutrient Requirement per Year	3,504	157	1,686

Note: 1/ ... milk quantity ... 4.0 kg/head/day
milk quality .... 3.5% milk fat

TABLE G-35. LABOR BALANCE WITH PROJECT

Month	Total Labor Requirement	Labor Requirement the Service Area 1/	Labor Balance 2/ (Total Labor Supply = 100) (%)
Jan.	120	110	55
Feb.	130	120	60
Mar.	130	120	60
Apr.	150	140	70
May	145	130	65
Jun.	90	80	40
Jul.	120	110	55
Aug.	140	130	65
Sep.	120	110	55
Oct.	175	160	80
Nov.	160	150	75
Dec.	125	120	60

Note: 1/ ... excluded NARC Area

2/ ... Total labor supply in the service area is estimated at 200,000 mandays per month.

TABLE G-36. Monthly Labor Requirement with Project

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
I. Labor Requirement per hectare (man-days/ha)													
1. Irrigated Area													
- Wheat	2.0	2.0	3.0	12.0	12.5	-	-	-	-	5.0	6.4	3.4	46.3
- Rabi Vegetable	26.6	20.4	5.7	-	-	-	-	6.4	18.9	26.8	12.3	21.9	139.0
- Kharif (I) Vegetable	18.2	35.4	46.0	41.0	36.0	22.0	-	-	-	-	-	-	198.6
- Kharif (II) Vegetable	-	-	-	-	-	1.1	26.1	36.0	35.3	35.7	27.3	21.7	183.2
- Rabi Fodders	12.0	12.0	7.5	-	-	-	-	-	2.5	10.8	3.0	12.0	59.8
- Fruit	3.0	3.0	4.0	7.5	6.0	5.7	86.0	85.0	4.0	7.5	3.5	3.0	218.2
2. Un-irrigated													
- Kharif Maize	-	-	-	-	-	6.4	10.0	2.5	-	16.5	15.0	-	50.4
- Kharif Fodders	-	-	-	-	-	11.8	2.5	2.5	-	-	27.0	-	43.8
3. Livestock	6.3	5.7	6.3	6.1	6.3	6.1	6.3	6.3	6.1	6.3	6.1	6.3	74.2
II. Total Labor Requirement ('000 man-days)													
1. Irrigated Area													
- Wheat (4,100 ha)	8.4	8.4	12.3	49.2	51.3	-	-	-	-	20.5	26.2	13.9	190.2
- Rabi Vegetable (1,400 ha)	37.2	28.6	8.0	-	-	-	-	9.0	26.5	37.5	17.2	30.7	194.7
- Kharif (I) Vegetable (1,300 ha)	23.7	46.0	59.8	53.3	46.8	28.6	-	-	-	-	-	-	258.2
- Kharif (II) Vegetable (1,400 ha)	-	-	-	-	-	1.5	36.5	50.4	49.4	50.0	38.2	30.4	256.4
- Rabi Fodders (700 ha)	8.4	8.4	5.3	-	-	-	-	-	1.8	7.6	2.1	8.4	42.0
- Fruit (400 ha)	1.2	1.2	1.6	3.0	2.4	2.3	34.4	34.0	1.6	3.0	1.4	1.2	87.3
2. Un-irrigated													
- Kharif Maize (850 ha)	-	-	-	-	-	5.4	8.5	2.1	-	14.0	12.8	-	42.8
- Kharif Fodders (850 ha)	-	-	-	-	-	10.0	2.1	2.1	-	-	23.0	-	37.2
Sub-total	78.9	92.6	87.0	105.5	100.5	47.8	81.5	97.6	79.3	132.6	120.9	84.6	1,108.8
3. Livestock	41.3	37.3	41.3	40.0	41.3	40.0	41.3	41.3	40.0	41.3	40.0	41.3	486.4
Total	120.2	129.9	128.3	145.5	141.8	87.8	122.8	138.9	119.3	173.9	160.9	125.9	1,595.2

TABLE G-37. LABOR REQUIREMENT OF WHEAT, WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Seedbed Preparation	-	-	-	-	-	-	-	-	-	1.5	2.4	0.9	4.8
4. Sowing/Planting	-	-	-	-	-	-	-	-	-	1.5	2.0	0.5	4.0
5. Fertilization	-	-	-	-	-	-	-	-	-	1.0	1.0	-	2.0
6. Plant Protection	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Cultivation/Weeding	1.0	1.0	2.0	-	-	-	-	-	-	-	-	1.0	5.0
8. Irrigation	1.0	1.0	1.0	-	-	-	-	-	-	1.0	1.0	1.0	5.0
9. Harvesting/Post Harvesting	-	-	-	12.0	12.5	-	-	-	-	-	-	-	25.5
Total	2.0	2.0	3.0	12.0	12.5	-	-	-	-	5.0	6.4	3.4	46.3

TABLE G-38. LABOR REQUIREMENT OF FODDER (RABI), WITH PROJECT
- BERSEEM -

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Seedbed Preparation	-	-	-	-	-	-	-	-	0.5	3.3	1.0	-	4.8
4. Sowing/Planting	-	-	-	-	-	-	-	-	0.5	4.5	-	-	5.0
5. Fertilization	-	-	-	-	-	-	-	-	0.5	1.5	-	-	2.0
6. Plant Protection	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Cultivation/Weeding	-	-	-	-	-	-	-	-	-	-	-	-	-
8. Irrigation	2.0	2.0	-	-	-	-	-	-	1.0	1.0	2.0	2.0	10.0
9. Harvesting/Post Harvesting	10.0	10.0	7.5	-	-	-	-	-	-	-	-	10.0	37.5
Total	12.0	12.0	7.5	-	-	-	-	-	2.5	10.3	3.0	12.0	59.3

TABLE G-39. LABOR REQUIREMENT OF CABBAGE (RABI), WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	9.2	-	-	-	9.2
2. Nursery	-	-	-	-	-	-	-	-	7.0	-	-	-	7.0
3. Seedbed Preparation	-	-	-	-	-	-	-	-	7.3	-	-	-	7.3
4. Sowing/Planting	-	-	-	-	-	-	-	-	-	36.0	-	-	36.0
5. Fertilization	-	-	-	-	-	-	-	-	3.0	-	2.0	-	5.0
6. Plant Protection	-	-	-	-	-	-	-	-	-	2.0	2.0	-	4.0
7. Cultivation/Weeding	-	-	-	-	-	-	-	-	-	3.0	3.0	-	6.0
8. Irrigation	3.0	-	-	-	-	-	-	-	-	3.0	3.0	3.0	12.0
9. Harvesting/Post Harvesting	15.0	15.0	-	-	-	-	-	-	-	-	-	15.0	45.0
Total	20.0	15.0	-	-	-	-	-	-	26.5	44.0	10.0	20.0	131.5

TABLE G-40. LABOR REQUIREMENT OF RADISH (RABI), WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Seedbed Preparation	-	-	-	-	-	-	-	4.0	3.3	-	-	-	7.3
4. Sowing/Planting	-	-	-	-	-	-	-	6.0	4.0	-	-	-	10.0
5. Fertilization	-	-	-	-	-	-	-	3.0	2.0	-	-	-	5.0
6. Plant Protection	-	-	-	-	-	-	-	1.0	1.0	1.0	1.0	-	4.0
7. Cultivation/Weeding	-	-	-	-	-	-	-	2.0	2.0	2.0	2.0	-	8.0
8. Irrigation	3.0	-	-	-	-	-	-	2.0	2.0	2.0	3.0	3.0	15.0
9. Harvesting/Post Harvesting	13.0	10.0	-	-	-	-	-	-	-	10.0	12.0	15.0	60.0
Total	16.0	10.0	-	-	-	-	-	18.0	14.3	15.0	18.0	19.0	109.3

TABLE G-41. LABOR REQUIREMENT OF PEAS (RABI), WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Seedbed Preparation	-	-	-	-	-	-	-	-	3.3	4.0	-	-	7.3
4. Sowing/Planting	-	-	-	-	-	-	-	-	4.0	6.0	-	-	10.0
5. Fertilization	-	-	-	-	-	-	-	-	2.0	3.0	-	-	5.0
6. Plant Protection	1.0	-	-	-	-	-	-	-	1.0	1.0	1.0	1.0	5.0
7. Cultivation/Weeding	4.0	-	-	-	-	-	-	-	3.0	3.0	4.0	4.0	18.0
8. Irrigation	3.0	-	-	-	-	-	-	-	2.0	3.0	3.0	3.0	14.0
9. Harvesting/Post Harvesting	40.0	40.0	20.0	-	-	-	-	-	-	-	-	20.0	120.0
Total	48.0	40.0	20.0	-	-	-	-	-	15.0	20.0	8.0	28.0	179.3

TABLE G-42. LABOR REQUIREMENT OF TOMATO (KHARIF-I-), WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	9.2	-	-	-	-	-	-	-	-	-	-	-	9.2
2. Nursery	4.0	3.0	-	-	-	-	-	-	-	-	-	-	7.0
3. Seedbed Preparation	4.0	3.3	-	-	-	-	-	-	-	-	-	-	7.3
4. Sowing/Planting	-	20.0	16.0	-	-	-	-	-	-	-	-	-	36.0
5. Fertilization	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	5.0
6. Plant Protection	-	1.0	1.0	2.0	2.0	2.0	-	-	-	-	-	-	8.0
7. Cultivation/Weeding	-	4.0	4.0	4.0	4.0	-	-	-	-	-	-	-	16.0
8. Irrigation	-	3.0	4.0	4.0	4.0	4.0	2.0	-	-	-	-	-	21.0
9. Harvesting/Post Harvesting	-	-	20.0	30.0	30.0	30.0	20.0	-	-	-	-	-	130.0
Total	18.2	35.3	46.0	41.0	41.0	36.0	22.0	-	-	-	-	-	239.5

TABLE G-43. LABOR REQUIREMENT OF CUCUMBER (KHARIF-II-), WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Seedbed Preparation	-	-	-	-	-	-	4.0	3.3	-	-	-	-	7.3
4. Sowing/Planting	-	-	-	-	-	-	8.0	7.0	-	-	-	-	15.0
5. Fertilization	-	-	-	-	-	-	2.0	1.0	1.0	1.0	-	-	5.0
6. Plant Protection	-	-	-	-	-	-	1.0	1.5	1.0	1.0	1.0	1.0	6.5
7. Cultivation/Weeding	-	-	-	-	-	-	4.0	4.0	4.0	4.0	-	-	16.0
8. Irrigation	-	-	-	-	-	-	3.0	2.0	2.0	3.0	4.0	2.0	16.0
9. Harvesting/Post Harvesting	-	-	-	-	-	-	-	20.0	35.0	35.0	30.0	25.0	145.0
Total	-	-	-	-	-	-	22.0	38.8	43.0	44.0	35.0	28.0	210.8

TABLE G-44. LABOR REQUIREMENT OF CAULIFLOWER (KHARIF-II-), WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	4.0	3.0	-	-	-	-	-	7.0
3. Seedbed Preparation	-	-	-	-	-	-	4.3	3.0	-	-	-	-	7.3
4. Sowing/Planting	-	-	-	-	-	-	20.0	16.0	-	-	-	-	42.0
5. Fertilization	-	-	-	-	-	-	2.0	2.0	1.0	-	-	-	5.0
6. Plant Protection	-	-	-	-	-	-	1.0	2.0	1.0	1.0	-	-	5.0
7. Cultivation/Weeding	-	-	-	-	-	-	4.0	4.0	4.0	4.0	-	-	16.0
8. Irrigation	-	-	-	-	-	-	2.0	2.0	2.0	2.0	2.0	-	10.0
9. Harvesting/Post Harvesting	-	-	-	-	-	-	-	-	8.0	8.0	6.0	6.0	28.0
Total	-	-	-	-	-	4.0	36.3	29.0	16.0	15.0	8.0	6.0	120.3

TABLE G-45. LABOR REQUIREMENT OF PEACH, WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Seedbed Preparation	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Sowing/Planting	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Fertilization	-	-	-	2.5	-	-	-	-	-	2.5	-	-	5.0
6. Plant Protection	-	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	-	7.5
7. Cultivation/Weeding	1.0	1.0	2.0	2.0	3.0	3.7	4.0	4.0	3.0	2.0	1.0	1.0	27.7
8. Irrigation	2.0	2.0	2.0	2.0	2.0	1.0	1.0	-	-	2.0	2.0	2.0	18.0
9. Harvesting/Post Harvesting	-	-	-	-	-	-	80.0	80.0	-	-	-	-	160.0
Total	3.0	3.0	4.0	7.5	6.0	5.7	86.0	85.0	4.0	7.5	3.5	3.0	218.2

TABLE G-46. LABOR REQUIREMENT OF MAIZE, WITH PROJECT

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Seedbed Preparation	-	-	-	-	-	4.4	5.0	-	-	-	-	-	9.4
4. Sowing/Planting	-	-	-	-	-	1.5	2.0	-	-	-	-	-	3.5
5. Fertilization	-	-	-	-	-	0.5	0.5	-	-	-	-	-	1.0
6. Plant Protection	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Cultivation/Weeding	-	-	-	-	-	-	2.5	2.5	-	-	-	-	5.0
8. Irrigation	-	-	-	-	-	-	-	-	-	-	-	-	-
9. Harvesting/Post Harvesting	-	-	-	-	-	-	-	-	-	16.5	15.0	-	31.5
Total	-	-	-	-	-	6.1	10.0	2.5	=	16.5	15.0	-	50.4

TABLE G-47. LABOR REQUIREMENT OF KHARIF FODDER, WITH PROJECT
- SORGHUM -

(Unit: mandays/ha)

Operation	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Preparatory Tillage	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Nursery	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Seedbed Preparation	-	-	-	-	-	4.8	-	-	-	-	-	-	4.8
4. Sowing/Planting	-	-	-	-	-	5.0	-	-	-	-	-	-	5.0
5. Fertilization	-	-	-	-	-	2.0	-	-	-	-	-	-	2.0
6. Plant Protection	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Cultivation/Weeding	-	-	-	-	-	-	2.5	2.5	-	-	-	-	5.0
8. Irrigation	-	-	-	-	-	-	-	-	-	-	-	-	-
9. Harvesting/Post Harvesting	-	-	-	-	-	-	-	-	-	-	27.0	-	27.0
Total	-	-	-	-	-	11.8	2.5	2.5	-	-	27.0	-	43.8

ANNEX H. DAM AND CANALS

ANNEX H. DAM AND CANALS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I. DAM

TABLE H-1 CALCULATION OF POSSIBLE POWER ENERGY IN 1966

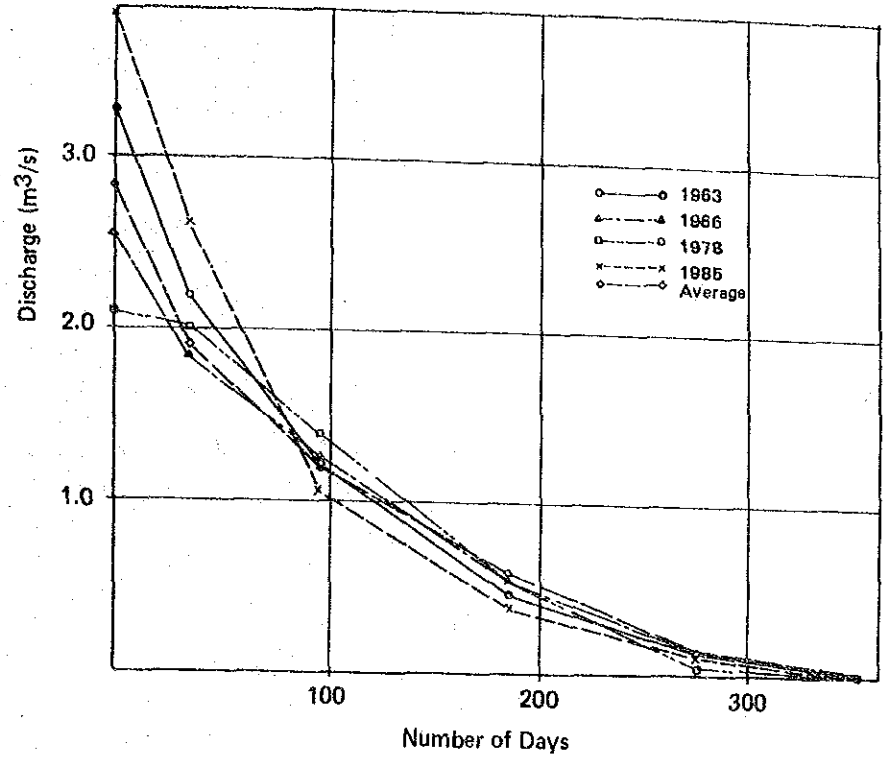
Month	Number of days	Discharge Q (㎥/s)	Reservoir water level EL. (m)	Total head (m)	Head loss (m)	Effective head H (m)	Combined efficiency η	Mean generated output (KW)	Generated energy (KWH)
JAN.	10	0	645.8	8.8	0	8.80	0.75	0	0
	10	1.40	645.1	8.1	0.15	7.95	〃	81.81	19,634
	11	1.40	644.2	7.2	0.15	7.05	〃	72.54	19,151
FEB.	10	1.40	643.2	6.2	0.15	6.05	〃	62.25	14,940
	10	0	646.7	9.7	0	9.70	〃	0	0
	8	0	647.0	10.0	0	10.00	〃	0	0
MAR.	10	1.18	646.9	9.9	0.11	9.79	〃	84.91	20,378
	10	1.29	646.7	9.7	0.15	9.55	〃	90.00	21,600
	11	0	647.0	10.0	0	10.00	〃	0	0
APR.	10	0.86	647.0	10.0	0.06	9.94	〃	62.83	15,079
	10	0.67	646.7	9.7	0.04	9.66	〃	47.57	11,417
	10	0.86	646.8	9.8	0.06	9.74	〃	61.57	14,777
MAY	10	1.34	646.3	9.3	0.15	9.15	〃	90.00	21,600
	10	0.78	646.7	9.7	0.05	9.65	〃	55.32	13,277
	11	1.34	646.3	9.3	0.15	9.15	〃	90.00	23,760
JUN.	10	1.40	645.8	8.8	0.15	8.65	〃	89.01	21,362
	10	1.25	645.3	8.3	0.12	8.18	〃	75.15	18,036
	10	0.61	645.1	8.1	0.03	8.07	〃	36.18	8,683
JUL.	10	0	646.5	9.5	0	9.50	〃	0	0
	10	1.06	646.3	9.3	0.09	9.21	〃	71.76	17,222
	11	0	646.6	9.6	0	9.60	〃	0	0
AUG.	10	0	647.0	10.0	0	10.00	〃	0	0
	10	0	647.0	10.0	0	10.00	〃	0	0
	11	0	647.0	10.0	0	10.00	〃	0	0
SEP.	10	0	647.0	10.0	0	10.00	〃	0	0
	10	0	647.0	10.0	0	10.00	〃	0	0
	10	0	647.0	10.0	0	10.00	〃	0	0
OCT.	10	0	647.0	10.0	0	10.00	〃	0	0
	10	0	647.0	10.0	0	10.00	〃	0	0
	11	0	647.0	10.0	0	10.00	〃	0	0
NOV.	10	0	647.0	10.0	0	10.00	0.75	0	0
	10	0.78	646.7	9.7	0.05	9.65	〃	55.32	13,277
	10	1.31	646.4	9.4	0.13	9.27	〃	89.26	21,422
DEC.	10	1.25	646.1	9.1	0.12	8.98	〃	82.50	19,800
	10	1.40	645.5	8.5	0.15	8.35	〃	85.92	20,621
	11	0.54	645.8	8.8	0.02	8.78	〃	34.85	9,200
TOTAL									345,236

Limit of Operation of Water Turbine : Q = 1.4 cu.m/s (100%) - 0.35 cu.m/s (25%)

Head Loss (m) = $0.078 \times Q^2$

Mean Gencrated Output (KW) = $9.8 \times Q \times H \times \eta$

FIGURE H-1. FLOW-DURATION CURVES



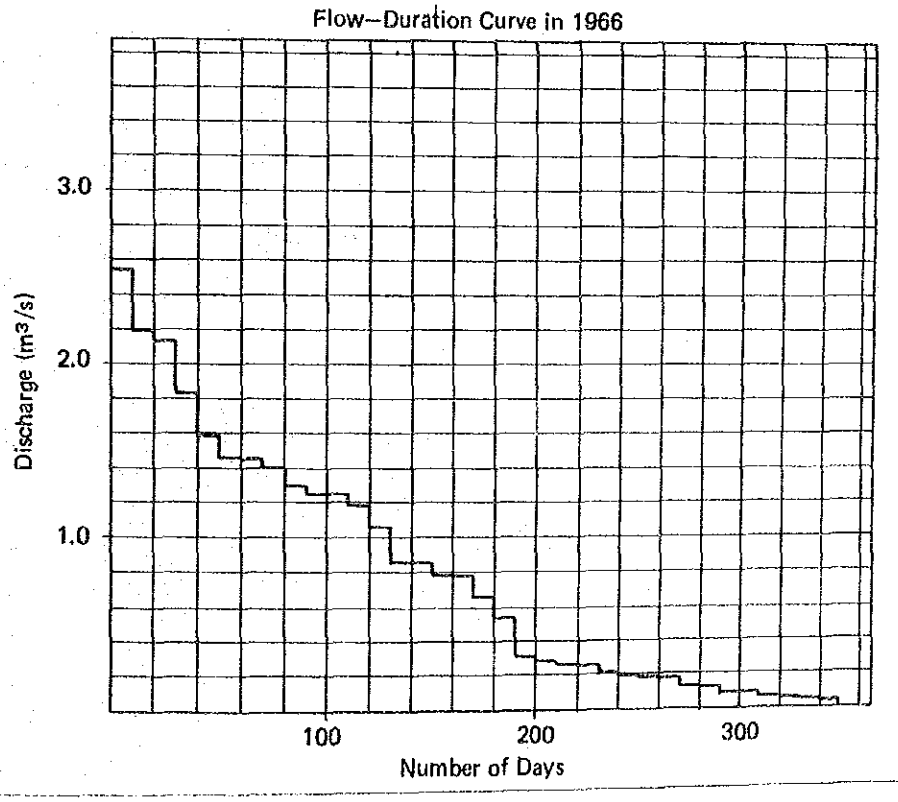
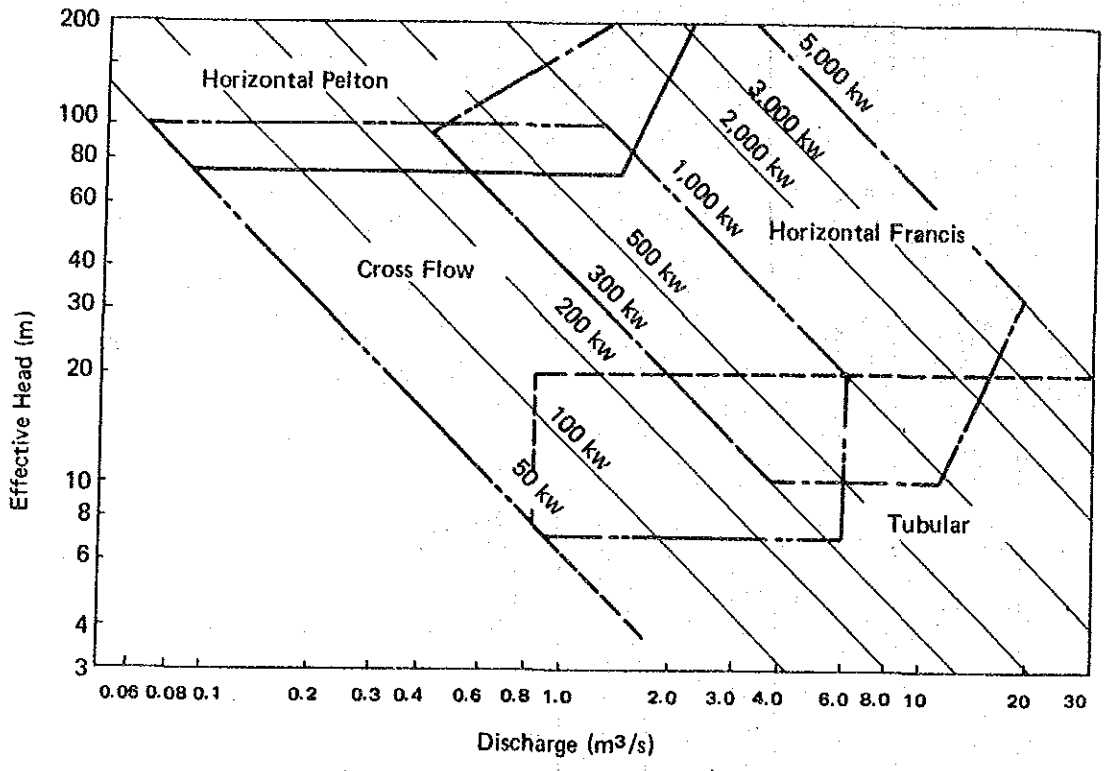


FIGURE H–2. TURBINE SELECTION DIAGRAM



Horizontal Pelton

Horizontal Francis

Cross Flow

Tubular

FIGURE H-3. TECTONIC MAP OF SURROUNDING AREA OF UPPER KURANG RIVER SCALE 1 : 60,000

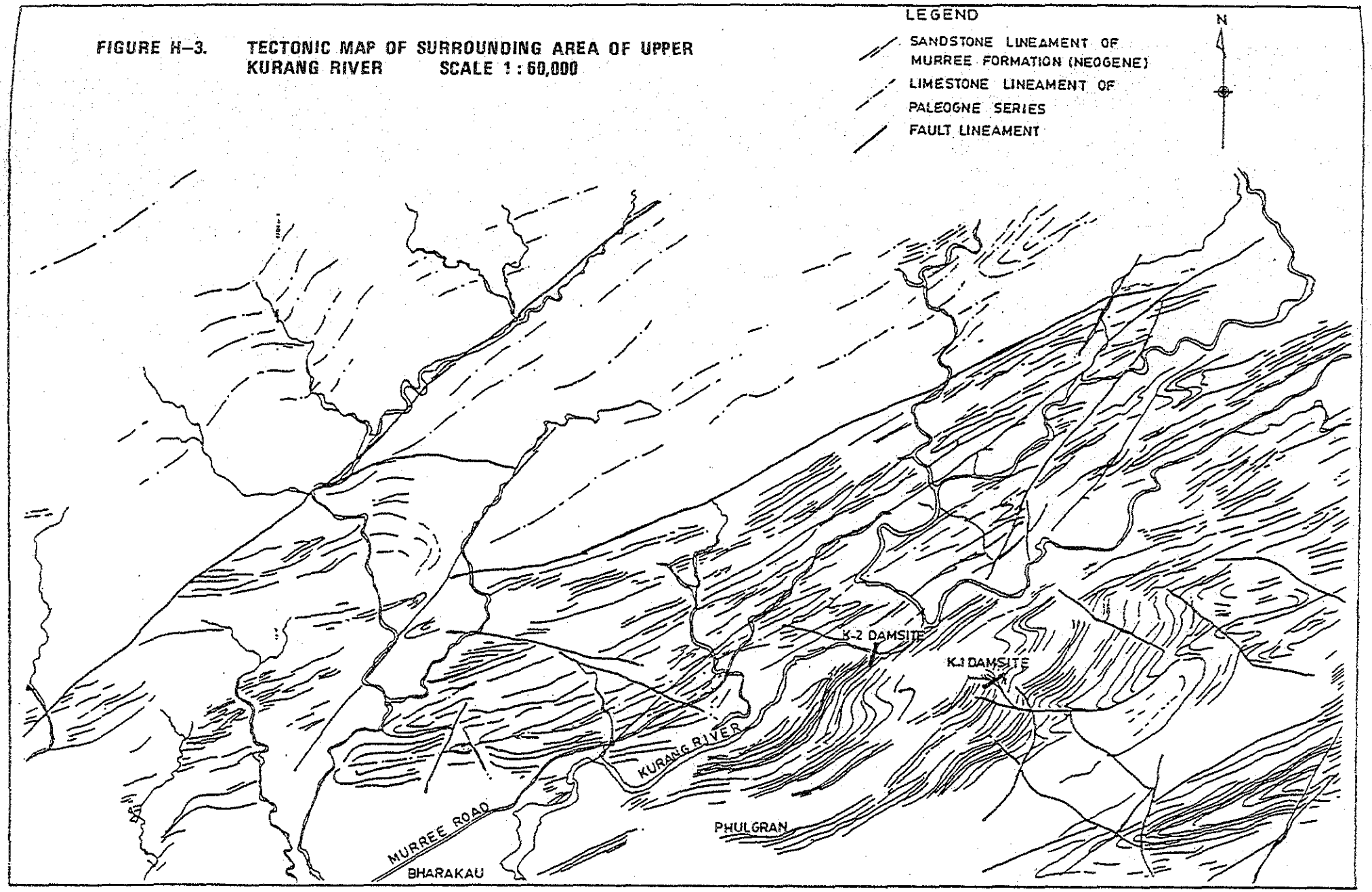
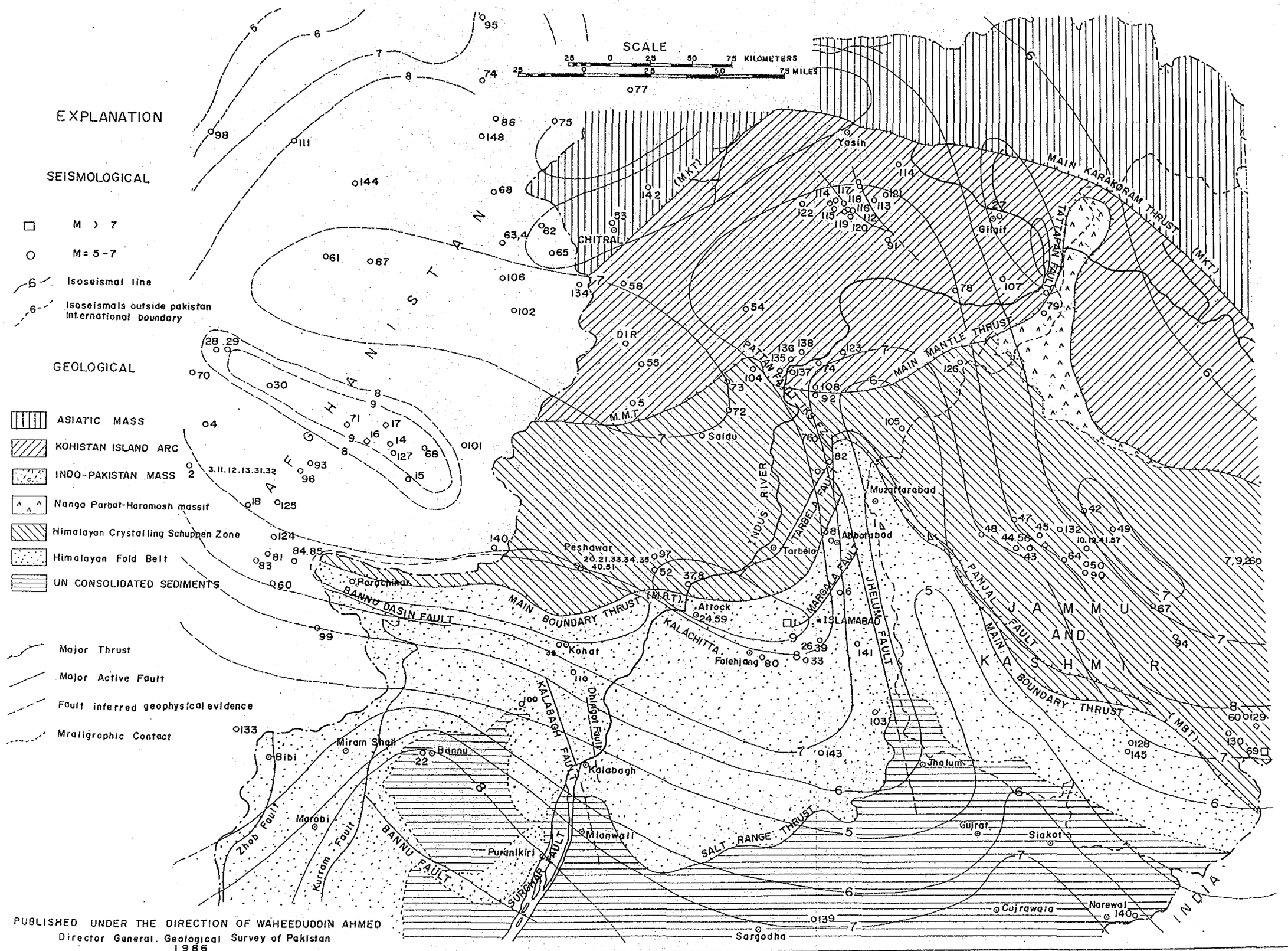


FIGURE H – 4 SEISMIC RISK MAP OF NORTHERN PAKISTAN



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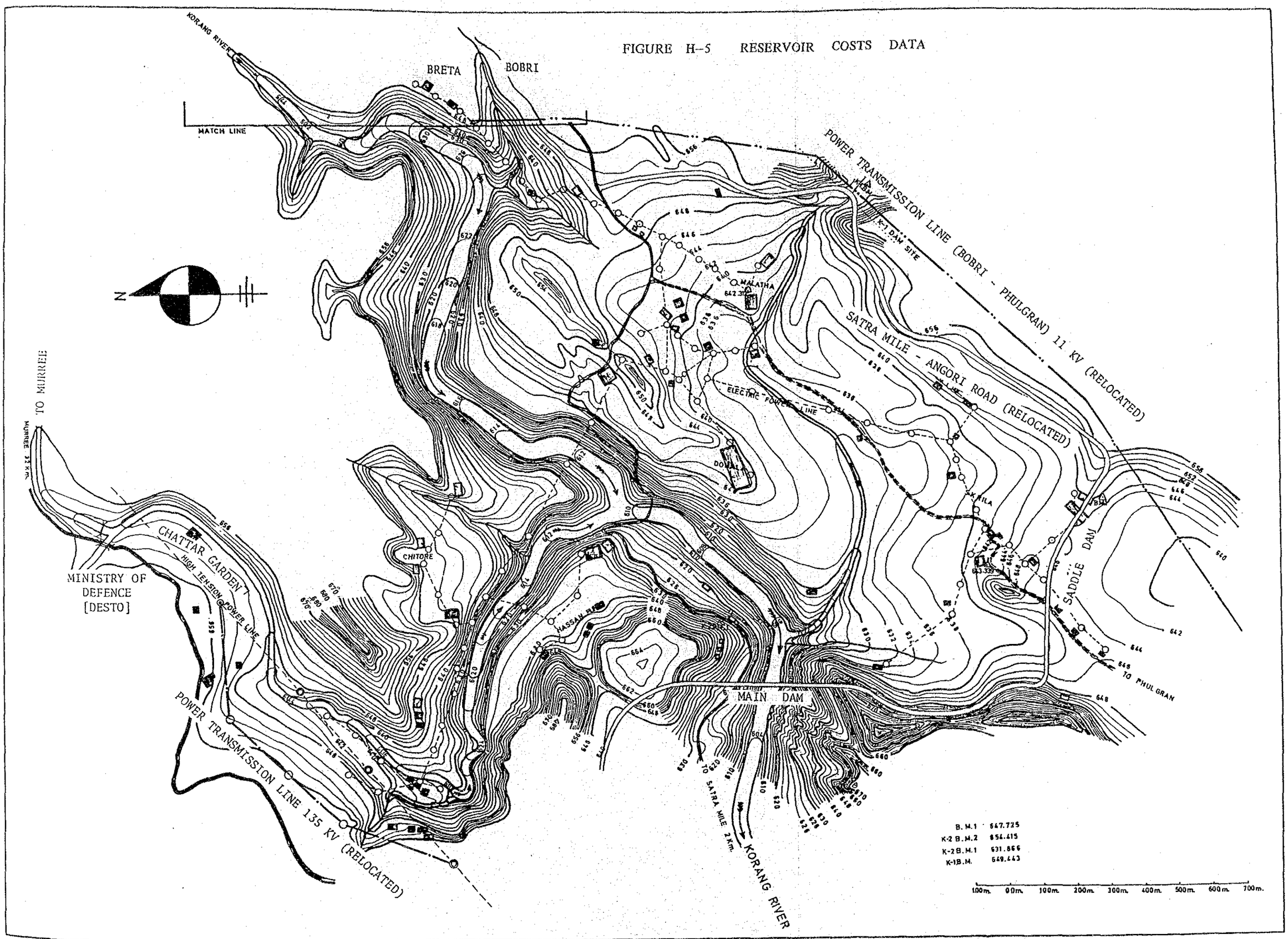
Director General, Geological Survey of Pakistan
1986

FIGURE H–5 RESERVOIR COSTS DATA



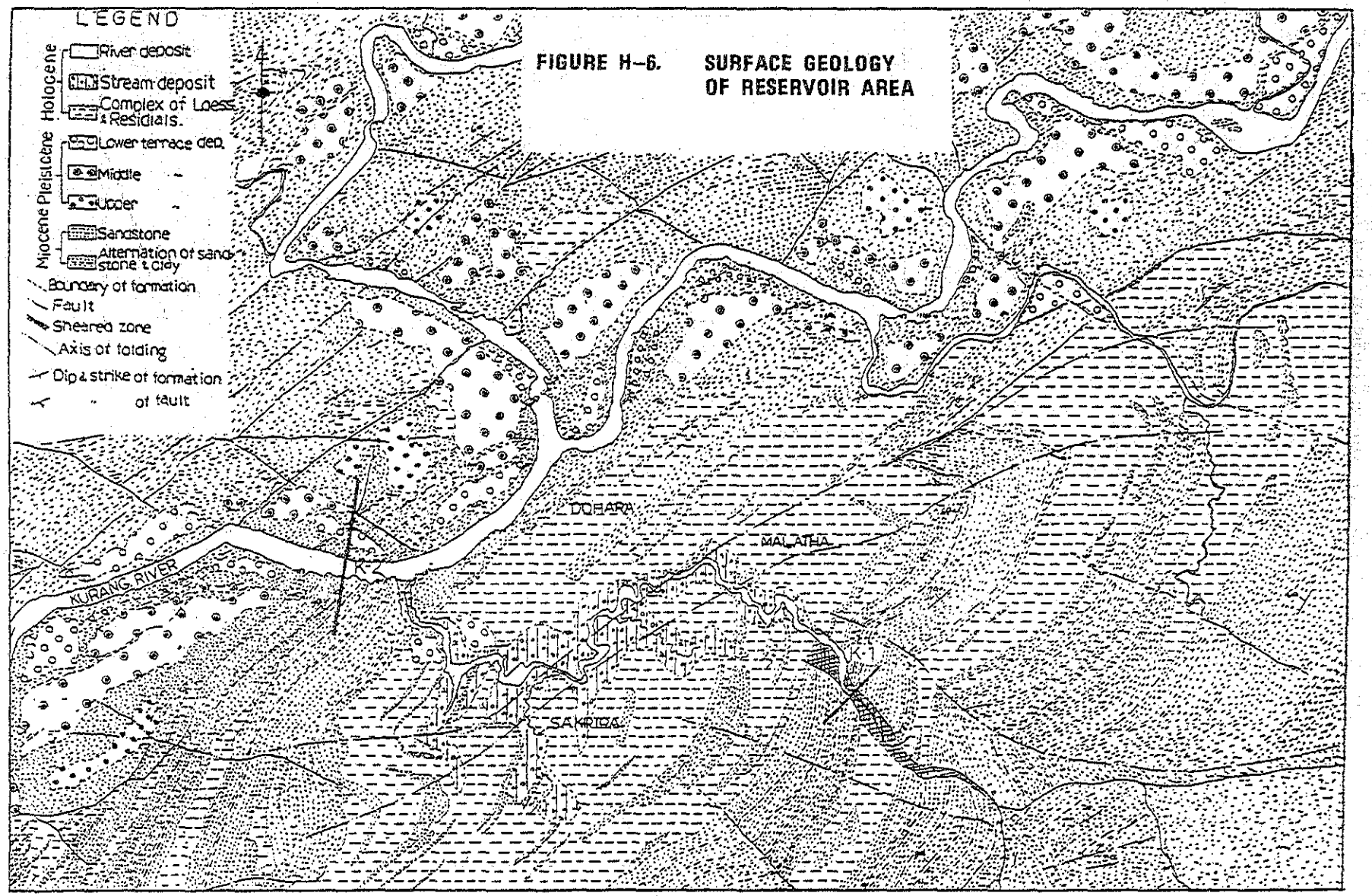
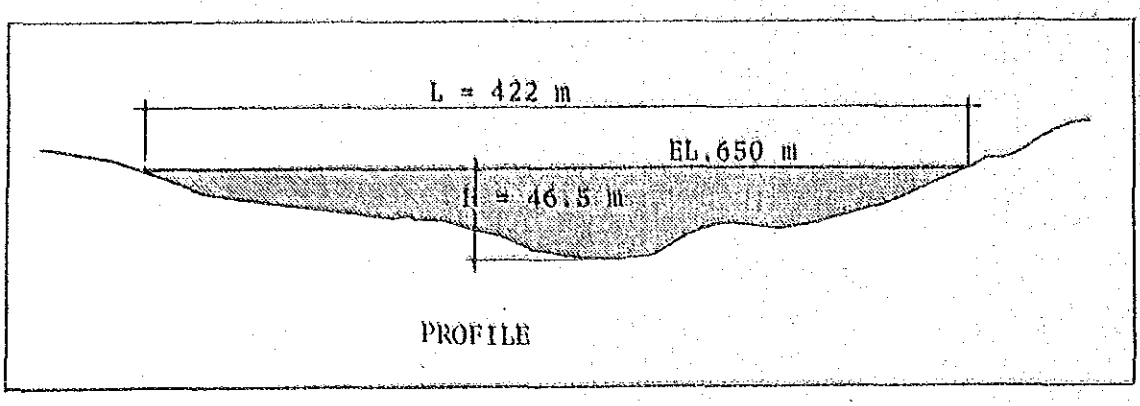
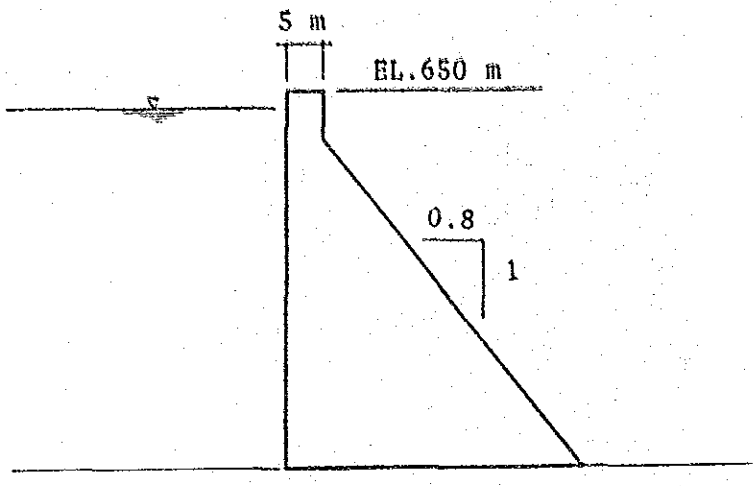


FIGURE H-6. SURFACE GEOLOGY OF RESERVOIR AREA

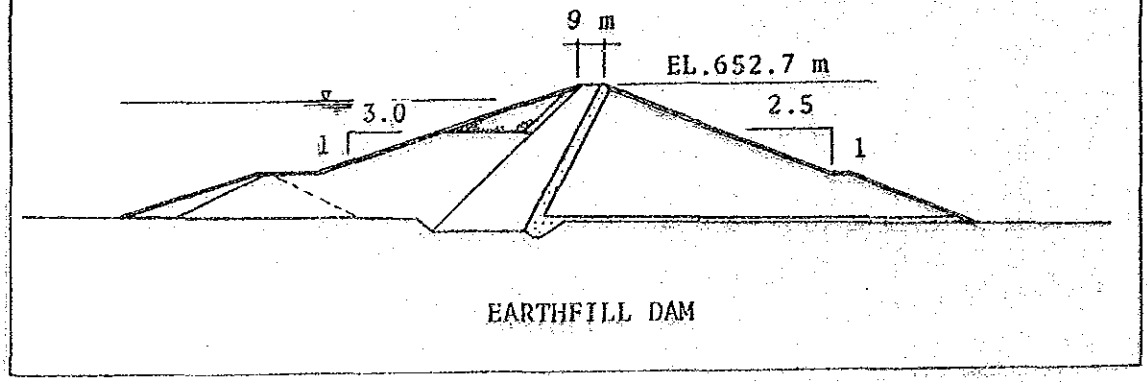
FIGURE H-7. PROFILE AND SECTIONS OF DAM



PROFILE



CONCRETE GRAVITY DAM



EARTHFILL DAM

CHAPTER II. CANALS

TABLE H-2. LENGTHS OF MAIN AND BRANCH CANALS

Q (cu.m/s)		Main canal	1st BC	2nd BC	3rd BC	4th BC	5th BC	6th BC	Total
4.0	O	1,744.5							1,744.5
	S	310							310
	C&C	-							-
	Dr	162							162
	OT	13.5							13.5
Sub Total		2,230							2,230
3.7	O	892.5							892.5
	S	780							780
	C&C	-							-
	Dr	54							54
	OT	13.5							13.5
Sub Total		1,740							1,740
3.3	O	926.5							926.5
	S	-							-
	C&C	-							-
	Dr	180							180
	OT	13.5							13.5
Sub Total		1,120							1,120
1.8	O	2,846.5							2,846.5
	S	270							270
	C&C	20							20
	Dr	160							160
	OT	13.5							13.5
Sub Total		3,310							3,310
1.5	O	8,430.5			3,732				12,162.5
	S	670			2,600				3,270
	C&C	20			20				40
	Dr	176			48				224
	OT	13.5			-				13.5
Sub Total		9,310			6,400				15,710
1.3	O				2,376				2,376
	S				800				800
	C&C				-				-
	Dr				64				64
	OT				-				-
Sub Total					3,240				3,240
1.0	O				1,360		200		1,560
	S				-		-		-
	C&C				-		-		-
	Dr				-		-		-
	OT				-		-		-
Sub Total					1,360		200		1,560
0.8	O				5,208				5,208
	S				-				-
	C&C				80				80
	Dr				112				112
	OT				-				-
Sub Total					5,400				5,400
0.5	O			100	1,380		4,828	1,680	7,988
	S			-	-		-	410	410
	C&C			100	-		100	20	240
	Dr			-	120		72	-	192
	OT			-	-		-	-	-
Sub Total				200	1,500		5,000	2,150	8,850
0.3	O		2,732	4,218	-	952	780	2,800	11,482
	S		690	350	-	-	-	1,400	2,440
	C&C		-	-	-	-	20	-	20
	Dr		168	132	-	48	-	-	348
	OT		-	-	-	-	-	-	-
Sub Total			3,590	4,700	-	1,000	800	4,200	14,290
0.15	O					844		1,550	2,394
	S					-		-	-
	C&C					20		-	20
	Dr					36		-	36
	OT					-		-	-
Sub Total						900		1,550	2,450
Total		17,710	3,590	4,900	17,900	1,900	6,000	7,900	59,900

Note: O --- Open Canal
S --- Syphon
C&C--- Cut & Cover Conduit
Dr --- Drop Structure
OT --- Off Take

TABLE H-3. LENGTHS OF DISTRIBUTARY AND MINOR CANALS

No.	L (m)	A (ha)	Mar. Design Discharge (cu.m/s)	Remarks
1	2,150	143	0.15	
2	1,150	126	0.15	
3	*(2,100)	215	0.3	Q = 0.13 1,470 m pipe; Q = 0.3 630 m open canal
4	840	106	0.15	
5	5,880	247	0.3	
6	1,680	295	0.3	
7	2,100	172	0.15	
8	520	149	0.15	
9	2,100	221	0.3	
10	940	96	0.15	
11	6,510	216	0.3	
12	2,940	167	0.15	
13	2,700	275	0.3	
14	2,050	260	0.3	
15	4,510	197	0.3	
16	2,730	385	0.5	
17	3,990	378	0.5	
18	1,470	174	0.15	
19	3,150	252	0.3	
20	2,310	417	0.5	
21	1,260	173	0.15	
22	2,100	368	0.5	
23	2,100	399	0.5	
24	*(2,730) 2,620	367	0.5	
25	600	166	0.15	
26	2,730	298	0.3	
27	1,780	152	0.15	
28	2,410	184	0.3	
Minor Canal Total	65,320	6,600		
Distributary Canal Total	*(4,830)			

Distributary Canal	
Q=0.13(pipe)	L=1,470m
Q=0.3	L = 630m
Q=0.5	L=2,730m
Total	4,830m
Minor Canal	
Q=0.15	L=15,750m
Q=0.3	L=33,720m
Q=0.5	L=15,850m
Total	65,320m

Note: *( ) --- Distributary Canal

TABLE H-4. CONSTRUCTION COST OF CANAL PER METER

(1) Design Discharge Q = 3.3 m^3/S

Item	Unit	Unit Price	Vertical Wall Type				Sloped Wall Type			
			Stone Masonry		Concrete		Stone Masonry		Concrete	
			Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount
Excavation	m^3	35 Rs.	9.5	333 Rs.	7.2	252 Rs.	12.6	441 Rs.	9.6	336 Rs.
Embankment	m^3	12 "	9.2	110 "	6.8	82 "	11.6	139 "	11.8	142 "
Concrete	m^3	1,500 "	-	-	0.94	1,410 "	-	-	0.86	1,290 "
Base Concrete	m^3	1,200 "	0.99	1,188 "	-	-	0.76	912 "	-	-
Reinforcing Bar	Kg.	13 "	-	-	54.0	702 "	-	-	-	-
Stone Masonry	m^3	700 "	1.6	1,120 "	-	-	2.12	1,484 "	-	-
Land Acquisition	m^2	25 "	11.0	275 "	10.0	250 "	20.0	500 "	18.0	450 "
Total				3,026 Rs.		2,696 Rs.		3,476 Rs.		2,218 Rs.

(2) DesignDischarge Q = 0.5 m^3/S

Item	Unit	Unit Price	Vertical Wall Type				Sloped Wall Type			
			Stone Masonry		Concrete		Stone Masonry		Concrete	
			Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount
Excavation	m^3	35 Rs.	5.7	200 Rs.	4.3	151 Rs.	6.7	235 Rs.	4.9	172 Rs.
Embankment	m^3	12 "	4.3	52 "	2.8	34 "	5.3	64 "	6.0	72 "
Concrete	m^3	1,500 "	-	-	0.71	1,065 "	-	-	0.42	630 "
Base Concrete	m^3	1,200 "	0.63	756 "	-	-	0.61	732 "	-	-
Reinforcing Bar	Kg.	13 "	-	-	-	-	-	-	-	-
Stone Masonry	m^3	700 "	0.7	490 "	-	-	0.92	644 "	-	-
Land Aquisition	m^2	25 "	10.0	250 "	9.0	225 "	14.0	350 "	12.0	300 "
Total				1,748 Rs.		1,475 Rs.		2,025 Rs.		1,174 Rs.

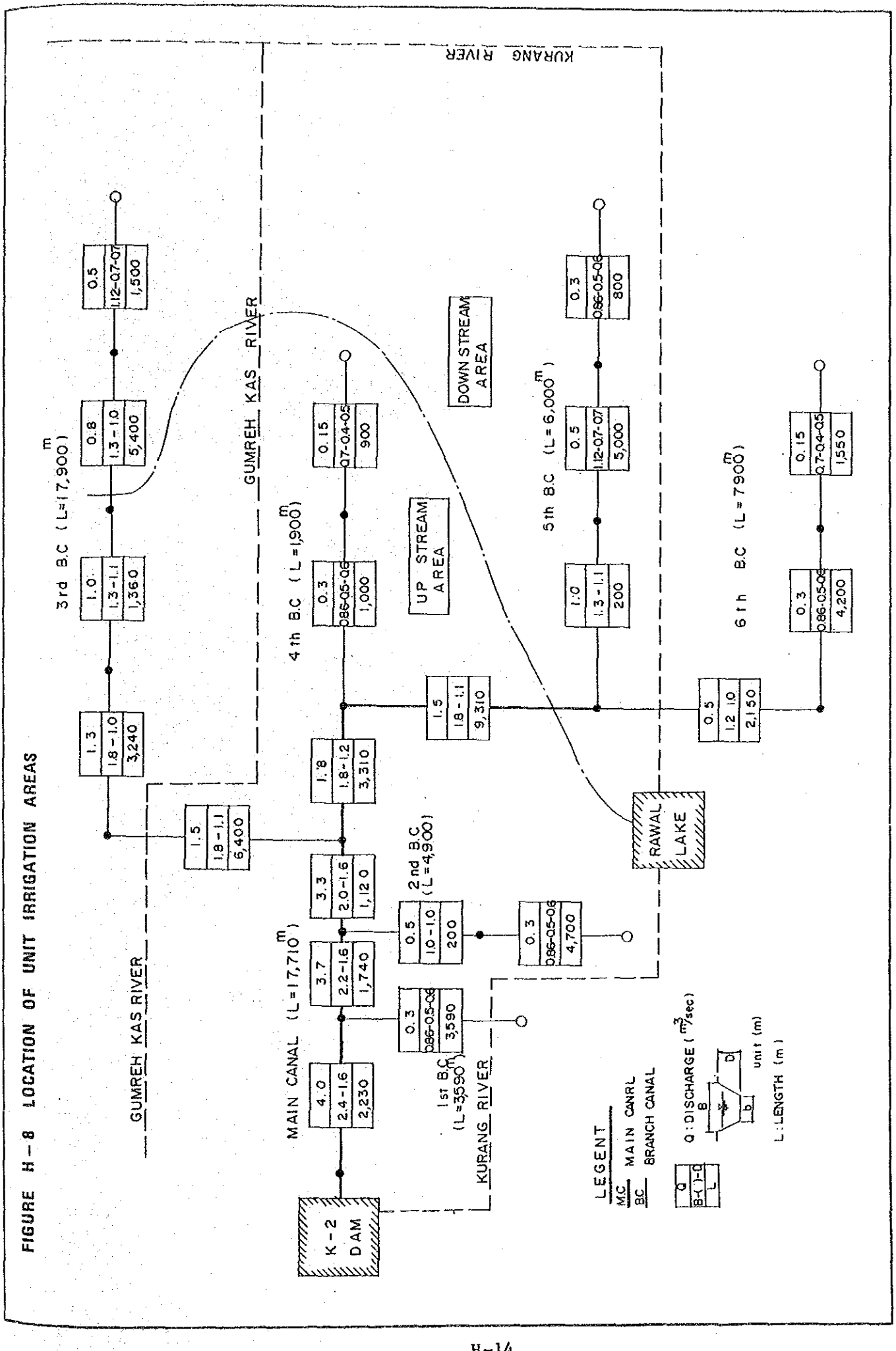
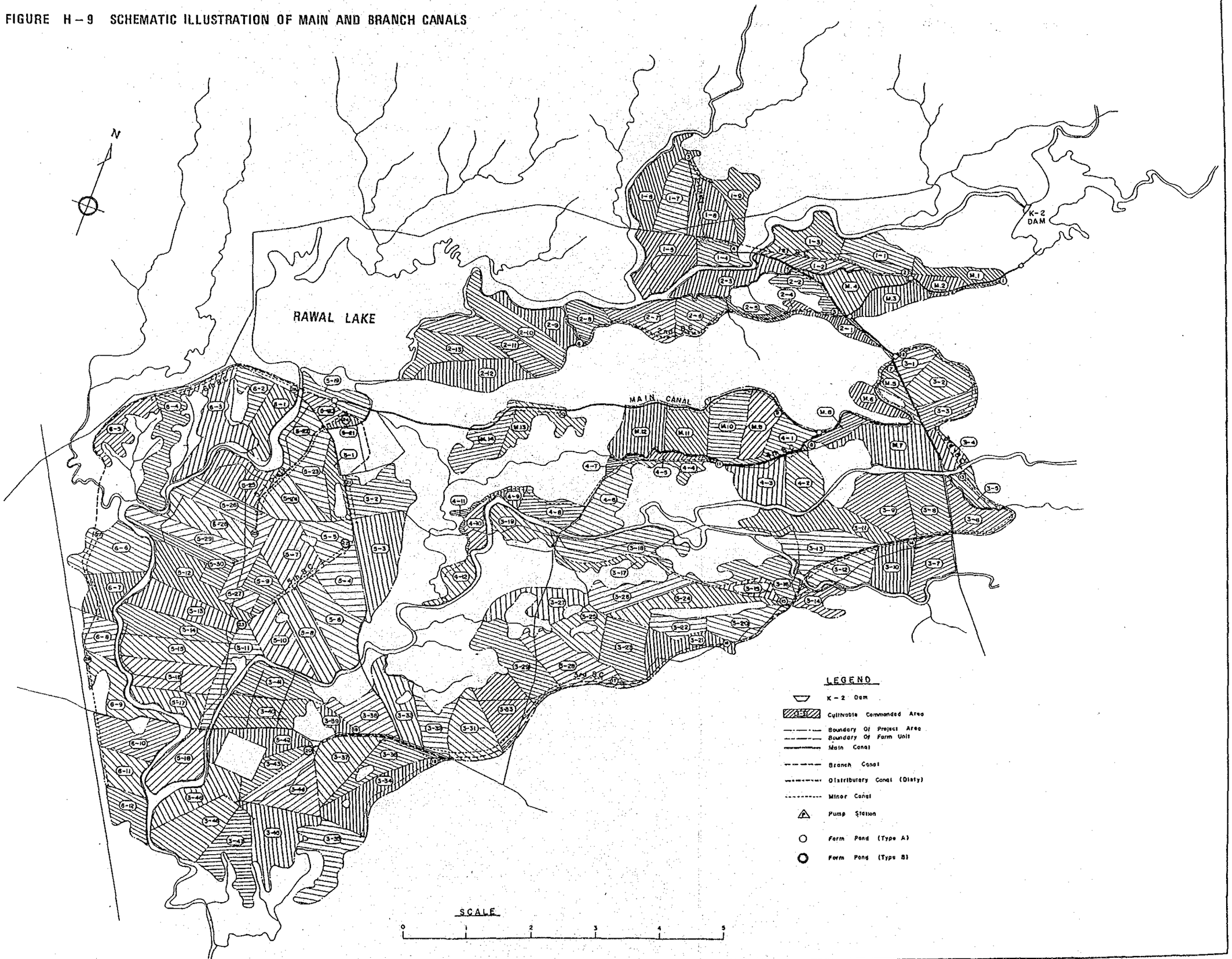


FIGURE H-8 LOCATION OF UNIT IRRIGATION AREAS

FIGURE H – 9 SCHEMATIC ILLUSTRATION OF MAIN AND BRANCH CANALS



ANNEX I. ON-FARM DEVELOPMENT WORKS

LIST OF TABLE

LIST OF FIGURES

TABLE I-1. PRESENT AREA OF FARM LAND IN SAMPLED AREAS

(unit: ha)

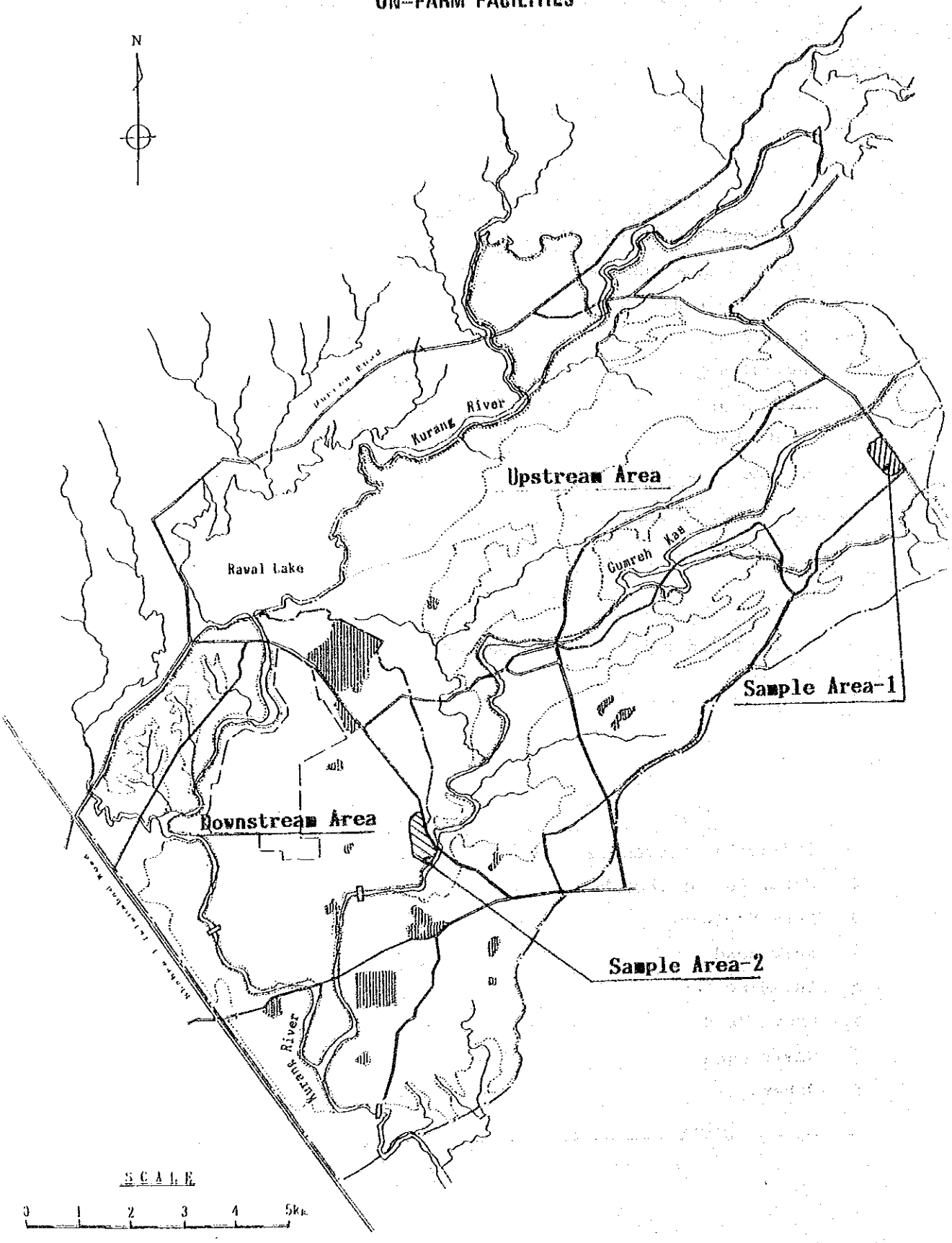
Item	Sample Area-1	Sample Area-2
1. Cultivable Commanded Area	28.1	40.6
2. Water Course (Katcha)	-	-
3. Farm Drainage	-	-
4. Farm Road	1.0	0.9
5. Building Lot	3.7	1.8
6. Grave Yard	0.1	-
7. Waste Land	3.3	0.4
8. Others	4.1	1.5
Total	40.3	45.2

TABLE I-2. PROPOSED AREA OF LAND IN SAMPLE AREA

(unit: ha)

Item	Sample Area-1	Sample Area-2
1. Cultivable Commanded Area	25.6	37.5
2. Water Course (Katcha)	1.2	1.2
3. Farm Drainage	0.8	0.6
4. Farm Road	1.7	2.2
5. Building Lot	3.7	1.8
6. Grave Yard	0.1	-
7. Waste Land	3.3	0.4
8. Others	3.9	1.5
Total	40.3	45.2

FIGURE I-1. LOCATION MAP OF SAMPLE AREA FOR ON-FARM FACILITIES



ANNEX J. COST ESTIMATE

ANNEX J. COST ESTIMATE

LIST OF TABLES

LIST OF FIGURES

CHAPTER I. UNIT COST

TABLE J-1. LABOUR RATES (as of December, 1987)

(unit: Rs.)

	Rs/Day
Laborer	35
Skilled-Laborer	50
General Foreman	100
Carpenter	80
Senior Carpenter	90
Mason	80
Senior Mason	90
Steel Bender	100
Welder	100
Driver (Light Equipment)	70
Driver (Heavy Equipment)	80
Driver (General)	50
Mechanic	75
Senior Mechanic	85
Electrician	50
Driller	50
Blaster	70
Plumber	75
Batch Plant Operator	70
Watchman	45
Janitor	40
Surveyor	55

TABLE J-2. UNIT COST OF CONSTRUCTION MATERIAL

(unit: Rs.)

Description	Unit	Total Unit Cost	Component F.C	Component L.C	Unit Cost F.C.	Unit Cost L.C.
Reinforced Bar	ton	9,000	80	20	7,200	1,800
Special Gasoline	lit	7.8	80	20	6.2	1.6
Gasoline	lit	7.2	80	20	5.7	1.5
Diesel	lit	3.9	80	20	3.1	0.8
Lubricating Oil	lit	16.0	80	20	12.8	3.2
Cement	ton	1,700	60	40	1,020	680
Reinforced Concrete Pipe						
ϕ100 (4")	m	40.0	60	40	24.0	16.0
ϕ300 (12")	m	117.0	60	40	71.0	46.0
ϕ400 (18")	m	207.0	60	40	124.0	83.0
ϕ600 (24")	m	367.0	60	40	220.0	147.0
ϕ750 (30")	m	550.0	60	40	330.0	220.0
ϕ900 (36")	m	750.0	60	40	450.0	300.0
ϕ1,000 (40")	m	830.0	60	40	500.0	330.0
ϕ1,300 (51")	m	1,330.0	60	40	800.0	530.0
ϕ1,500 (60")	m	1,670.0	60	40	1,000.0	670.0
Sand for Concrete	m^3	110	50	50	55	55
Sand for Bed of Riprap, Pipe	m^3	70	50	50	35	35
Gravel (Crusher-run)	m^3	100	65	35	65	35
" (Pit-run)	m^3	55	50	50	28	27
Blasting Material Dynamite	kg	40.0	80	20	32.0	8.0
A.N.F.O	kg	37.0	80	20	30.0	7.0
Detonator	pc	26.0	80	20	21.0	5.0
Fuse	m	13.0	80	20	10.5	2.5
Lumber	m^3	7,600.0	0	100	0	7,600.0
Plywood	m^2	70.0	0	100	0	70.0
Sod	m^2	1.5	0	100	0	1.5
Drilling Rod	pc	1,370.0	80	20	1,096.0	274.0
Bit	pc	1,930.0	80	20	1,540.0	390.0
Sleaves	pc	780.0	80	20	625.0	155.0

TABLE J-3. LAND ACQUISITION AND COMPENSATION COST

(unit: Rs.)

Description	Unit	Total Unit Cost	Component F.C	Component L.C	Unit Cost F.C	Unit Cost L.C
Mountain Area	ha	100,000	0	100	0	100,000
Waste Area	ha	100,000	0	100	0	100,000
Cultivated Area	ha	400,000	0	100	0	400,000
Resettlement Cost	1 family	75,000	0	100	0	75,000

TABLE J-4. HIRING RATE AND FUEL CONSUMPTION (per hr)

(unit: Rs.)

Equipment		(p.s)	Capital Cost (x1,000)	Hiring Rate (x0.001)	Equipment Rate F/C	Equipment Rate L/C	Fuel Consumption (lit/day)
Bulldozer	32t	310	3,500	0.280	780	200	33
Bulldozer (with Ripper)	32t	310	3,950	0.280	890	220	33
Bulldozer	21t	200	2,330	0.280	520	130	21
Bulldozer (with Ripper)	21t	200	2,450	0.280	550	170	21
Bulldozer	15t	150	1,480	0.280	330	80	16
Bulldozer	11t	108	1,140	0.280	260	60	11
Bulldozer	8t	86	839	0.433	290	70	9
Backhoe Shovel	1.0m^3	175	2,292	0.292	535	135	19
Bakchoe Shovel	0.6m^3	108	1,429	0.292	330	90	12
Bakchoe Shovel	0.35m^3	78	1,083	0.308	265	70	9
Wheel Leader	2.30m^3	159	1,610	0.300	380	100	17
Wheel Loader	1.70m^3	105	1,237	0.300	290	70	12
Wheel Loader	3.20m^3	210	2,550	0.300	620	150	23
Wheel Loader	1.20m^3	75	900	0.300	220	50	8
Tunnel Muck Loader	0.35m^3	80	1,300	0.450	470	110	9
Dump Truck	11t	314	805	0.270	150	40	11
Dump Truck	4t	160	283	0.385	90	20	6
Truck	6.5t	175	343	0.361	100	25	6
Truck	4.5t	164	267	0.385	80	25	6
Water Lorry	4t	155	410	0.336	110	30	6
Truck with Crane	4t	146	300	0.385	92	23	6
Truck Crane	15t	230	2,200	0.239	420	105	9
Truck Crane	20t	230	2,800	0.239	535	135	9
Road Roller	8 - 10t	90	605	0.355	170	45	6
Vibrating Roller	11 - 12t	115	1,560	0.380	470	120	13
Vibrating Roller	8 - 10t	105	1,310	0.380	400	100	11
Vibrating Roller	3 - 5t	23	362	0.380	140	35	3
Tamping Roller	13 - 20t	210	930	0.260	240	60	21
Tamping Roller	8 - 15t	96	610	0.260	155	40	10
Tamping Roller	3 - 5t	30	260	0.260	70	15	3
Tamper	60kg	4	24	0.260	6	2	1
Tamper	120kg	6	33	0.321	8	3	2
Motor Grader	L=2.5H	76	891	0.356	250	70	5
Motor Grader	L=3.1H	110	995	0.356	280	75	7

TABLE J-5. HIRING RATE AND FUEL CONSUMPTION (per or day)

(unit: Rs.)

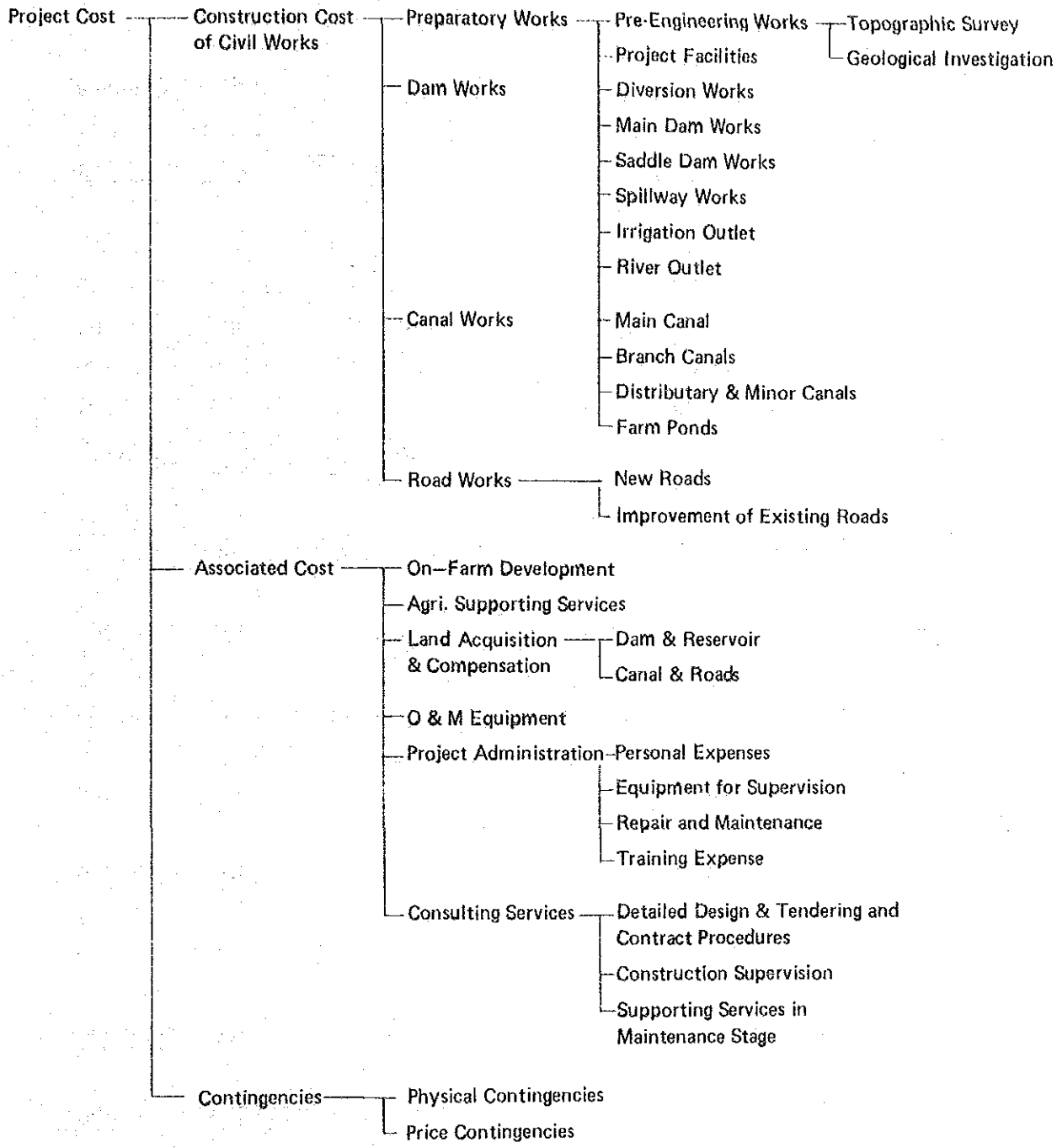
Equipment		Capital Cost (x1,000)	Hiring Rate (x0.001)	Equipment Rate F/C	Equipment Rate L/C	Fuel Consumption (lit/day)
Compressor	11.0 m^3/min (per day) 110 p.s.	466	2.500	930	235	27
Compressor	7.5 " (per day) 80 p.s.	289	2.500	580	140	20
Compressor	5.0 " (per day) 70 p.s.	246	2.500	490	125	18
Compressor	3.7 " (per day) 52 p.s.	169	2.500	340	80	13
Generator	22 kw (per day) 32 p.s.	163	2.231	290	70	8
Generator	40 " (per day) 52 p.s.	214	1.987	340	85	13
Generator	80 " (per day) 99 p.s.	321	1.987	510	130	24
Generator	100 " (per day) 120 p.s.	407	1.987	650	160	30
Drainage Pump	ϕ80m/m H-10M 2.2 kw (per day)	14	3.194	35	10	
Drainage Pump	ϕ110m/m H-20M 11 kw (per day)	42	3.194	110	25	
Turbin Pump	ϕ100m/m 7.5 kw (per day)	45	3.194	115	30	
Water Pump	ϕ50m/m 1.7 kw (per day)	17	3.750	50	15	
Water Pump	ϕ100m/m 3.7 kw (per day)	18	3.750	55	10	
Water Pump	ϕ150m/m 7.5 kw (per day)	27	3.750	80	20	
Grouting Pump	15 - 30 lit/min 2.2 kw (per day)	52	3.648	150	40	
Grout Mixer	200 lit 5.5 kw (per day)	44	3.648	130	30	
Concrete Plant	0.5m^3 26m^3/h 4.1 kw (per day)	953	0.463	350	90	
Concrete Mixer	0.5m^3 3.5 kw (per day)	629	0.463	230	60	
Concrete Pump Car	20m^3/hr 80 p.s.	950	0.413	310	80	6
Truck Mixer	3.0m^3 220 p.s.	617	0.360	180	40	8
Crawler Drill (10m class)		721	0.479	275	70	
Hand Rammer 20kg (per day)		24	4.808	90	25	
Leg Drill for Tunnel 30kg (per day)		25	4.808	95	25	
Boring Machine 5.5 kw (per day)		198	2.462	390	97	10
Vibrator 45 m/m	(per day) 5.0 p.s.	15	4.028	50	10	1
Water Pipe 100 m/m		0.5	2.713	1.1	0.3	
Aggregate Hopper		40	2.639	85	20	

TABLE J-6. FOREIGN AND LOCAL COMPONENTS

	Description	Foreign Portion (%)	Local Portion (%)
1.	Cement	60	40
2.	Reinforcement Bar	80	20
3.	Fuel and Oil	55	45
4.	Construction Machinery	80	20
5.	Truck and Vehicle	70	30
6.	Depreciation for Machinery	100	0
7.	Repair of Machinery	70	30
8.	Maintenance of Machinery	0	100
9.	Timber, Lumber	0	100
10.	Explosive	80	20
11.	Large Pump, Gate, Valve, etc.	95	5
12.	Electrical Control Facilities	95	5
13.	Metal and Steel Product	75	25
14.	Labour	0	100
15.	Taxes and Bonding Charge	0	100
16.	Contractors Overhead	40	60
17.	Facilities for Supervision	60	40
18.	Engineering Service	50	50

CHAPTER II. PROJECT COST ESTIMATION

PROJECT COST COMPONENT



PROJECT COST

(unit: '000 Rupee)

Item	F/C	L/C	Total
1. Civil Works			
1.1. Pre-Engineering Works	7,300	0.0	7,300
1.2. Dam Works	277,200	128,700	405,900
1.3. Canal Works	82,700	66,300	149,000
1.4. Road Works	5,400	2,500	7,900
1.5. Project Facilities	1,400	4,300	5,700
Sub-Total	374,000 (65%)	201,800 (35%)	575,800
2. On-Farm Development	27,100	25,100	52,200
3. Agricultural Supporting Facilities	16,700	3,300	20,000
4. Land Acquisition and Compensation	3,400	110,500	113,900
5. O & M Equipment	12,300	500	12,800
6. Project Administration	4,200	5,300	9,500
7. Consulting Services	60,000	23,800	83,800
8. Total (1 - 7)	497,700	370,300	868,000
9. Contingency (10%)	49,800	37,000	86,800
10. Total (8 + 9)	547,500	407,300	954,800
11. Price Escalation	120,000	255,600	375,600
Grand Total (10 + 11)	667,500	662,900	1,330,400

TABLE J-7. PRE-ENGINEERING WORKS COOST (INVESTIGATIONS FOR DETAILED DESIGN)

Description	Q'ty	Unit	Rate F.C (Rs.)	Rate L.C (Rs.)	Amount F.C ('000 Rs.)	Amount L.C ('000 Rs.)	Amount Total ('000 Rs.)
1. Topographic Survey							
1.1. Project Area							
Topographic Survey (S=1/5,000)	12,900	ha	200	-	2,580	-	2,580
1.2. K-2 Dam							
Topographic Survey (S=1/5,000)	100	ha	300	-	30	-	30
" (S=1/1,000)	50	ha	600	-	30	-	30
Route Survey	20	km	3,000	-	60	-	60
Sub-total					120		120
1.3. Irrigation Canal							
Topographic Survey (S=1/1,000)	250	ha	600	-	150	-	150
Route Survey	130	km	3,000	-	300	-	300
Sub-total					450	-	450
Total					3,150		3,150
2. Geological Investigation							
2-1. K-2 Damsite							
Core Drilling	1,740	m	1,300	-	2,262	-	2,262
Testing							
Lugeon Test	300	Nos.	300	-	90	-	90
Loading Test	90	Nos.	500	-	45	-	45
Seismic Prospecting	3,300	m	100	-	330	-	330
Sub-total					2,727		2,727
2-2. Borrow Area of Impervious Materials							
Test Pits	60	Place	300	-	18	-	18
Field Density Text	20	Nos.	200	-	4	-	4
Sub-total					22		22
2-3. Irrigation Canal Route							
Core Drilling	20	m	1,300	-	26	-	26
Hand Auger Boring	160	Nos.	200	-	32	-	32
Sub-total					58		58
2-4. Laboratory Test							
Rock Test	30	Samples	800	-	24	-	24
Soil Test							
Physical Test	40	Samples	600	-	24	-	24
Mechanical Test	40	Samples	1,500	-	60	-	60
Sub-total					108		108
Total					2,915		2,915
3. Others (= 20%)					1,235		1,235
Grand Total					7,300		7,300

TABLE J-8. DAM WORK COST

Description	Amount (1000Rs) F.C.	L.C.	Total	Remarks F/C	L/C
SUMMARY					
(1) Diversion Works	42,644	22,673	65,317	65.3%,	34.7%
(2) Main Dam Works	71,135	31,438	102,573	69.4%,	30.6%
(3) Saddle Dam Works	10,280	4,329	14,609	70.4%,	29.6%
(4) Spillway Works	131,032	65,490	196,522	66.7%,	33.3%
(5) Irrigation Outlet	11,588	2,169	13,757	84.2%	15.8%
(6) River Outlet	10,472	2,608	13,080	80.0%,	20.0%
Total of Dam Works	277,151	128,707	405,858	68.3%,	31.7%

TABLE J-8(1). COST ESTIMATION OF DAM WORKS

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1000Rs) F.C.	Amount (1000Rs) L.C.	Amount (1000Rs) Total	Remarks
(1)	Diversion Works									
	- Excavation in Tunnel	cu.m	51,000	180	75	255	9,180	3,825	13,005	
	- Steel Supports	set	440	21,575	8,765	30,340	9,493	3,857	13,350	
	- Concrete of tunnel lining	cu.m	23,000	712	465	1,177	16,376	10,695	27,071	
	- Concrete other than tunnel lining	cu.m	4,000	575	455	1,030	2,300	1,820	4,120	
	- Reinforcing bar	ton	100	8,900	3,270	12,170	890	327	1,217	
	- Drilling for curtain grout	m	2,160	268	118	386	579	255	834	
	- Pressure grouting	ton	110	3,345	3,040	6,385	368	334	702	
	- Bulkhead gate	L.S.	-	-	-	-	1,425	475	1,900	
	- Miscellaneous works	L.S.	-	-	-	-	2,033	1,085	3,118	
	Sub Total						42,644	22,673	65,317	F/C 65.3%, L/C 34.7%
(2)	Main Dam									
	- Excavation (Earth)	cu.m	45,000	23	7	30	1,035	315	1,350	Soil
	- Excavation (Soft)	cu.m	270,000	27	10	37	7,290	2,700	9,990	Soft rock
	- Excavation (Hard)	cu.m	135,000	62	25	87	8,370	3,375	11,745	Hard rock
	- Embankment (Core)	cu.m	380,000	47	17	64	17,860	6,460	24,320	Zone 1
	- Embankment (Filter)	cu.m	100,000	48	38	86	4,800	3,800	8,600	Zone 2
	- Embankment (Rock)	cu.m	100,000	17	6	23	1,700	600	2,300	Zone 3
	- Embankment (Randam)	cu.m	1,160,000	12	5	17	13,920	5,800	19,720	Zone 4
	- Riprap	cu.m	112,000	17	10	27	1,904	1,120	3,024	
	- Bedding for riprap	cu.m	16,000	46	38	84	736	608	1,344	
	- Drilling of grout holes	m	20,000	210	93	303	4,200	1,860	6,060	
	- Pressure grouting	ton	1,000	3,340	3,040	6,380	3,340	3,040	6,380	
	- Instrumentation	L.S.	-	-	-	-	2,560	280	2,840	
	- Miscellaneous works	L.S.	-	-	-	-	3,420	1,480	4,900	
	Sub Total						71,135	31,438	102,573	F/C 69.4%, L/C 30.6%
(3)	Saddle Dam									
	- Excavation (Earth)	cu.m	20,000	23	7	30	460	140	600	
	- Excavation (Soft)	cu.m	16,000	27	10	37	432	160	592	
	- Excavation (Hard)	cu.m	9,000	62	25	87	558	225	783	
	- Embankment (Core)	cu.m	150,000	47	17	64	7,050	2,550	9,600	Zone 1
	- Embankment (Filter)	cu.m	16,000	48	38	86	768	608	1,376	Zone 2
	- Riprap	cu.m	17,000	17	10	27	289	170	459	
	- Bedding for riprap	cu.m	5,000	46	38	84	230	190	420	
	- Sodding	sq.m	16,000	-	5	5	0	80	80	
	- Miscellaneous works	L.S.	-	-	-	-	493	206	699	
	Sub Total						10,280	4,329	14,609	F/C 70.4%, L/C 29.6%
(4)	Spillway									
	- Excavation (Earth)	cu.m	164,000	23	7	30	3,772	1,148	4,920	Soil
	- Excavation (Soft)	cu.m	984,000	27	10	37	26,568	9,840	36,408	Soft rock
	- Excavation (Hard)	cu.m	492,000	62	25	87	30,504	12,300	42,804	Hard rock
	- Backfill	cu.m	200,000	17	5	22	3,400	1,000	4,400	
	- Concrete	cu.m	65,000	575	455	1,030	37,375	29,575	66,950	
	- Reinforcing bar	ton	2,600	8,900	3,270	12,170	23,140	8,502	31,642	
	- Miscellaneous works	L.S.	-	-	-	-	6,273	3,125	9,398	
	Sub Total						131,032	65,490	196,522	F/C 66.7%, L/C 33.3%
(5)	Irrigation Outlet									
	- Excavation (Earth)	cu.m	35,000	23	7	30	805	245	1,050	
	- Excavation (Soft rock)	cu.m	28,000	27	10	37	756	280	1,036	
	- Excavation (Hard)	cu.m	7,000	62	25	87	434	175	609	
	- Backfill	cu.m	15,000	17	5	22	255	75	330	
	- Riprap	cu.m	3,800	17	10	27	65	38	103	
	- Bedding for riprap	cu.m	1,200	46	38	84	55	46	101	
	- Sodding	sq.m	1,900	-	5	5	0	10	10	
	- Concrete	cu.m	1,000	575	455	1,030	575	455	1,030	
	- Steel pipe ϕ1,500mm	m	90	11,280	3,220	14,500	1,015	290	1,305	
	- Steel pipe ϕ1,200mm	m	20	7,835	1,900	9,735	157	38	195	
	- Emergency slide gate	set	1	-	-	-	1,200	65	1,265	
	- Maintenance slide gate	set	1	-	-	-	2,148	122	2,270	
	- Jet flow gate	set	1	-	-	-	3,563	198	3,761	
	- Gate house	sq.m	35	190	760	950	7	27	34	
	- Miscellaneous works	L.S.	-	-	-	-	553	105	658	
	Sub Total						11,588	2,169	13,757	F/C 34.2%, L/C 15.8%

- to be continued -

- Continued -

Item	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1000Rs) F.C.	Amount (1000Rs) L.C.	Amount (1000Rs) Total	Remarks
(6)	River Outlet									
	- Excavation in Tunnel	cu.m	2,000	470	198	668	940	396	1,336	
	- Excavation (Soft)	cu.m	1,000	27	10	37	27	10	37	Open cut
	- Excavation (Hard)	cu.m	800	62	25	87	50	20	70	Open cut
	- Backfill	cu.m	700	17	5	22	12	3	15	
	- Steel supports	set	340	2,195	960	3,155	746	326	1,072	
	- Concrete of tunnel plugging	cu.m	1,520	575	465	1,040	874	707	1,581	
	- Concrete other than tunnel lining	cu.m	470	575	455	1,030	270	214	484	
	- Steel pipe ø1,000mm	m	430	5,225	1,175	6,400	2,247	505	2,752	
	- Steel pipe ø 800 mm	m	12	3,635	875	4,510	44	10	54	
	- Emergency slide gate	set	1	-	-	-	1,229	68	1,297	
	- Maintenance slide gate	set	1	-	-	-	1,292	73	1,365	
	- Jet flow gate	set	1	-	-	-	2,234	124	2,358	
	- Gate house	sq.m	35	190	760	950	7	27	34	
	- Miscellaneous works	L.S.	-	-	-	-	500	125	625	
	Sub Total						10,472	2,608	13,080	F/C 86.0%, L/C 28.0%
	Total of Dam Works						277,151	128,707	405,858	F/C 68.3%, L/C 31.7%

TABLE J-9. CANAL WORK COST

Description	Amount (1000Rs) F.C.	L.C.	Total	Remarks
SUMMARY				
(1) Main Canal	27,972	22,042	50,014	
(2) 1st Branch Canal	4,176	3,503	7,679	
(3) 2nd Branch Canal	3,290	2,969	6,259	
(4) 3rd Branch Canal	22,898	18,394	41,292	
(5) 4th Branch Canal	1,136	1,069	2,205	
(6) 5th Branch Canal	4,790	4,510	9,300	
(7) 6th Branch Canal	7,815	6,833	14,648	
(8) Distributary Canals	2,841	2,771	5,612	
(9) Minor Canals	3,984	2,139	6,123	
(10) Farm Ponds	3,768	2,095	5,863	F/C L/C
Total of Canal Works	82,670	66,325	148,995	55.5%, 44.5%

TABLE J-9(1). COST ESTIMATION OF CANAL WORKS

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1000Rs) F.C.	Amount (1000Rs) L.C.	Amount (1000Rs) Total	Remarks
(1)	Main Canal									
	- Excavation (Soft)	cu.m	148,800	24	9	33	3,571	1,339	4,910	incl. stripping
	- Excavation (Hard)	cu.m	2,500	55	24	79	138	60	198	
	- Fill and backfill	cu.m	114,200	8	4	12	914	457	1,371	
	- Concrete	cu.m	17,000	860	910	1,770	14,620	15,470	30,090	FC & PC incl. formwork
	- Reinforcing bar	ton	550	9,370	3,440	12,810	5,154	1,892	7,046	
	- R.C. Pipe ϕ 800 mm	m	5	475	318	793	2	2	4	
	- R.C. Pipe ϕ1000mm	m	670	525	348	873	352	233	585	
	- R.C. Pipe ϕ1500mm	m	1,380	1,025	688	1,713	1,415	949	2,364	
	- Sand bed	cu.m	3,300	62	63	125	205	208	413	
	- Sodding	sq.m	45,000	-	5	5	0	225	225	
	- Gate 2.5 x 1.6	set	1	36,000	20,000	56,000	36	20	56	
	- Gate 2.3 x 1.6	set	1	33,000	19,000	52,000	33	19	52	
	- Gate 2.1 x 1.6	set	1	31,000	17,000	48,000	31	17	48	
	- Gate 1.9 x 1.2	set	1	21,000	12,000	33,000	21	12	33	
	- Gate 1.9 x 1.1	set	3	19,000	11,000	30,000	57	33	90	
	- Gate 1.3 x 1.0	set	2	12,000	7,000	19,000	24	14	38	
	- Gate 1.1 x 1.0	set	2	10,000	6,000	16,000	20	12	32	
	- Gate 1.1 x 0.6	set	4	6,000	4,000	10,000	24	16	40	
	- Gate ϕ 800 mm	set	1	5,000	3,000	8,000	5	3	8	
	- Turnout	NO.	1	17,600	11,400	29,000	18	11	29	
	- Miscellaneous works	L.S.	-	-	-	-	1,332	1,050	2,382	5%
	Sub Total						27,972	22,042	50,014	
(2)	1st Branch Canal									
	- Excavation (Soft)	cu.m	14,900	24	9	33	358	134	492	incl. stripping
	- Excavation (Hard)	cu.m	-	55	24	79	0	0	0	
	- Fill and backfill	cu.m	12,200	8	4	12	98	49	147	
	- Concrete	cu.m	2,350	860	910	1,770	2,021	2,139	4,160	RC & PC incl. farmwork
	- Reinforcing bar	ton	-	9,370	3,440	12,810	0	0	0	
	- R.C. Pipe ϕ1000mm	m	700	525	348	873	368	244	612	
	- Sand bed	cu.m	900	62	63	125	56	57	113	
	- Sedding	sq.m	8,700	-	5	5	0	44	44	
	- Turnout	NO.	3	17,600	11,400	29,000	53	34	87	
	- Pump station	L.S.	-	-	-	-	1,100	700	1,800	ϕ400m, 37KW pump x 2
	- Miscellaneous works	L.S.	-	-	-	-	122	102	224	3%
	Sub Total						4,176	3,503	7,679	
(3)	2nd Branch Canal									
	- Excavation (Soft)	cu.m	16,800	24	9	33	403	151	554	incl. stripping formwork
	- Excavation (Hard)	cu.m	-	55	24	79	0	0	0	
	- Fill and back fill	cu.m	15,600	8	4	12	125	62	137	
	- Concrete	cu.m	2,570	860	910	1,770	2,210	2,339	4,549	RC & PC incl. formwork
	- Reinforcing bar	ton	20	9,370	3,440	12,810	187	69	256	
	- R.C. Pipe ϕ1000mm	m	350	525	348	873	184	122	306	
	- Sand bed	cu.m	800	62	63	125	50	50	100	
	- Sodding	sq.m	13,400	-	5	5	0	67	67	
	- Turnout	NO.	2	17,600	11,400	29,000	35	23	58	
	- Miscellaneous works	L.S.	-	-	-	-	96	86	182	3%
	Sub Total						3,290	2,969	6,259	
(4)	3rd Branch Canal									
	- Excavation (Soft)	cu.m	119,300	24	9	33	2,863	1,074	3,937	incl. stripping
	- Excavation (Hard)	cu.m	2,000	55	24	79	110	48	158	
	- Fill and back fill	cu.m	93,700	8	4	12	750	375	1,125	
	- Concrete	cu.m	14,800	860	910	1,770	12,728	13,468	26,196	RC & PC incl. formwork
	- Reinforcing bar	ton	380	9,370	3,440	12,810	3,561	1,307	4,868	
	- R.C. Pipe ϕ1000mm	m	3,400	525	348	873	1,785	1,183	2,968	
	- R.C. Pipe ϕ 800 mm	m	5	475	318	793	2	2	4	
	- R.C. Pipe ϕ 400 mm	m	5	149	101	250	1	1	2	
	- Sand bed	cu.m	4,300	62	63	125	267	271	538	
	- Gate ϕ800	set	1	5,000	3,000	8,000	5	3	8	
	- Gate ϕ400	set	1	1,000	1,000	2,000	1	1	2	
	- Sodding	sq.m	4,300	-	5	5	0	22	22	
	- Turnout	NO.	9	17,600	11,400	29,000	158	103	261	
	- Miscellaneous works	L.S.	-	-	-	-	667	536	1,203	3%
	Sub Total						22,898	18,394	41,292	

- to be continued -

- Continued -

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1000Rs) F.C.	Amount (1000Rs) L.C.	Amount (1000Rs) Total	Remarks
(5)	4th Branch Canal									
	- Excavation (Soft)	cu.m	4,700	24	9	33	113	42	155	incl. stripping
	- Fill and backfill	cu.m	4,700	8	4	12	38	19	57	
	- Concrete	cu.m	990	860	910	1,770	851	901	1,752	incl. formwork
	- Reinforcing bar	ton	7	9,370	3,440	12,810	66	24	90	
	- Sodding	sq.m	5,700	-	5	5	0	29	29	
	- Turnout	NO.	2	17,600	11,400	29,000	35	23	58	
	- Miscellaneous works	L.S.	-	-	-	-	33	31	64	
	Sub Total						1,136	1,069	2,205	
(6)	5th Branch Canal									
	- Excavation (Soft)	cu.m	21,500	24	9	33	516	194	710	incl. stripping
	- Fill and backfill	cu.m	20,300	8	4	12	162	81	243	
	- Concrete	cu.m	4,230	860	910	1,770	3,638	3,849	7,487	incl. formwork
	- Reinforcing bar	ton	21	9,370	3,440	12,810	197	72	269	
	- Sodding	sq.m	17,600	-	5	5	0	88	88	
	- Off take	NO.	1	83,700	61,900	145,600	84	62	146	
	- Turnout	NO.	3	17,600	11,400	29,000	53	34	87	
	- Miscellaneous works	L.S.	-	-	-	-	140	130	270	3%
	Sub Total						4,790	4,510	9,300	
(7)	6th Branch Canal									
	- Excavation (Soft)	cu.m	39,500	24	9	33	943	356	1,304	incl. stripping
	- Fill and backfill	cu.m	32,200	8	4	12	258	129	387	
	- Concrete	cu.m	5,600	860	910	1,770	4,816	5,096	9,912	incl. formwork
	- Reinforcing bar	ton	45	9,370	3,440	12,810	422	155	577	
	- R.C. Pipe ϕ 400 mm	m	5	149	101	250	1	1	2	
	- R.C. Pipe ϕ1000mm	m	1,800	525	348	873	945	626	1,571	
	- Sand bed	cu.m	2,300	62	63	125	143	145	288	
	- Gate ϕ400	set	1	1,000	1,000	2,000	1	1	2	
	- Sodding	sq.m	18,200	-	5	5	0	91	91	
	- Turnout	NO.	3	17,600	11,400	29,000	53	34	87	
	- Miscellaneous works	L.S.	-	-	-	-	228	199	427	3%
	Sub Total						7,815	6,833	14,648	
(8)	Distributory Canals									
	- Excavation (Soft)	cu.m	10,700	24	9	33	257	96	353	incl. stripping
	- Fill and backfill	cu.m	6,200	8	4	12	50	25	75	
	- Concrete	cu.m	2,270	860	910	1,770	2,322	2,457	4,779	incl. formwork
	- R.C. Pipe ϕ400	m	630	149	101	250	94	64	158	
	- Turnout	NO.	2	17,600	11,400	29,000	35	23	58	
	- Sodding	sq.m	5,000	-	5	5	0	25	25	
	- Miscellaneous works	L.S.	-	-	-	-	83	81	164	3%
	Sub Total						2,841	2,771	5,612	
(9)	Minor Canals									
	- Excavation (Soft)	cu.m	117,000	24	9	33	2,808	1,053	3,861	incl. stripping
	- Fill and backfill	cu.m	130,000	8	4	12	1,040	520	1,560	
	- Turnout	NO.	138	144	102	246	20	14	34	with ϕ300mm pipe L=2.00m
	- Sodding	sq.m	98,000	-	5	5	0	490	490	
	- Miscellaneous works	L.S.	-	-	-	-	116	62	178	3%
	Sub Total						3,984	2,139	6,123	
(10)	Farm Ponds									TYPE - A 25 places TYPE - B 3 places
	- Excavation (Soft)	cu.m	95,600	24	9	33	2,294	860	3,154	incl. stripping
	- Fill and backfill	cu.m	49,000	8	4	12	392	196	588	
	- Sodding	sq.m	14,800	-	5	5	0	74	74	
	- Concrete	cu.m	600	860	910	1,770	516	546	1,062	incl. formwork
	- Reinforcing bar	ton	23	9,370	3,440	12,810	216	79	295	
	- R.C. Pipe ϕ450	m	420	149	101	250	63	42	105	
	- Sluice valve ϕ300	NO.	56	1,000	1,000	2,000	56	56	112	
	- Fence	m	3,550	34	51	85	121	181	302	
	- Miscellaneous works	L.S.	-	-	-	-	110	61	171	3%
	Sub Total						3,768	2,095	5,863	
	Total of Canal Works						82,670	66,325	148,995	

TABLE J-10. ROAD WORK COST

Description	Unit	Q'ty	Amount (1000Rs) F.C.	L.C.	Total	Remarks F/C	L/C
SUMMARY							
(1) Newly Organized Roads	km	13.8	4,237	2,001	6,238	67.9%,	32.1%
(2) Implovement of Roads	km	4.8	1,161	519	1,680	69.1%,	30.9%
Total of Road Works			5,398	2,520	7,918	68.2%,	31.8%

TABLE J-10(1). COST ESTIMATION OF ROAD WORKS

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1000Rs) F.C.	Amount (1000Rs) L.C.	Amount (1000Rs) Total	Remarks
(1)	Newly Organized Roads									
	Construction of;									with T.S.T. pavement
	- Road N-1	m	1,100	307	145	452	338	160	498	incl. "V" drain and
	- Road N-2	m	1,100	307	145	452	338	160	498	culvert
	- Road N-3	m	1,000	307	145	452	307	145	452	
	- Road N-4	m	1,700	307	145	452	522	246	768	
	- Road N-5	m	600	307	145	452	184	87	271	
	- Road N-6	m	1,800	307	145	452	553	261	814	
	- Road N-7	m	3,600	307	145	452	1,105	522	1,627	
	- Road N-8	m	2,900	307	145	452	890	420	1,310	
	Sub Total	m	13,800				4,237	2,001	6,238	F/C 67.9%, L/C 32.1%
(2)	Implovement of Roads									
										with T.S.T. pavement
	- Road I-1	m	4,200	242	108	350	1,016	454	1,470	incl. "V" drain and
	- Road I-2	m	600	242	108	350	145	65	210	culvert
	Sub Total	m	4,800				1,161	519	1,680	F/C 69.1%, L/C 30.9%
	Total of Road Works						5,398	2,520	7,918	F/C 68.2%, L/C 31.8%

TABLE J-11. PROJECT FACILITY COST

(unit: Rs'000)

Description	Q'ty	Unit	Unit Rate F.C	Unit Rate L.C	Total Amount F.C	Total Amount L.C	Total Amount Total
1. Facility for Construction Stage							
- Main Office	400	sq.m	390	1,540	156	616	772
- Staff Residence	800	sq.m	430	1,700	344	1,360	1,704
- Guest House	200	sq.m	430	1,700	86	340	426
- Equipment Warehouse	200	sq.m	320	1,290	64	258	322
- Furniture and Others		L.S		500	200	300	500
Sub-total					850	2,874	3,724
2. Facilities for O/M stage							
- Dam Operation Office	150	sq.m	430	1,700	65	255	320
- Zone Office (2 sites)	300	sq.m	430	1,700	129	510	639
- Equipment Warehouse (2 sites)	300	sq.m	320	1,290	96	387	483
- Furniture and Others				200	200	300	500
Sub-total					490	1,452	1,942
Total					1,340	4,326	5,666

PROJECT J-12. ON-FARM DEVELOPMENT COST

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1000Rs) F.C.	Amount (1000Rs) L.C.	Amount (1000Rs) Total	Remarks
	SUMMARY									
(1)	Upstream Area	ha	3,790	4.9	4.6	9.5	13,571	17,434	36,005	ref. Sample area-1
(2)	Downstream Area	ha	2,310	3.7	3.3	7.0	8,547	7,623	16,170	ref. Sample area-2
	Total		6,100				27,118	25,057	52,175	F/C 52.0%, L/C 48.0%

TABLE J-12(1). COST ESTIMATION OF ON-FARM DEVELOPMENT

ON-FARM, Upstream Area Sample area-1, Net irrigable area 25.6 ha

Item No.	Description	Unit	Q'ty	Unit Price			Amount (1000Rs)			Remarks
				F.C.	L.C.	Total	F.C.	L.C.	Total	
(1)	KATCHA Road	km	2.23	40,848	31,498	72,346	91.1	70.2	161.3	
(2)	KATCHA	km	5.20	900	2,980	3,880	4.7	15.5	20.2	
(3)	Drop structure	NO.	42	38	95	133	1.6	4.0	5.6	
(4)	KATCHA, Cross culvert	NO.	12	360	293	653	4.3	3.5	7.8	
(5)	NUCCA Type I	NO.	203	24	18	42	4.9	3.7	8.6	
	NUCCA Type II	NO.	29	120	90	210	3.5	2.6	6.1	
(6)	Drainage Canal	km	2.61	3,840	5,520	9,360	10.0	14.4	24.4	
(7)	Drainage Cross culvert	NO.	3	894	663	1,557	2.7	2.0	4.7	
(8)	Wasteway	NO.	7	216	356	572	1.5	2.5	4.0	
	Total in 25.6 ha						124.3	118.4	242.7	
	Total per 1 ha						4.9	4.6	9.5	

TABLE 3-12(2). COST ESTIMATION OF ON-FARM DEVELOPMENT

ON-FARM, Downstream Area Sample area-2, Net irrigable area 37.5 ha

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1000Rs) F.C.	Amount (1000Rs) L.C.	Amount (1000Rs) Total	Remarks
(1)	KATCHA Road	km	2.85	40,843	31,498	72,346	116.4	89.8	206.2	
(2)	KATCHA	km	5.09	900	2,980	3,880	4.6	15.2	19.8	
(3)	Drop structure	NO.	10	38	95	133	0.4	0.9	1.3	
(4)	KATCHA, Cross culvert	NO.	8	360	293	653	2.9	2.3	5.2	
(5)	NUCCA Type I	NO.	138	24	18	42	3.3	2.5	5.8	
	NUCCA Type II	NO.	12	120	90	210	1.4	1.1	2.5	
(6)	Drainage Canal	km	1.91	3,840	5,520	9,360	7.3	10.6	17.9	
(7)	Drainage Cross culvert	NO.	3	894	663	1,557	2.7	2.0	4.7	
(8)	Wasteway	NO.	2	216	356	572	0.4	0.7	1.1	
	Total in 37.5ha						139.4	125.1	264.5	
	Total per 1 ha						3.7	3.3	7.0	

TABLE J-13 (1). AGRICULTURAL SUPPORTING FACILITY COST

Item No	Description	Unit	Q'ty	Amount (1,000 Rs) F.C.	L.C.	Total	Remarks
1.	Extension Center						
1-1.	Main Building	m^2	1,000	390	1,540	1,930	
1-2.	Office Facilities			1,150	-	1,150	
1-3.	Vehicles			1,800	100	1,900	
1-4.	Research Facilities			1,195	120	1,315	
	Sub-Total			4,535	1,760	6,295	
2.	Research Field in the Extension Center						
2-1.	Building	m^2	660	211	1,051	1,262	
2-2.	Farm Machinery			1,430	100	1,530	
	Sub-Total			1,641	1,151	2,792	
3.	Farm Machinery for Demonstration (by Five Districts)			10,560	400	10,960	
	Total			16,736	3,311	20,047	

TABLE J-13(2-1). AGRICULTURAL SUPPORTING FACILITY COST

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1,000 Rs) F.C.	Amount (1,000 Rs) L.C.	Amount (1,000 Rs) Total	Remarks
1.	Extension Center									
1-1.	Main Building									
a.	Office Space	m^2	290							included directors room, main office, printing room, warehouse, lobby and etc.
b.	Research Space	"	460							included eight (8) research rooms and six (6) experiment rooms.
c.	Training Space	"	250							lecture room, audio-visual room and library.
	Total	"	1,000	390	1,540	1,930	390	1,540	1,930	
1-2.	Office Facilities									
a.	Copy Machine	set	2	90,000	-	90,000	180	-	180	
b.	Word Processor	"	2	50,000	-	50,000	100	-	100	
c.	Overhead Projector	"	1	15,000	-	15,000	15	-	15	
d.	Audio and Visual Aids	"	1	450,000	-	450,000	450	-	450	
e.	Furniture and Others	L.S		300,000	-	300,000	300	-	300	
	Sub-Total						1,045		1,045	
f.	Miscellaneous (10%)						105	-	105	
	Total						1,150	-	1,150	

Table J-13 (2-2). AGRICULTURAL SUPPORTING FACILITY COST

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1,000 Rs) F.C.	Amount (1,000 Rs) L.C.	Amount (1,000 Rs) Total	Remarks
1-3.	Vehicles									
a.	Station Wagon	set	2	350,000	-	350,000	700	-	700	
b.	Pickup, 2 ton	"	1	100,000	-	100,000	100	-	100	
c.	Micro Bus	"	1	400,000	-	400,000	400	-	400	
d.	Motor Cycle (70cc)	"	15	20,000	-	20,000	300	-	300	included the number for extension workers
	Sub-Total						1,500	-	1,500	
e.	Miscellaneous(10%)						150	-	150	
f.	Spare Parts (10%)						150	-	150	
g.	Transportation etc.						-	100	100	
	Total						1,800	100	1,900	
1-4.	Research Facilities									
							1,195	120	1,315	
2.	Research Filed in the Extension Center									
2-1.	Building									
a.	Work Space	m^2	290							for crop research.
b.	Storage Space	"	120							for seeds and fertilizers
c.	Machinery & Repair Space	"	250							for large and small machinery
	Sub-Total		660	320	1,290	1,160	211	850	1,062	

TABLE J-13(2-3). AGRICULTURAL SUPPORTING FACILITY COST

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1,000 Rs) F.C.	Amount (1,000 Rs) L.C.	Amount (1,000 Rs) Total	Remarks
	d. Furniture and Others						-	200	200	
	Total		660				211	1,051	1,262	
2-2.	Farm Machinery for Research Field									
a.	Tractors, 70HP	set	1	500,000	-	500,000	50	-	500	
b.	Disc Plow	"	1	70,000	-	70.000	70	-	70	
c.	Bottom Plow	"	1	50,000	-	50,000	50	-	50	
d.	Disc Harrow	"	1	70,000	-	70,000	70	-	70	
e.	Rotary Harrow	"	1	90,000	-	90,000	90	-	90	
f.	Broadcaster	"	1	40,000	-	40,000	40	-	40	
g.	Power Pest Controller	"	1	30,000	-	30,000	30	-	30	
h.	Disc Mower	"	1	80,000	-	80,000	80	-	80	
i.	Power Reaper	"	1	20,000	-	20,000	20	-	20	
j.	Hard Tractors, 8HP	"	2	60,000	-	60,000	120	-	120	
k.	Rotary for Hand Tractor	"	2	10,000	-	10,000	20	-	20	
l.	Track, 2 ton	"	1	100,000	-	100,000	100	-	100	
	Sub-Total						1,190	-	1,190	
m.	Miscellaneous (10%)						120	-	120	
n.	Spare Parts (10%)						120	-	120	
o.	Transportation etc.						-	100	100	
	Total						1,430	100	1,530	

TABLE J-13(2-4). AGRICULTURAL SUPPORTING FACILITY COST

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1,000 Rs) F.C.	Amount (1,000 Rs) L.C.	Amount (1,000 Rs) Total	Remarks
3.	Farm Machinery for Demonstration (by Five Districts)									
a.	Tractors, 70 HP	set	10	500	-	500	5,000	-	5,000	
b.	Disc Plow	"	5	70	-	70	350	-	350	
c.	Bottom Plow	"	5	50	-	50	250	-	250	
d.	Disc Harrow	"	5	70	-	70	350	-	350	
e.	Rotary Harrow	"	5	90	-	90	450	-	450	
f.	Broadcaster	"	5	40	-	40	200	-	200	
g.	Power Pest Controller	"	5	30	-	30	150	-	150	
h.	Disc Mower	"	5	80	-	80	400	-	400	
i.	Power Reaper	"	5	20	-	20	100	-	100	
j.	Hand Tractors, 8HP	"	15	60	-	60	900	-	900	
k.	Rotary for Hand Tractor	"	15	10	-	10	150	-	150	
l.	Pickup 2 ton	"	5	100	-	100	500	-	500	
	Sub-Total						8,800	-	8,800	
m.	Miscellaneous (10%)						880	-	880	
n.	Spare Parts (10%)						880	-	880	
o.	Transportation etc.						-	400	400	
	Total						10,560	400	10,960	

TABLE J-14. LAND ACQUISITION AND COMPENSATION COST

Item No.	Description	Unit	Q'ty	Unit Price F.C.	Unit Price L.C.	Unit Price Total	Amount (1000Rs) F.C.	Amount (1000Rs) L.C.	Amount (1000Rs) Total	Remarks
1.	Dam & Reservoir Site									
(a)	Land expropriation									
	Cultivated Area	ha	130	-	400,000	400,000	0	52,000	52,000	
	Mountainous area	ha	170	-	100,000	100,000	0	17,000	17,000	
(b)	Living Compensation									
	Resettlement of houses	NO.	125	-	75,000	75,000	0	9,375	9,375	
(c)	Re-installation of High tension line									in accordance with WAPDA's brief quotation
	132 KV line	L.S.	(1.2km)	-	-	-	1,120	280	1,400	
	11 KV line	L.S.	(7.0km)	-	-	-	960	240	1,200	
(d)	Relocation of road									
	Road construction	m	4,200	307	145	452	1,289	609	1,898	
	Sub Total						3,369	79,504	82,873	
2.	Canal and Road Site									
(a)	Land expropriation for canal with maintenance road									incl. farm ponds
	Cultivated area	ha	50	-	400,000	400,000	0	20,000	20,000	
	Wasted area	ha	70	-	100,000	100,000	0	7,000	7,000	
(b)	Land expropriation for marketting road									incl. increase of land for widening the existing road improvement
	Cultivated area	ha	10	-	400,000	400,000	-	4,000	4,000	
	Wasted area	ha	-	-	100,000	100,000	-	0	0	
	Sub Total						0	31,000	31,000	
	Total of Land acquisition and Compensation						3,369	110,504	113,873	

TABLE J-15. OPERATION AND MAINTENANCE EQUIPMENT COST

(unit: Rs'000)

Description	Q'ty	Unit	Unit Rate F.C	Unit Rate L.C	Total Amount F.C	Total Amount L.C	Total Amount Total
Bulldozer, 8 ton	1	unit	640	-	640	-	640
Backhoe Excavator, 0.25 m^3	2	unit	950	-	1,900	-	1,900
Dump Truck, 4 ton	3	unit	280	-	840	-	840
Motor Grader, L = 2.5 m	1	unit	890	-	890	-	890
Crawler Type Loader, 6 ton	1	unit	600	-	600	-	600
Crawler Type Tractor, 6 ton	1	unit	400	-	400	-	400
Truck with Crane, 2 ton	1	unit	200	-	200	-	200
Truck Pickup, 2 ton	3	unit	100	-	300	-	300
Station Wagon, 4 x 4	4	unit	300	-	1,200	-	1,200
Jeep, 4 x 4	8	unit	150	-	1,200	-	1,200
Motorcycle, 70 cc	59	unit	20	-	1,180	-	1,180
Concrete Mixer, 0.2 m^3	1	unit	30	-	30	-	30
Water Pump, 2" - 4"	2	unit	20	-	40	-	40
Transceiver	4	set	120	-	480	-	480
Walkie-talkie	10	set	6	-	60	-	60
Meteorological Station	1	set	50	-	50	-	50
Surveying Instrument	2	set	90	-	180	-	180
Sub-total					10,190	-	10,190
Miscellaneous (10%)		L.S			1,019	-	1,019
Spare Parts (10%)		L.S			1,121	-	1,121
Transportation etc.		L.S			-	500	500
Sub-total					2,140	500	2,640
Total					12,330	500	12,830

TABLE J-16. PROJECT ADMINISTRATION COST

1. Personnel Cost

(Rs'000)

1-1. Detailed Design Stage

Project Office Staff

Rs.1,700/month x 7 pers. x 18 man-month = 214

1-2. Construction Stage

Project Management		
Project Manager	Rs.39,600 x 1 pers. =	Rs.39,600
Assistant Manager	24,400 x 1 pers. =	24,400
Secretary	13,700 x 1 pers. =	13,700
Administration Division		
Division Chief	20,600 x 1 pers. =	20,600
Accounting Clerk	15,300 x 1 pers. =	15,300
Asst. Accounting Clerk	14,600 x 1 pers. =	14,600
Administrative Clerk	14,600 x 1 pers. =	14,600
Asst. Administ. Clerk	13,700 x 1 pers. =	13,700
Typist	13,700 x 2 pers. =	27,400
Land Acquisition Division		
Division Chief	20,600 x 1 pers. =	20,600
Clerk	14,600 x 2 pers. =	29,200
Asst. Clerk	13,700 x 2 pers. =	27,400
Typist	13,700 x 1 pers. =	13,700
Engineering Division		
Division Chief	20,600 x 1 pers. =	20,600
Civil Engineer	19,500 x 2 pers. =	39,000
Technician	16,700 x 6 pers. =	16,700
Surveyor	16,700 x 2 pers. =	33,400
Typist	13,700 x 2 pers. =	27,400
Equipment Division		
Division Chief	20,600 x 1 pers. =	20,600
Mechanic	14,100 x 3 pers. =	42,300
Typist	13,700 x 1 pers. =	13,700
Sub-total		488,500

O/M Division			
Division Chief	20,600 x 1 pers. =	20,600	
O/M Engineer	16,700 x 3 pers. =	50,100	
Agronomist	16,700 x 1 pers. =	16,700	
Extension Service Expert	16,700 x 1 pers. =	16,700	
Water/Farm Manag. Expert	16,700 x 1 pers. =	16,700	
Typist	13,700 x 1 pers. =	13,700	
Sub-total		134,500	
Total		623,000	
Rs.488,500 x 4 year =	Rs.1,954,000		
Rs.134,500 x 2 year =	269,000		
Total	2,223,000	2,223	
			Rs.2,437

2. Equipment Cost for Construction Supervision

(unit: '000 Rs)

Equipment	Q'ty	Unit Rate F.C	Unit Rate L.C	Amount F.C	Amount L.C	Amount Total
- Jeep, 4 x 4	7 unit	150	-	1,050	-	1,050
- Motorcycle, 70 cc	7 unit	20	-	140	-	140
- Theodlite	2 unit	60	-	120	-	120
- Level	2 unit	25	-	50	-	50
- Current Meter	2 set	40	-	80	-	80
- Transceiver	1 set	120	-	120	-	120
- Walkie-Talkie	10 set	6	-	60	-	60
- Personal Computer	1 set	250	-	250	-	250
- Miscellaneous	L.S			160	-	160
Total				2,030	-	2,030

3. Repair and Maintenance Cost

(unit: '000 Rs)

- Vehicle Repair	Rs.150,000 x 15% x 7 units	= 158
- Vehicle Fuel	Rs.3.9/lit x 15 lit/day x 300 days x 7 units	= 123
- Building Maintenance	Rs.3,724 x 10^3 x 5%	= 186
- Office Supply (10%)		= 47
	Sub-total	514
Rs.514.0 x 4 years		= 2,056

4. Training Cost

- 6 person/year x 4 year = 24 persons
- 20 days/1 time
- 1 time/year

4-1. Foreign Currency

(unit: '000 Rs)

International travel expenses, Rs.50,000 x 24 pers.	=	Rs.1,200
Accommodation charge, Rs.1,500 x 24 pers. x 20 days	=	720
Attendance Cost		
Accommodation charge, Rs.1,500 x 4 times x 20 days x 1 pers.	=	120
Domestic transportation charge Rs.12,500 x 1 pers. x 4 times	=	50
Allowance charge, Rs.1,500 x 1 pers. x 4 times x 20 days	=	120
Sub-total		2,210

4-2. Local Currency

Domestic transportation charge Rs.1,300 x 24 pers.	= Rs.	31
Allowance charge, Rs.1,500 x 24 pers. x 20 days	=	720
Sub-total		751
Total		2,961
Grand Total (1 + 2 + 3 + 4)		9,481

TABLE J-17. CONSULTING SERVICES COST

Item	Description	Quantity	Unit	Rate (Rs)	Total Amount: Foreign Currency (Rs'000)	Total Amount: Local Currency (Rs'000)
1.	Detailed Design Stage					
	1-1. Foreign Currency					
	Consultants Remuneration	82	month	200,000	16,400	
	Out-of-Pocket Expenses					
	International Travel Expense	15	trip	50,000	750	
	Reimbursable Cost Items and Other (10%)		L.S		1,715	
	Miscellaneous (10%)		L.S		1,886	
	Sub-total				20,751	
	1-2. Local Currency					
	Consultants Remuneration	27	month	60,000		1,620
	Consultants per Diem					
	Foreign	2,460	day	900		2,214
	Local	810	day	600		486
	Living Allowance and Quarter					
	Foreign	82	month	10,000		820
	Local	27	month	6,000		162
	Local Communication and Transportation		L.S			450
	Printing of Reports		L.S			400
	Miscellaneous (10%)		L.S			615
	Sub-total					6,767

1/: Schedule of consulting services is shown in Figure J-1.

Item	Description	Quantity	Unit	Rate (Rs)	Total Amount: Foreign Currency (Rs'000)	Total Amount: Local Currency (Rs'000)
2.	Construction Supervision Stage					
	2-1. Foreign Currency					
	Consultants Remuneration	124	month	200,000	24,800	
	Out-of-Pocket Expenses					
	International Travel Expenses	12	trip	50,000	600	
	Reimbursable Cost Item and Others (10%)		L.S		2,540	
	Miscellaneous (10%)		L.S		2,794	
	Sub-total				30,734	
	2-2. Local Currency					
	Consultants Remuneration	78	month	60,000		4,680
	Consultants per Diem					
	Foreign	3,720	day	900		3,348
	Local	2,340	day	600		1,404
	Living Allowance and Quarter					
	Foreign	124	month	10,000		1,240
	Local	78	month	6,000		468
	Local Communication and Transportation		L.S			1,200
	Printing of Report		L.S			400
	Miscellaneous (10%)		L.S			1,274
	Sub-total					14,014

Item	Description	Quantity	Unit	Rate (Rs)	Total Amount: Foreign Currency (Rs'000)	Total Amount: Local Currency (Rs'000)
3.	Supporting Services and Management Stage					
	3-1. Foreign Currency					
	Consultants Remuneration	34	month	200,000	6,800	
	Out-of-pocket Expenses					
	International Travel Expenses	4	trip	50,000	200	
	Reimbursable Cost Item and Others (10%)		L.S		700	
	Miscellaneous (10%)		L.S		770	
	Sub-total				8,470	
	3-2. Local Currency					
	Consultants Remuneration	12	month	60,000		720
	Consultant per Diem					
	Foreign	1,020	day	900		918
	Local	360	day	600		216
	Living Allowance and Quarter					
	Foreign	34	month	10,000		340
	Local	12	month	6,000		72
	Local Communication and Transportation		L.S			500
	Miscellaneous (10%)		L.S			277
	Sub-total					3,043
	Total				59,955	23,824
					83,779	
					≒ 83,800	

FIGURE J-1. PROPOSED SCHEDULE FOR CONSULTANTS SERVICES

Description	Man-Month		1989			1990			1991			1992			1993			1994			1995		
	Foreign	Local	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
I. DETAILED DESIGN																							
1. Leader	16																						
2. Hydrologist	2																						
3. Irrigation Engineer	3																						
4. Engineering Geologist	5																						
5. Soil Mechanical Engineer	6																						
6. Design Engineer (Dam)	10																						
7. - do - (Canal)	10																						
8. - do - (Structure)	10																						
9. - do - (On-Farm)		12																					
10. - do - (Achitecture)		3																					
11. Mechanical Engineer (Equipment)	3																						
12. Construction Planner	3																						
13. Cost Estimator	3																						
14. Specialist for Tender Document	3																						
15. Specification Writer	3																						
16. Agronomist	3																						
17. Economist	2																						
18. - do -		12																					
Sub-Total	82	27																					
II. CONSTRUCTION SUPERVISION																							
II-1. Tendering																							
1. Project Engineer (Leader)	2																						
2. Mechanical Engineer (Equipment)	2																						
3. Cost Estimator	1																						
Sub-Total	5																						
II-2. Construction Supervision																							
4. Project Engineer (Leader)	48																						
5. Dam Engineer	42																						
6. Canal Engineer		42																					
7. Engineering Geologist	16																						
8. Soil Mechanical Engineer	12																						
9. Mechanical Engineer	4																						
10. Economist	2																						
11. Surveyor		36																					
Sub-Total	124	78																					
III. SUPPORTING SERVICES AND MANAGEMENT																							
1. Agronomist	18																						
2. Extension Service Expert		12																					
3. Water and Farm Management Expert	16																						
Sub-Total	34	12																					
Total	245	117																					

Note: I ... Jan. - Apr.
II ... May - Aug.
III ... Sep. - Dec.

TABLE J-18. DISBURSEMENT SCHEDULE OF PROJECT COST

COST ITEMS	TOTAL FOREIGN CURRENCY	TOTAL LOCAL CURRENCY	TOTAL TOTAL	1989 F.C.	1989 L.C.	1989 TOTAL	1990 F.C.	1990 L.C.	1990 TOTAL	1991 F.C.	1991 L.C.	1991 TOTAL
1. CIVIL WORKS												
- PRE-ENGINEERING	7.3	0.0	7.3	5.1	0.0	5.1	2.2	0.0	2.2	0.0	0.0	0.0
- DAM WORKS	277.2	128.7	405.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- CANAL WORKS	82.7	66.3	149.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- ROAD WORKS	5.4	2,5	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- PROJECT FACILITIES	1.4	4.3	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUB-TOTAL	374.0	201.8	575.8	5.1	0.0	5.1	2.2	0.0	2.2	0.0	0.0	0.0
2. ON-FARM WORKS	27.1	25.1	52.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3. AGRI. SUPPORTING FACIL.	16.7	3.3	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4. LAND ACQUI. & COMPENSAT.	3.4	110.5	113.9	0.0	0.0	0.0	0.0	0.0	0.0	3.4	90.6	94.0
5. O & M EQUIPMENT	12.3	0.5	12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. PROJECT ADMINISTRATION	4.2	5.3	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.1	1.9
7. CONSULTING SERVICES	60.0	23.8	83.8	0.0	0.0	0.0	0.0	0.0	0.0	6.0	2.4	8.4
SUB-TOTAL	497.7	370.3	868.0	5.1	0.0	5.1	2.2	0.0	2.2	10.2	94.0	104.3
8. CONTINGENCY (10.%)	49.8	37.0	86.8	0.5	0.0	0.5	0.2	0.0	0.2	1.0	9.4	10.4
T O T A L	547.5	407.3	954.8	5.6	0.0	5.6	2.4	0.0	2.4	11.3	103.5	114.7
9. PRICE CONTINGENCY	120.0	255.6	375.6	0.4	0.0	0.4	0.3	0.0	0.3	1.6	42.9	44.5
T O T A L	667.4	663.0	1330.4	6.1	0.0	6.1	2.7	0.0	2.7	12.9	146.4	159.2

COST ITEMS	1992 F.C.	1992 L.C.	1992 TOTAL	1993 F.C.	1993 L.C.	1993 TOTAL	1994 F.C.	1994 L.C.	1994 TOTAL	1995 F.C.	1995 L.C.	1995 TOTAL
1. CIVIL WORKS												
- PRE-ENGINEERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- DAM WORKS	69.3	32.2	101.5	83.2	38.6	121.8	97.0	45.0	142.1	27.7	12.9	40.6
- CANAL WORKS	16.5	13.3	29.8	24.8	19.9	44.7	24.8	19.9	44.7	16.5	13.3	29.8
- ROAD WORKS	1.6	0.8	2.4	2.2	1.0	3.2	1.6	0.8	2.4	0.0	0.0	0.0
- PROJECT FACILITIES	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.1	2.8	0.7	2.1	2.8
SUB-TOTAL	87.5	46.2	133.6	110.1	59.5	169.6	124.1	67.8	192.0	45.0	28.3	73.2
2. ON-FARM WORKS	0.0	0.0	0.0	8.1	7.5	15.7	9.5	8.8	18.3	9.5	8.8	18.3
3. AGRI. SUPPORTING FACIL.	16.7	3.3	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4. LAND ACQUI. & COMPENSAT.	0.0	11.0	11.0	0.0	8.8	8.8	0.0	0.0	0.0	0.0	0.0	0.0
5. O & M EQUIPMENT	12.3	0.5	12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. PROJECT ADMINISTRATION	0.8	1.1	1.9	0.8	1.1	1.9	0.8	1.1	1.9	0.8	1.1	1.9
7. CONSULTING SERVICES	21.0	8.3	29.3	12.0	4.8	16.8	12.0	4.8	16.8	9.0	3.6	12.6
SUB-TOTAL	138.3	70.4	208.7	131.1	81.7	212.8	146.5	82.4	228.9	64.3	41.7	106.0
8. CONTINGENCY	13.8	7.0	20.9	13.1	8.2	21.3	14.6	8.2	22.9	6.4	4.2	10.6
T O T A L	152.1	77.5	229.6	144.2	89.9	234.1	161.1	90.7	251.8	70.7	45.9	116.6
9. PRICE CONTINGENCY	26.9	40.9	67.8	30.6	58.4	89.0	40.0	70.9	111.0	20.2	42.4	62.6
T O T A L	179.0	118.4	297.4	174.8	148.3	323.1	201.1	161.6	362.8	90.9	88.3	179.2

TABLE J-19. OPERATION AND MAINTENANCE COST

1. Salaries and Wages

Description	No. of Personnel	Salary per Annum (Rs)	Cost per Annum (Rs'000)
a) Main Office			
Irrigation Superintendent	1	39,600	39.6
Executive Engineer	1	24,400	24.4
O/M Section			
Section Engineer	1	20,600	20.6
Engineer	1	19,500	19.5
Administration Section			
Cashier	1	20,600	20.6
Accounting Clerk	1	15,300	15.3
Billing Clerk	1	15,300	15.3
Collection Representative	1	14,600	14.6
Security Guard	2	14,100	28.2
Heavy Equipment Operator	5	14,100	70.5
Vehicle Driver	2	13,410	26.8
Janitor	1	12,540	12.5
Watchmen	1	12,540	12.5
Casual Employees for Repair Works (60 days per year)			
Construction Foreman	1 day x Rs.100 = Rs.100.0		
Skilled Labor	1 day x Rs. 50 = Rs. 50.0		
Labor	1 day x Rs. 35 = Rs. 35.0		
Total	Rs.185.0		
Rs.185.0 x 60 days = Rs.11,100			11.1
Sub-total			331.5
b) Dam Operation Office			
Mechanical Engineer	1	20,600	20.6
Gate Operator	1	14,100	14.1
Electrical Engineer	1	14,100	14.1
Janitor	1	12,540	12.5
Watchmen	1	12,540	12.5
Sub-total			73.8

Description	No. of Personnel	Salary per Annum (Rs)	Cost per Annum (Rs'000)
c) Zone Office (I and II)			
Sub-Executive Engineer	2	20,600	41.2
Engineer	2	16,700	33.4
Water Master	5	15,900	79.5
Service Engineer	26	15,900	413.4
Gate Keeper	14	14,100	197.4
Canal Supervisor	13	14,100	183.3
Agronomist	2	16,700	33.4
Extension Service Expert	2	16,700	33.4
Clerk	2	14,600	29.2
Vehicle Driver	2	13,410	26.8
Sub-total			1,071.0
d) Extension Center			
Expert of Research & Extension	8	20,600	164.8
Assistants	5	15,900	79.5
Vehicle Driver	2	13,410	26.8
Sub-total			271.1
Total			1,747.0 (1,747.4)

2. Administration and General Expenditure Cost

Rs.1,747,000 x 0.1 =	175.0

3. Equipment Operation Cost

a) Operation Cost

Description	Q'ty	Unit Cost (Rs'000)	Total Cost (Rs'000)	Cost per Annum (Rs'000)
Main Office				
Bulldozer, 8 ton	1	750	750	75
Backhoe Excavator, 0.25	2	950	1,900	190
Dump Truck, 4 ton	3	240	720	72
Motor Grader, L = 2.5 m	1	800	800	80
Crawler Type Loader, 6 ton	1	600	600	60
Crawler Type Tractor, 6 ton	1	400	400	40
Truck with Crane, 2 ton	1	200	200	20
Truck Pickup, 2 ton	1	100	100	10
Station Wagon, 4 x 4	1	350	350	35

Description	Q'ty	Unit Cost (Rs'000)	Total Cost (Rs'000)	Cost per Annum (Rs'000)
Jeep, 4 x 4	2	150	300	30
Motorcycle, 70 cc	4	20	80	8
Concrete Mixer, 0,2 m^3	1	30	30	3
Water Pump, 2" - 4"	2	20	40	4
Transceiver	1	120	120	12
Walkie-talkie	3	6	18	2
Meteorological Station	1	50	50	5
Surveying Instrument	2	90	180	18
Miscellaneous tools and Equip.	L.S		500	50
Spare Part (10%)			750	75
Sub-total				789
Dam Operation Office				
Station Wagon, 4 x 4	1	350	350	35
Jeep, 4 x 4	2	150	300	30
Motorcycle, 70 cc	3	20	60	6
Sub-total				71
Zone Office (I and II)				
Station Wagon, 4 x 4	2	350	700	70
Jeep, 4 x 4	4	150	600	60
Motorcycle, 70 cc	52	20	1,040	104
Sub-total				234
Extension Center				
Station Wagon	2	350	700	70
Pickup, 2 ton	1	100	100	10
Micro Bus	1	400	400	40
Motor Cycle	15	20	300	30
Sub-total				150

b) Fuel and Oil

Heavy Equipment:	
3.9 Rs/lit x 20 lit/day x 150 day x 9 units =	105
Truck:	
3.9 Rs/lit x 20 lit/day x 150 day x 3 units =	35
Vehicle:	
3.9 Rs/lit x 15 lit/day x 300 day x 15 units =	263
Motorcycle and Other (10%)	40
Sub-total	443

Description	Cost per Annum (Rs'000)
c) Pump Operation cost	
Power Cost: 37 kw x 2 units x 12 hr x 25 days x 12 months	= 266
Operater Cost: 3 persons x Rs.1,500 x 12 months	= 54
Others (10%)	= 32
Sub-total	352
Total	2,039
4. Office Maintenance Cost	
a) Maintenance of Building	
Main Office : Rs.3,724 x 10^3 x 0.02 =	74
Dam and Zone Offices : Rs.1,942 x 10^3 x 0.02 =	39
Extension Center : Rs. 663 x 10^3 x 0.02 =	13
Sub-total	126
b) Office Supplies	
5,666 x 10^3 x 0.05 =	283
Total	409
Grand Total (1 + 2 + 3 + 4)	4,370