

ANNEX - X

**PROFILE
OF
PROJECT AREA**

**LHUNTSHI AND MONGAR
INTEGRATED AGRICULTURAL DEVELOPMENT PROJECT**

ANNEX-X PROFILE OF PROJECT AREA

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1. PANG KHAR PROJECT AREA

1. Location

- (1) District: Lhuntshi Block: Khoma Village: Pang Khar
- (2) Location: 15 minutes by vehicle from district capital through national road, and 210 minutes' walk from the national road.

2. Topography

- (1) Elevation: Intake Structure ; EL 2,190 m EL 1,850 m
Farm Land ; EL 1,200 m EL 2,200 m
- (2) Slope and Direction of Farm Land

Slope: 1/3 Direction: West to South

3. Climate and Water Resources

- (1) Climate (Station: Tangmachhu)

Temperature

(unit: °C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Max.	13.8	15.3	17.3	20.6	21.8	23.8	22.8	23.7	22.6	21.1	18.1	14.7	19.6
Min.	5.0	7.6	10.3	12.5	14.9	18.7	19.1	19.5	18.3	15.9	9.9	6.7	13.2
Average	9.4	11.4	13.8	16.5	18.3	21.3	21.0	21.6	20.5	18.5	14.0	10.9	16.4

Relative Humidity

(unit: %)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	68.0	71.3	72.1	69.3	75.2	79.3	88.1	85.0	89.0	80.9	79.3	76.9	77.7

Rainfall

(unit: mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	3.1	0	55.3	79.4	70.7	130.6	169.8	109.8	116.8	74.5	10.9	5.0	825.7

- (2) Water Resource

- 1) River Name : Paka chu
 2) Catchment Area : 0.25 km²
 3) Length of River : 0.95 km
 4) Mean Elevation of River : EL 2,395 m
 5) Available Water :

(unit: lit./s)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Mean	4.2	3.3	3.5	5.3	6.2	9.4	16.6	12.5	13.7	6.9	5.6	4.6	7.6
Drought	2.6	2.4	2.2	2.7	3.9	5.0	7.7	5.9	4.5	4.2	4.0	3.2	4.0

4. Demography

(1) Population

- 1) Block Population 5,500 (Khoma)
- 2) Project Area Population
 - a. Population 221 (100%)
(Male: 55%, Female: 45%)
 - b. Student (5-14 years) 54 (24%)
 - c. Labour Force (15-54 years) 103 (47%)

Age	Male	Female	Total
0 - 4	22	15	37
5 - 9	18	7	25
10 - 14	13	16	29
15 - 19	10	8	18
20 - 24	8	6	14
25 - 29	9	5	14
30 - 34	7	9	16
35 - 39	2	5	7
40 - 44	4	6	10
45 - 49	5	5	10
50 - 54	6	8	14
55 - 59	7	6	13
60 - 64	7	2	9
65 -	4	1	5
Total	122	99	221

- 3) Share of Population in Block 4%

(2) No. of Household

- 1) Block 500
- 2) Project Area
 - a. Total 37
 - b. Share of (a) in Block 7%
- 3) Average Family Size of the Project Area 6.01

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil units in the Pang Khar project area are as follows:

- | | |
|-----------------------|---|
| Gleysols | paddy field and marsh land located near the existing intake site in limited area, showing surface histic feature and hydromorphic property. |
| Cambisols | generally located in paddy field and dry land. |
| Lithosols/Regosols .. | steep slopes, shallow surface layer, stony phase. |

6. Agriculture

(1) Agricultural Land Use

	(Unit: ha)				
	Wet	Dry	Tsheri	Others	Total
Project Area	6	19	9	1	35
Average Holding Size	0.16	0.51	0.24	0.03	0.94

(2) Agricultural Production

		Area (ha)	Unit Yield (t/ha)	Production
1) Wet Land	- Paddy	6	1.5	9
	- Wheat	0	0	0
	- Total	6	-	-
2) Dry Land	- Maize	19	1.7	32
	- Wheat	0	0	0
	- Soyabeans	(19)	0.7	13
	- Potato	0	0	0
	- Chilli	2	2.0	4
	- Total	21	-	-
3) Tsheri Land	- Maize	0	0	0
	- Wheat	2	0.7	1
	- Soyabeans	0	0	0
	- Total	2	-	-

(3) Cropping Intensity (%)

- Wet land	100
- Dry land	111
- Tsheri land	22
- Total land	85

(4) Livestock Production

	(Unit: head)			
	Cattle	Horse	Pig	Poultry
Young	48	8	45	65
Adult	90	9	15	20
Total	138	17	60	85
Average Holding per Household	3.7	0.5	1.6	2.3

7. Irrigation

- (1) Intake: No facilities, lot natural spring, 0.01 m³/sec of capacity at EL 2,190 m
- (2) Canal: 3 km long, earth canal mostly, EL 2,050 m at canal end

(3) O & M and Necessity of Improvement

- 1) Intake : No facilities, under the law suit on water right
- 2) Canal : Constructed in 1984, destroyed by landslide in 1987, useless condition at present
- 3) Major collapse : 3 places, 200 m long
- 4) Reasons of collapse : For landslide, and for overtopping of canal

(4) Irrigation

Shortage of water, finding alternative water resources

8. Rural Facilities

(1) Access Road and Necessity of Improvement

The road from the district capital to Khoma is relatively plain, while the foot pass is steep and in poor condition. The improvement of the foot pass is required from the view point of the topography.

(2) Other Public Facilities

Water supply

9. Farmers' Intention on the Priority Development

- (1) Construction/Rehabilitation of irrigation facilities
- (2) Construction of feeder road
- (3) Strengthening of agricultural extension

10. Remarks

- (1) The water resource is in absolute shortage. The low suit of water right is disputed between the land owner of water resource and the beneficiaries.
- (2) It is planned to take the water from other water resources, but it is very difficult technically.
- (3) The canal route is much deteriorated and in poor conditions. No plan for the improvement exists at present.

SOIL PROFILE DESCRIPTION

I. General Information at the Site;

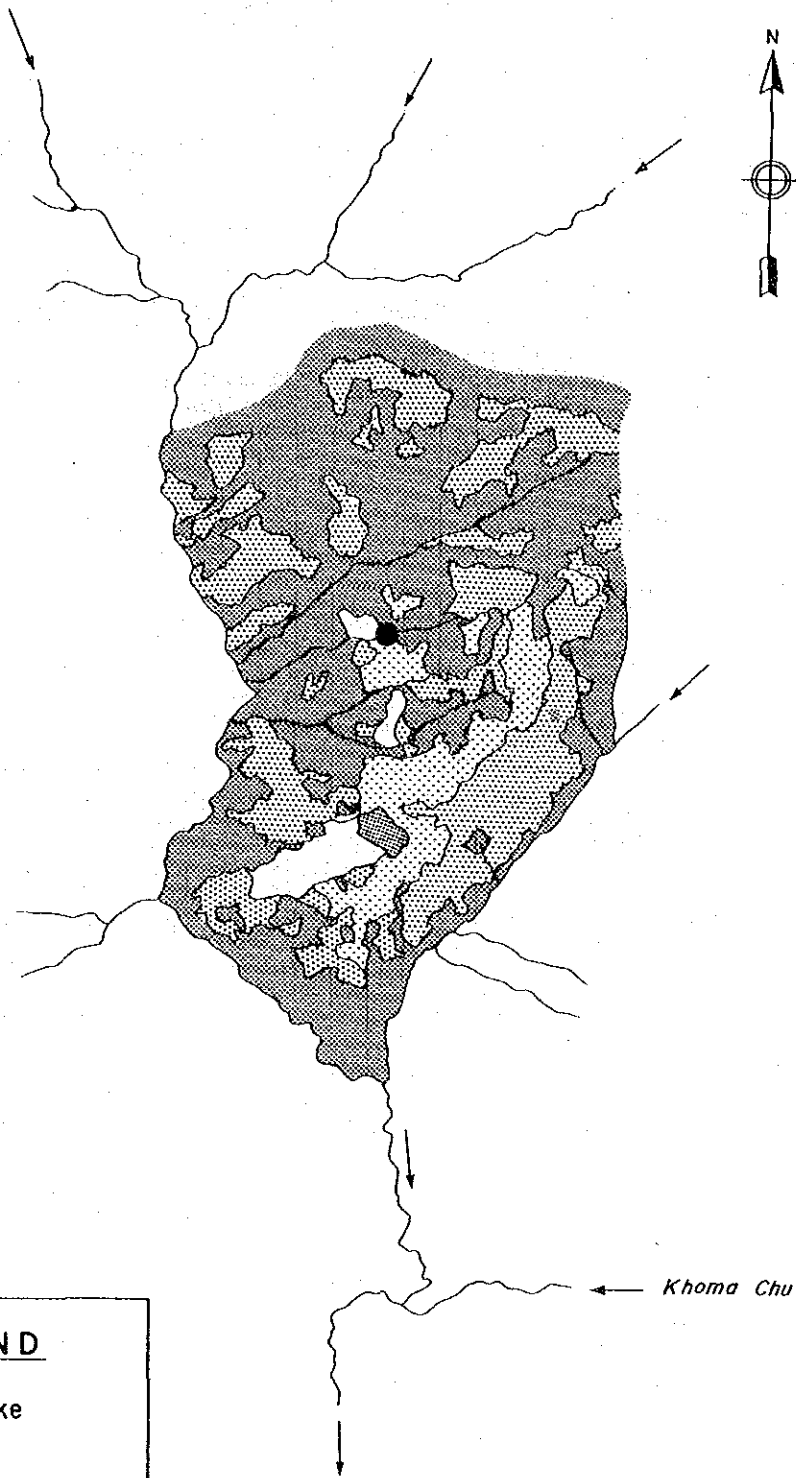
- a) Profile number 22
- b) Soil name Cambisols
- c) Date of examination January 31, 1988
- d) Location Pang Khar, 2,010 m
- e) Land form:
 - 1) Physiographical Terraced field
 - 2) Surrounding area Cultivated paddy land in terraced fields)
- f) Slope Almost flat; 1 -2 %
- g) Land use/vegetation Paddy field: monocropping

II. General Information of the Soil:

- a) Parent material Colluvial
- b) Drainage Good; well drained
- c) Moisture condition of site Wet in upper part, moist in lower part
- d) Ground water depth < 100 cm
- e) Surface stones/rock outcrops None, but some are around
- f) Erosion No evidence
- g) Human influence cultivated

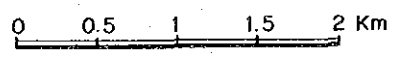
III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 11	Dark brown (10YR 3/3); clay loam; few fine faint mottle (bright brown 7.5YR 5/8); weak angular blocky and granular fine to medium structure; slightly sticky; slightly plastic; hard when dry; frequent paddy roots; common fine pebbles; gradual to diffuse irregular boundary.
B	11 - 25	Dark brown (10YR 3/3); clay loam; common fine distinct mottle (bright brown 7.5YR 5/8); weak angular blocky and granular fine structure; slightly sticky; slightly plastic; hard when dry; common paddy roots; frequent fine to medium pebbles; diffuse irregular boundary.
C1	25 - 47	Dull yellowish brown (10YR 5/4); sandy clay loam; common medium distinct mottle (bright brown 7.5YR 5/8, bright reddish brown 2.5YR 5/8); weak angular blocky medium to coarse structure; slightly sticky; slightly plastic; hard when dry; few grass roots; gradual irregular boundary.
C2	47 - 61	Dull yellowish brown (10YR 5/4); sandy loam; fine medium distinct mottle (bright brown 7.5YR 5/6); weak blocky angular blocky medium to coarse structure; slightly sticky; slightly plastic; hard when dry; gradual irregular boundary.
C3	61 -	Dull reddish brown (2.5YR 5/3); sandy loam; many medium distinct mottle (orange 7.5YR 6/8); strong platy medium structure; sticky; plastic; weathered bed rock; fine chacole.



LEGEND

- Intake
- ▨ Forest
- ▤ Grass Land
- ▥ Dry Land
- Paddy Field



PRESENT LAND USE MAP OF PANG KHAR PROJECT AREA

2. GANGZOOR PROJECT AREA

1. Location

- (1) District: Lhuntshi Block: Ganzoor Village: Ganzoor
- (2) Location: 15 minutes by vehicles from district capital through the national road

2. Topography

- (1) Elevation: Intake Structure ; EL 1,560 m EL 1,450 m
 Farm Land ; EL 1,200 m EL 1,320 m
- (2) Slope and Direction of Farm Land
- Slope: 1/1 Direction: North East

3. Climate and Water Resources

- (1) Climate (Station: Tangmachhu)

Temperature

(unit: °C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Max	13.8	15.3	17.3	20.6	21.8	23.8	22.8	23.7	22.6	21.1	18.1	14.9	19.6
Min	5.0	7.6	10.3	12.5	14.9	18.7	19.1	19.5	18.3	15.9	9.9	6.7	13.2
Average	9.4	11.4	13.8	16.5	18.3	21.3	21.0	21.6	20.5	18.5	14.0	10.7	16.4

Relative Humidity

(unit: %)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	68.0	71.3	72.1	69.3	75.2	79.3	88.1	85.0	87.0	80.9	79.3	76.9	77.7

Rainfall

(unit: mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	3.1	0	55.3	79.4	70.7	130.6	169.8	109.8	116.8	74.5	10.7	5.0	825.7

- (2) Water Resource

- 1) River Name : Lekpagang chu
- 2) Catchment Area : 8.60 km²
- 3) Length of River : 4.45 km
- 4) Mean Elevation of River : EL 2,355 m
- 5) Available Water :

(unit: lit./s)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Mean	142.8	111.8	121.3	183.2	212.4	324.2	570.2	429.1	471.3	235.6	192.6	156.5	262.3
Drought	88.6	81.7	74.8	91.2	135.0	172.0	264.0	202.1	153.9	144.5	137.6	110.1	137.6

4. Demography

(1) Population

- 1) Block Population 5,300 (Gangzoor)
- 2) Project Area Population
 - a. Population 200 (100%)
(Male: 57%, Female: 43%)
 - b. Student (5-14 years) 61 (31%)
 - c. Labour Force (15-54 years) 102 (51%)

Age	Male	Female	Total
0 - 4	13	10	23
5 - 9	15	11	26
10 - 14	20	15	35
15 - 19	16	13	29
20 - 24	16	12	28
25 - 29	10	7	17
30 - 34	5	3	8
35 - 39	4	3	7
40 - 44	3	1	4
45 - 49	2	3	5
50 - 54	3	1	4
55 - 59	2	3	5
60 - 64	3	1	4
65 -	2	3	5
Total	114	86	200

- 3) Share of Population in Block 4%
- (2) No. of Household
 - 1) Block 650
 - 2) Project Area
 - a. Total 23
 - b. Share of (a) to (1) 4%
 - 3) Average Family Size of the Scheme 8.7

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil units in the Ganzoor project area are as follows:

- Gleysols paddy field in lower elevation, high ground water table, in limited area.
- Cambisols generally located in paddy field and dry land.
- Acrisols upper terrace, generally sloping area.
- Lithosols/Regosols .. steep slopes, shallow surface layer, stony phase.

6. Agriculture

(1) Agricultural Land Use

	(Unit: ha)				
	Wet	Dry	Tsheri	Others	Total
Project Scheme	16	18	4	1	53
Average Holding Size	0.70	0.78	0.17	0.04	1.69

(2) Agricultural Production

		Area (ha)	Unit Yield (t/ha)	Production
1) Wet Land	- Paddy	16	3.3	53
	- Wheat	0	0	0
	- Total	16	-	-
2) Dry Land	- Maize	18	2.5	45
	- Wheat	0	0	0
	- Soyabean	0	0	0
	- Potato	0	0	0
	- Chilli	0	0	0
	- Total	18	-	-
3) Tsheri Land	- Maize	2	1.7	3
	- Wheat	0	0	0
	- Soyabeans	0	0	0
	- Total	2	-	-

(3) Crop Intensity (%)

- Wet land	100
- Dry land	100
- Tsheri land	50
- Total land	95

(4) Livestock Production

	(Unit: head)			
	Cattle	Horse	Pig	Poultry
Young	40	5	25	35
Adult	00	5	5	5
Total	140	10	30	40
Average Holding per Household	6.1	0.4	1.3	1.7

7. Irrigation

- (1) Intake: Random stone fill weir at EL 1,560 m
- (2) Canal: Constructed in 1972, 2.5 km long, earth canal mostly, EL 1,450 m at canal end

(3) O & M and Necessity of Improvement

- 1) Intake : Temporary facility to be repaired every year
- 2) Canal : Pipe aqueduct or syphon may be utilizable in collapsed canals for improvement, very poor maintenance
- 3) Major collapse : 2 places, 50 m long
- 4) Reasons of collapse : For landslide, for land collapse

(4) Irrigation

Small repairing of facilities in every year

8. Rural Facilities

(1) Access Road and Necessity of Improvement

Though there is a feeder road passable by vehicle, it is in dangerous conditions because of poor maintenance and heavy collapses.

(2) Other Public Facilities

Water supply, Grocer

9. Farmers' Intension for Development

- (1) Construction/Rehabilitation of irrigation facilities
- (2) Strengthening of agricultural extension
- (3) Electrification

10. Remarks

- (1) This project area is considered significant on the district level, because it is a small scale scheme and favorably located in spite of its poor irrigation facilities. (Based on the interview with Gup)
- (2) The reason that the rice yield is on extreme high level is as follows:
 - Abundant irrigation water throughout the cultivation period
 - Sufficient supply of manure by the application of the compost and the pasture in winter season (based on the interview with Gup)

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

- a) Profile number 1
- b) Soil name Dystric Cambisols
- c) Date of examination January 16, 1988
- d) Location Gangzoor (1/2), EL. 1,270 m; 2 km NE of Dzong
- e) Land form:
 - 1. Physiographical alluvial terrace at the foothill of deep valley, right bank of Kuri chu
 - 2. Surrounding land form Undulating to flat area surrounded by the valley on three sides except north-east where Kuri chu flows.
- f) Slope Gently sloping, about 2% slope
- g) Land use/vegetation Upland; chilli, maize, potato, vegetables

II. General Information of the Soil:

- a) Parent materials Illuvial material
- b) Drainage Moderately well drained
- c) Moisture condition Moist (affected by ground water)
- d) Depth of ground water Less than 100 cm
- e) Surface stones/rock outcrops Few.
- f) Erosion Almost none.
- g) Human influence Moderate; made terraces; regular disturbances confined to plough layer.

III. Profile Description

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 22	Greyish yellow brown (10YR 4/2); clay loam; no mottle; moderate blocky fine structure; slightly sticky and plastic; diffused irregular boundary
AB	22 - 36	Dark reddishbrown (2.5YR 3/3); many fine and prominent mottle; sandy clay to sandy loam; moderate blocky fine structure; sticky and plastic (wet) and slightly hard (dry); 2 - 3 cm boulders; diffused irregular boundary.
B1	36 - 57	Greyish yellow brown (10YR 4/2); silty loam; common medium mottle (orange 7.5YR 6/8); moderate blocky medium structure; slightly sticky and slightly plastic; diffused irregular boundary.
B2	57 - 71	Dark brown (10YR 3/4); silty loam; common fine prominent mottle (yellow orange 10YR 7/8); moderate angular blocky medium structure; slightly sticky and slightly plastic; manganese nodule (black 10YR 1.7/1); diffused irregular boundary.
C1	71 -	Brown (10YR 4/4); sandy loam; many fine to medium prominent mottle (orange 5YR 6/6); moderate angular blocky medium structure; slightly sticky and slightly plastic; many weathered rocks.

SOIL PROFILE DESCRIPTION

I. General Information at the Site

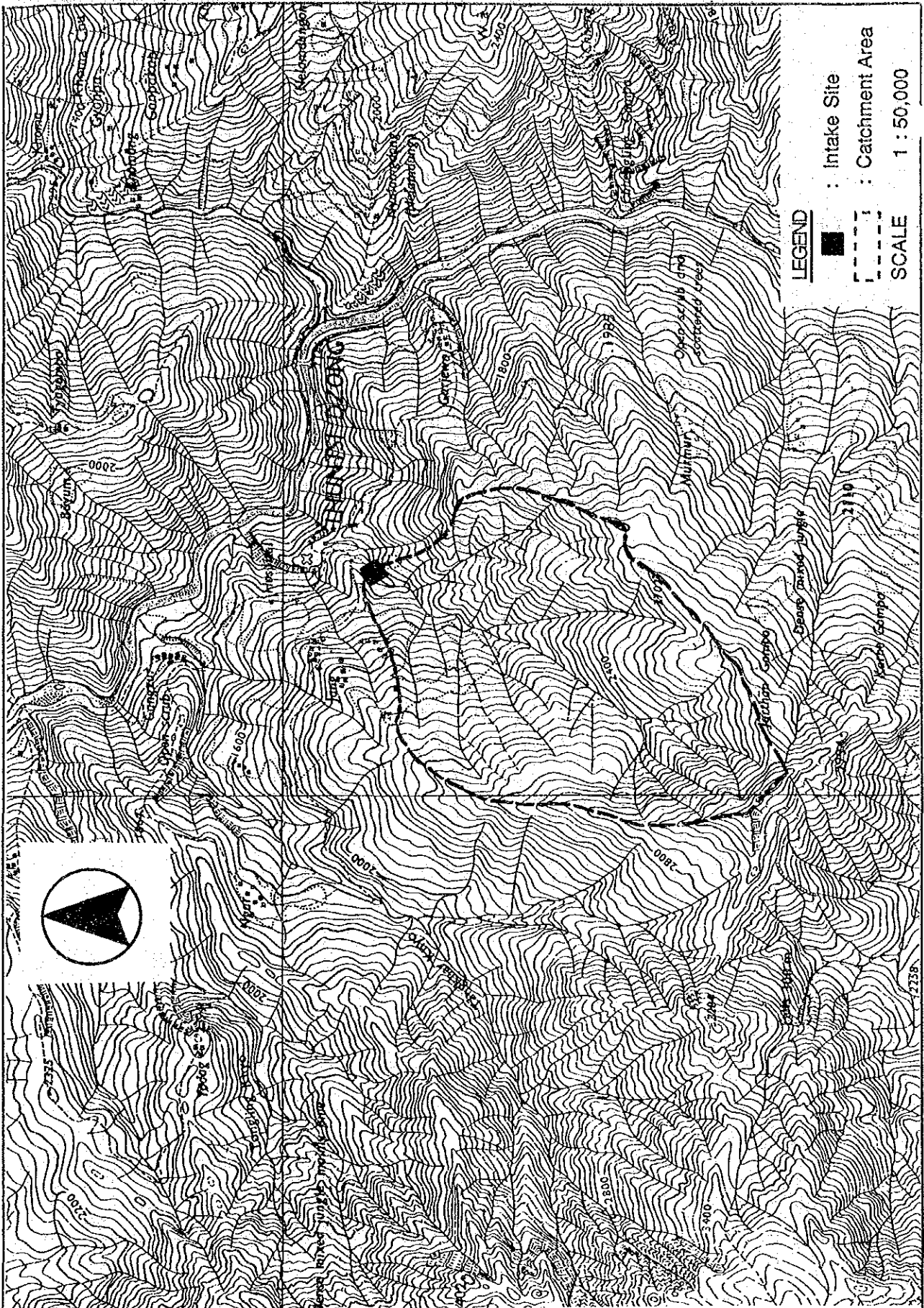
- a) Profile number 2
- b) Soil name Dystric Gleysols
- c) Date of examination January 16, 1988
- d) Location Gangzoor (2/2); 1,250 m elevation; 2 km Ne of Dzung
- e) Land form:
1. Physiographical On deep valley on the right bank of Kuri chu
 2. Surrounding land form Undulating to flat in farm land otherwise the valley is surrounded by high hills on three sides except north-east where river Kurichu flows.
- f) Slope Gently sloping, 2% slope
- g) Land use/vegetation Paddy field, mono-crop of rice, ploughing by bullocks

II. General Information of the Soil:

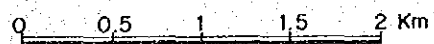
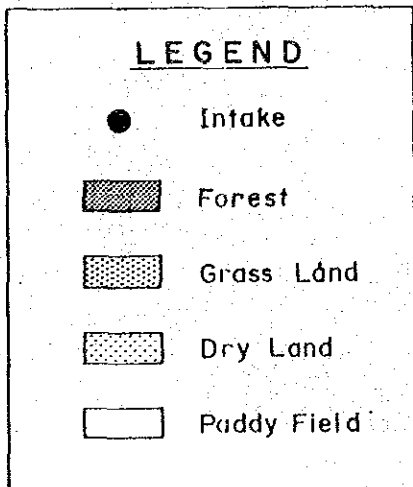
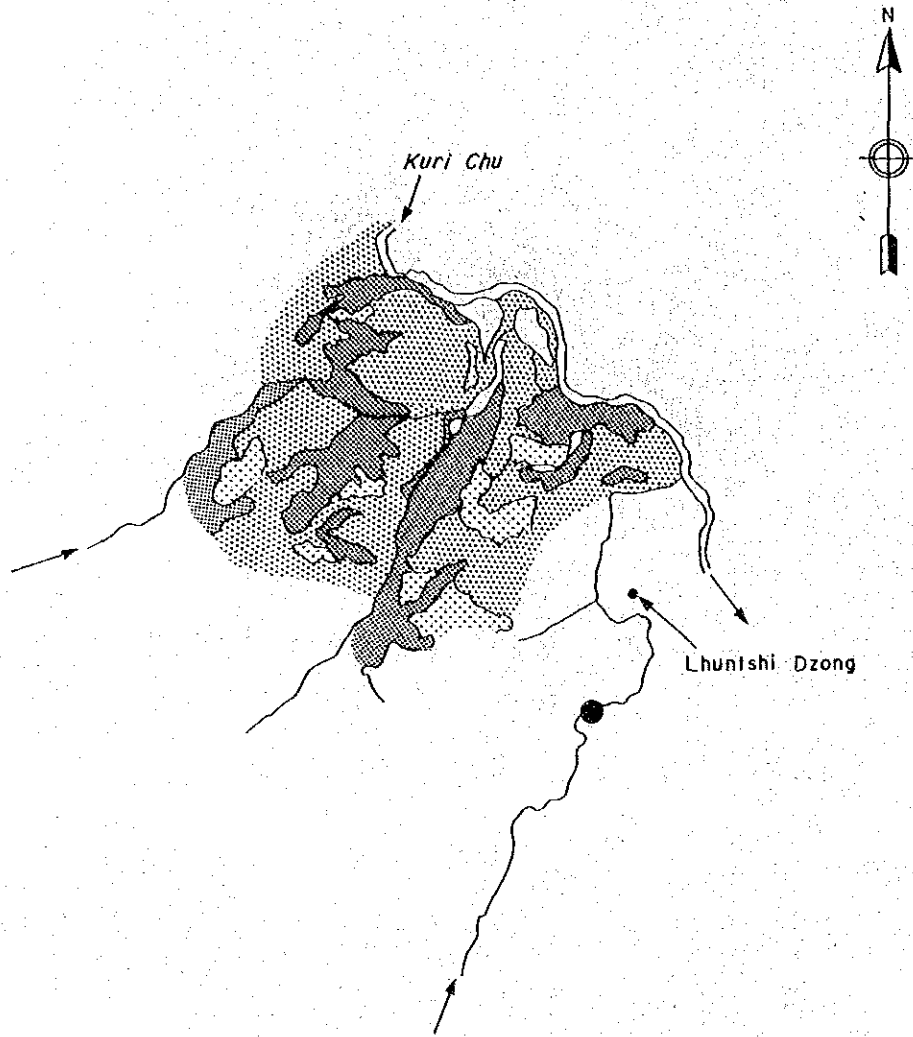
- a) Parent materials Alluvial
- b) Drainage Moderately well drained
- c) Moisture condition of the site .. Moist (affected by ground water)
- d) Depth of ground water Less than 60 m
- e) Surface stones/rock outcrops Few, mostly stones deposited at bund or in the middle of terraces
- f) Erosion None due to terracing; but slight erosion in the none-tarraced field.
- g) Human influence Moderate; made terraces; regular disturbances confined to plough layer.

III. Profile Description

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 10	Greyish yellow brown (10YR 5/2); clay loam; common fine distinct mottles; weak blocky fine structure; sticky and plastic (wet) slightly hard (dry); some micropores; some pebbles; frequent paddy roots present rain water remains 3 days in the field after stop; diffused irregular boundary.
B	10 - 20	Greyish yellow brown (10YR 4/2); clay loam; many fine prominent mottles along roots; moderate blocky and angular blocky structure; sticky and plastic (wet); slightly hard (dry); frequent paddy roots present; diffused irregular boundary.
C1	20 - 42	Greyish yellow brown (10YR 4/2); clay loam; many coarse and prominent mottles colour (dark reddish brown 5 YR3/6); moderate blocky and angular medium structure; slightly sticky and slightly plastic; diffused irregular boundary.
C2	42 -	Dull yellow orange (10YR 6/4); sandy silt; moderate blocky to angular blocky medium structure; non-sticky and non-plastic; red concretion (5YR 3/6); many weathered rocks; 40 % gravels (5-10 cm).



CATCHMENT AREA AT INTAKE SITE, GANGZOR



PRESENT LAND USE MAP OF GANGZOOR PROJECT AREA

3. TANGMACHHU PROJECT AREA

1. Location

- (1) District: Lhuntshi Block: Tangmachhu Village: Tangmachhu
- (2) Location: 30 minutes by vehicle from district capital through the national road, and 30 minutes by vehicle through the feeder road

2. Topography

- (1) Elevation: Intake Structure ; Lower: EL 1,890 m EL 1,780 m
Upper: EL 2,210 m
Farm Land ; EL 1,300 m EL 1,680 m
- (2) Slope and Direction of Farm Land
Slope: 1/3 Direction: West

3. Climate and Water Resources

- (1) Climate (Station: Tangmachhu)

Temperature

(unit: °C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Max	13.8	15.3	17.3	20.6	21.8	23.8	22.8	23.7	22.6	21.1	18.1	14.7	19.6
Min	5.0	7.6	10.3	12.5	14.9	18.7	19.1	19.5	18.3	15.9	9.9	6.7	13.2
Average	9.4	11.4	13.8	16.5	18.3	21.3	21.0	21.6	20.5	18.5	14.0	10.7	16.4

Relative Humidity

(unit: %)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	68.0	71.3	72.1	69.3	75.2	79.3	88.1	85.0	87.0	80.9	79.3	76.9	77.7

Rainfall

(unit: mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	3.1	0	55.3	79.4	70.7	130.6	169.8	109.8	116.8	74.5	10.7	5.0	825.7

- (2) Water Resource

- 1) River Name : Begang Sher chu Begang Sher chu
- 2) Catchment Area : 15.10 km² (Lower) 5.4 km² (Upper)
- 3) Length of River : 6.7 km 3.05 km
- 4) Mean Elevation of River : EL. 2,880 m EL. 2,920 m
- 5) Available Water :

(unit: lit./s)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Mean	250.7	196.3	212.9	321.6	373.0	569.3	1,001.0	753.5	827.5	413.7	338.2	274.8	460.6
Drought	155.5	143.5	131.4	160.1	237.1	302.0	463.6	354.9	270.3	253.7	241.6	193.3	241.6

Remark: Available water is assessed at lower intake point.

4. Demography

(1) Population

- 1) Block Population 4,900 (Tangmachu)
- 2) Project Area Population
 - a. Population 2,427 (100%)
(Male: 49%, Female: 51%)
 - b. Student (5-14 years) 457 (19%)
 - c. Labour Force (15-54 years) 1,589 (65%)

Age	Male	Female	Total
0 - 4	56	48	104
5 - 9	126	158	284
10 - 14	92	81	173
15 - 19	92	84	176
20 - 24	147	151	298
25 - 29	103	110	213
30 - 34	100	92	192
35 - 39	70	62	132
40 - 44	107	92	199
45 - 49	111	140	251
50 - 54	55	73	128
55 - 59	96	114	210
60 - 64	23	22	45
65 -	11	11	22
Total	1,189	1,238	2,427

- 3) Share of Population in Block 50%

(2) No. of Household

- 1) Block 520
- 2) Project Area
 - a) Total 253
 - b) Share of (a) to (1) 49%
- 3) Average Family Size of the Scheme 9.6

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil units in the Tangmachhu project area are as follows:

- | | |
|--------------------|--|
| Gleysols | paddy field near the springs, high ground water table. |
| Cambisols | generally located in paddy field and dry land. |
| Acrisols | generally located ridges and grass land and suffered by erosion. |
| Lithosols/Regosols | steep slopes, shallow surface layer, stony phase. |

6. Agriculture

(1) Agricultural Land Use

(Unit: ha)

	Wet	Dry	Tsheri	Others	Total
Project Scheme	224	114	95	45	478
Average Holding Size ^{/1}	0.86	0.44	0.37	0.17	1.84

^{/1}: Divided by the number of land owner of 259

(2) Agricultural Production

	Area (ha)	Unit Yield (t/ha)	Production
1) Wet Land			
- Paddy	224	2.3	515
- Wheat	29	0.4	12
- Potato	2	1.4	3
- Total	256	-	-
2) Dry Land			
- Maize	114	1.4	160
- Wheat	0	0	0
- Soyabeans	(90)	0.3	27
- Potat	0	0	0
- Chilli	2	0.9	2
- Mustard	7	0.2	1
- Total	123	-	-
3) Tsheri Land			
- Maize	38	0.6	23
- Wheat	0	0	0
- Soyabeans	0	0	0
- Total	38	-	-

(3) Crop Intensity (%)

- Wet land	114
- Dry land	108
- Tsheri land	40
- Total land	111

(4) Livestock Production

	Cattle	Horse	Pig	Poultry
Young	770	60	397	692
Adult	771	101	132	274
Total	1,541	161	529	966
Average Holding per Household	6.1	0.6	2.1	3.8

7. Irrigation

(1) Intake

Nge chu intake ; Random stone fill weir, 0.8 m³/sec capacity at EL 2,240 m

Sher chu intake ; Random stone fill weir, 0.3 m³/sec capacity at EL 1,960 m

(2) Canal

Tangmachhu canal; 8.6 km long mostly earth canal and, EL 1,960 m at canal end

Gorgan canal ; 4.1 km long mostly earth canal and, EL 1,840 m at canal end

(3) O & M and Necessity of Improvement

1) Intake : Nge chu Intake is in worst situations. Sher chu Intake is necessary to be improved for drought year.

2) Canal : Renovated in 1985 in both canals, many collapses due to poor maintenance and insufficient maintenance road.

3) Major collapse : Tangmachhu canal; 2 places, 120 m long. Gorgan canal; 3 places, 300 m long.

4) Reasons of collapse : Landslide, land collapse and over topping of canal.

(4) Irrigation

Shortage of water in drought year due to inadequate irrigation facilities

8. Rural Facilities

(1) Access Road and Necessity of Improvement

Project area is located in taking 30 minutes by vehicle (a feeder road is planned to be paved by asphalt in future).

(2) Other Public Facilities

Water supply, School, Basic health unit, Agricultural extension center, Grocer

9. Farmers' Intension for Development

(1) Construction/Rehabilitation of irrigation facilities

(2) Strengthening of agricultural extension

(3) Electrification

10. Remarks

(1) This area is substantially a center of Lhuntshi District. The feeder road is newly constructed to the center of Tangmachu village from the national road. From the end of feeder road, the foot path reaches the four villages of Menjibi, Nebi, Shangkhar and Tongling, and plays the important roles socio-economically.

(2) This is the largest irrigation area and has the maximum production of rice in Lhuntshi District. The land reclamation reaches the limit and there is no area to be reclaimed any more.

(3) The higher yield of rice in this area depends on the better soils and temperate weather. (based on the interview with the Gup)

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

- a) Profile number 14 (1/3 in Tangmachhu)
- b) Soil name Distric Cambisols
- c) Date of examination January 26, 1988
- d) Location Tangmachhu (1) 1,570 m
- e) Land form:
 - 1) Physiographical
 - 2) Surrounding Land form Almost all land around is terraced and cultivated
- f) Slope Gently sloping; 5%
- g) Land use/vegetation Paddy cultivation; monocrop

II. General Information of the Soil:

- a) Parent material Terrace (Alluvial)
- b) Drainage Good
- c) Moisture condition of the site Dry
- d) Ground water <1.8 m
- e) Surface stones/rock outcrops .. Few
- f) Erosion No evidence
- g) Human influence Annual cultivation; ploughing by bullocks

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A1	0 - 27	10YR 5/6, yellowish brown, none, silt loam clay, weak, blocky, fine to medium, slightly sticky, slightly plastic, loose when moist and dry, frequent grass roots, gradual, irregular.
A2	18 - 28	10YR 5/6, yellowish brown, common, medium, distinct, silt loam clay, weak, blocky, fine, lightly sticky, slightly plastic, loose, frequent grass roots, diffuse, irregular.
B	28 - 37	10YR 3/3, dark brown, many, 10YR 2/3, black, medium, angular blocky, slightly sticky, slightly plastic, clear, smooth.
C1	37 - 47	10YR 6/4, dull yellow orange, many, 5YR 2/3 very dark reddish brown, loamy sand, wavy, blocky, medium, slightly sticky, slightly plastic, diffused.
C2	47 - 80	2.5YR 5/4, dull reddish brown, common, medium, sand, weak, grammular, fine, non-sticky, non plastic, diffused, wavy to irregular.
Ab	80 - 82	2.5YR 6/4, dull orange, few, fine sand, weak, non sticky, slightly plastic, loos, plant tissue, gravels, black clay below Ab. horizon.

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

- a) Profile number 15 (2/3 in Tangmachhu)
- b) Soil name Distric Cambisols
- c) Date of examination January 26, 1988
- d) Location Tangmachhu (1) 1,570 m
- e) Land form:
 - 1) Physiographical Terrace sloped gently
 - 2) Surrounding Land form Almost all land around is terraced and cultivated
- f) Slope Gently sloping; 2-4 %
- g) Land use/vegetation Paddy cultivation; monocrop

II. General Information of the Soil:

- a) Parent material Colluvial material
- b) Drainage Good
- c) Moisture condition of the site Dry
- d) Ground water <1.0 m
- e) Surface stones/rock outcrops .. Few
- f) Erosion No evidence
- g) Human influence Annual cultivation; ploughing by bullocks

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 10	Dull reddish brown (2.5YR 5/4), loam sand, many fine distinct mottlings (orange 5YR 6/8), weak blocky fine structure, sticky, plastic, loose, dry hard, frequent grass roots, gradual irregular boundary.
B	10 - 16	Dull reddish brown (2.5YR 5/4), loamy sand, common medium distinct mottlings (orange 5YR 6/8), weak angular blocky fine structure, slightly sticky, slightly plastic, dry hard, frequent paddy roots, diffused irregular boundary.
C	16 - 24	Dull yellowish orange (10YR 5/4), loamy clay, common fine distinct mottlings (bright brown 7.5YR 5/8), weak medium angular blocky and subangular blocky slightly sticky, slightly plastic, few paddy roots, dry hard, Manganese concretion (brownish black 7.5YR 3/2), 2-3 mm pebbles, clear smooth boundary.
Ab	24 - 50	Brown black (5YR 2/1), loamy clay, common fine distinct mottlings (bright reddish brown 10YR 2/3), moderate fine angular blocky, slightly sticky, slightly plastic, small weathered stone, few gravels, gradual irregular boundary.
Bb	50 -	Dull reddish brown (2.5YR 4/4), loamy sand, few fine distinct mottlings (bright brown 7.5YR 5/8), weak angular blocky, sticky, plastic.

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

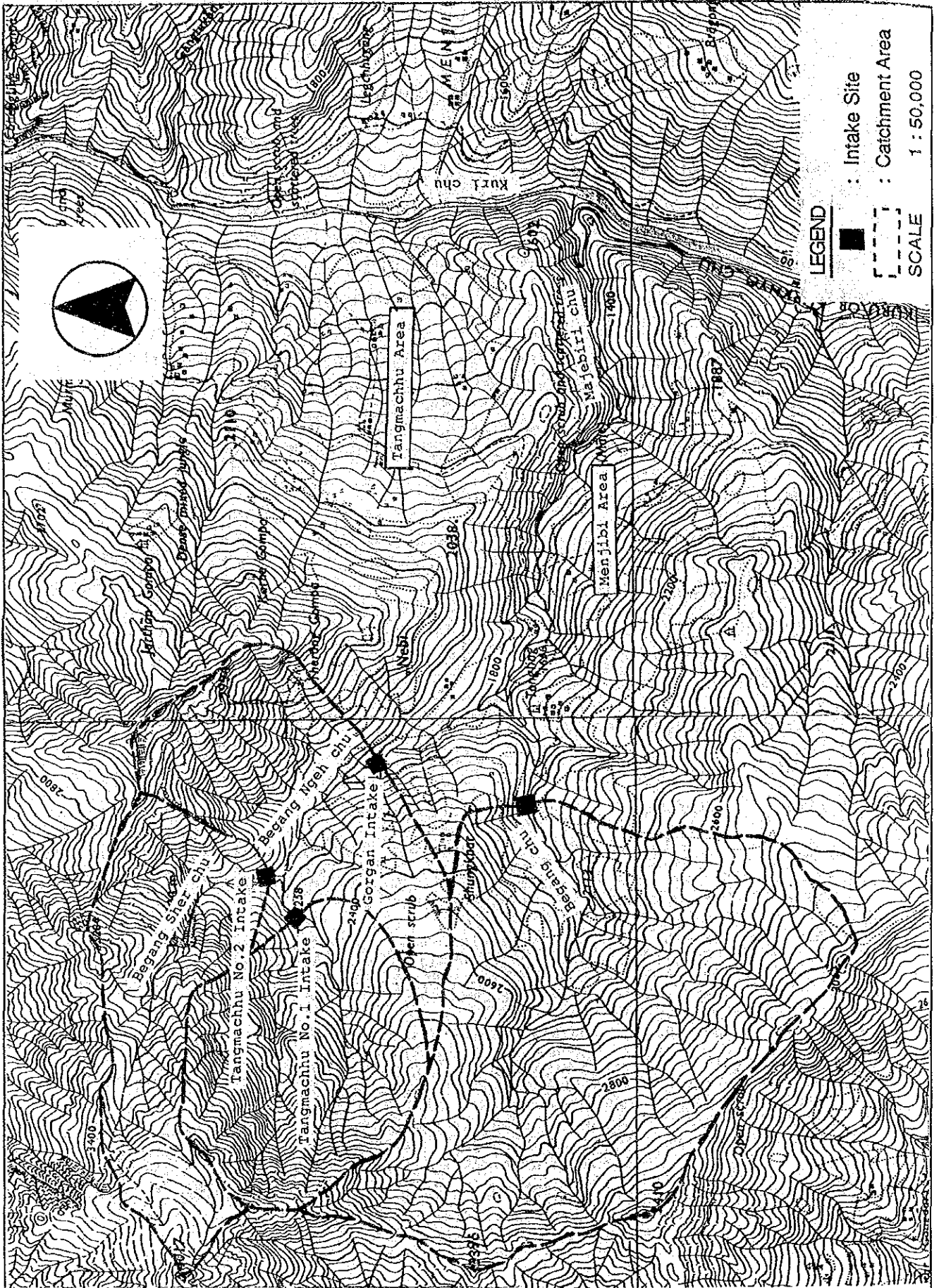
- a) Profile number 16 (3/3 in Tangmachhu)
- b) Soil name Distric Cambisols
- c) Date of examination January 26, 1988
- d) Location Tangmachhu (3) 1,400 m
- e) Land form:
 - 1) Physiographical Terrace sloped gently
 - 2) Surrounding Land form Terraced and cultivated
- f) Slope Gently sloping; 5-8 %
- g) Land use/vegetation Paddy cultivation; monocrop

II. General Information of the Soil:

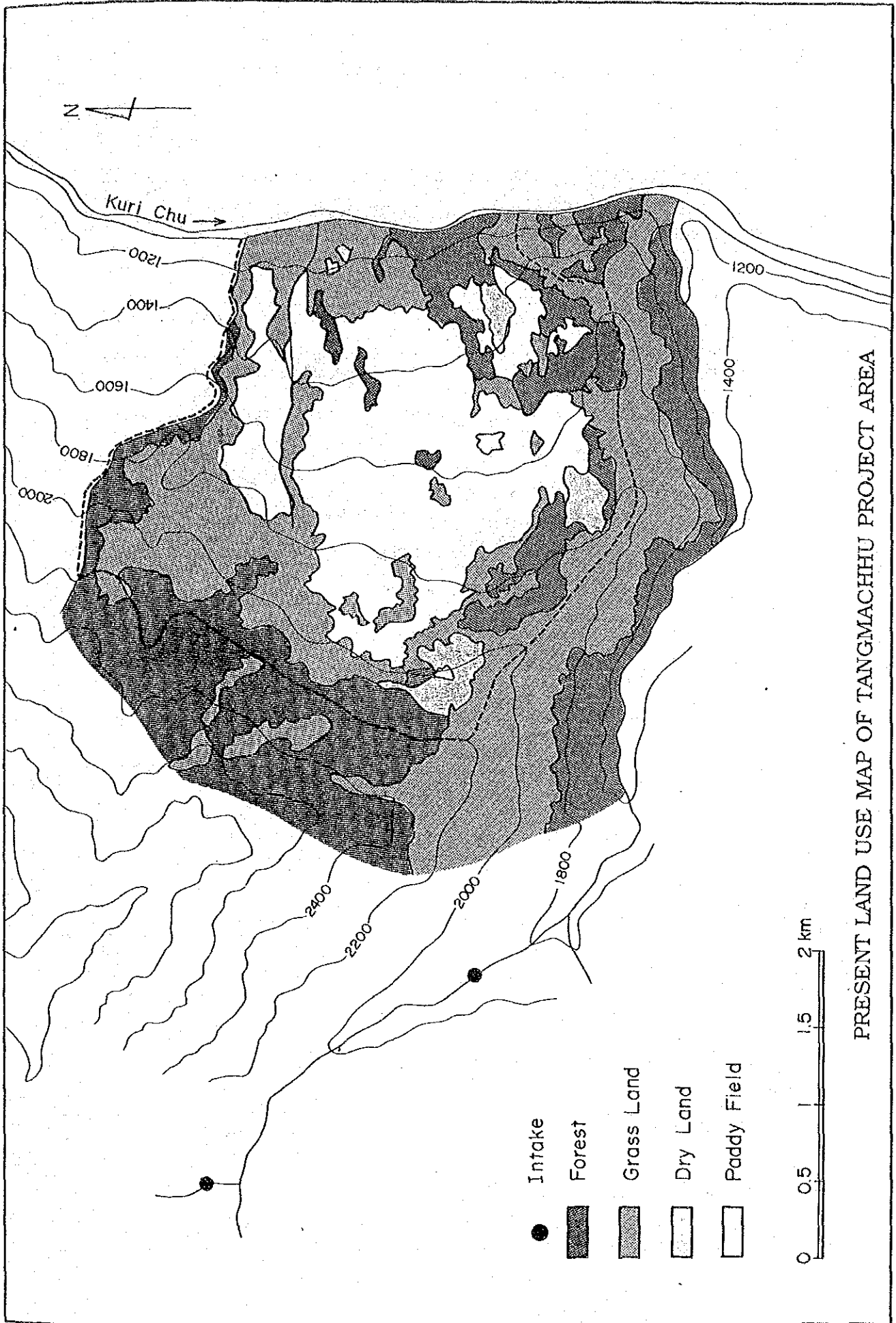
- a) Parent material Colluvial material
- b) Drainage Good
- c) Moisture condition of the site Wet
- d) Ground water <1.0 m
- e) Surface stones/rock outcrops .. Few
- f) Erosion No evidence
- g) Human influence Annual cultivation; ploughing by bullocks

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 15	Dull yellowish brown (10YR 4/3), clay loam, common fine faint mottlings (orange 7.5YR 6/8), weak medium blocky, sticky, plastic, frequent paddy roots, diffused irregular boundary.
B1	15 - 30	Dull yellowish brown (10YR 4/3), sandy loam, many fine distinct mottlings (orange 2.5YR 4/8), weak medium subangular blocky, sticky, slightly plastic, diffused irregular boundary.
B2	30 - 52	Dull yellowish orange (2.5YR 4/2), sandy loam, common to many medium distinct mottlings (bright brown 7.5YR 5/8), weak subangular blocky, slightly sticky, slightly plastic, clear wavy boundary.
C	52 -	Bright reddish brown (5YR 5/8), sandy loam, few medium faint mottlings (dark reddish brown 5YR 3/4), weak angular blocky, slightly sticky, slightly plastic, manganese concretion (brownish black 5YR 2/1), quartz granules.



CATCHMENT AREA AT INTAKE SITE, TANGMACHHU



PRESENT LAND USE MAP OF TANGMACHHU PROJECT AREA

4. MINJI PROJECT AREA

1. Location

- (1) District: Lhuntshi Block: Minji Village: Minji
- (2) Location: 30 minutes by vehicle from district capital through the national road, and 80 minutes' walk from the national road.

2. Topography

- (1) Elevation: Intake Structure ; EL 1,700 m EL 1,550 m
Farm Land ; EL 1,360 m EL 2,120 m
- (2) Slope and Direction of Farm Land
- Slope: 1/3 Direction: West

3. Climate and Water Resources

- (1) Climate (Station: Tangmachhu)

Temperature

(unit: °C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Max	13.8	15.3	17.3	20.6	21.8	23.8	22.8	23.7	22.6	21.1	18.1	14.7	19.6
Min	5.0	7.6	10.3	12.5	14.9	18.7	19.1	19.5	18.3	15.9	9.9	6.7	13.2
Average	9.4	11.4	13.8	16.5	18.3	21.3	21.0	21.6	20.5	18.5	14.0	10.7	16.4

Relative Humidity

(unit: %)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	68.0	71.3	72.1	69.3	75.2	79.3	88.1	85.0	87.0	80.9	79.3	76.9	77.7

Rainfall

(unit: mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	3.1	0	55.3	79.4	70.7	130.6	169.8	109.8	116.8	74.5	10.7	5.0	825.7

- (2) Water Resource

- 1) River Name : Narigang chu
- 2) Catchment Area : 36.2 km² (Lower) 15.38 km² (Upper)
- 3) Length of River : 9.6 km 5.45 km
- 4) Mean Elevation of River : EL. 2,870 m EL. 3,115 m
- 5) Available Water :

(unit: lit./s)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Mean	600.9	470.6	510.4	771.1	894.1	1,364.7	2,400.1	1,806.4	1,983.8	991.9	810.9	658.8	1,104.1
Drought	372.9	343.9	324.9	383.7	568.3	724.0	1,111.3	850.7	648.0	608.2	579.2	463.4	579.2

Remark: Available water is assessed at lower intake point.

4. Demography

(1) Population

- 1) Block Population 3,500 (Minji)
- 2) Project Area Population
 - a. Population 750 (100%)
(Male: 48%, Female: 52%)
 - b. Student (5-14 years) 165 (22%)
 - c. Labour Force (15-54 years) 458 (61%)

Age	Male	Female	Total
0 - 4	34	28	62
5 - 9	29	42	71
10 - 14	43	51	94
15 - 19	44	43	87
20 - 24	32	27	59
25 - 29	32	21	53
30 - 34	34	37	71
35 - 39	22	43	65
40 - 44	21	25	46
45 - 49	18	15	33
50 - 54	24	20	44
55 - 59	17	18	35
60 - 64	12	9	21
65 -	5	4	9
Total	367	383	750

- 3) Share of Population in Block 21%

(2) No. of Household

- 1) Block 500
- 2) Project Area
 - a) Total 92
 - b) Share of (a) to (1) 18%
- 3) Average Family Size of the Scheme 8.2

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil units in the Minji project area are as follows:

- Cambisols generally located in paddy field and dry land.
- Acrisols part of dry land and grass land.
- Lithosols/Regosols .. steep slopes, shallow surface layer, stony phase.

6. Agriculture

(1) Agricultural Land Use

	(Unit: ha)				
	Wet	Dry	Tsheri	Others	Total
Project Area	116	42	20	28	206
Average Holdg Size	1.26	0.46	0.22	0.30	2.24

(2) Agricultural Production

		Area (ha)	Unit Yield (t/ha)	Production
1) Wet Land	- Paddy	116	3.0	348
	- Wheat	0	0	0
	- Total	116	-	-
2) Dry Land	- Maize	42	3.0	126
	- Wheat	0	0	0
	- Soyabeans	(42)	0.7	29
	- Potato	0	0	0
	- Chilli	0	0	0
	- Total	42	-	-
3) Tsheri Land	- Maize	6	3.0	18
	- Wheat	0	0	0
	- Soyabeans	(6)	0.7	4
	- Total	6	-	-

(3) Crop Intensity (%)

- Wet land	100
- Dry land	100
- Tsheri land	30
- Total land	92

(4) Livestock Production

	(Unit: head)			
	Cattle	Horse	Pig	Poultry
Young	104	16	89	4.7
Adult	143	33	62	23
Total	247	49	151	70
Average Holding per Household	2.7	0.5	1.6	0.8

7. Irrigation

- (1) Intake: Minji Intake ; Random stone fill weir, 0.09 m³/sec Capacity at EL 2,190 m
- Lekpachu Intake ; Random stone fill weir, 0.085 m³/sec Capacity at EL 1,700 m
- (2) Canal: Minji Canal ; Constructed in 1984, 5.6 km long of mostly earth canal except 35 m of masonry and 14 Nos. of wooden shoots, EL 2,020 m at canal end
- Lekpachu Canal ; Constructed in 1985, 5.5 km long including 1.5 km of earth canal and 4 km of masonry canal, EL 1,550 m at canal end

(3) O & M and Necessity of Improvement

- 1) Intake : Minji Intake; Not functioned due to the collapses of upper canal, taking water from small mountain stream at present. Lerpachu intake; No problem at present
- 2) Canal : As for both canals, no good maintenance, many collapsed canals, poor O & M road.
- 3) Major collapse : Minji canal; 4 places, 100 m long
Lerpachu canal; 9 places, 50 m long
- 4) Reasons of collapse : Landslides, over-toppings of canal and destruction by cattle passing

(4) Irrigation

Insufficient due to lack of water.

8. Rural Facilities

(1) Access Road and Necessity of Improvement

The foot path is passable on foot and by horse, and expected to be improved because of its steep slope.

(2) Other Public Facilities

Water Supply, Basic health unit

9. Farmers' Intension for Development

- (1) Construction of feeder road
- (2) Construction of primary school
- (3) Electrification

10. Remarks

- (1) The improvement of the canal from main water source is inevitable for assuring the efficient irrigation water supply.
- (2) It is expected by the beneficiaries to reclaim the paddy field of about 400 ha, providing a new canal of approximately 2 km from the drop structure with 20m head established in the lower canal.

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

- a) Profile number 18
- b) Soil name Eutric Cambisols
- c) Date of examination January 28, 1988
- d) Location Miniji (1/2), 1,595 m
- e) Land form:
 - 1) Physiographical Terraced field
 - 2) Surrounding area Cultivated paddy land in terraced fieldsf)
- f) Slope Slopy gently; 10-15%
- g) Land use/vegetation Paddy field: monocropping

II. General Information of the Soil:

- a) Parent material Colluvial
- b) Drainage Good; well drained
- c) Moisture condition of site Moist
- d) Ground water depth < 100 cm
- e) Surface stones/rock outcrops None, but some are around
- f) Erosion No evidence
- g) Human influence Ploughed and cultivated

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A1	0 - 13	Dull yellow brown (10YR 4/3); loamy clay; few fine faint mottles (orange 7.5YR 6/8); weak medium angular blocky structure; sticky; plastic; very friable when moist and loose when dry; frequent paddy roots; gradual wavy boundary.
A2	13 - 21	Dull yellow brown (10YR 4/3); loamy clay; many fine distinct mottle (reddish brown 2.5YR 4/8); weak medium angular blocky structure; slightly sticky; slightly plastic; common paddy roots; high mica content; few stones; clear smooth boundary.
Am	21 - 23	Bright reddish brown (5YR 5/8); loamy clay; many fine mottle; weak medium angular blocky structure; sticky; plastic; clear smooth boundary.
B	23 - 70	Dark brown (10YR 3/4); silty clay; many few distinct mottle (bright reddish brown 5YR 5/6); weak angular blocky structure; sticky; plastic; diffused irregular boundary.
C	70 -	Brown (7.5YR 4/3); sandy clay; few medium; distinct mottle (bright reddish brown 5YR 5/8); weak angular blocky structure; slightly sticky; slightly plastic; Mn oxides (brownish black 5YR 2/2); distinct few gravels; water course pores.

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

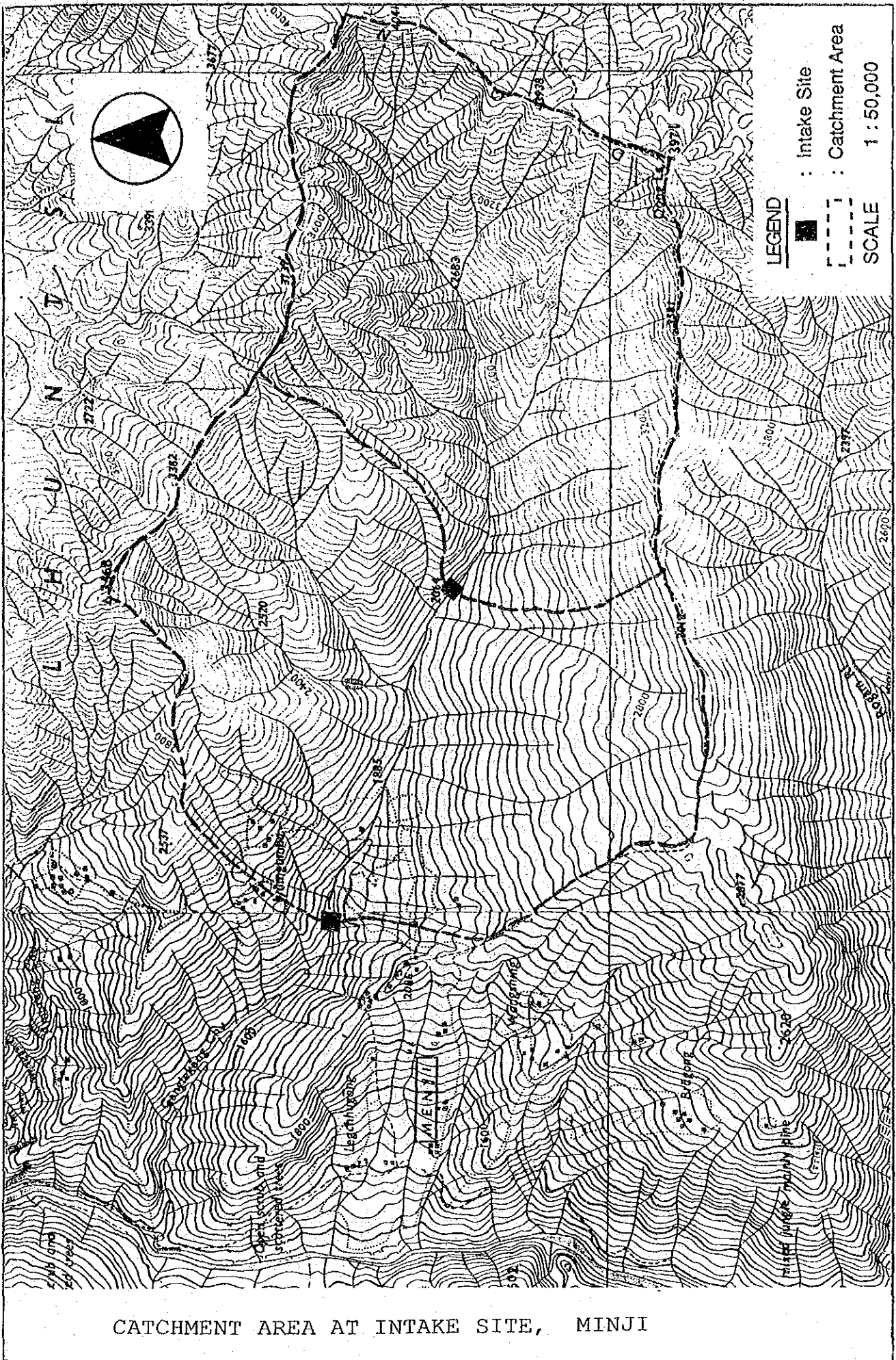
- a) Profile number 19
- b) Soil name Eutric Gleysols
- c) Date of examination January 28, 1988
- d) Location Miniji (2/2), 1,510 m
- e) Land form:
- 1) Physiographical Terraced field
- 2) Surrounding area Cultivated paddy land in terraced fields)
- f) Slope Slopy gently; 10%
- g) Land use/vegetation Paddy field: monocropping

II. General Information of the Soil:

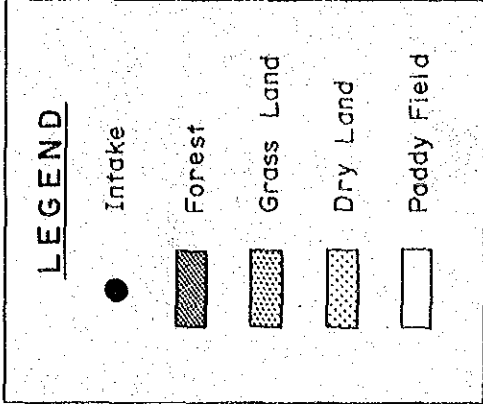
- a) Parent material Colluvial
- b) Drainage Good; well drained
- c) Moisture condition of site Moist (upper part), moist to wet (lower part)
- d) Ground water depth < 100 cm
- e) Surface stones/rock outcrops None, but some are around
- f) Erosion No evidence
- g) Human influence Ploughed and cultivated

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 20	Grayish red (2.5YR 4/2); silty loam clay; few medium mottle (orange 5YR 6/6); weak medium angular blocky structure; sticky; plastic; frequent to common paddy roots; mica rich; clear smooth boundary.
B	20 - 63	Grayish red (2.5YR 5/2); sandy loam; many fine distinct mottle (bright reddish brown 5YR 5/8); weak angular blocky; sticky; slightly plastic; few grass roots; few gravel; some water illuviation; mica rich; gradual irregular boundary.
C	63 -	Yellowish brown (10YR 5/6); loamy sand; few fine distinct mottle (black 10YR 2/1); loose structure; slightly sticky; slightly plastic; mica rich; weathered stone.



CATCHMENT AREA AT INTAKE SITE, MINJI



PRESENT LAND USE MAP OF MINJI PROJECT AREA

5. MENJIBI PROJECT AREA

1. Location

- (1) District: Lhuntshi Block: Tangmachhu Village: Menjibi
- (2) Location: 60 minutes by vehicle from district capital through the national road and feeder road, and 60 minutes' walk from the end of feeder road.

2. Topography

- (1) Elevation: Intake Structure ; EL 1,920 m EL 1,730 m
 Farm Land ; EL 1,680 m EL 1,840 m
- (2) Slope and Direction of Farm Land
 Slope: 1/3 Direction: North

3. Climate and Water Resources

- (1) Climate (Station: Tangmachhu)

Temperature

(unit: °C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Max	13.8	15.3	17.3	20.6	21.8	23.8	22.8	23.9	22.6	21.1	18.1	14.9	19.6
Min	5.0	7.6	10.3	12.5	14.7	18.7	19.1	19.5	18.3	15.9	9.9	6.7	13.2
Average	9.4	11.4	13.8	16.5	18.3	21.3	21.0	21.6	20.5	18.5	14.0	10.7	16.4

Relative Humidity

(unit: %)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	68.0	71.3	72.1	69.3	75.2	79.3	88.1	85.0	87.0	80.9	79.3	76.9	77.7

Rainfall

(unit: mm)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
	3.1	0	55.3	79.4	70.7	130.6	169.8	109.8	116.8	74.5	10.7	5.0	825.7

- (2) Water Resource

- 1) River Name : Begang chu
 2) Catchment Area : 13.28 km²
 3) Length of River : 4.65 km
 4) Mean Elevation of River : EL. 2,560 m
 5) Available Water :

(unit: lit./s)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Mean	220.5	172.6	187.3	282.9	328.0	500.7	880.5	662.7	727.7	363.9	297.5	241.7	405.0
Drought	136.8	126.2	115.5	140.8	208.5	265.6	407.7	312.1	237.7	223.1	212.5	170.0	212.5

4. Demography

(1) Population

- 1) Block Population 4,900 (Tangmachhu)
- 2) Project Area Population
 - a. Population 552 (100%)
(Male: 57%, Female: 43%)
 - b. Student (5-14 years) 84 (15%)
 - c. Labour Force (15-54 years) 415 (75%)

Age	Male	Female	Total
0 - 4	25	16	41
5 - 9	22	13	35
10 - 14	23	26	49
15 - 19	64	16	80
20 - 24	32	13	45
25 - 29	16	22	38
30 - 34	16	32	48
35 - 39	64	32	96
40 - 44	9	32	41
45 - 49	19	16	35
50 - 54	13	19	32
55 - 59	12	0	12
60 - 64	0	0	0
65 -	0	0	0
Total	315	237	552

- 3) Share of Population in Block 11%

(2) No. of Household

- 1) Block 500
- 2) Project Area
 - a. Total 61
 - b. Share of (a) to (1) 12%
- 3) Average Family Size of the Scheme 9.0

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil units in the Manjibi project area are as follows:

Cambisols generally located in paddy field and dry land.

Lithosols/Regosols .. steep slopes, shallow surface layer, stony phase.

6. Agriculture

(1) Agricultural Land Use

	(Unit: ha)				
	Wet	Dry	Tsheri	Others	Total
Project Area	25	20	8	78	131
Average Holdg Size	0.41	0.33	0.13	1.28	1.54

(2) Agricultural Production

		Area (ha)	Unit Yield (t/ha)	Production
1) Wet Land	- Paddy	25	3.0	75
	- Wheat	0	0	0
	- Total	25	-	-
2) Dry Land	- Maize	20	2.0	40
	- Wheat	0	0	0
	- Soyabeans	0	0	0
	- Potato	0	0	0
	- Chilli	0	0	0
- Total	20	-	-	
3) Tsheri Land	- Maize	3	2.0	6
	- Wheat	0	0	0
	- Soyabeans	0	0	0
	- Total	3	-	-

(3) Cropping Intensity (%)

- Wet land	100
- Dry land	100
- Tsheri land	38
- Total land	91

(4) Livestock Production

	(Unit: head)			
	Cattle	Horse	Pig	Poultry
Young	4.5	10	25	30
Adult	120	6	22	25
Total	165	16	47	55
Average Holding per Household	11.0	1.1	3.1	3.7

7. Irrigation

- (1) Intake: Random stone fill weir, 0.10 m³/sec capacity at EL 1,920 m, 4 additional inlets at small streams.
- (2) Canal: Constructed in 1982, 4 km long including 3.6 km of earth canal and 0.4 km of masonry canal, EL 1.730 m at canal end.

(3) O & M and Necessity of Improvement

- 1) Intake : To be improved for drought year
- 2) Canal : Poor maintenance due to no maintenance road, to be renovated at collapsed canal
- 3) Major collapse : 3 places, 75 m long
- 4) Reasons of collapse : Over topping of canal, collapse and stone falling

(4) Irrigation

Insufficient irrigation water due to inadequate facilities and poor maintenance, some private canal is still used.

8. Rural Facilities

(1) Access Road and Necessity of Improvement

The foot path leads to this area, taking 60 minutes on foot from the end of feeder road provided in Tangmachhu area and is desirable to be improved as soon as possible.

(2) Other Public Facilities

Water Supply

9. Farmers' Intension for Development

- (1) Construction/Rehabilitation of irrigation facilities
- (2) Construction of Feeder Road.
- (3) Electrification

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

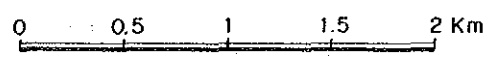
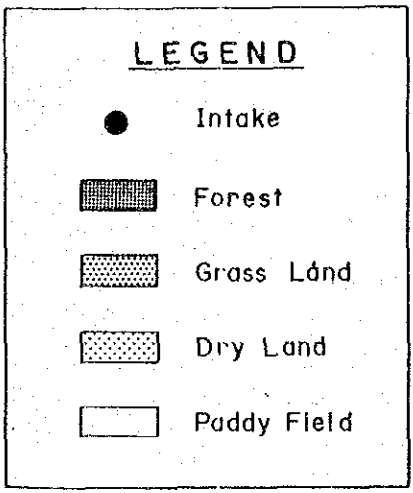
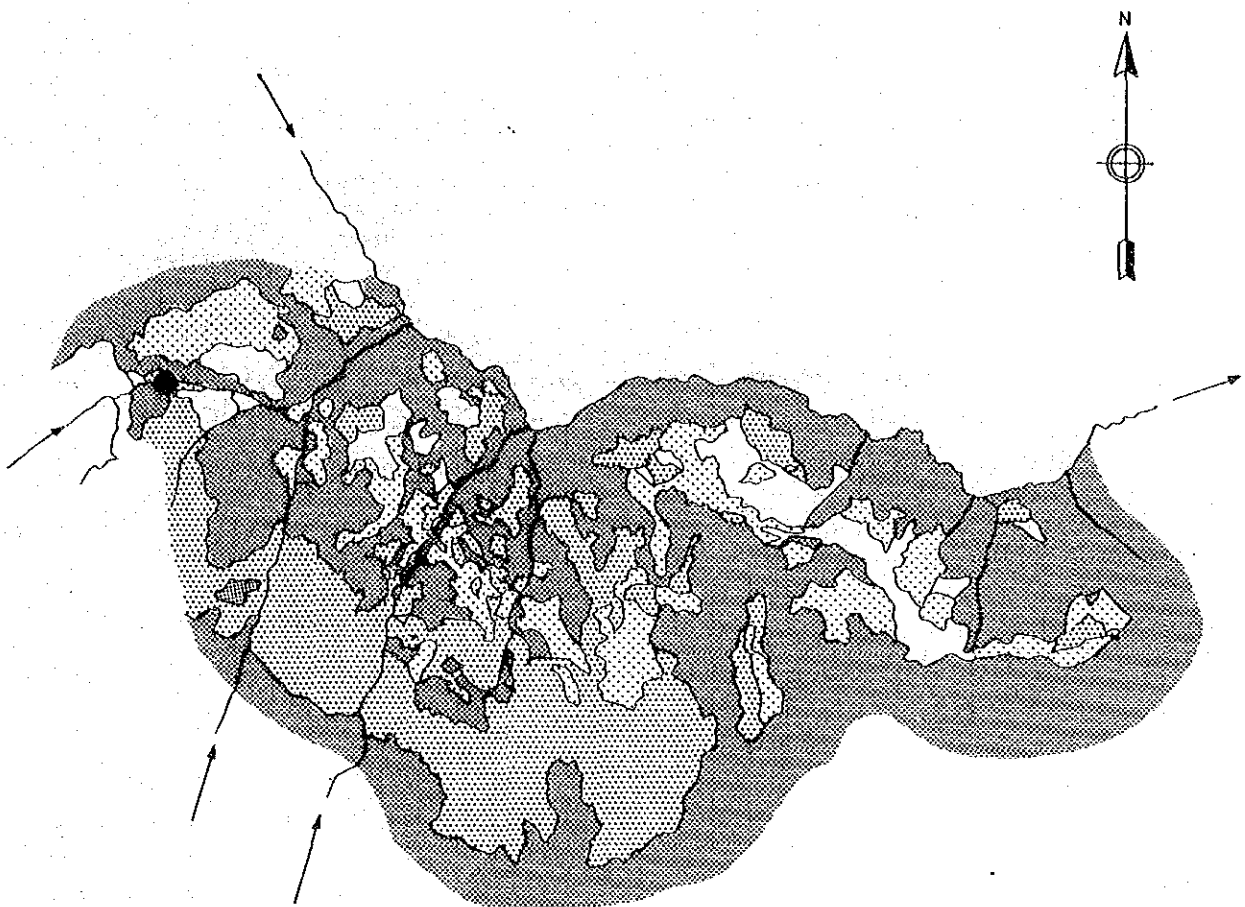
- a) Profile number 17
- b) Soil name Distric Cambisols
- c) Date of examination January 27, 1988
- d) Location Menjibi; 1,650 m
- e) Land form:
 - 1) Physiographical Terraced slope
 - 2) Surrounding area Paddy field
- f) Slope Slopy; 7-8 %
- g) Land use/vegetation Paddy cultivation bullock ploughing; wheat also takenup

II. General Information at the Soil:

- a) Parent material Colluvial material
- b) Drainage Good to well drained
- c) Moisture condition of site Dry
- d) Ground water < 1.0 m
- e) Surface stones/rock outcrops Few; small boulders
- f) Erosion No evidence
- g) Human influence Cultivated land; annual paddy crop, some winter wheat crop grown

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A1	0 - 11	Dull yellow (2.5Y 6/3), sandy clay loam, common medium distinct mottlins (bright reddish brown 2.5YR 5/8), moderate subangular blocky fine to medium structure, slightly sticky, slightly plastic, frequent paddy roots, pebbles 3-5 mm 10-15 %, gradual irregular boundary.
A2	11 - 21	Dull yellow (2.5Y 6/3), sandy loam, many medium distinct mottlins (bright reddish brown 2.5YR 5/8), weak angular blocky fine to medium structure, slightly sticky, slightly plastic, frequent paddy roots, pebbles 5-10 mm 10-15 %, clear irregular.
C	21 - 100	Dark dive brown (2.5Y 3/3), sandy loam, few mottlings, weak blocky medium structure, slightly sticky, slightly plastic, frequent gravels 5-50 mm 10-20 %, many weathered rocks, mica rich, good; permeable.



PRESENT LAND USE MAP OF MENJIBI PROJECT AREA

6. KUPINESA PROJECT AREA

1. Location

- (1) District: Lhuntshi Block: Tangmachhu Village: Menjibi
- (2) Location: 80 minutes by vehicle from district capital through thenational road, and 120 minutes' walk from the national road.

2. Topography

- (1) Elevation: Intake Structure ; EL 2,100 m EL 1,740 m
Farm Land ; EL 1,550 m EL 2,100 m
- (2) Slope and Direction of Farm Land

Slope: 1/3 Direction: West

3. Climate and Water Resources

- (1) Climate (Station: Tangmachhu)

Temperature

(unit: °C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Max	13.8	15.3	17.3	20.6	21.8	23.8	22.8	23.7	22.6	21.1	18.1	14.7	19.6
Min	5.0	7.6	10.3	12.5	14.9	18.7	19.1	19.5	18.3	15.9	9.9	6.7	13.2
Average	9.4	11.4	13.8	16.5	18.3	21.3	21.0	21.6	20.5	18.5	14.0	10.7	16.4

Relative Humidity

(unit: %)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	68.0	71.3	92.1	69.3	75.2	79.3	88.1	85.0	87.0	80.9	79.3	76.9	77.7

Rainfall

(unit: mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	3.1	0	55.3	79.4	70.7	130.6	169.8	109.8	116.8	74.5	10.7	5.0	825.7

- (2) Water Resource

- 1) River Name : Dungkhar chu
- 2) Catchment Area : 6.80 km²
- 3) Length of River : 3.50 km
- 4) Mean Elevation of River : EL. 2,800 m
- 5) Available Water :

(unit: lit./s)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Mean	112.9	88.4	95.9	144.8	168.0	256.4	450.8	339.3	372.6	186.3	152.3	123.8	207.4
Drought	70.0	64.6	59.2	72.1	106.8	136.0	202.8	159.8	121.7	114.2	108.8	87.0	108.8

4. Demography

(1) Population

1) Block Population	3,500 (Minji)
2) Project Area Population	
a. Population	207 (100%)
	(Male: 54%, Female: 46%)
b. Student (5-14 years)	49 (24%)
c. Labour Force (15-54 years)	103 (50%)

Age	Male	Female	Total
0 - 4	19	13	32
5 - 9	10	18	28
10 - 14	8	13	21
15 - 19	13	9	22
20 - 24	16	4	20
25 - 29	7	8	15
30 - 34	6	6	12
35 - 39	5	8	13
40 - 44	3	5	8
45 - 49	6	1	7
50 - 54	4	2	6
55 - 59	7	2	9
60 - 64	6	4	10
65 -	2	2	4
Total	112	95	207

3) Share of Population in Block 6%

(2) No. of Household

1) Block	500
2) Project Area	
a) Total	57
b) Share of (a) to (1)	11%
3) Average Family Size of the Scheme	3.6

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil units in the Kupinesa project area are as follows:

Cambisols generally located in paddy field and dry land.

Acrisols part of dry land and grass land.

Lithosols/Regosols .. steep slopes, shallow surface layer, stony phase.

6. Agriculture

(1) Agricultural Land Use

	(Unit: ha)				
	Wet	Dry	Tsheri	Others	Total
Project Area	16	38	32	3	89
Average Holdg Size	0.28	0.67	0.56	0.05	1.56

(2) Agricultural Production

		Area (ha)	Unit Yield (t/ha)	Production
1) Wet Land	- Paddy	16	3.0	48
	- Wheat	0	0	0
	- Total	16	-	-
2) Dry Land	- Maize	38	2.5	95
	- Wheat	0	0	0
	- Soyabean	(38)	0.5	19
	- Potato	0	0	0
	- Chilli	0	0	0
	- Total	38	2.5	95
3) Tsheri Land	- Maize	6	0.5	3
	- Wheat	0	0	0
	- Soyabeans	(6)	0.5	3
	- Total	6	-	-

(3) Cropping Intensity (%)

- Wet land	100
- Dry land	100
- Tsheri land	19
- Total land	70

(4) Livestock Production

	(Unit: head)			
	Cattle	Horse	Pig	Poultry
Young	100	5	30	105
Adult	130	8	50	63
Total	230	13	80	168
Average Holding per Household	4.0	0.2	1.4	2.9

7. Irrigation

- (1) Intake: Random stone fill weir, 0.09 m³/sec capacity at El 2,100 m, 6 additional inlets at small streams
- (2) Canal: Constructed in 1984, 6.9 km long including 6.3 km of earth canal and 0.6 km of masonry canal, EL 1.740 m at canal end

(3) O & M and Necessity of Improvement

- 1) Intake : No problem, but not used since 1986 due to continuous canal collapse
- 2) Canal : Poor maintenance, many damages by cattle, one spillway exists only
- 3) Major collapse : 3 places, 1,000m long
- 4) Reasons of collapse : Large scale landslide, over-topping of canal

(4) Irrigation

Landslide occurred 1 year after completion, no more use about 2 km canal from intake, shortage of water from subsidiary resources of 6 small streams.

8. Rural Facilities

(1) Access road and Necessity of Improvement

This area is 120 minutes walk from the national road. The foot path is passable on foot and by horse and necessitates to be renovated because of the steep slope and the exposure of many rocks.

(2) Other Public Facilities

Water Supply

9. Farmers' Intension for Development

- (1) Construction/Rehabilitation of irrigation facilities
- (2) Construction of bridge (between Minji Village cross Rogang river)
- (3) Strengthening of Agricultural extension

10. Remarks

- (1) It seems that the renovation of the collapsed places in canal routes has much difficulties, technically and financially by the Bhutanese Government's own efforts. However, it is under planning to shift the intake point to upstream on main tributary at the strong request of the beneficiaries.
- (2) There exists a drop structure with about 140 m head in the canal route which has the potentiality of mini-hydro-power.

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

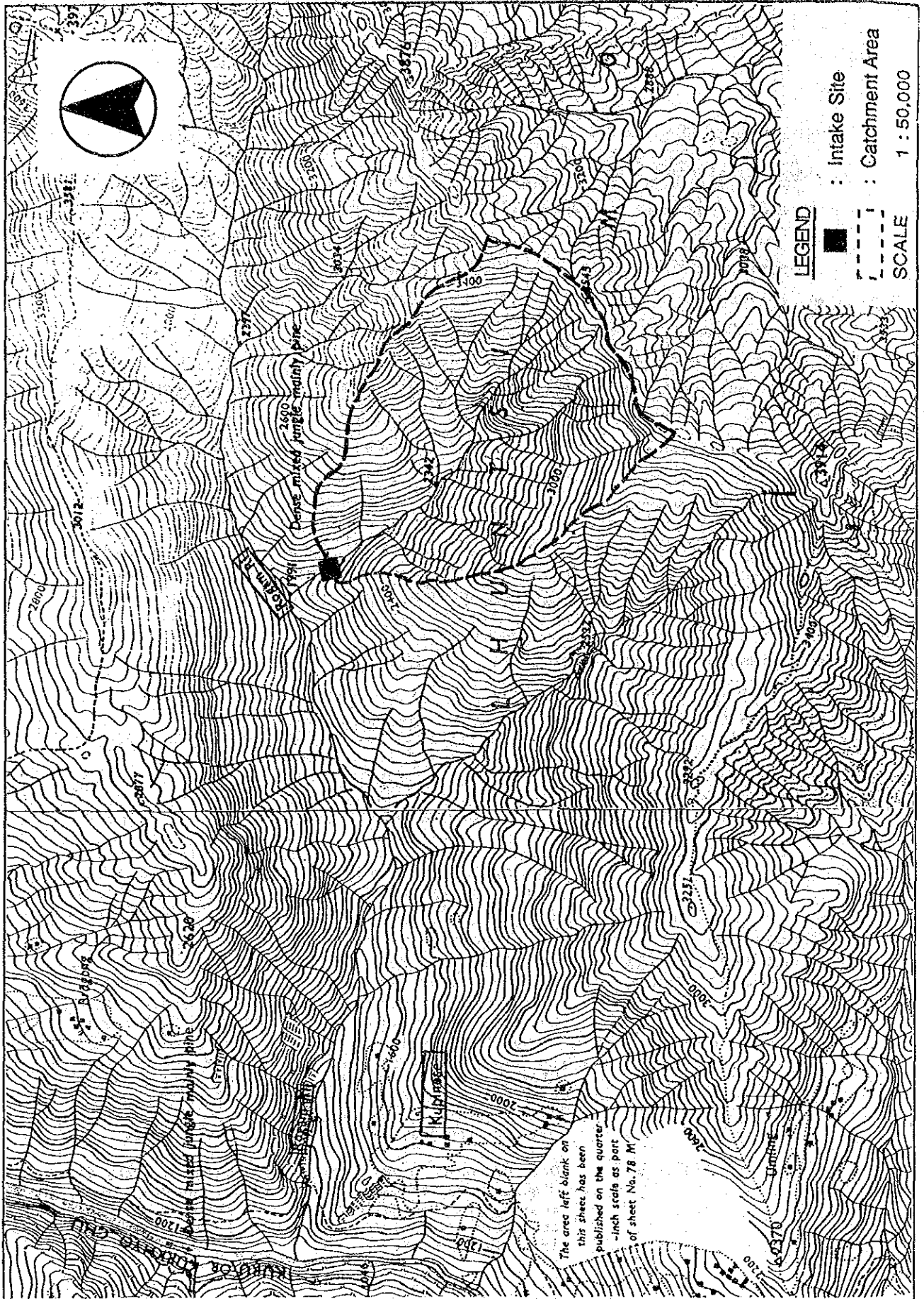
- a) Profile number 20
- b) Soil name Chromic Cambisols
- c) Date of examination January 29, 1988
- d) Location Kupinesa, 1,600 m
- e) Land form:
 - 1) Physiographical Terraced field
 - 2) Surrounding area Cultivated paddy land in terraced fields)
- f) Slope Slopy gently; 8 - 10 %
- g) Land use/vegetation Paddy field: monocropping

II. General Information of the Soil:

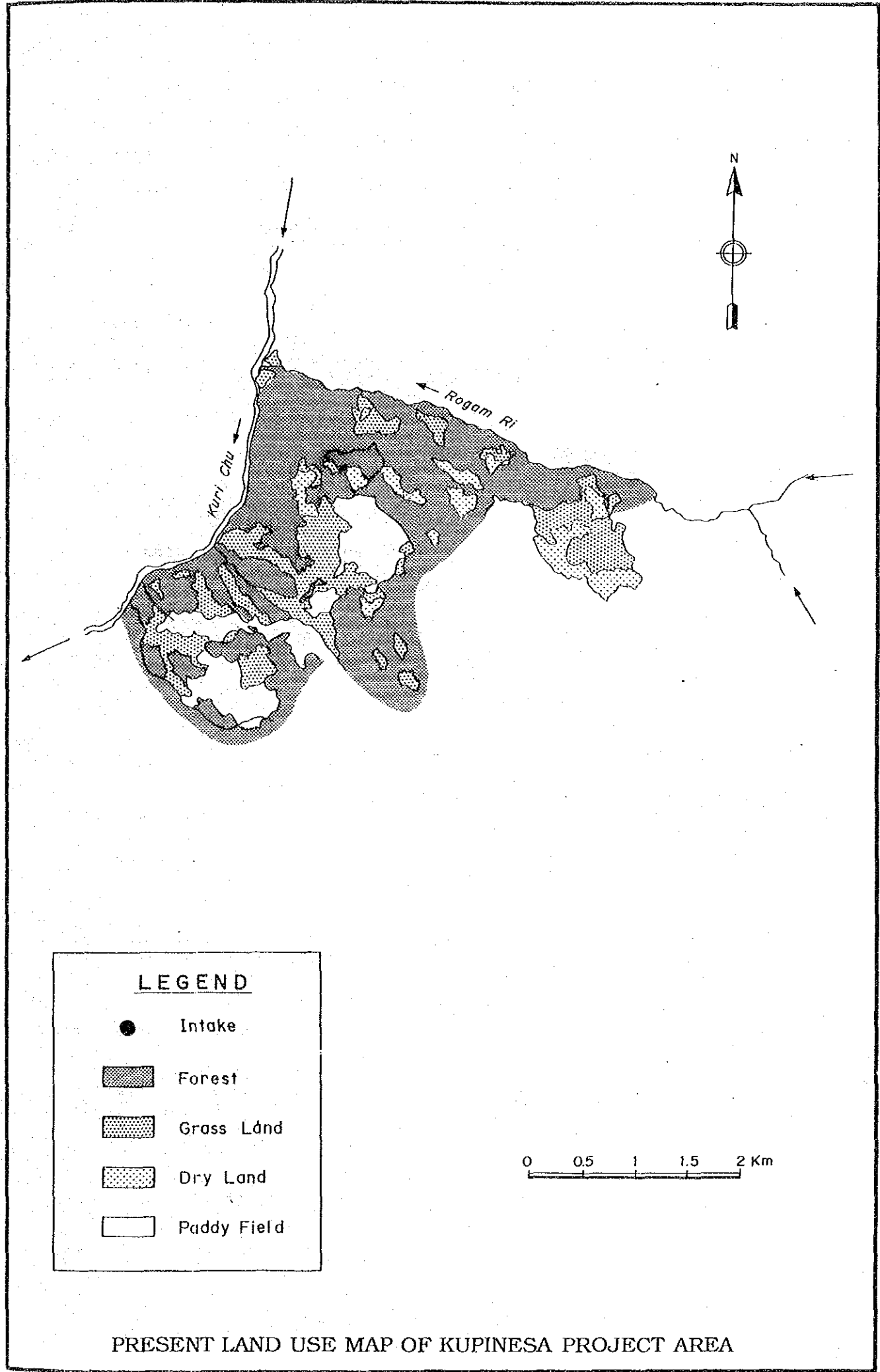
- a) Parent material Colluvial
- b) Drainage Good; well drained
- c) Moisture condition of site Dry (upper part), moist (lwer part)
- d) Ground water depth < 100 cm
- e) Surface stones/rock outcrops None, but some are around
- f) Erosion No evidence
- g) Human influence Ploughed and cultivated

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 11	Bright reddish brown (2.5YR 5/6); clay loam; few fine distinct mottle (orange 7.5YR 6/8); weak angular and granular blocky fine structure; sticky; plastic; loose when dry; frequent paddy roots; gradual to diffuse irregular boundary.
B1	11 - 32	Bright reddish brown (2.5YR 5/6); clay loam; many fine faint mottle (bright reddish brown 5YR 5/8); weak angular blocky fine structure; sticky; plastic; loose when dry; few to common paddy roots; few gravels 10 to 20 mm; gradual irregular boundary.
B2	32 - 44	Gleyish yellow brown (10YR 5/2) when moist; sandy loam; many fine distinct mottle (bright reddish brown 5YR 5/8); weak angular medium blocky structure; sticky; slightly plastic; few gravel; gradual irregular boundary.
C1	44 - 65	Dull yellowish brown (10YR 4/3); sandy loam; many fine distinct mottle (brown 10YR 4/6); weak angular blocky medium structure; slightly sticky; slightly plastic; Mn concretion (10YR 1.7/1); common to frequent gravel; diffuse irregular boundary.
C2	65 -	Brown (7.5YR 4/4); loamy clay; few fine faint mottle; weak angular blocky medium structure; slightly sticky; slightly plastic; Mn concretion; few gravel.



CATCHMENT AREA AT INTAKE SITE, KUPINESA



LEGEND

- Intake
- ▨ Forest
- ▤ Grass Land
- ▥ Dry Land
- Paddy Field

0 0.5 1 1.5 2 Km

PRESENT LAND USE MAP OF KUPINESA PROJECT AREA

4. Demography

(1) Population

- 1) Block Population 4,900 (Chengkhar)
- 2) Project Area Population
 - a. Population 520 (100%)
(Male: 45%, Female: 55%)
 - b. Student (5-14 years) 117 (23%)
 - c. Labour Force (15-54 years) 285 (50%)

Age	Male	Female	Total
0 - 4	39	46	85
5 - 9	37	30	67
10 - 14	19	31	50
15 - 19	28	28	56
20 - 24	20	28	48
25 - 29	12	26	38
30 - 34	15	15	30
35 - 39	11	14	25
40 - 44	6	15	21
45 - 49	10	12	22
50 - 54	9	9	18
55 - 59	3	7	10
60 - 64	17	18	35
65 -	8	7	15
Total	234	286	520

- 3) Share of Population in Block 11%

(2) No. of Household

- 1) Block 500
- 2) Project Area
 - a. Total 60
 - b. Share of (a) to (1) 12%
- 3) Average Family Size of the Scheme 8.7

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil units in the Wambu project area are as follows:

- Cambisols generally located in paddy field and dry land.
- Acrisols part of dry land and grass land.
- Lithosols/Regosols .. steep slopes, shallow surface layer, stony phase.

6. Agriculture

(1) Agricultural Land Use

	(Unit: ha)				
	Wet	Dry	Tsheri	Others	Total
Project Area	43	81	16	0	140
Average Holdg Size	0.72	1.35	0.27	0	2.34

(2) Agricultural Production

		Area (ha)	Unit Yield (t/ha)	Production
1) Wet Land	- Paddy	43	1.7	73
	- Wheat	0	0	0
	- Total	43	-	-
2) Dry Land	- Maize	81	1.7	138
	- Wheat	0	0	0
	- Soyabean	(81)	0.7	57
	- Potato	0	0	0
	- Chilli	0	0	0
	- Total	81	-	-
3) Tsheri Land	- Maize	5	1.5	8
	- Wheat	0	0	0
	- Soyabeans	0	0	0
	- Total	5	-	-

(3) Cropping Intensity (%)

- Wet land	100
- Dry land	111
- Tsheri land	31
- Total land	92

(4) Livestock Production

	(Unit: head)			
	Cattle	Horse	Pig	Poultry
Young	-	-	-	-
Adult	-	-	-	-
Total	-	-	-	-
Average Holding per Household	-	-	-	-

7. Irrigation

- (1) Intake: Random stone fill weir, 0.17 m³/sec capacity at EL 2,300 m, 6 additional inlets at small streams
- (2) Canal: Constructed in 1984, 5.2 km long including 2.2 km of earth canal and 3 km of masonry canal, El 2,200 m at canal end

(3) O & M and Necessity of Improvement

- 1) Intake : No problem
- 2) Canal : Good maintenance
- 3) Major collapse : 3 places, 100 m long
- 4) Reasons of collapse : Over-topping due to shortage of spillway

(4) Irrigation

High quality of the work performed, good maintenance and operation.

8. Rural Facilities

(1) Access Road and Necessity of Improvement

150 minutes walk from the national road. The foot path is passable on foot and by horse. It is desired to be renovated owing to the steep slope and the much exposure of rocks.

(2) Other Public Facilities

Water Supply, School, Basic Health unit

9. Farmers' Intension for Development

- (1) Construction/Rehabilitation of irrigation facilities
- (2) Construction of feeder road
- (3) Strengthening of agricultural extension

10. Remarks

- (1) The intake site and canal routes are topographically and geologically in good conditions on the whole, and the maintenance of these facilities is proper. Because the maintenance works are imposed upon each beneficiary for about three weeks a year.
- (2) There is a natural fall with about 40m head in the canal route which has the potentiality of mini-hydro-power.

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

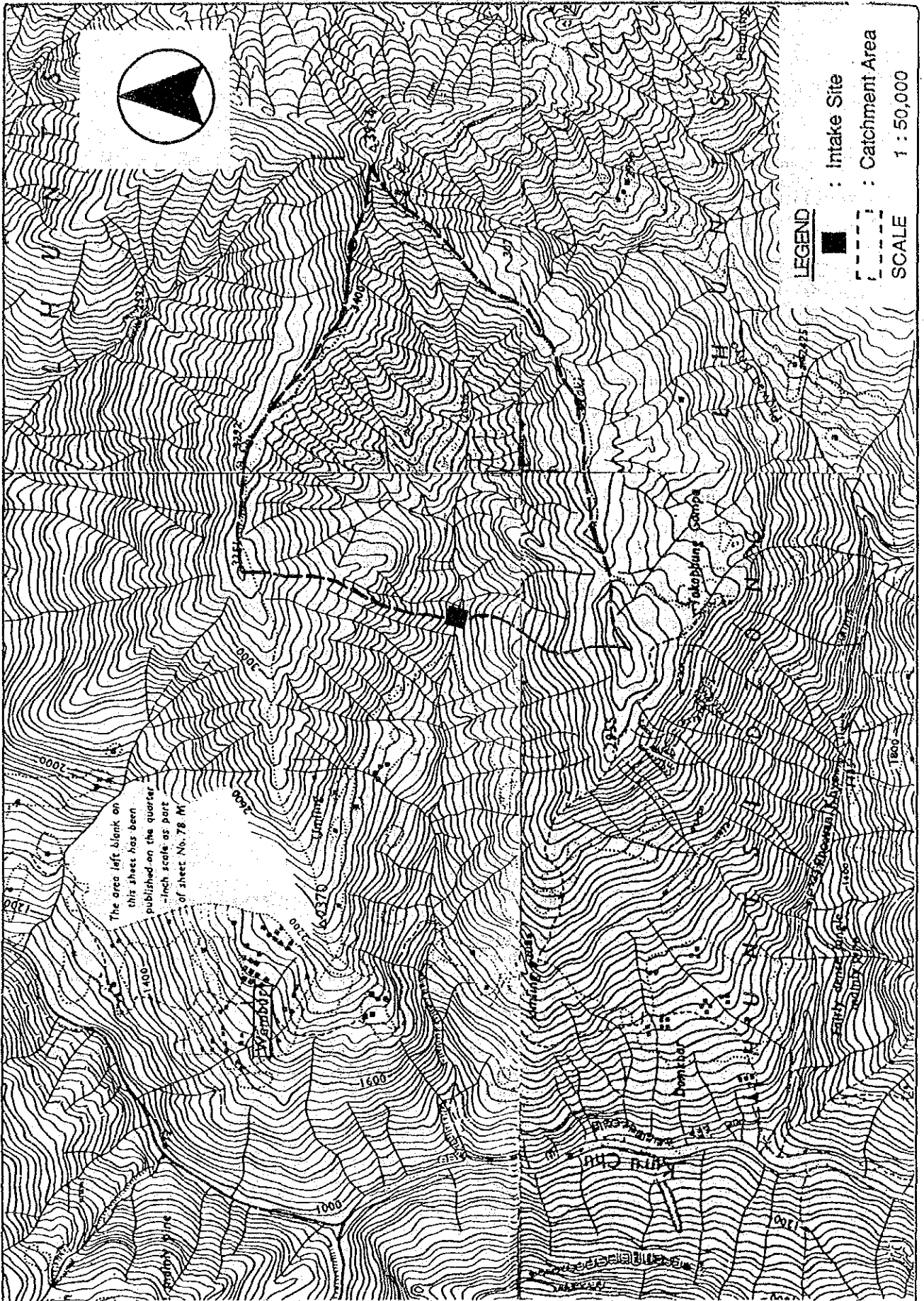
- a) Profile number 21
- b) Soil name Dystric Cambisols
- c) Date of examination January 30, 1988
- d) Location Wambur, 1,840 m
- e) Land form:
 - 1) Physiographical Terraced field
 - 2) Surrounding area Cultivated paddy land in terraced fields)
- f) Slope :..... Moderate; 20 -25 %
- g) Land use/vegetation Paddy field: monocropping

II. General Information of the Soil:

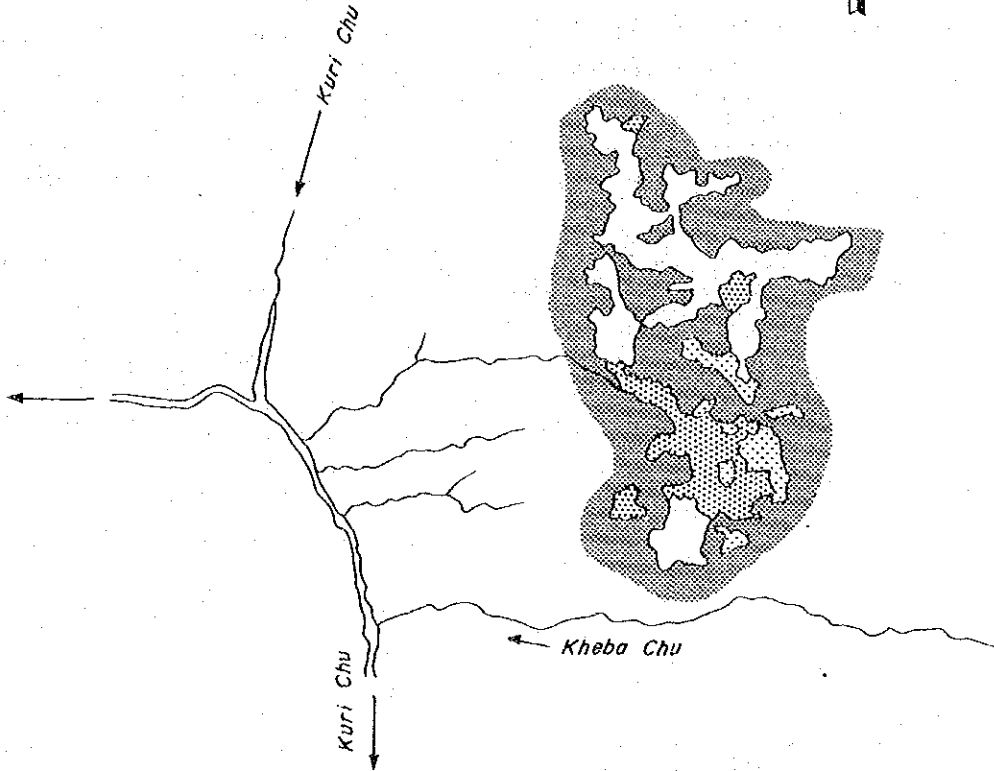
- a) Parent material Colluvial
- b) Drainage Good; well drained
- c) Moisture condition of site Moist
- d) Ground water depth < 100 cm
- e) Surface stones/rock outcrops None, but some are around
- f) Erosion No evidence
- g) Human influence After 3 years realaimed

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 14	Dark brown (10YR 3/4); clay loam; no mottle; weak blocky and angular blocky fine structure; sticky; plastic; very frage; slightly hard when dry; frequent paddy roots; few stone 15 - 30 mm; gradual to diffuse irregular boundary.
B	14 - 25	Dark brown (10YR 3/4); clay loam; no mottle; weak blocky and angular blocky structure; slightly sticky; slightly plastic; few to common paddy roots; few small weathered stone; fine chacole; few stone 15 - 30 mm; gradual diffuse irregular boundary.
C	25 -	Clay loam; no mottle; weak blocky angular blocky structure; sticky; slightly plastic; few gravel; fine chacole; few stone 15 - 30 mm.

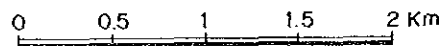


CATCHMENT AREA AT INTAKE SITE, WAMBUR



LEGEND

- Intake
- ▨ Forest
- ▩ Grass Land
- ▤ Dry Land
- Paddy Field



PRESENT LAND USE MAP OF WAMBUR PROJECT AREA

8. CHALI PROJECT AREA

1. Location

- (1) District: Mongar Block: Chakaling Village: Chali
- (2) Location: 30 minutes by vehicle from district capital through the national road (Besides national road)

2. Topography

- (1) Elevation: Intake Structure ; EL 1,670 m EL 1,590 m
Farm Land ; EL 1 850 m EL 1,600 m

- (2) Slope and Direction of Farm Land

Slope: 1/1 Direction: West to South

3. Climate and Water Resources

- (1) Climate (Station: Chakaling)

Temperature

(unit: °C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Max	18.9	20.2	21.5	23.3	25.0	26.3	25.3	26.6	25.7	24.7	22.2	20.1	23.3
Min	7.4	8.9	10.9	13.9	15.7	18.7	18.7	19.0	18.1	14.4	11.2	8.8	13.8
Average	13.1	14.5	16.2	18.6	20.4	22.5	22.0	22.8	21.9	19.5	16.7	14.5	18.6

Rainfall

(unit: mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	5.0	72.3	40.9	72.1	87.9	190.4	211.3	156.2	184.1	50.2	15.7	12.0	1,097.9

- (2) Water Resource: Thruwan (Diwang) chu

- 1) River Name : Thruwan (Diwang) chu
 2) Catchment Area : 3.53 km²
 3) Length of River : 2.50 km
 4) Mean Elevation of River : EL 2,235 m
 5) Available Water :

(unit: lit./s)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Mean	58.6	45.9	49.8	75.2	87.2	133.1	234.0	176.2	193.4	96.7	79.1	64.2	107.7
Drought	36.4	33.5	30.7	37.4	55.4	70.6	108.4	83.0	63.2	59.3	56.5	45.2	56.5

4. Demography

(1) Population

- 1) Block Population 9,700 (Chakaling)
- 2) Project Scheme Population
 - a. Population 1,591 (100%)
(Male: 50%, Female: 50%)
 - b. Student (5-14 years) 399 (25%)
 - c. Labour Force (15-54 years) 790 (50%)

Age	Male	Female	Total
0 - 4	85	136	221
5 - 9	108	112	220
10 - 14	99	80	179
15 - 19	75	65	140
20 - 24	67	58	125
25 - 29	52	64	116
30 - 34	49	46	95
35 - 39	41	37	78
40 - 44	42	30	72
45 - 49	55	40	95
50 - 54	34	35	69
55 - 59	34	35	69
60 - 64	20	22	42
65 -	34	36	70
Total	795	796	1,591

- 3) Share of Population in Block 16%

(2) No. of Household

- 1) Block 1,210
- 2) Project Area
 - a. Total 134
 - b. Share of (a) to (1) 11%
- 3) Average Family Size of the Scheme 11.9

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil units in the Chali project area are as follows:

Cambisols generally located in paddy field and dry land.

Acrisols part of dry land and grass land.

Lithosols/Regosols .. steep slopes, shallow surface layer, stony phase.

6. Agriculture

(1) Agricultural Land Use

(Unit: ha)

	Wet	Dry	Tsheri	Others	Total
Project Area	54	100	50	0	204
Average Holdg Size	0.40	0.75	0.37	0	1.52

(2) Agricultural Production

	Area (ha)	Unit Yield (t/ha)	Production
1) Wet Land			
- Paddy	54	1.6	86
- BUCKWHEAT	0	0	0
- Maize	16	1.9	30
- Total	70	-	-
2) Dry Land			
- Maize	100	1.9	190
- Wheat	8	1.0	8
- Mustard	8	0.8	6
- Buckwheat	0	0	0
- Barley	8	0	0
- Potatheat	0	0	0
- Chilli	0	0	0
- Total	116	-	-
3) Tsheri Land			
- Maize	10	1.9	19
- Buckwheat	0	0	0
- Soyabeans	0	0	0
- Total	10	-	-

(3) Cropping Intensity (%)

- Wet land	130
- Dry land	116
- Tsheri land	20
- Total land	96

(4) Livestock Production

(Unit: head)

	Cattle	Horse	Pig	Poultry
Young	246	8	60	120
Adult	541	23	338	260
Total	787	31	398	380
Average Holding per Household	5.9	0.2	3.0	2.8

7. Irrigation

- (1) Intake: Random stone fill weir, 0.141 m³/sec capacity at EL 1,670 m, 6 additional inlets at small streams
- (2) Canal: Constructed in 1983, under renovation from 1987, 5.5 km long of all masonry canal, EL 1,590 m at canal end

(3) O & M and Necessity of Improvement

- 1) Intake : No problem
- 2) Canal : Good maintenance, renovation is on going
- 3) Major collapse : 2 places, 100 m long
- 4) Reasons of collapse : Over-topping due to shortage of spillway

(4) Irrigation

Fairly good condition, has potentiality of expansion of area.

8. Rural Facilities

(1) Access Road and Necessity of Improvement

The foot path from the national road to the project area is passable only on foot or by horse. It is necessitated to be renovated because of many land collapses and the much exposure of rocks.

(2) Other Public Facilities

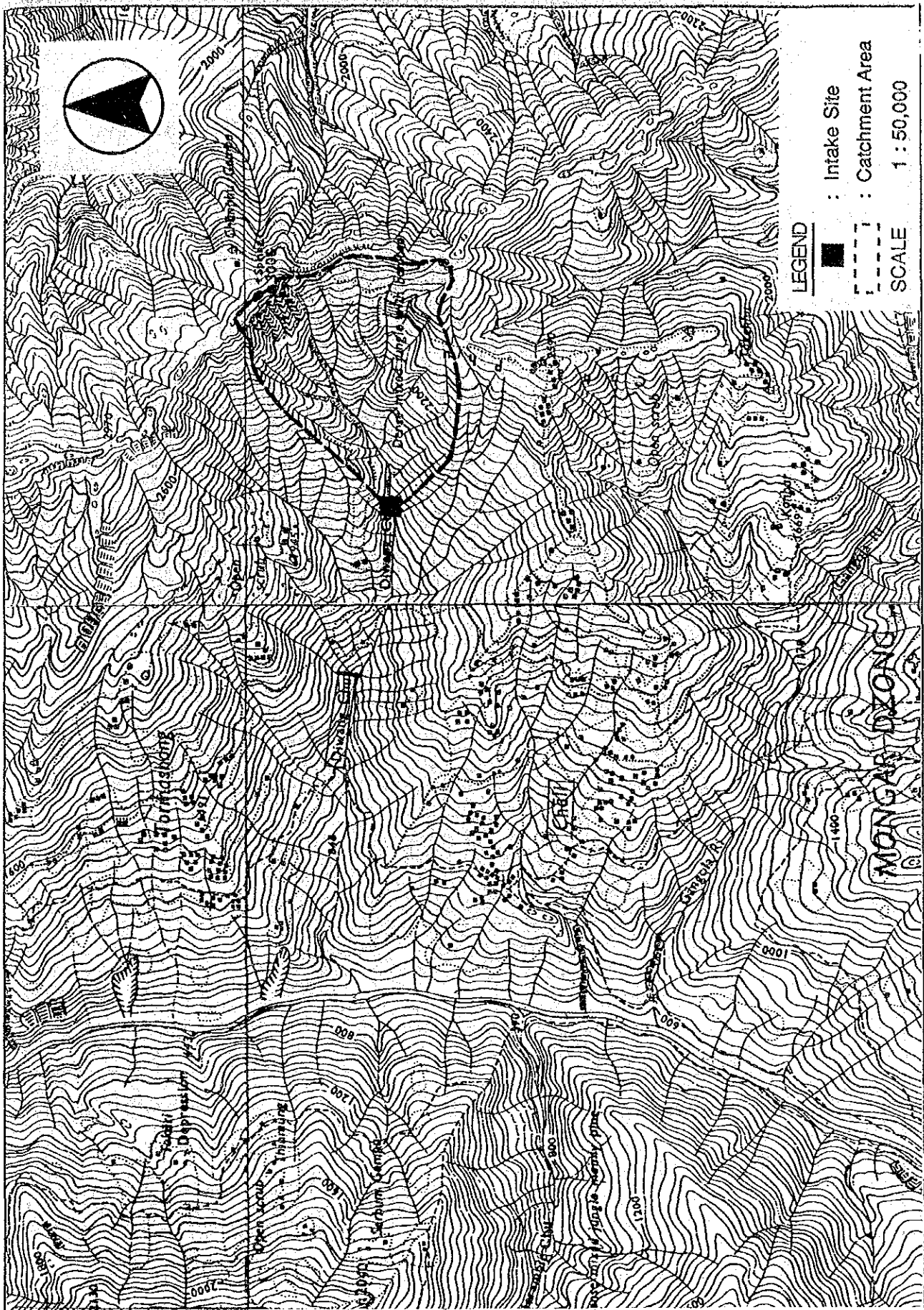
Electrification, Water supply

9. Farmers' Intension for Development

- (1) Construction/Rehabilitation of irrigation facilities
- (2) Strengthening of agricultural extension
- (3) Promotion of agricultural mechanization

10. Remarks

This has been implemented by Mongar and Tashigang Area Development Project, financed by International Fund of Agriculture Development, which aimed at renovation of a main canal with 4 km long and that of a feeder road with 7 km long for the irrigation area of 70 ha.

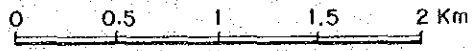


CATCHMENT AREA AT INTAKE SITE, CHALI



LEGEND

- Intake
- Forest
- ▨ Grass Land
- ▧ Dry Land
- Paddy Field



PRESENT LAND USE MAP OF CHALI PROJECT AREA

9. KARBITHANG PROJECT AREA

1. Location

- (1) District: Mongar Block: Salling Village: Karbithang
- (2) Location: 50 minutes by vehicle from district capital through the national road, and 20 minutes walk from the national road.

2. Topography

- (1) Elevation: Intake Structure ; EL 810 m EL 710 m
Farm Land ; EL 720 m EL 820 m
- (2) Slope and Direction of Farm Land
- Slope: 1/4 Directio: North to West

3. Climate and Water Resources

- (1) Climate (Station: Lingmethang)

Temperature

(unit: °C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Max	23.2	25.3	26.5	29.2	30.7	32.0	31.1	31.6	30.5	29.0	26.2	23.7	28.3
Min	9.0	11.6	14.3	18.3	20.4	24.2	24.1	24.1	22.5	17.3	13.8	10.6	17.5
Average	16.1	18.5	20.4	23.8	25.6	28.1	27.6	27.9	26.5	23.2	20.0	17.2	22.9

Relative Humidity

(unit: %)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	76.1	75.0	72.2	71.1	72.8	82.3	84.2	80.7	85.4	79.4	78.9	81.4	78.3

Rainfall

(unit: mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	0.5	13.2	49.7	101.8	64.0	187.0	182.7	118.7	187.3	64.0	6.0	9.9	984.8

- (2) Water Resource

- 1) River Name : Shongjari chu
- 2) Catchment Area : 21.90 km²
- 3) Length of River : 7.15 km
- 4) Mean Elevation of River : EL 1,810 m
- 5) Available Water :

(unit: lit./s)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Mean	363.5	284.7	308.8	466.5	540.9	825.6	1,452.0	1,092.8	1,200.1	600.1	490.6	398.6	668.0
Drought	225.6	208.1	190.5	232.1	343.8	438.0	672.3	514.7	392.0	367.9	359.4	280.3	350.4

4. Demography

(1) Population

- 1) Block Population 4,700 (Salling)
- 2) Project Scheme Population
 - a. Population No resident in the project area
 - b. Student (5-14 years)
 - c. Labour Force (15-54 years)
- 3) Share of Population in Block

(2) No. of Household

- 1) Block 600
- 2) Project Area
 - a. Total No house in the project area
 - b. Share of (a) to (1)
- 3) Average Family Size of the Scheme

5. Land Use and Soil

(1) Land Use

Present land use is illustrated in attached land use map.

(2) Soil

Main soil unit in the Karbithang project area is as follows:

Cambisols generally located in paddy.

6. Agriculture

(1) Agricultural Land Use

	(Unit: ha)				
	Wet	Dry	Tsheri	Others	Total
Project Area	11	0	0	0	11
Average Holdg Size	-	-	-	-	-

(2) Agricultural Production

		Area (ha)	Unit Yield (t/ha)	Production
1) Wet land	- Paddy	11	2.0	22
	- Buckwheat	0	0	0
	- Maize	0	0	0
	- Total	11	-	-
2) Dry Land	- Maize	0	0	0
	- Buckwheat	0	0	0
	- Mustard	0	0	0
	- Burley	0	0	0
	- Potat	0	0	0
	- Chilli	0	0	0
	- Total	0	-	-
3) Tsheri Land	- Maize	0	0	0
	- Buckwheat	0	0	0
	- Soyabeans	0	0	0
	- Total	0	-	-

(3) Cropping Intensity (%)

- Wet land	100
- Dry land	-
- Tsheri land	-
- Total land	100

(4) Livestock Production

	(Unit: head)			
	Cattle	Horse	Pig	Poultry
Young	-	-	-	-
Adult	-	-	-	-
Total	-	-	-	-
Average Holding per Household	-	-	-	-

7. Irrigation

- (1) Intake: Random stone fill weir with log, 0.022 m³/sec capacity at EL 810 m
- (2) Canal: Renovated in 1974, 1.8 km long including 1.7 km of earth canal, 0.1 km of masonry and 1 wooden aqueduct, EL. 741 m at canal end
- (3) O & M and Necessity of Improvement
 - 1) Intake : Temporary facility to be repaired every year
 - 2) Canal : No maintenance road, poor maintenance, renovation is necessary
 - 3) Major collapse : 2 places, 20 m long
 - 4) Reasons of collapse : Over-topping of canal

(4) Irrigation

Shortage of irrigation water

8. Rural Facilities

(1) Access Road and Necessity of Improvement

The foot path is passable only on foot or by horse and needs to be renovated owing to the much exposure of rocks.

(2) Other Public Facilities

Nothing

9. Farmers' Intension for Development

10. Remarks

(1) This area (11 ha) are owned by Monastery (9.6 ha) and 12 farmers (1.4 ha) which are from Mongar. Monastery land is cultivated by neighboring farmers under the fixed rent of 9.5 ton in total.

(2) It is requested to irrigate the Karibee project area by use of irrigation system of this project. (The extension of canals and new construction of inverted syphon will be necessary for the above purpose.)

SOIL PROFILE DESCRIPTION

I. General Information at the Site:

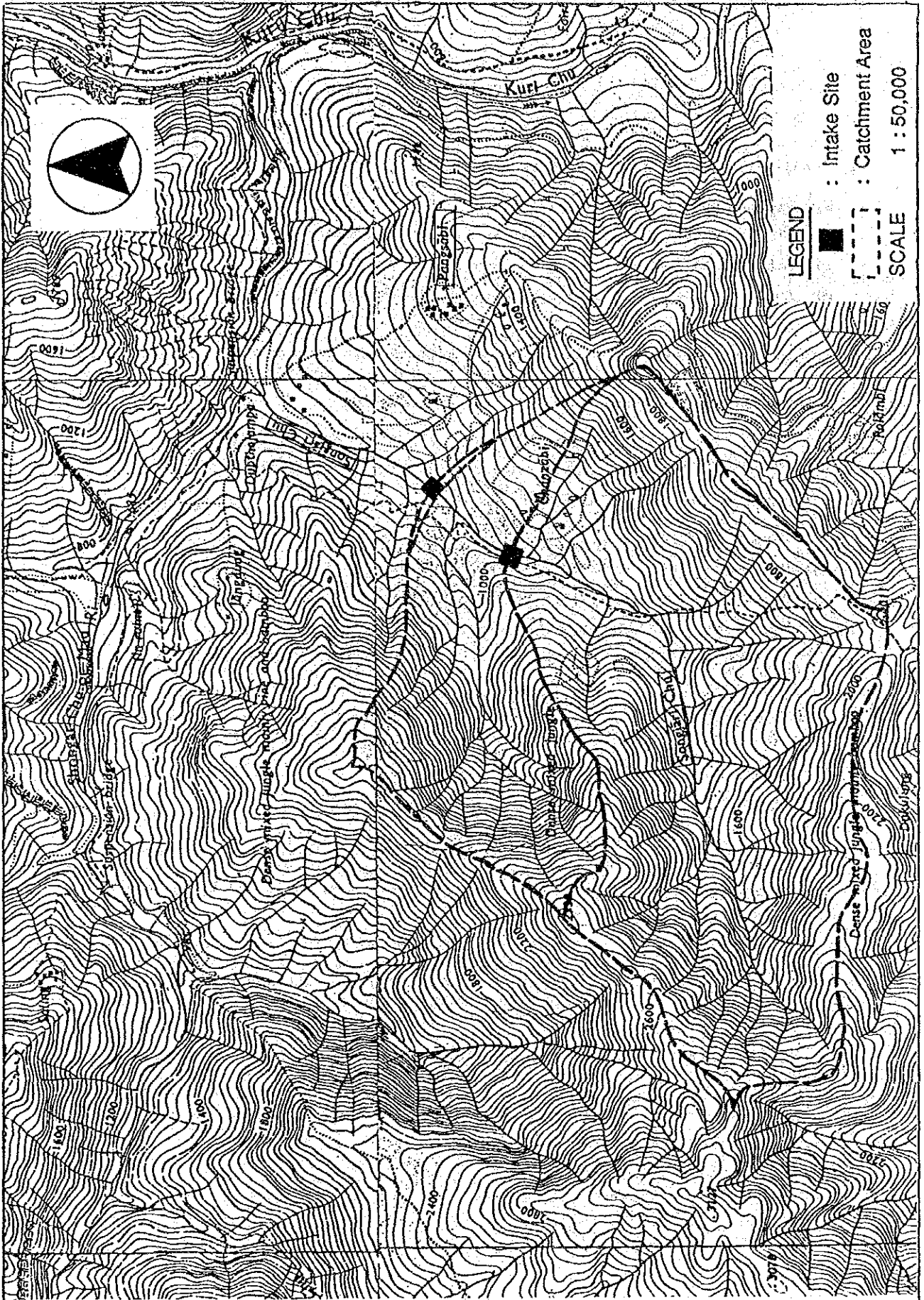
- a) Profile number 9
- b) Soil name Eutric Cambisols
- c) Date of examination January 20, 1988
- d) Location Karbithang; 915 m
- e) Land form:
 - 1. Physiographical Gently sloping at top; on the high hill, located at the top of hill.
 - 2. Surrounding land form Undulating
- f) Slope Gently sloping, 5-8%
- g) Land use/vegetation Paddy field; bullock ploughing

II. General Information of the Soil:

- a) Parent materials Alluvial
- b) Drainage Well drained
- c) Moisture condition of the site .. Moist
- d) Depth of ground water <1.0 m
- e) Surface stones/rock outcrops Some stones, some rock out crops
- f) Erosion None at the site
- g) Human influence Land is cultivated every year with paddy and maize and vegetables.

III. Profile Description:

<u>(Horizon)</u>	<u>(Depth)</u> (cm)	<u>Description</u>
A	0 - 17	10YR 2/3, brownish black, few, sandy clay loam, weak, sub angular blocky, medium size, slightly sticky and slightly plastic, very friable when moist and loose when dry, gradual.
B	17 - 80	10YR 3/2, brownish black, few, sandy, clay and loam, weak, subangular blocky, medium size, slightly sticky, slightly plastic, very friable in moist and loose in dry, Stones, gravels common, frequent roots present, gradual, irregular, Good.
C1	80	10YR 4/6, brown colour, few, sandy, loam, structureless, granular, single grain, non-sticky, non-plastic when wet and very friable in moist and loose in dry, frequent gravels present, few stones observed, good, permeable.



CATCHMENT AREA AT INTAKE SITE, KARBITHANG

