

Soil Fertility Map of Banke District



Prepared by
Ministry of Agriculture and Co-operatives
Department of Agriculture
Crop Development Directorate
Regional Soil Testing Laboratory
Khajura, Nepalgunj

FY 2058/59(2001/2002)



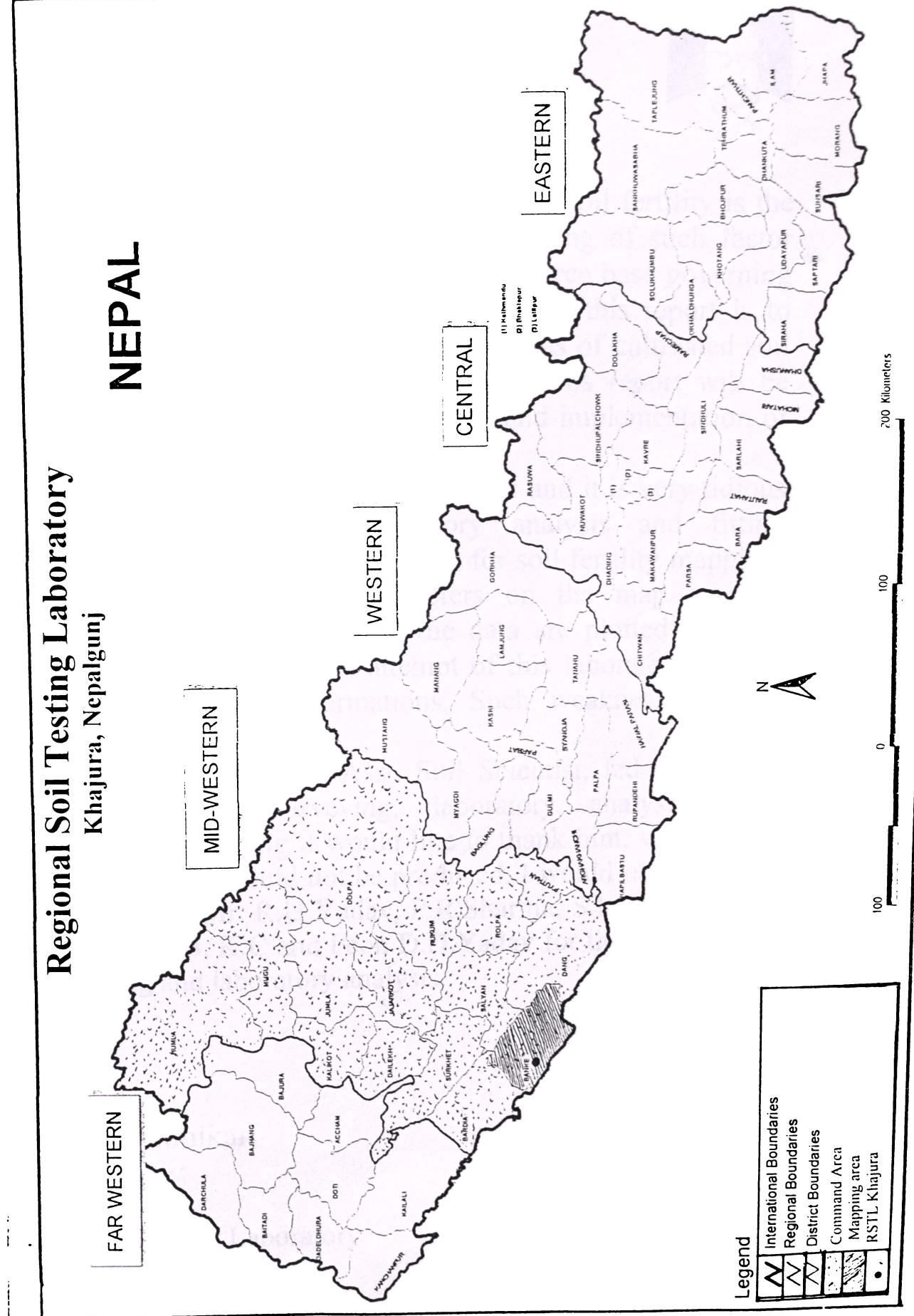
**His Majesty King Ganendra Bir Bikram Shah Dev
And
Her Majesty Queen Komal Rajya Laxmi Devi Shah**

Regional Soil Testing Laboratory

Khajura, Nepalganj

Khajura, Nepalgunj

NEPAL





Forward

This is the soil fertility map of Banke District. Soil fertility is the key factor for agricultural productivity. Mapping of such factor provides the information about important resource base governing agriculture productivity. The main objective of this report is to provide the information about the fertility status of cultivated soil in Banke District in summery form. I hope this report will be helpful to concern authorities for planning and implementation of agricultural production programs.

Soil fertility mapping is not a easy task and it is very tedious work. Planning, surveying, laboratory analysis and fitting analytical data in the map is major work for soil fertility mapping. Therefore plotting individual characters on the map is very difficult so dominant characters of the data are plotted in these maps. This mapping is the first attempt of this laboratory, which may lack some of the informations. Such weakness will be minimized in the coming days.

Mr Indra Bahadur Oli, Asst. Soil Scientist, led the whole work i.e. planning, surveying, laboratory analysis, data manipulation and mapping .I would like to thank him, without his hard effort this report could not be produced. I would like to thank Junior Technicians Mr. R.U Yadav, P.R.Sharma, S.K. Chaudhary, Field Assistant, T.B. K.C and Peon D.D.Yadav for their hard work in soil sampling and laboratory analysis.

Bharat Mani Adhikari
Asst. Soil Scientist
Chief
Regional Soil Testing Laboratory
Khajura, Nepalgunj

Regional Soil Testing Laboratory

Khajura, Nepalgunj

Introduction

Regional Soil laboratory (RSTL) Khajura is situated at Banke District of mid Western Region. It is 7 Km west from Nepalgunj city, just north side of Nepalgunj- Gulariya road within the compound of Regional Agriculture Research Station Khajura Banke. The command area of this laboratory is 15 Districts under Mid-Western Region.

It was established under the Department of Agriculture in 2049 BS But it has started its work in the F.Y. 2051/52. It is working under the technical direction of Soil Testing and Service Section of DOA and administrative control of Crop Development Directorate DOA.

Objectives:

The Main objectives of this laboratory are:

- Recommendation of fertilizer on the basis of soil analysis report and identification of soil problems.
- To carry out the study on nutritional problem and to suggest solutions
- To transfer the technology to the extension workers and farmers, recently generated by Research.
- To analyze fertilizer and provide report to the concerning authorities for quality control.

- To provide soil information for planning and programming of agriculture production system through soil survey and land use mapping.

Running Program of Regional Soil Testing Laboratory

- Soil sampling, analysis and fertilizer recommendation on the basis of the soil test report in the laboratory.
- Soil sampling, analysis and fertilizer recommendation on the basis of the soil test reports in the farmer's field, this is called as soil test campaign.
- Monitoring and evaluation: Micro nutrient study in the farmers field on the basis of visual symptoms and monitoring to the farmers whether farmers are using or not according to the recommendation.
- Fertilizer analysis: Quality control of the fertilizer selling in the market.
- Extension: Extension service to the farmers about chemical, and organic fertilizer.

Introduction of Study Area

Banke District is situated in mid western Region of Nepal. Geographically this District lies at $80^{\circ}37''$ east longitudes and $20^{\circ}06''$ north latitude at the elevation about 181 above msl. Banke District is very important for agriculture point of view. Main crops in this district are Rice, Wheat, Maize, Tori, Pluses, Vegetables etc. The District bounded in the east by parts of Dang and Salyan, in the north Surkhet, in the west Bardiya, and in the South by

India. Total area of the district is 225835 ha. Cultivated area is 52838 ha (Low land 37838 ha, Upland 15000 ha). Forest area is 113295 ha. and remaining part of the District is covered by Settlement, River, Road, Grazing land.

Climate

The major parts of district have hot and humid climate. According to the meteorological record of the Regional Agriculture Research Station, Nepalganj Following meteorological Data can be fond.

Meteorological Data Of Banke District(From July,2000 to June 2001)				
Month	Tem.Maxi (0c)	Tem.Maxi (0c)	Rainfall mm	RH%
July	32.9	26.3	403.4	90.02
August	32.6	26.1	264	85.9
September	31.7	24.4	300.2	86.12
October	32.5	19.9	0	86.66
November	28.1	14.3	0	110.7
December	22.5	7.6	0	87.76
January	20.7	9.1	0	87.92
February	26	9.4	6	84.47
March	31.4	12.6	3.3	73.59
April	37.2	22.4	0	71.85
May	35.2	24.5	138.6	88.27
June	34.2	25.9	365.2	87.67

Cropping Pattern in the District

The main cropping pattern in the Banke Districts are below

- 1 Rice -Wheat
- 2 Rice-Lentil
- 3 Rice-Chickpea
- 4 Rice-Toria
- 5 Rice-Toria-Maize
- 6 Rice- Potato
- 7 Rice-Potato-Maize
- 8 Rice-Vegetable-Vegetable
- 9 Rice-Potato-Vegetable
- 10 Rice-Fallow
- 11 Maize-Oil Seed
- 12 Maize-Fallow
- 13 Peginon Pea-Fallow
- 14 Fruits

Pocket Area of the Different Crops

S.N	Crops	VDC
1	Rice	Naubasta,Titihiriya,Binauna,Holiya,
2	Maize	Kushum,Kchanapur,Mahadevpuri,Chishapani
3	Wheat	Naubasta,Bankatti,Bethani,Holiya
4	Potato	Mahadevpuri, Naubasta,Sitapur,Radhapur,Hirminiya
5	Vegetable	Naubasta,Hirminiya,Jaishpur,Paraspur,Sitapur,Bhabniyapur,Puraini,Kamdi,Shaigaun
6	Fruits	Udharapur,Bankatti,Kohalpur,Baizapur,Nrainapur, Maitehiya,Kalaphata,Katkuiya,Paraspur,
7	Chickpea	Baktwa,Titihiriya,Bankatti,Holiya
8	Groundnut	Hiriminiya,Udayapur,

Methodology

1 Table Work

Digital map and other base maps of Banke District Prepared by Land resource Management Project (LRMP) 1986 from National Planning Commission Kathmandu were taken. Soil sampling sites on the maps were pointed and distributed with the representing all the VDC boundary and agriculturally important land type.

2 Field Work

Fieldwork was conducted according to the sampling sites fixed on the base maps. soil samples are collected by using soil auger, kurpi, kodali and plastics bags. Minimum 5 and maximum 7-soil samples were taken from every VDC. 245 soil samples were collected from whole of the Districts with well leveling.

3 Laboratory Work

Soil samples from different VDC were air dried first. These air-dried soil samples were then crushed with a wooden pestal and mortar and sieved through 2-mm sieve which were again sieved through 0.2-MM sieve. Whole of the laboratory analysis is determined as Total nitrogen, Available phosphorus, Available potash, Soil pH, Organic matter and Soil texture.

Nutrient Rating

Nutrient Status	N	P	K	OM
Very low	<0.05	<10	<55	<0.75
Low	0.05-0.10	10-30	55-110	0.75-1.5
Medium	0.10-0.20	30-55	110-280	1.5-3
High	0.20-0.50	55-110	280-500	3.0-5.0
Very High	>0.50	>110	>500	>5

Soil Reaction

pH	Rating
Acidic	<6.4
Neutral	6.5-7.5
Alkaline	>7.6

Soil Texture

According to the texture triangular (USDA System)

Land System in Banke

The Topography of the Banke District is almost flat plain. Rapti River deposits most of the soil material. Land systems in banke District are given below.

- Depressional recent alluvial material with fine loamy soil and it is 1/2-degree slope.
- Gently sloping alluvial plain with loamy soil and it is 1-5 degree slope.
- Higher recent alluvial plain with loamy soil and this area is about <1-degree slope.
- Higher terraces on active and recent alluvial plain with <1-degree slope.
- Highly Dissected alluvial Fan with 0-20 degree slope and loamy soil.
- Level recent alluvial plain 1/2-degree slope and loamy soil.
- Low terraces on active alluvial plain with <1-degree slope and sandy soil.
- Low terraces on active and recent alluvial plain with <1-degree slope.
- Non dissected (high position)depositional with 1/2 degree slope
- Rolling Fans and tars with 0-20 degree slope and loamy soil.
- Sand and gravel bars on active and recent alluvial plain with 1/2 degree slope.

Land type description with Land Utilization Map

S.N	Land type	Description
1	Tar, alluvial material & Fan	This is included higher, medium and lower terraces, where alluvial materials are dominant. Mainly Tori, Chickpea, Lentil, Rice crops are cultivating by farmers.
2	Wet land	Wet land is lower part of the District where most area is depressed. Soil materials are fine. Rice is the main crop including wheat, Lentil.
3	Mixed land	Mixed land is more undulating between Tar and Wet land and soil materials are more coarse than tar and wet land, where farmers are cultivating Chickpea, Lentil, vegetable few Rice,Pegan pea wheat etc
4	Sandy area	Sandy area is near the Rapti River, where fine sand is taking by Rapti River. Mainly Lentil Groundnut Alas is cultivating.

BANKE DISTRICT (Land Utilization)



Note: VDC Boundaries are updated by DDC on topo map 1:25,000 in participatory method. Land use are from LRMP map of 1:50,000 scale.

Legend

- Boundaries (DDC Updated on Topo Map)
- VDC Boundary
 - District Boundary
 - International Boundary
 - Land Use (LRMP)
 - Hardwood Forests (Broad Leaved Forests)
 - Protected Forest
 - Shrubs
 - Grasslands
 - Cultivation in Tars, Alluvial Fans & Lower Footslopes
 - Dry Lands Cultivation
 - Mixed Lands Cultivation
 - Sloping Terraces in Hill Slope Cultivation
 - Wet Land Cultivation
 - Sand, Gravels & Boulders
 - Settlements, Urban Areas & Built Up Areas

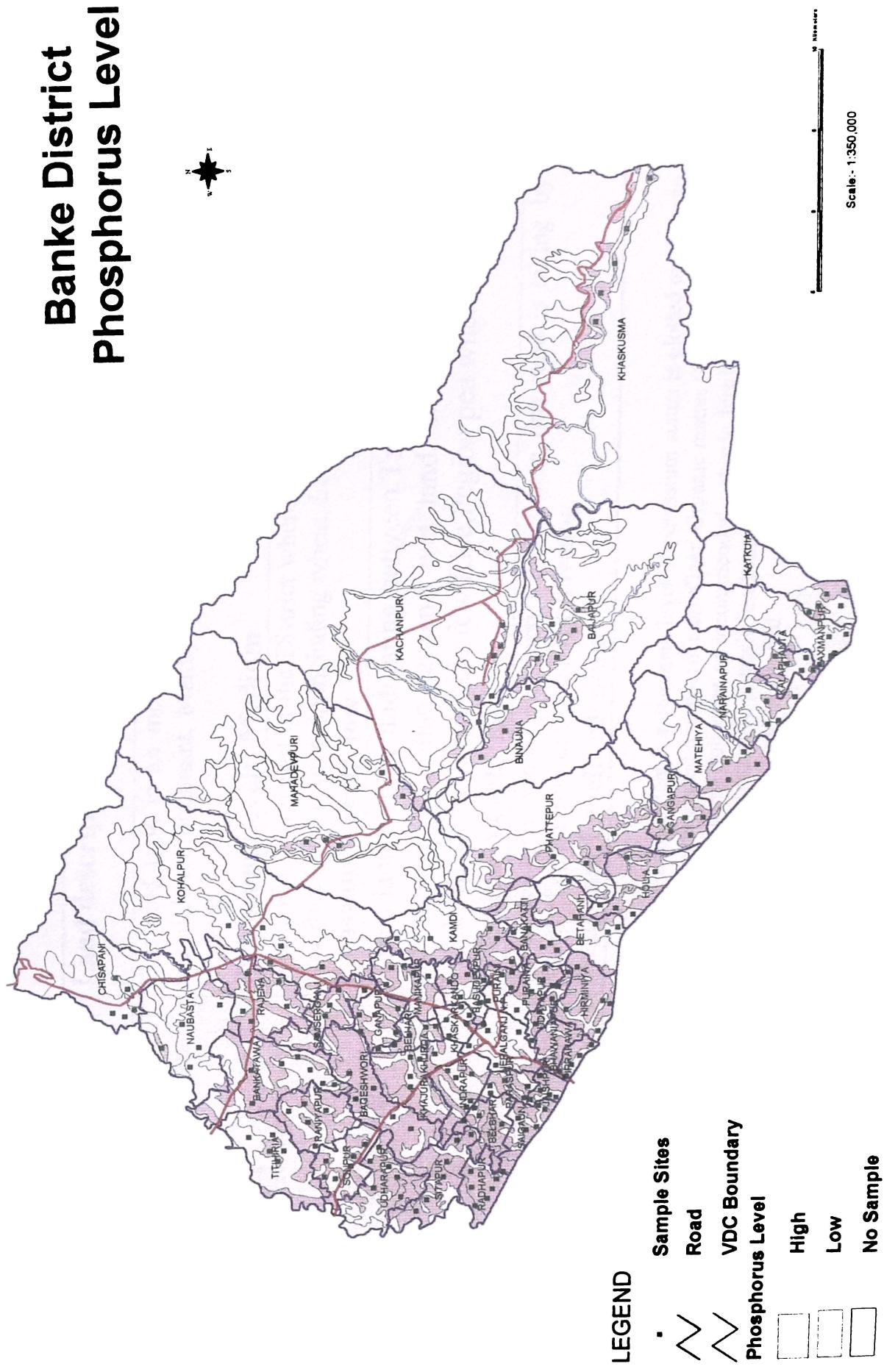
10 Kilometers

Land Type	N	P	K	pH	OM	Texture	
Tar & Alluvial Material Total sample (103)	H	M	L	H	M	L	0
Mixed Land Total sample (32)	0	6.25	0	6.25	16.98	83.01	33.33
Wet Land Total sample (106)	0	0	34.90	46.87	59.37	78.64	0
Sandy Area Total sample (3)	16.03	18.75	2.9	9.43	21.87	18.44	0
100	48.11	34.37	46.60	37.73	31.25	41.77	66.66
0	31.13	37.5	36.89	53.77	46.87	39.77	33.33
0	46.22	25	49.51	46.22	12.62	0.97	33.33
0	0	3.12	0	0	7.54	12.62	33.33
66.66	92.45	87.5	86.40	73.58	71.87	72.81	100
0	26.41	28.12	20.38	0	0	6.79	0

H=High, M=Medium, L=Low, AC=Acidic, N=Neutral, AL=Alkaline, SaL=Sandy, Loam=L, =Loam, Lsa=Lomy Sand

SFM of Banke, District

Banker District Phosphorus Level



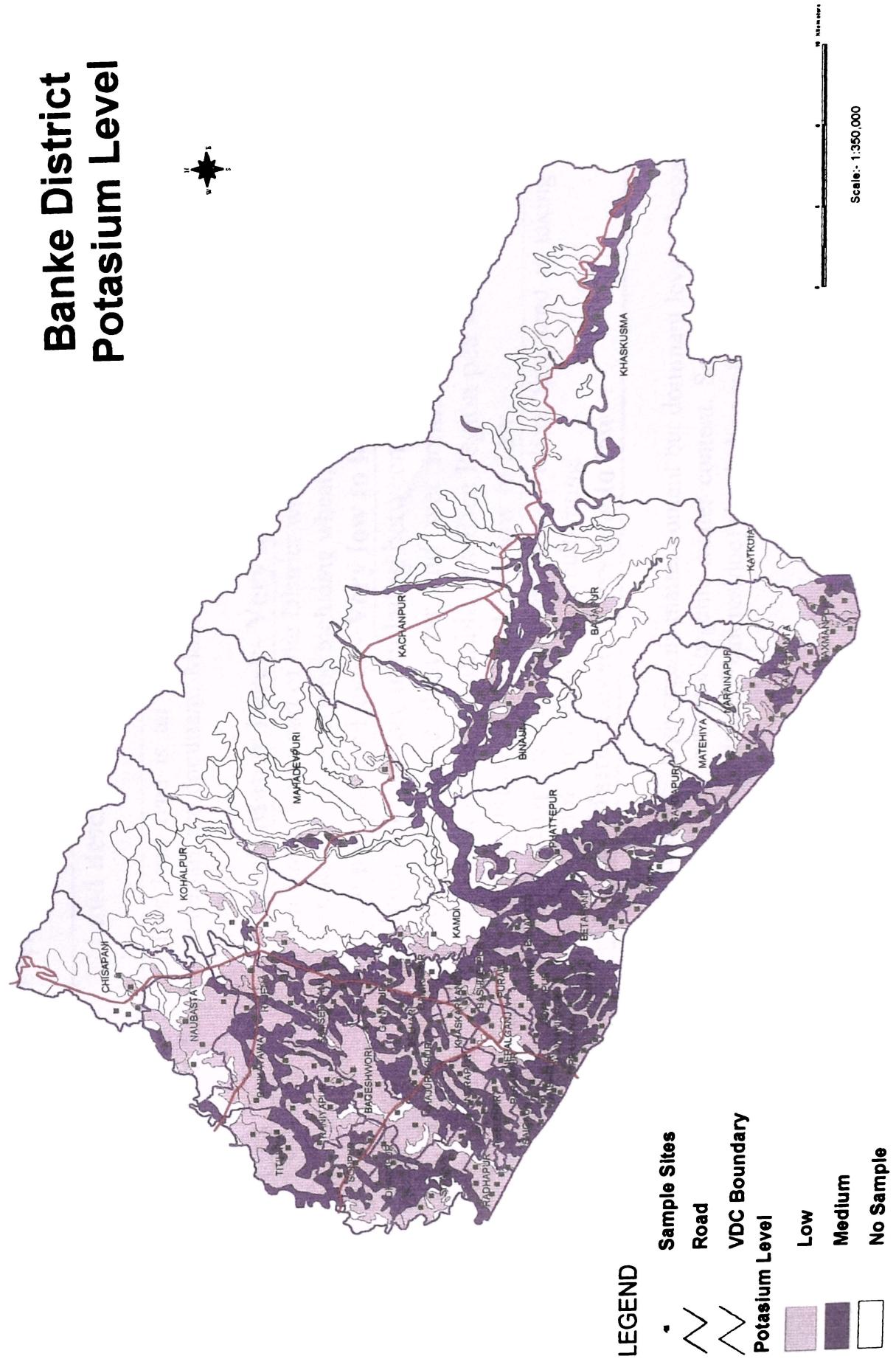
3.Potassium Level

15

S.N.	Land type	Land description and Potassium Level
1	Tar, alluvial material & Fan	This land type is an included higher, medium and lower terraces, where alluvial materials are dominant. Mainly Tori, Chickpea, Lentil, Rice crops are cultivating by farmers. Potassium Level:- Medium
2	Wet land	Wet land is lower part of the District where most area is depressed. Soil materials are fine. Rice is the main crop including wheat, Lentil. Potassium Level:- low
3	Mixed land	Mixed land is more undulating between Tar and Wet land and soil materials are more coarse than tar and wet land, where farmers are cultivating Chickpea, Lentil, vegetable few Rice, Pegan pea wheat etc Potassium Level:- low
4	Sandy area	This land type is near the Rapti River, where fine sand is taking by Rapti River. Mainly Lentil Groundnut Alas is cultivating. Potassium Level:- Medium

Note :- Few soil samples have high potassium content but dominant level of potassium status is plotted on the map. Banke District has low to high potassium content. So it is recommended that potassic fertilizer, Organic matter (Compost Farmyard manure,) should be apply. If land has low level of potassium content, full dose of recommended potassic fertilizer should be applied. If land has medium level of potassium content, half dose of recommended potassic fertilizer should be applied. If land has high level of potassium content, 25 % dose of recommended potassic fertilizer should be applied.

Banke District Potassium Level



4. Organic Matter Level

S.N.	Land type	Land description and Organic Matter Level
1	Tar, alluvial material & Fan	This land type is an included higher, medium and lower terraces, where alluvial materials are dominant. Mainly Tori, Chickpea, Lentil, Rice crops are cultivating by farmers. Organic Matter Level:- Very low to low
2	Wet land	Wet land is lower part of the District where most area is depressed. Soil materials are fine. Rice is the main crop including wheat, Lentil. Organic Matter Level:- Very low to low
3	Mixed land	Mixed land is more undulating between Tar and Wet land and soil materials are more coarse than tar and wet land, where farmers are cultivating Chickpea, Lentil, vegetable few Rice, Pegan pea wheat etc Organic Matter Level:- Very low to low
4	Sandy area	This land type is near the Rapti River, where fine sand is taking by Rapti River. Mainly Lentil Groundnut Alas is cultivating. Organic Matter Level:- Very low to low

Note:- Few soil samples have Medium and high organic matter content but dominant level of organic matter status is plotted on the map. Banke District has very low organic matter content. So it is recommended that, organic matter (Compost Farmyard manure, Green manure, Plant residue) should be apply.

5. Soil Reaction (pH)

17

S.N.	Land type	Land description and Soil Reaction (pH)
1	Tar, alluvial material & Fan	This land type is an included higher, medium and lower terraces, where alluvial materials are dominant. Mainly Tori, Chickpea, Lentil, Rice crops are cultivating by farmers. Soil Reaction (pH):- Neutral
2	Wet land	Wet land is lower part of the District where most area is depressed. Soil materials are fine. Rice is the main crop including wheat, Lentil. Soil Reaction (pH):- Neutral
3	Mixed land	Mixed land is more undulating between Tar and Wet land and soil materials are more coarse than tar and wet land, where farmers are cultivating Chickpea, Lentil, vegetable few Rice, Pegan pea wheat etc Soil Reaction (pH):- Alkaline
4	Sandy area	This land type is near the Rapti River, where fine sand is taking by Rapti River. Mainly Lentil Groundnut Alas is cultivating. Soil Reaction (pH):- Neutral

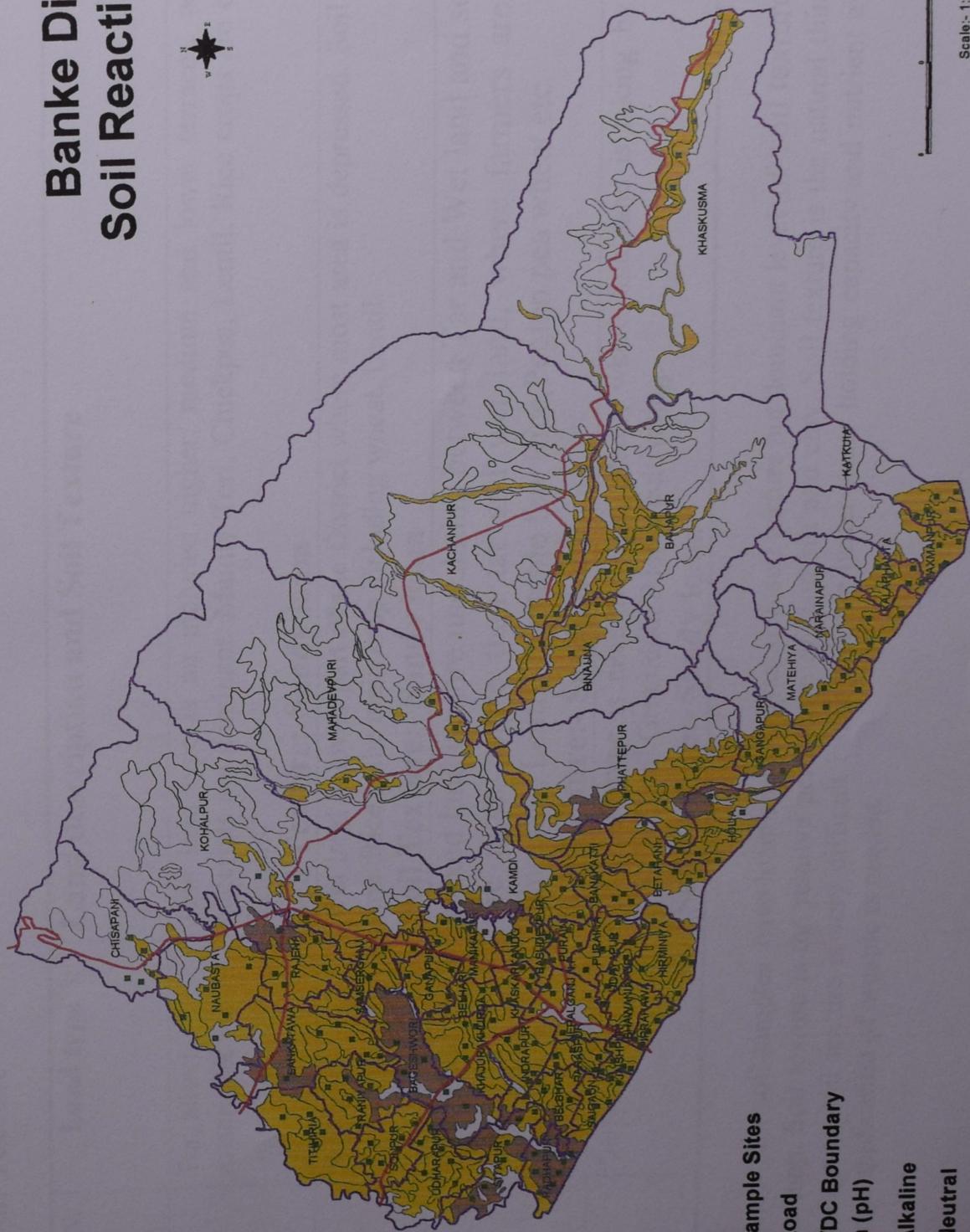
Note:- Few soil samples have acidic in nature but dominant level of Soil Reaction (pH) is plotted on the map. Banke District has Slightly acidic to alkaline in soil reaction. So it is recommended that, if soil reaction is acidic agriculture lime, if soil reaction is alkaline then green manure (Dhaicha, Ashuro, Titepati) should be applied. Beside these lime and green manure, application of organic matter (Compost Farmyard manure,) is also very essential.

Banka District Soil Reaction (pH)



Scale:- 1:350,000

Scale:- 1 Kilometer



LEGEND

Sample Sites

Road

VDC Boundary

Soil Reaction (pH)

Alkaline

Neutral

No Sample



6.Soil Texture

18

S.N.	Land type	Land description and Soil Texture
1	Tar, alluvial material & Fan	This land type is an included higher, medium and lower terraces, where alluvial materials are dominant. Mainly Tori, Chickpea, Lentil, Rice crops are cultivating by farmers. Soil Texture:-Sandy loam
2	Wet land	Wet land is lower part of the District where most area is depressed. Soil materials are fine. Rice is the main crop including wheat, Lentil. Soil Texture:- Sandy loam
3	Mixed land	Mixed land is more undulating between Tar and Wet land and soil materials are more coarse than tar and wet land, where farmers are cultivating Chickpea, Lentil, vegetable few Rice,Pegion pea wheat etc Soil Texture:-Sandy loam
4	Sandy area	This land type is near the Rapti River, where fine sand is taking by Rapti River. Mainly Lentil Groundnut Alas is cultivating. Soil Texture:- Sandy loam

Note:- Few soil samples have loam and loamy sand in soil texture but dominant level of soil texture is plotted on the map. Soil texture is the relative percentage of sand silt and clay, Soil texture is the natural things. Bring the change on soil texture is very difficult but to manage better water holding capacity and nutrient availability the huge application of organic is needed.

Soil is the most important natural resources. Soil people are always saying "*Poor soil and poor people go together*" that's why soil protection, soil management and soil fertility improvement is very essential. Soil fertility map of Banke District shows that fertility status is not satisfactory. So following soil fertility improvement technique should be follow.

- Proper use of organic matter
- Balance dose of chemical fertilizer
- Good cropping pattern
- Control on soil erosion
- Manage on leguminous crops
- Improvement on compost making
- Use bio-fertilizer
- Manage on acidic and alkaline soil
- Terrace farming on sloping land
- Use green manuring crops in fallow land
- Follow integrated plant nutrient management system
- Forest conservation
- Follow Agro-forestry

Thank you