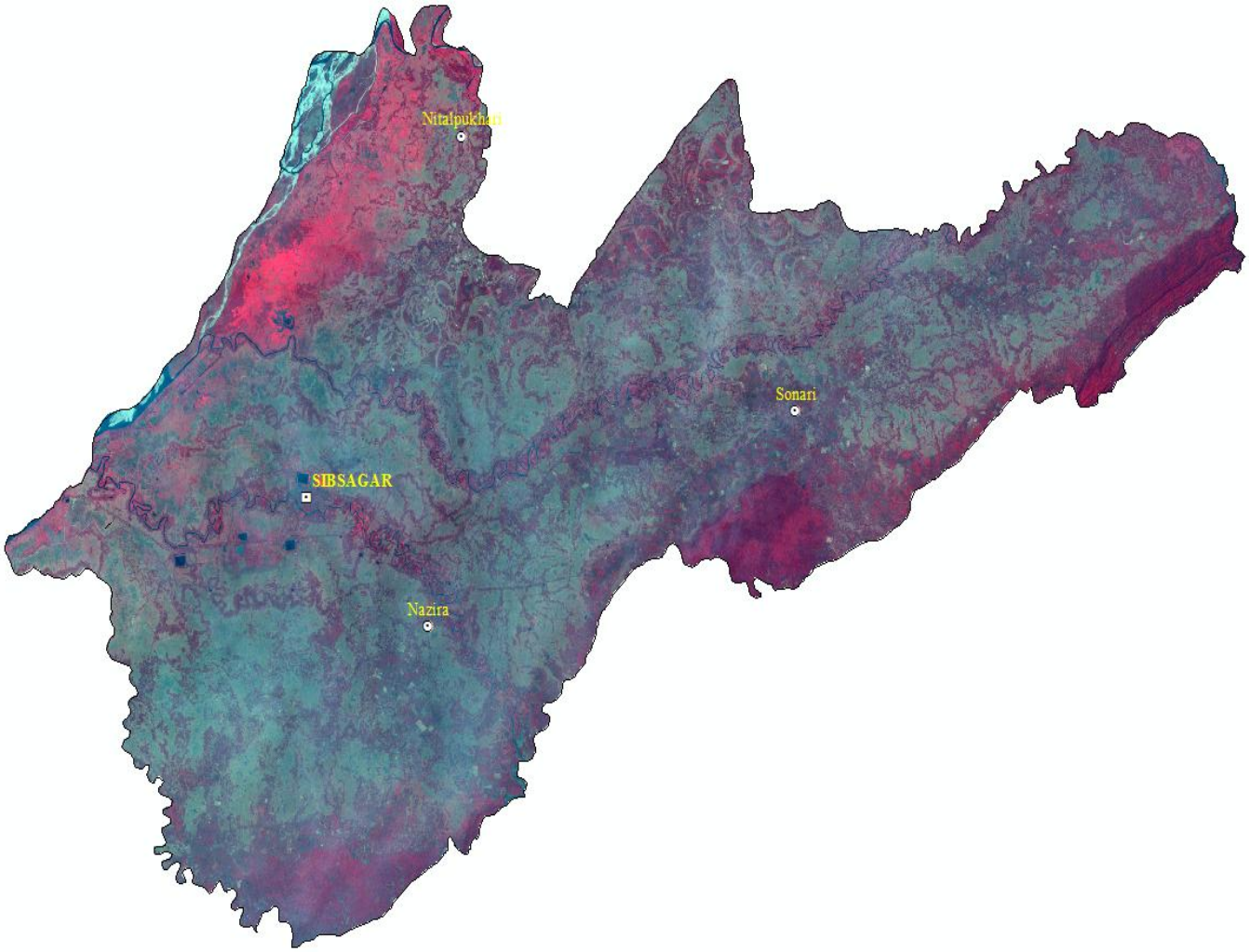
REPORT NO.529

SOIL SURVEY REPORT OF SIBSAGAR DISTRICT ASSAM



NORTH EASTERN REGIONAL CENTRE

JORHAT

National Bureau of Soil Survey & Land Use Planning

(Indian Council of Agricultural Research)

Nagpur - 440 033, Maharashtra, India

CONTENTS

LIST OF TABLES

LIST OF FIGURES

Meta Data for Sibsagar District, Assam

Sr.No.	Elements	Scheme	Value
1.	Identification Information	Name of the Dataset	Soil Survey Report of Sibsagar District (Assam)
		Contents	Soil Survey Reports, Maps and Imagery
		Keywords	Soil Survey Report
		Report/Map Language	English
		Map Scale	1:50000
		Survey Year	1980-1985
		Imprint Year	-
		Edit Year	-
		Value-addition Year	2013
		Purpose of Value-addition	To Create Interactive Maps and Reports and Disseminate to the End-User Agencies.
		Access Constraints	Permission Required
		Use Constraints	Permission Required
2.	Contact Information	Generating Agency	NBSS & LUP, Nagpur
		Contact Person	Director, NBSS & LUP, Nagpur
		Mailing Address	National Bureau of Soil Survey & Land Use Planning Sankar Nagar P.O. Amarabati Road, Nagpur - 440 033 Maharashtra, India
		City/Locality	Nagpur, Amarabati Road
		Country	India
		Contact Telephone	+91- 712- 2500386, 2500545
		Contact Fax	+91- 712- 2500534
		Contact Email	director@nbsslup.ernet.in
3.	Spatial Domain	Bound Left	94°25' E
		Bound Right	95°22' E
		Bound Top	27°15' N
		Bound Bottom	26°45' N
		Area/Coverage	
		Projection	UTM
		Datum	WGS 1984
		Unit	Meter
		Administrative Location	State: Assam, District: Sibsagar
4.	Citation	Data Prepared By	NBSS & LUP, Jorhat (Regional Centre)
		Associated Project	G.S. CHAMUAH
		Associated Value- additions	-
		Associated Publications	-
		Coordinator Value- added Publication	-
5.	Storage	Data Format	PDF/GeoPDF
		Data File Size	
		Data Physical Location	\\GIST6\D:\GeoPDF Mapping Project _2013\Sibsagar
		Download Location	-
6.	Quicklook	Graphic file in jpg format	Y
7.	Image Data	Name of the Satellite	Landsat
		Sensor	ETM+
		Date of Image	21 January 2003
		File Format	TIFF
		Spatial Resolution	30 m
		Image Downloaded From	http://earthexplorer.usgs.gov/
		Credit	USGS
8.	Rights	Copyright	NBSS & LUP, Nagpur
		Distributor Contact	Director, NBSS & LUP, Nagpur

1.

INTRODUCTION

Reconnaissance soil survey of Sibsagar district of Assam was carried out by the Regional Centre, Jorhat of National Bureau of Soil Survey and Land Use Planning (ICAR) with the objectives of preparing a soil map on a scale of 1:50,000 to (i) classify the soils and delineate their location and extent, evaluate their problems and potentials and prepare interpretative maps on soils and land resources of the district, (ii) correlate the soils and establish the various soil series, (iii) develop interpretations based on present land use and inherent soil properties, (iv) develop suitable legends for soil and interpretative maps based on the principles of correlation and other land use data for the use of planners, decision makers and scientists for optimum land use planning and agricultural development.

The survey was carried out during the period of 1980 to 1985.

2.

GENERAL DESCRIPTION OF THE AREA

2.1 Location and extents

The district is situated in Assam between 94° 25' to 95° 22' E longitudes and 26° 45' to 27° 15' N latitudes. It is surrounded by the Disang river in the east and Jhanji in the west. Tirap district of Arunachal Pradesh is situated in the south, while the river Brahmaputra lies in the north of the district (Fig.l). The total geographical area of the district is about 2.60 lakh ha. The district has two subdivisions, namely Sibsagar and Sonari.

2.2 Population:

Total population of district is 547,716 and police station wise population is presented in Table 1. The district is densely populated. The occupation of the people is largely agriculture.

Table 1.Population of Sibsagar district, Assam

Police station	Rural	Urban	Total population
Sibsagar	156,775	15,106	171,881
Amguri	83,546	20,016	103,562
Nazira	121,780	4,910	126,690
Sonari	165,599	4,910	170,509
Total	527,700	44,842	572,542

* Source: District Census Handbook 1961, Sibsagar.

2.3 Physiography, Relief and Drainage:

Sibsagar falls into three natural divisions so far as the physiography is concerned viz.

a) upland

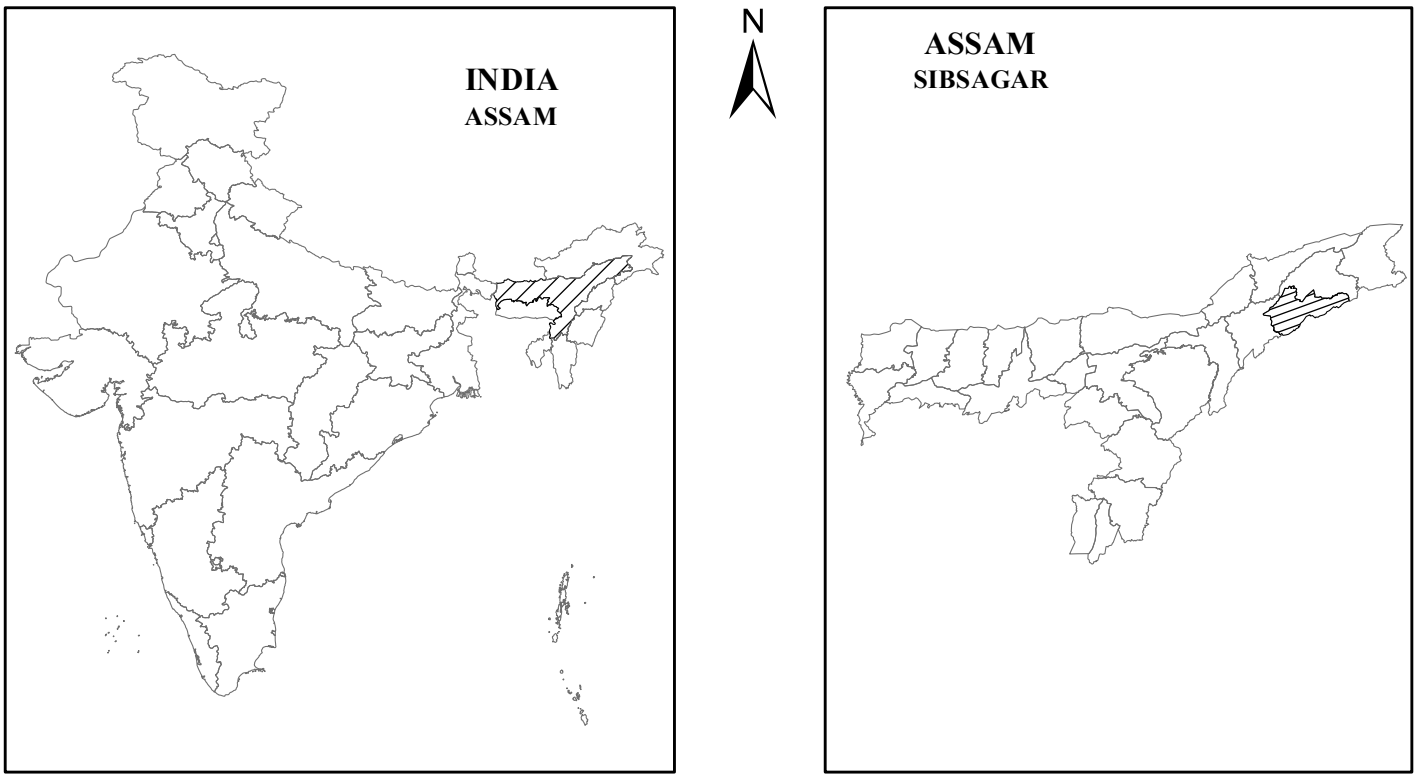
b) lowland

c) flood plains.

The upland forms the base of the Nagahills where the geology is sandstones and shales. Many areas in this physiographic unit are under tea plantations and forest species (Fig.2).

The lowlands are the areas between the foothills of Naga-hills and the floodplains. The natural depressions cause huge accumulation of both alluvial and colluvial materials.

LOCATION MAP



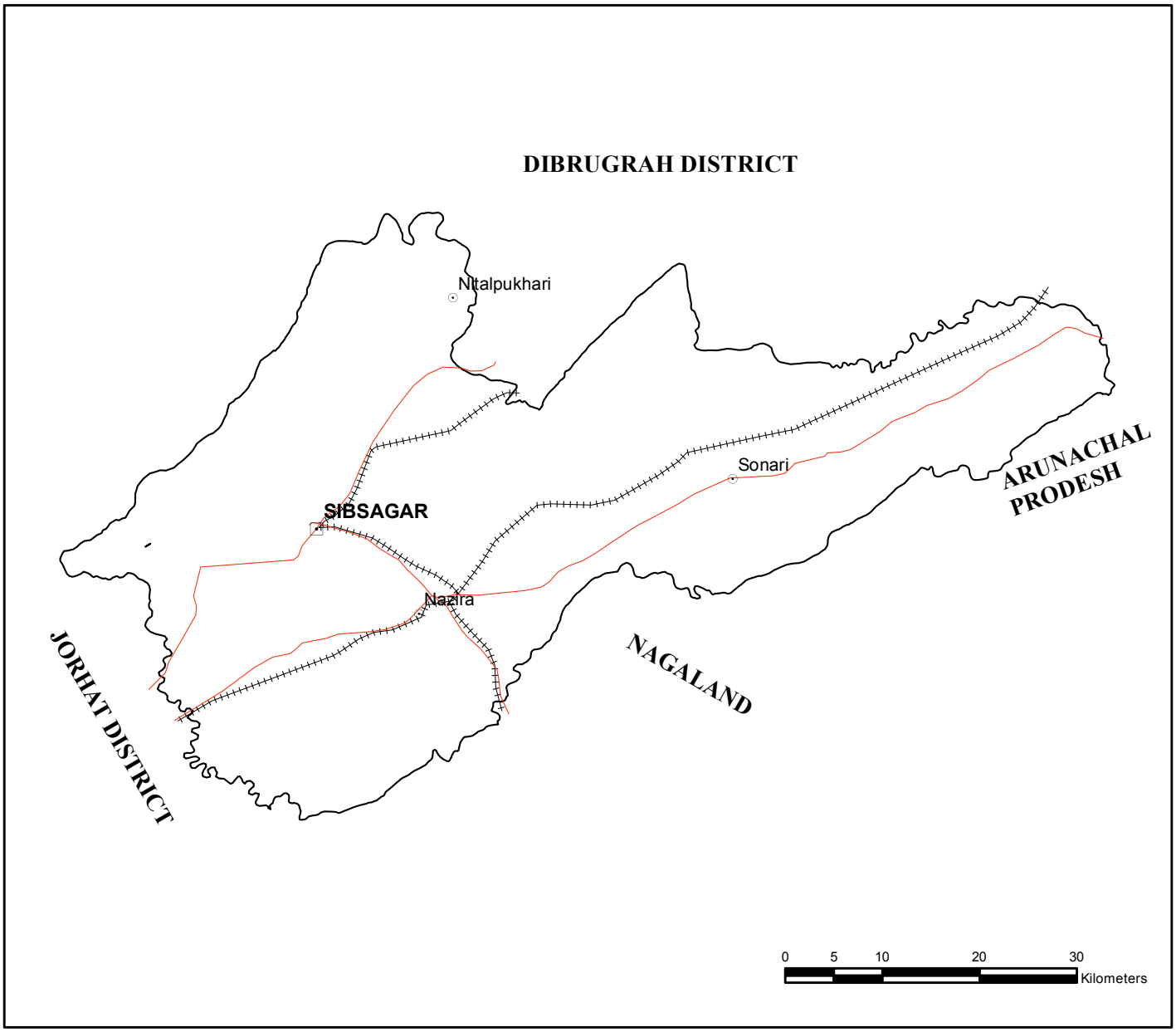
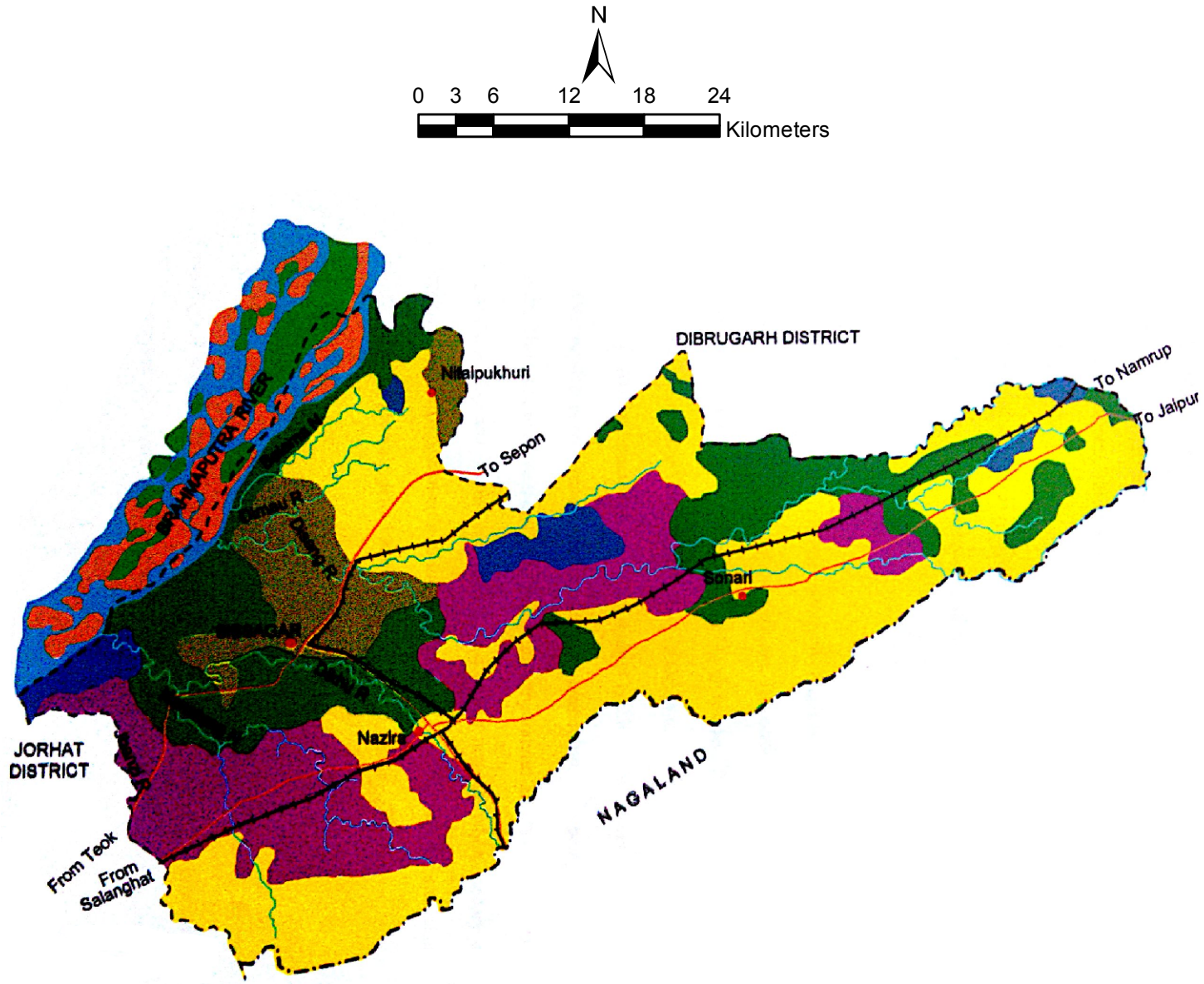


Fig. 1: Location Map

SIBSAGAR

Physiography



Legend

- Upland
- Lowland
- Active Flood Plain
- Recent Flood Plain
- Lower Flood Plain

References

- State Boundary
- District Boundary
- District Head Quarter
- Other Location
- National Highway
- Other Road
- Railway
- River
- GrassLand
- Sandbar
- Brahmaputra Area

Fig. 2: Physiography

The floodplains are the belt of flooded land situated on the south bank of the Brahmaputra throughout the whole of its course through Sibsagar. The country in this part is covered at places with high reed jungle, interspersed with swamps or "bils" and magnificent stretches of rich fodder grass. Depending on the stage of formation the floodplains are further divided into

i) active floodplains

ii) recent floodplains and

iii) lower floodplains.

The general slope of the district is from east to west with the highest elevation of 305 m above mean sea level (msl) in Dilli R.F. and the lowest of 80 m above msl in Kalugaon (please see Fig.2).

The region is drained mainly by the Brahmaputra river. The river along with its tributaries, namely, Disang, Dikhou and Jhanji traverse the district and deposit alluvium carried from the Himalayas in the north and the Assam range in the south.

2.4 Climate:

The district has a climate which is characterized by a highly humid atmosphere, abundant rains and general coolness. The cold season from December to February is followed by thunder storms from March to May. The south west monsoon sets in June and continues up to the beginning of October.

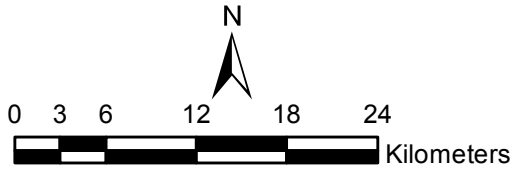
The average annual rainfall in the district is 2504 mm. About 64% of the total rainfall is received during the monsoon season with July being the wettest month. The mean maximum and mean minimum temperatures are 28.600 and 17.400 respectively. July and August are generally the hottest months; while January and December are the coldest months of the year (Table 2). Fig.4 gives the water balance and the length of growing period in the Sibsagar district, Assam.

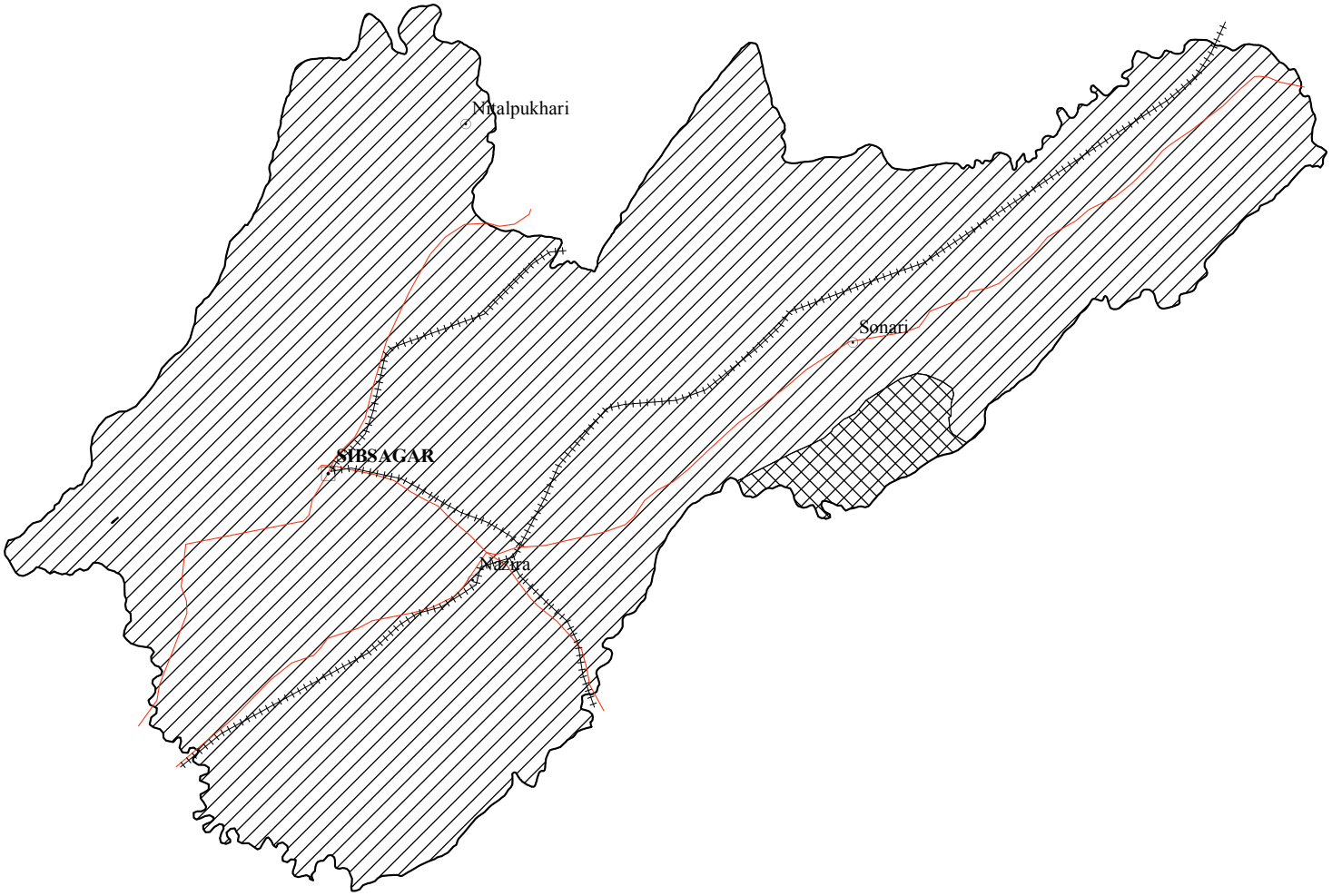
2.5 Geology:

The geology of almost the entire district consists of alluvial deposits. Geological surveys have indicated that under the recent deposits there are many thousands feet of tertiary sediments which lie over an Archean basement complex. These Tertiary rocks represent the foreland facies and are distinguishable from the geosynclinals facies of Tertiary rocks which form the hills on the south and south east of the district. Rocks of the later facies are found as outcropping in a small area within the district along the hills to the south of the railway near the north-eastern boundary. Fig. 3 shows the geology of the district.

SIBSAGAR

Geology





Legend

- Alluvium
- Tipam

References

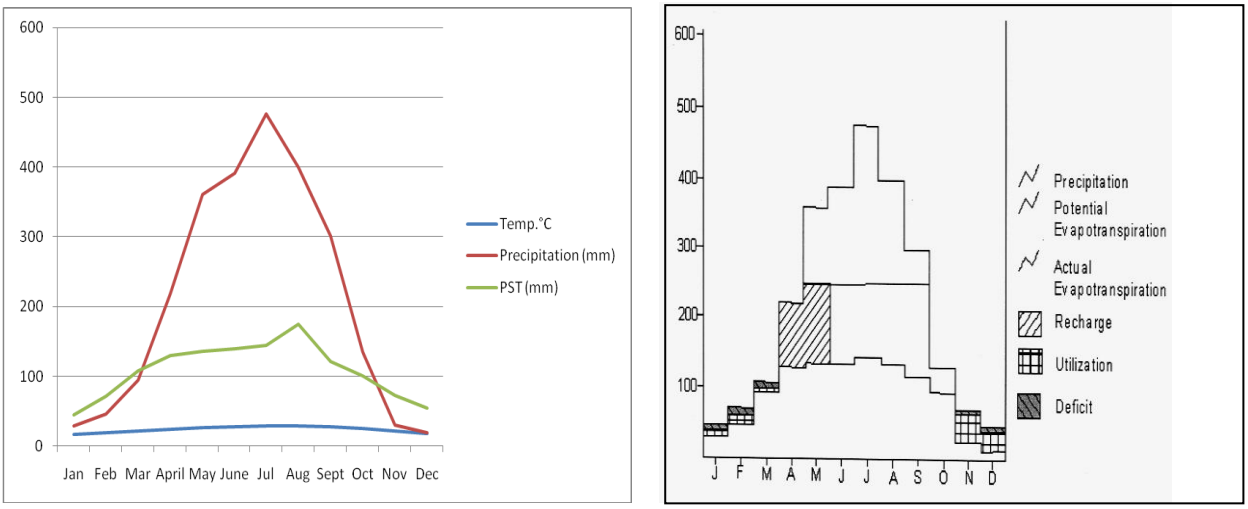
- District HQ
- Tehsil HQ
- Railway
- Road
- District Boundary

Fig. 3: Geology

Table-2. Climatic information of Sibsagar district, Assam (Stations: Sibsagar)

Months	Temp.°C	Precipitation (mm)	PET (mm)
Jan	16.3	29.7	44.1
Feb	18.3	46.5	70.6
Mar	21.7	94.6	108.2
April	24.0	218.2	129.5
May	26.0	361.1	135.3
June	28.1	390.8	139.6
Jul	28.9	476.3	144.3
Aug	28.7	400.2	174.8
Sept	28.1	301.8	121.4
Oct	25.7	135.5	99.7
Nov	21.4	30.1	72.3
Dec	17.6	19.5	53.4
Total	-	2504.3	1256.2
Average	23.7	-	-

Source: IMD, Pune.



Growing Period 365 Days

Fig. 4: Water balance and length of growing period in Shibsagar district,Assam

2.6 Natural vegetation:

The natural vegetation consists of trees, shrubs, grasses and weeds. The botanical name of the important trees, shrubs and grasses along with their local/english names are given below:

Trees

Acacia arabica (Babul) *Albizzia lebbek* (Sirish); *Azadirachta indica* (Neem); *Artocarpus integritolia* (Jeek fruit); *Butea monospema* (Palas); *Borassus flabellifer* (Tal); *Ficus, cunea* (Fig); *Cacsapinia Pulcherrima* (Krishnachura); *Dalbergia sisso* (Sisso); *Emblica officiarnalis* (Amloki); *Ficus bengalensis* (Banyan); *Jambulana Indica*; (Jam); *Jerminalis arjun* (Arjun); Mangifera indica (Mango); *Terminalia sp* (Nollock): Bambusa sp. (Bamboo); *Tactona grandis* (Teak); Shorea robusta (Sal); *Flacontia nemontchi* (Boinchi); *Jatropa gosovpifoliq* (Lal bharenda); *Clerodendron inerma* (Banjul.); Ziziphus jujuba (Ber).

Grasses

Cynodon dactylon (Doob); *Chryopogon aciculatus* (Retz); Trin (Bonguti); *Eleusina indica* (Bobosaban); *Imperata cvlindsica* (Ula).

Weeds

cyperus rotundus (Mutha); *Chenopodium album* (Goose foot): *Saccharum spontaneum* (Kans).

2.7 Present land use

The total geographical area of Sibsagar district is 260290 ha of which nearly 88 per cent is rural and the remaining 12 per cent is urban. Detailed data of land use is given in Table 3.

Rice is the most important crop of the district grown during autumn, winter and summer crops and covers about 92 per cent of the total cropped area. Potato, wheat, oilseeds, pulses, jute, vegetables etc. are also grown in patches. The crop rotations followed in the district are (a) paddy-paddy-paddy: (b) jute-paddy-wheat; (c) jute-pulses-potato (d) paddy-wheat-pulses; (e) paddy-potato-pulses, (f) paddy-pulses. The district of Sibsagar has the highest acreage under tea in the state.

Table-3. Land utilization in Sibsagar district, Assam (1991-92)

Sl. No.	Items	Area (ha)
1	Total geographical area	260290
2	Forest	33,000
3	Barren lard	9,000
4	Cultivable waste-	1,000
5	Land under misc, trees, crops and groves	26,000
6	Net area sown	139,000
7	Land put to now-agricultural uses	38,000
8	Permanent pastures and other grazing land	7.900
9	Old fallows	5,090
10	Current fallows	2,000
11	Area sown more than once	30,000
12	Total cropped area	169,000

Sources: Statistical Handbook, Assam, 1992,

3.

SOIL SURVEY PROCEDURE

Survey of India toposheet (1:63,360) were used as base maps for this study. Soil survey was conducted following the procedure described by All India Soil and Land Use Survey Organisation (1970). The study area was delineated into different physiographic units using the base maps taking into consideration not only the topographical features but also climate, vegetation and geology. The field operation includes correction of physiographic and soil boundaries, soil site selection, profile examination and soil classification as the series level.

Soil mapping was done on different physiographic units. Major differentiating characteristics for identification of soils were morphological features such as texture, structure, colour, depth, soil consistency, mottling, roots together with the associated surface features like slope, erosion, drainage etc, The soil series occurring on different physiographic units were identified and mapped at the level of series association. Area under different soil series associations was calculated and area under different soil series estimated on the basis of observations made during the survey has been reported (Fig.5).

Soils were sampled from all the identified series for the following analysis using the methods described by Jackson (1973).

- Particle size distribution
- pH
- Organic carbon
- Cation exchange capacity
- Exchangable base - Ca, Mg, K, Na
- Extractable acidity H^+ and $A1^{3+}$

The laboratory data along with the series descriptions are shown in the appendix. The land use and socio-economic information were collected during the soil survey. Using the soil map as base, various interpretative maps such as land capability classification, land irrigability classification have been prepared.

Areas under different soil series associations were calculated. Fig, 6 shows the area covered by the individual soil series.

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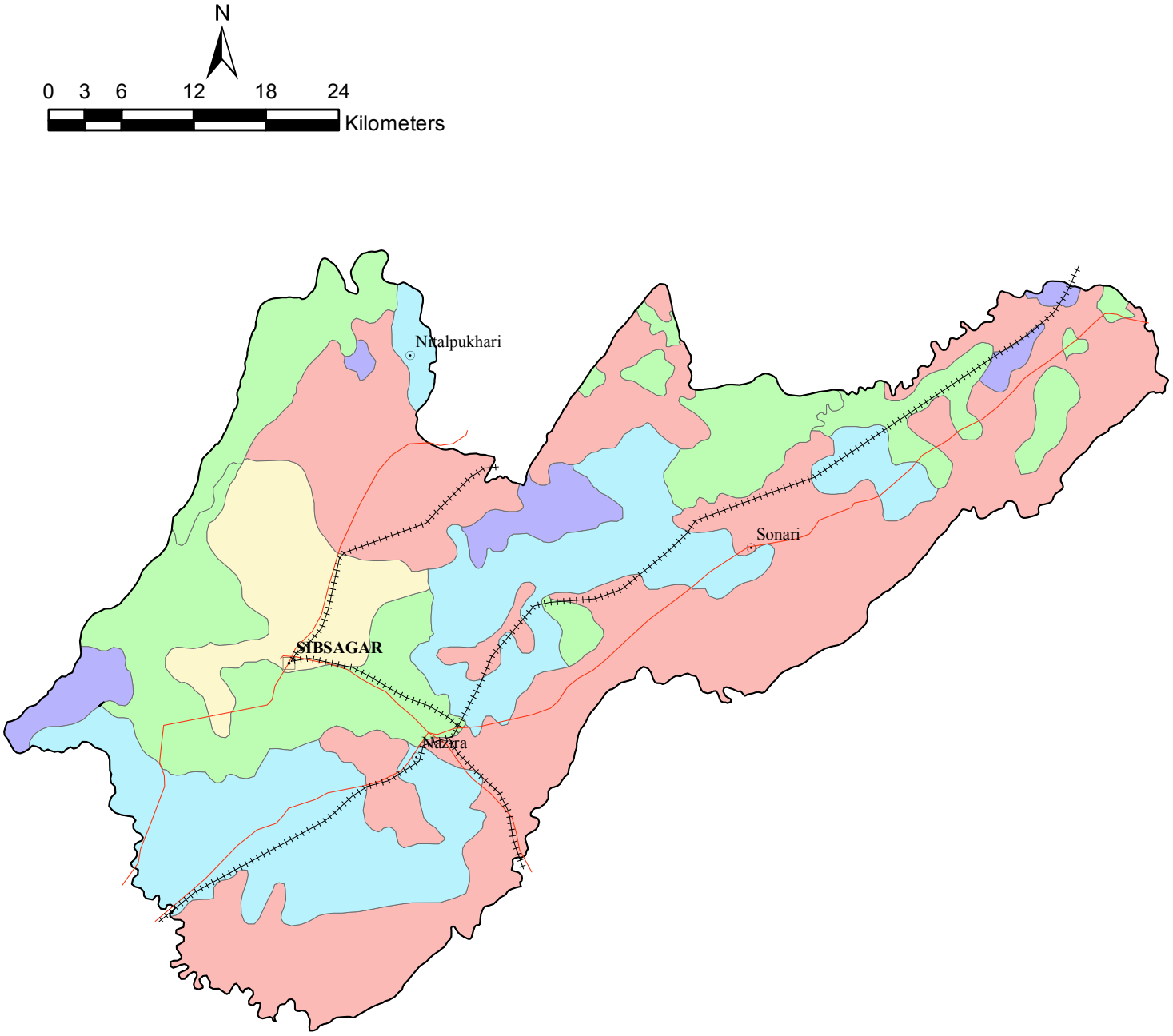
Soil Series Association



Legend

- BetbariDagaon-Biptaghat
- Bhuyanbasti-Romagaon
- Ikarani-Kalugaon-Desaipathar
- Katanipar-Chagelibari-Solmari
- Mathurapur-Naharbari

References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Contour
- Drainage
- Watershed

Fig. 5: Soil Series Association

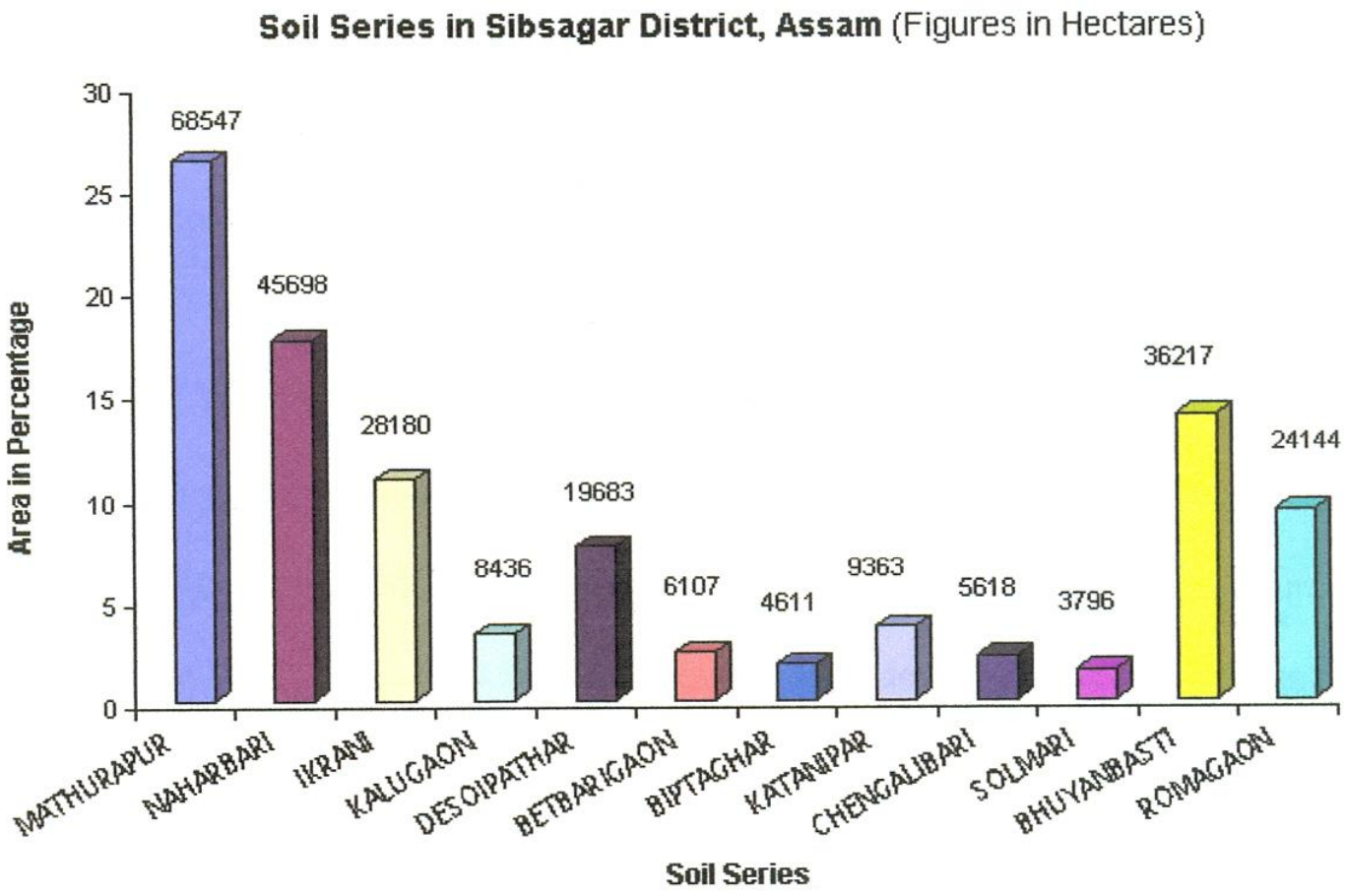


Fig. 6: Soil series in Sibsagar district (Showing in Bar graph)

4.

SOIL

4.1 General description of soils:

During the course of the survey twelve soil series were identified which form five soil series association on different geomorphic units. Each association is described with respect to the soil properties, soil -site characteristics and the land use in the following paragraphs.

4.1.1 Soils on uplands:

4.1.1.1 Mathurapur - Naharbari Association

The soils of this association occur on uplands in the floodplains of the district. The Mathurapur and Naharbari soils are deep, fine silty and occur on nearly level lands at less than 1 percent slope. The surface texture of Mathurapur soils ranges from silty loam to silty clay loam underlain by silty loam subsurface horizons with mottles. The organic carbon content decreases from 0.6 percent to 0.1 percent down the profile, .The CEC is low and it decreases with depth. The percentage base saturation reaches its highest value at the bottom layers of the profile. The soils are under tea plantation.

The surface texture of Naharbari soils varies from silty clay to clay. The organic carbon content decreases with depth. These soils are strongly acidic throughout the profile. The CEC is rather low and shows no definite pattern in its variation with depth. Base saturation ranges from 24 to 45 percent. Exchangeable Al ranges from 2 to 5 cmol (+) kg^{-1}. These soils are also under tea plantation.

4.1.2 Soils on low lands:

4.1.2.1 Ikarani - Kalugaon - Desoipathar Association

The soils of this association occur on low lands in the alluvial plain. Ikarani soils occur on 1 to 3 per cent slopes, Kalugaon and Desoipathar on 0 to 1 per cent slopes. All the soils have aquic moisture regime.

Ikarani soils are silty at the surface underlain by clay subsoil. The soils are very strongly acidic. The CEC is low while the base saturation ranges from 60 to 81 percent.

Desoipather soils are medium textured at the surface underlain by moderately fine and fine textured subsoil. They are very strongly acidic to neutral. The CEC value ranges from 6.9 to 12.3 cmol (+) kg^{-1} and the base saturation varies from 59 to 83 percent.

Kalugaon soils are fine textured and very strongly acidic to neutral. The CEC varies from 14.6 to 22.8 cmol (+) kg^{-1} and the base saturation from 47 to 77 percent. These soils are under paddy cultivation.

4.1.3 Soils on active floodplains:

4.1.3.1 Betbari Degaon - Biptaghat Association

Both the soils are found on nearly level lands on 0 to 1 percent slopes. The Betbari Degaon soils are fine textured in the soil control section. The surface texture varies from silty clay to clay loam which is underlain by silty clay loam sub soils with mottles. The surface soil contains relatively high organic carbon content. These are strongly acidic at the surface and become medium acidic in lower depths. The CEC ranges from 16 to 21 cmol (+) kg^{-1}. The base saturation increases with depth.

The surface texture of the Biptaghat series varies from clay loam to clay overlying the sandy clay to clay sub soils with mottles. These soils have also high organic carbon at the surface. The soil reaction is very strongly to extremely acidic throughout the profile. The CEC ranges from 11 to 18 cmol (+) kg^{-1}. These are used for paddy cultivation.

4.1.4 Soils on recent floodolains:

4.1.4.1 Katanipar - Chengalibari - Solmari Association

Katanipar soils occur generally on slightly undulating lands on 3 to 5 per cent slope. The surface texture varies from loam to silty clay loam underlain by clay loam to clay horizons sub soils with mottles. They are strongly to medium acidic. The CEC value ranges from 12 to 16 cmol (+) kg^{-1}. The organic carbon is high at the surfaces and decreases regularly with depth. The base saturation ranges from 5 to 77 percent.

The Chengalibari soils occur on nearly level recent floodplains at 0 to 1 per cent slope. The texture of the surface soil varies from loam to silt loam over silty loam to silty sub soils. The surface soils are strongly acidic. The organic carbon content is higher at the top and it decreases with depth. The CEC ranges from 12 to 17 cmol (+) kg^{-1} and the surface soil exhibited the highest CEC value. The base saturation increases with depth from 56 to 82 percent,

The Solmari soils occur also on nearly level recent floodplains at 0 to 1 percent slope. The surface texture varies from sandy loam to silty loam while the subsoil texture ranges from loam to silt loam. The soils are very strongly acidic throughout the depth. The CEC value is rather low and gradually increases with depth. The base saturation ranges from 55 to 97 percent. These soils are used for paddy cultivation.

4.1.5 Soils on lower floodplains:

4.1.5.1 Romagaon - Bhuyanbasti Association

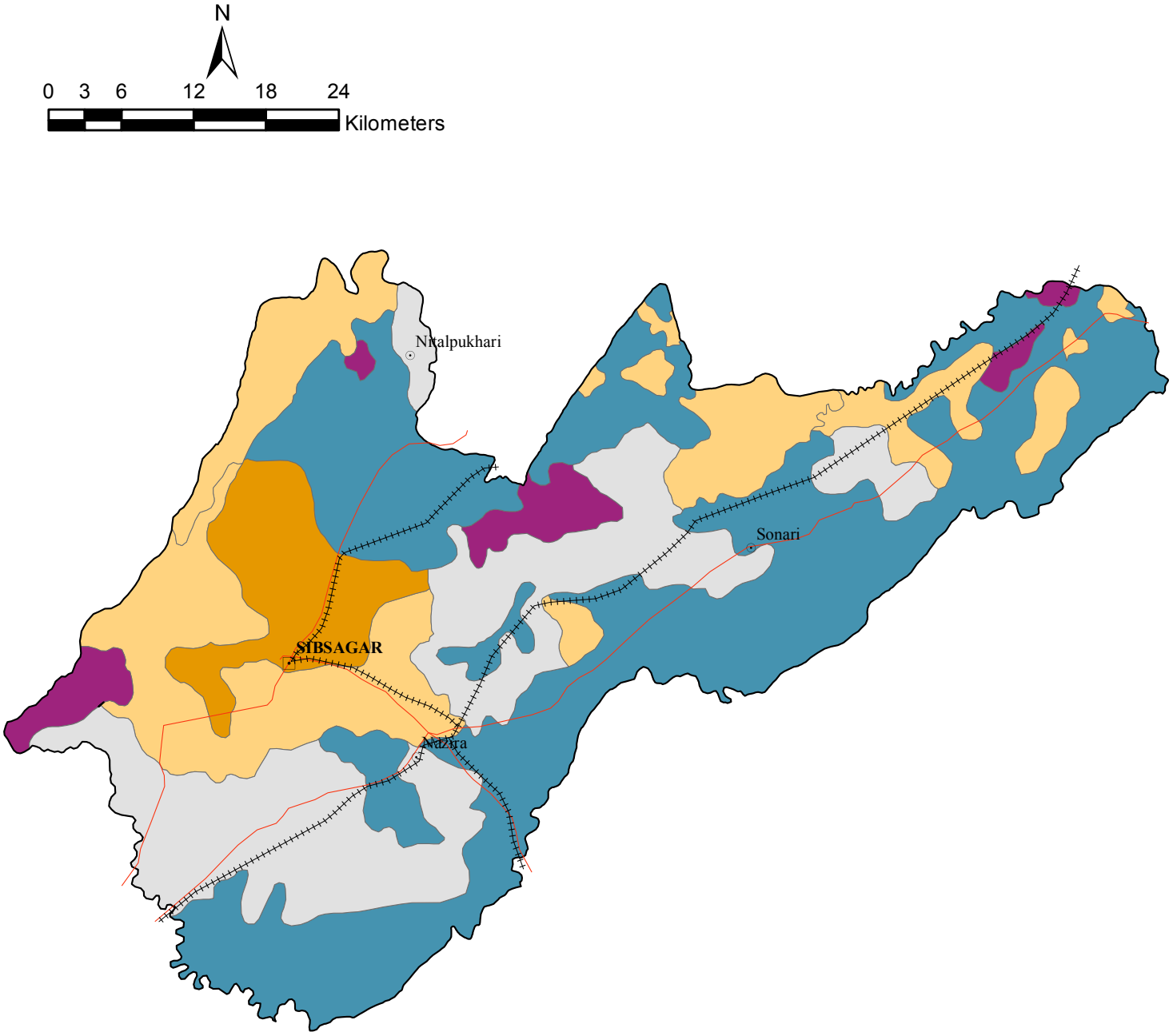
These soils occur on lower floodplains of the district at 0 to 1 per cent slope. The soils of Bhuyanbasti series are fine loamy and medium acidic. The organic carbon content is more than the Romagaon soils, though it decreases with depth. The CEC is low but the base saturation is higher ranging from 54 at the surface to 80 at the sub soils.

Romagaon soils are fine loamy and medium acidic. The surface soils exhibit the highest content of organic carbon and decreases regularly with depth. Ca is the dominant cation in the exchange complex. The CEC value decreases with depth. The base saturation is low and tended to decrease with depth. The soils are cultivated for paddy.

Thematic maps on slope, parent material, surface form, soil depth, drainage, erosion, surface texture, particle size class, soil reaction (pH) are shown in figure 7 to 15, respectively

SIBSAGAR

Slope



Legend

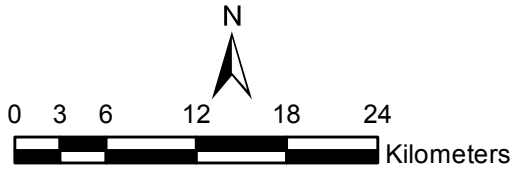
- Gently sloping-Very gently sloping
- Level to nearly level-Very gently sloping
- Level to nearly level
- NA-Level to nearly level
- NA

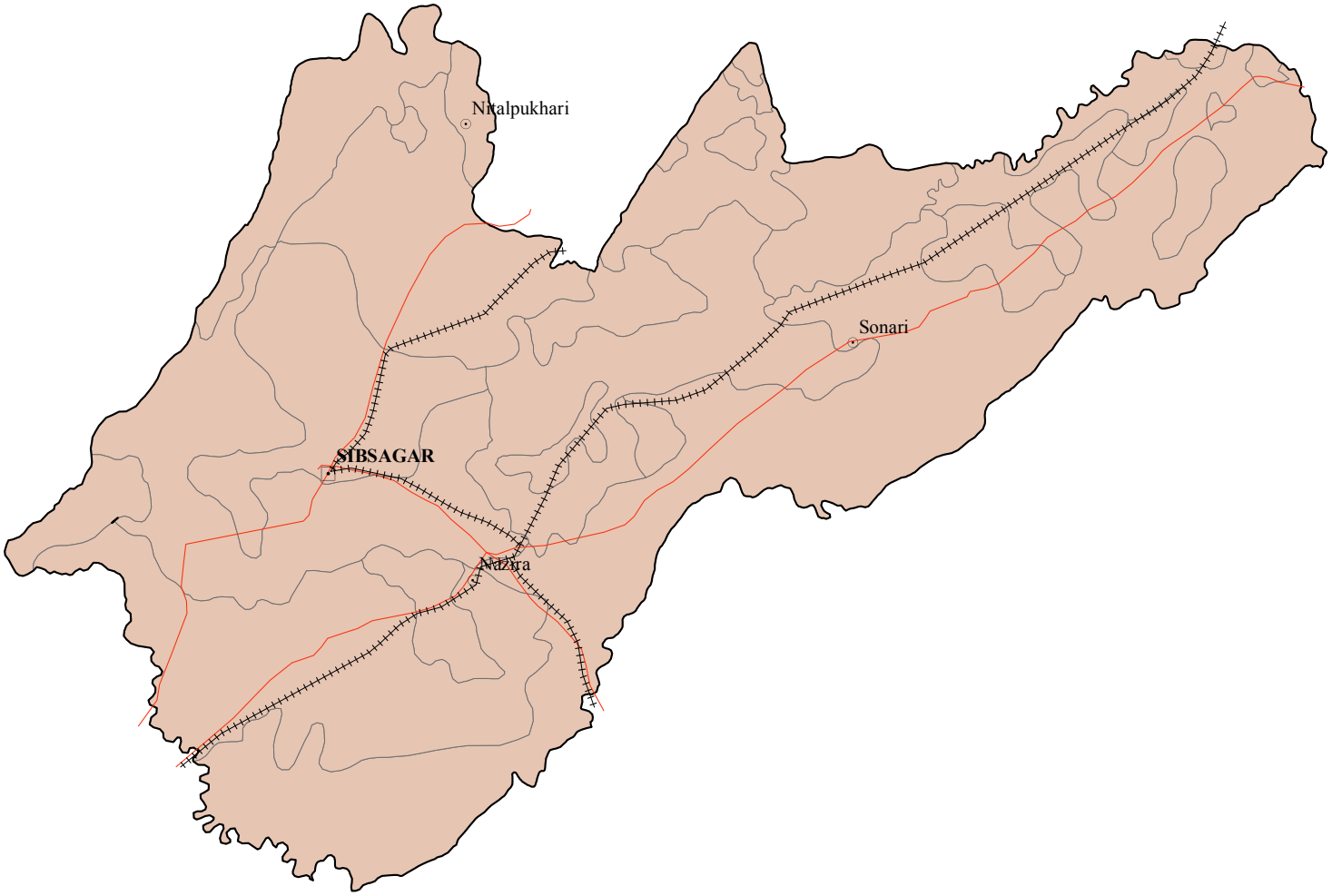
References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

SIBSAGAR

Parent Material





Legend

- Alluvium

References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

Fig. 8: Parent Material

SIBSAGAR

Surface Form

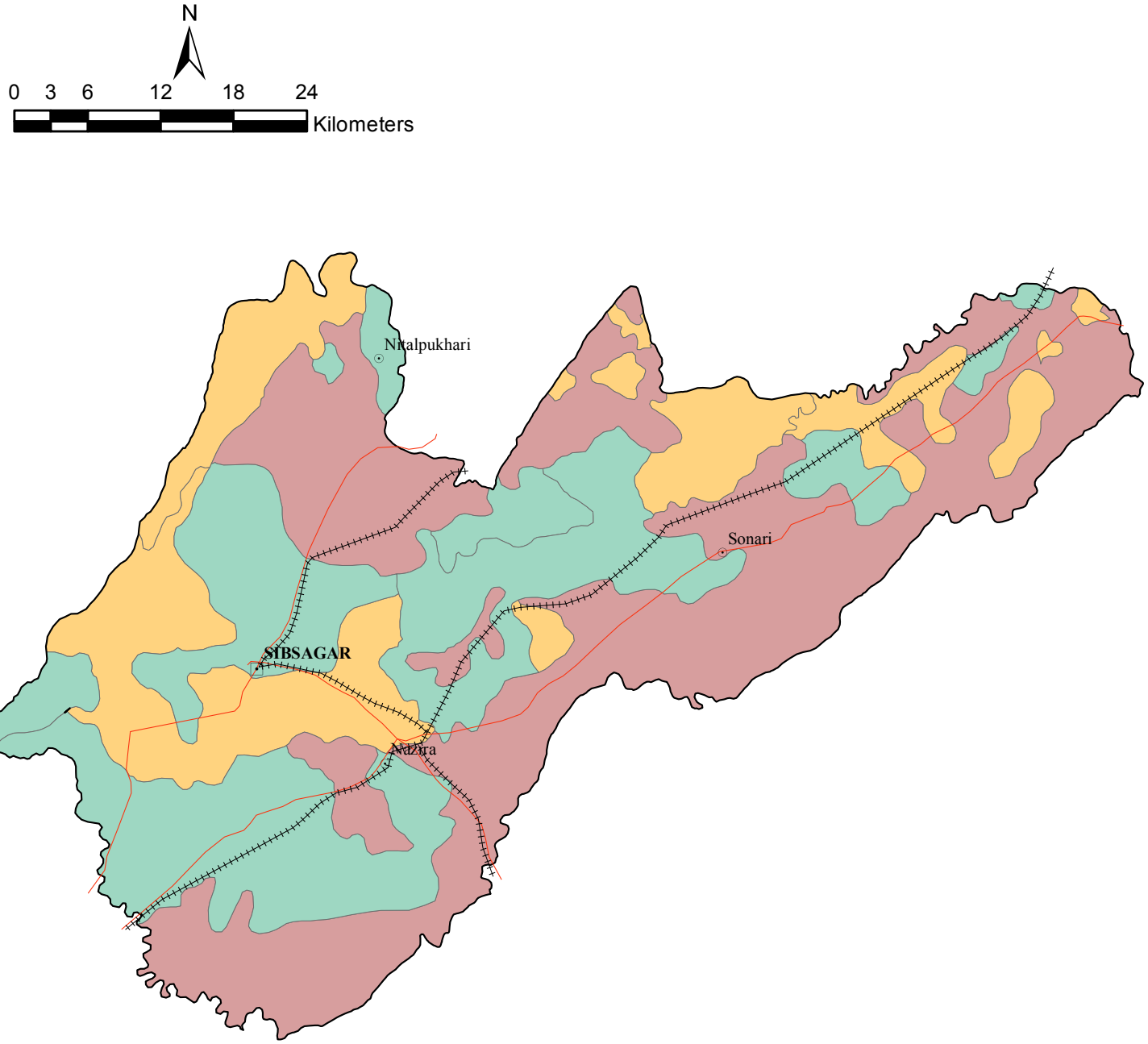
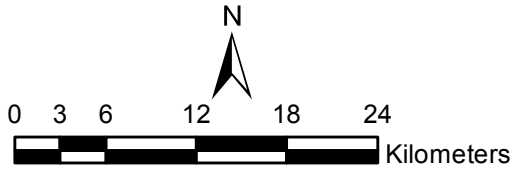
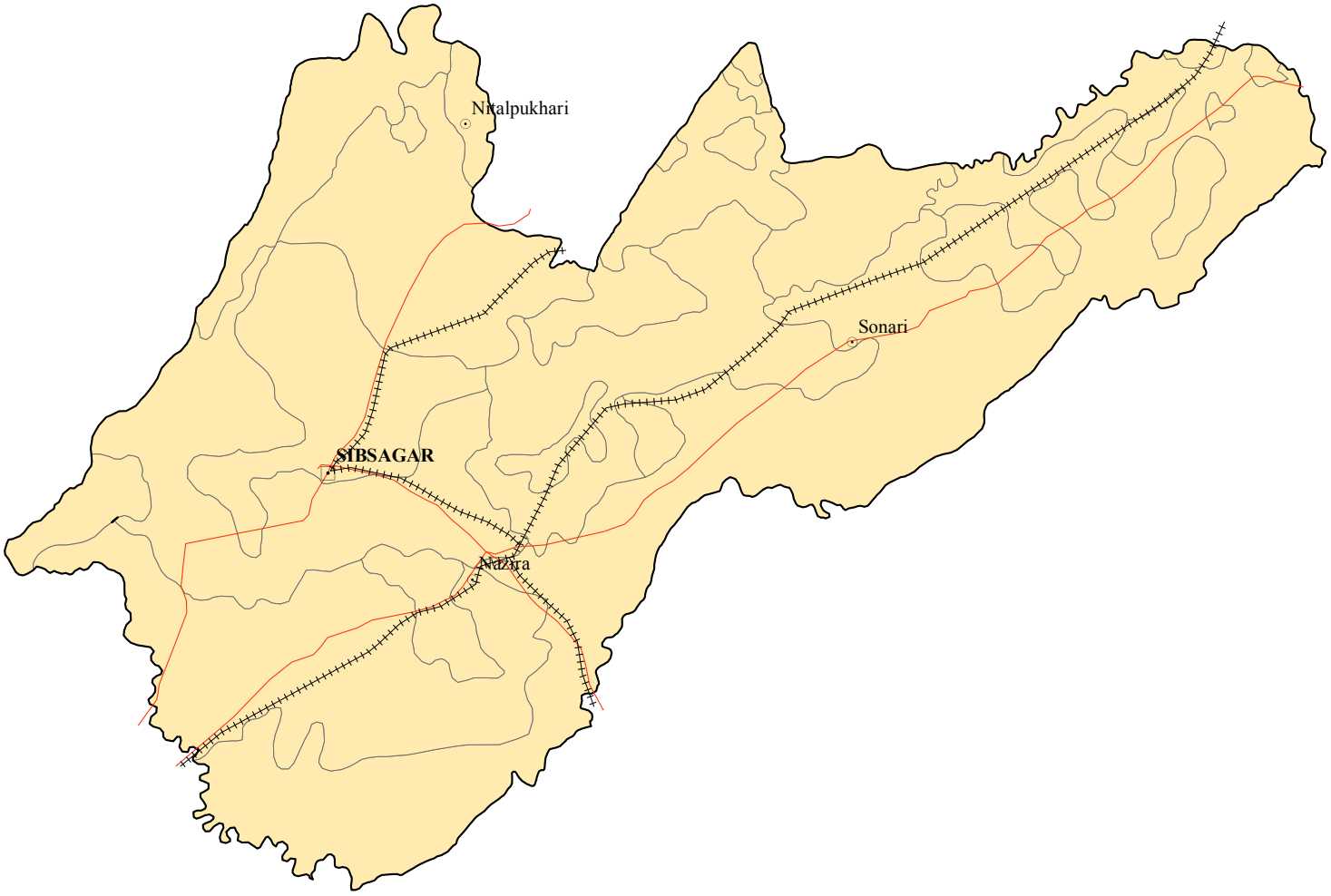


Fig. 9: Surface Form

SIBSAGAR

Soil Depth





References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

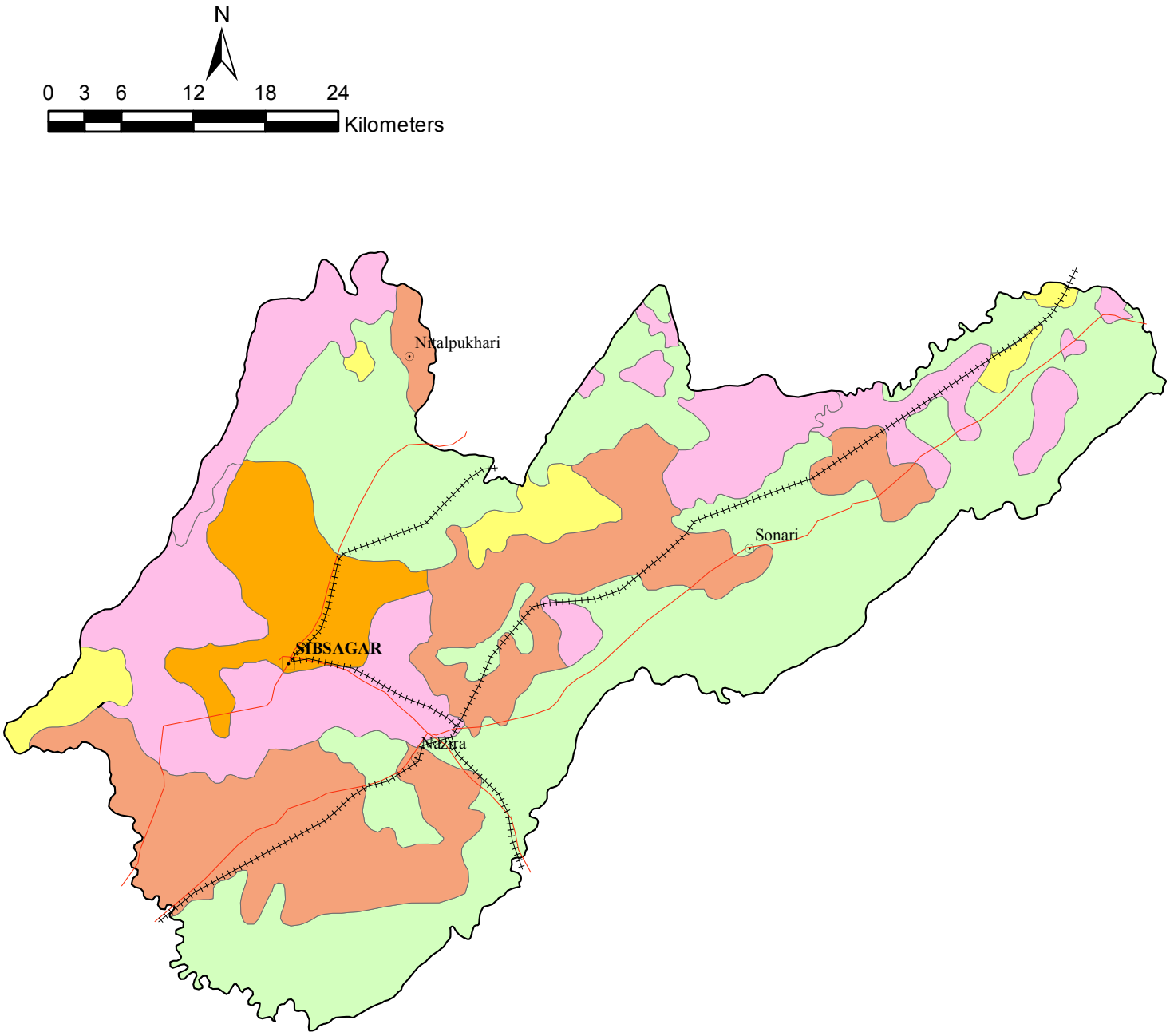
Legend

- Very deep

Fig. 10:Soil Depth

SIBSAGAR

Soil Drainage



Legend

- Imperfect-Moderately -well
- Moderately well-Imperfect
- Moderately well-Well
- Imperfect-Poor-Moderately well
- Imperfect-Poor

References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

Fig. 11: Soil Drainage

SIBSAGAR

Erosion

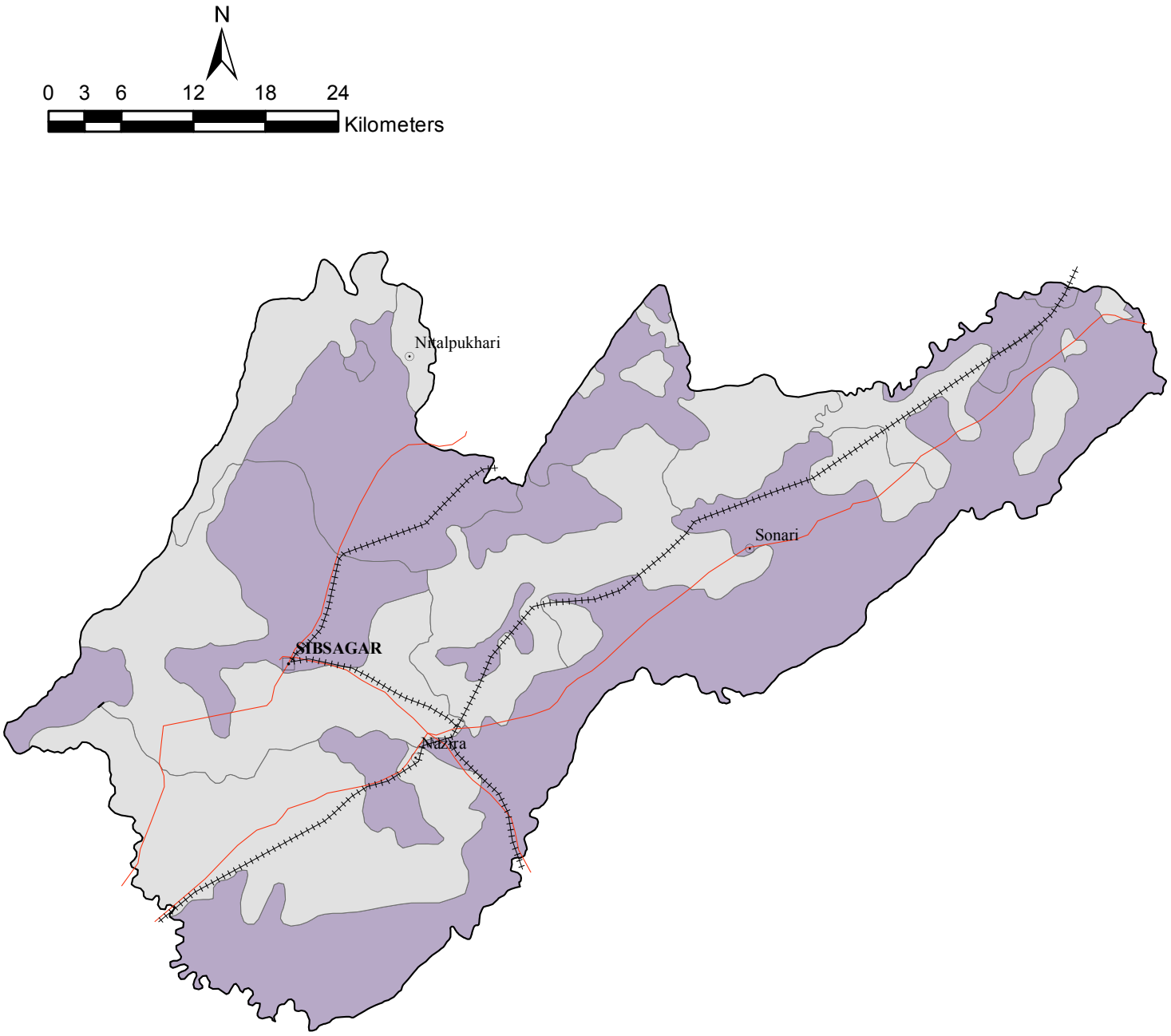
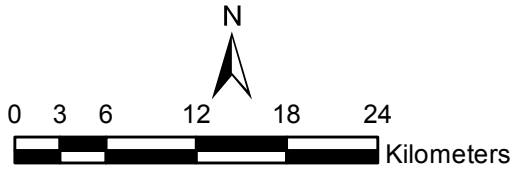
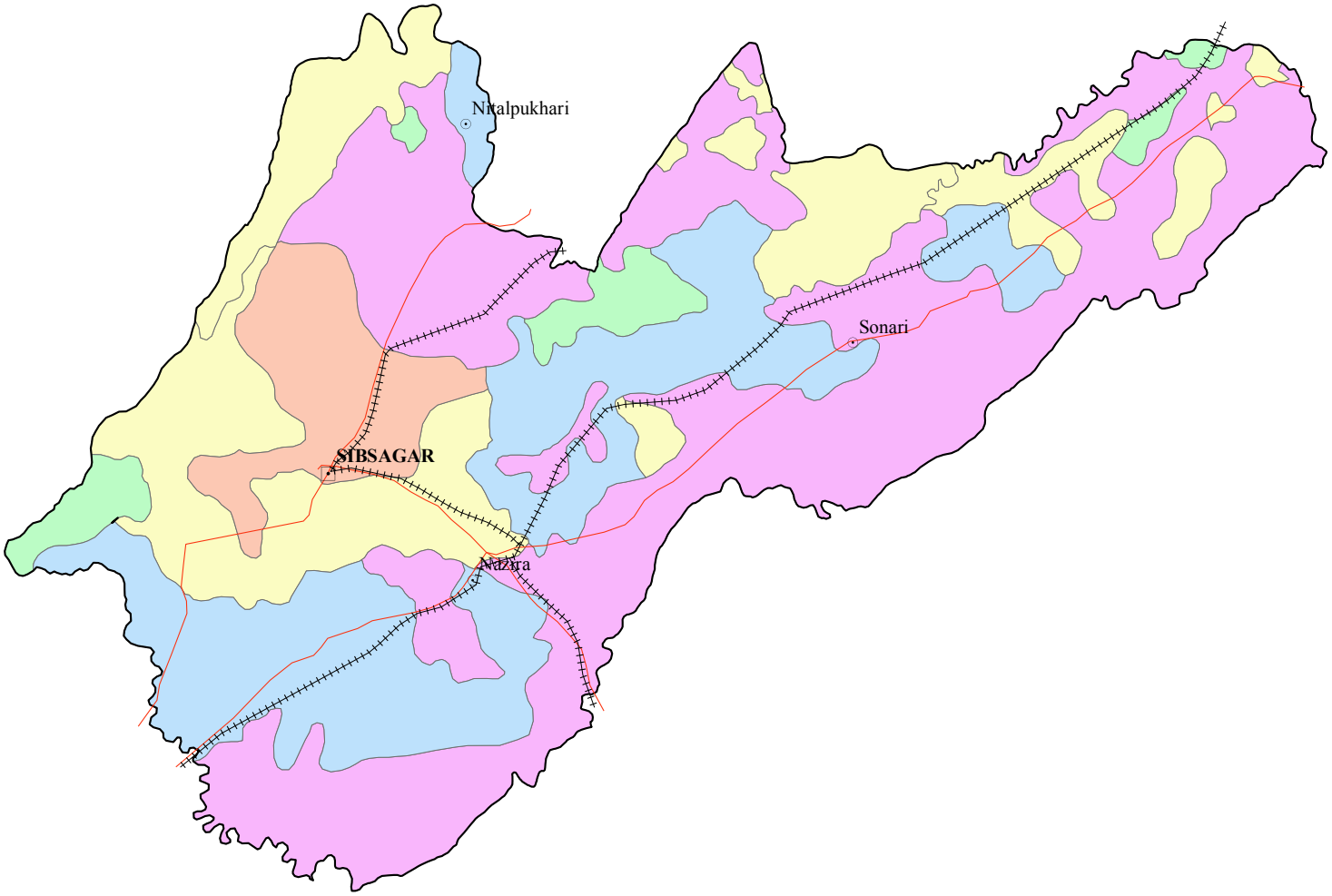


Fig. 12: Erosion

SIBSAGAR

Surface Texture





Legend

- Silty-Clayey-Loamy
- Loamy-Clay loam-Silty loam
- Silty loam-Silty Clay-Clayey
- Loamy-Silty clay loam-Clay loam-Sandy loam-Silty loam
- Clay loam-Silty clay-Silty loam-Silty clay loam

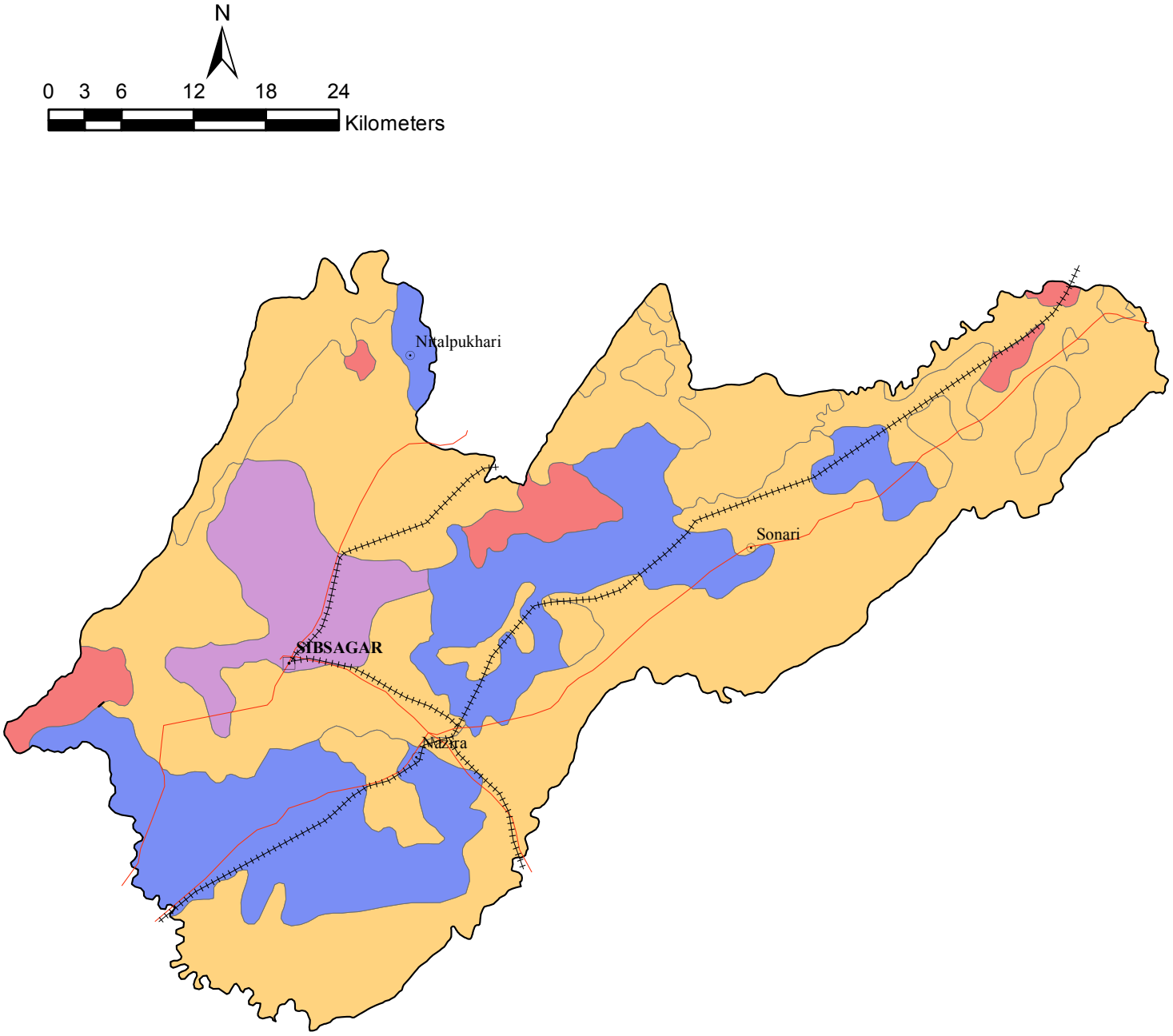
References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

Fig. 13: Surface Texture

SIBSAGAR

Particle Size Class



Legend

- Fine loamy-Coarse loamy
- Fine loamy-Fine
- Fine-Coarse silty-Fine loamy
- Fine-Fine loamy

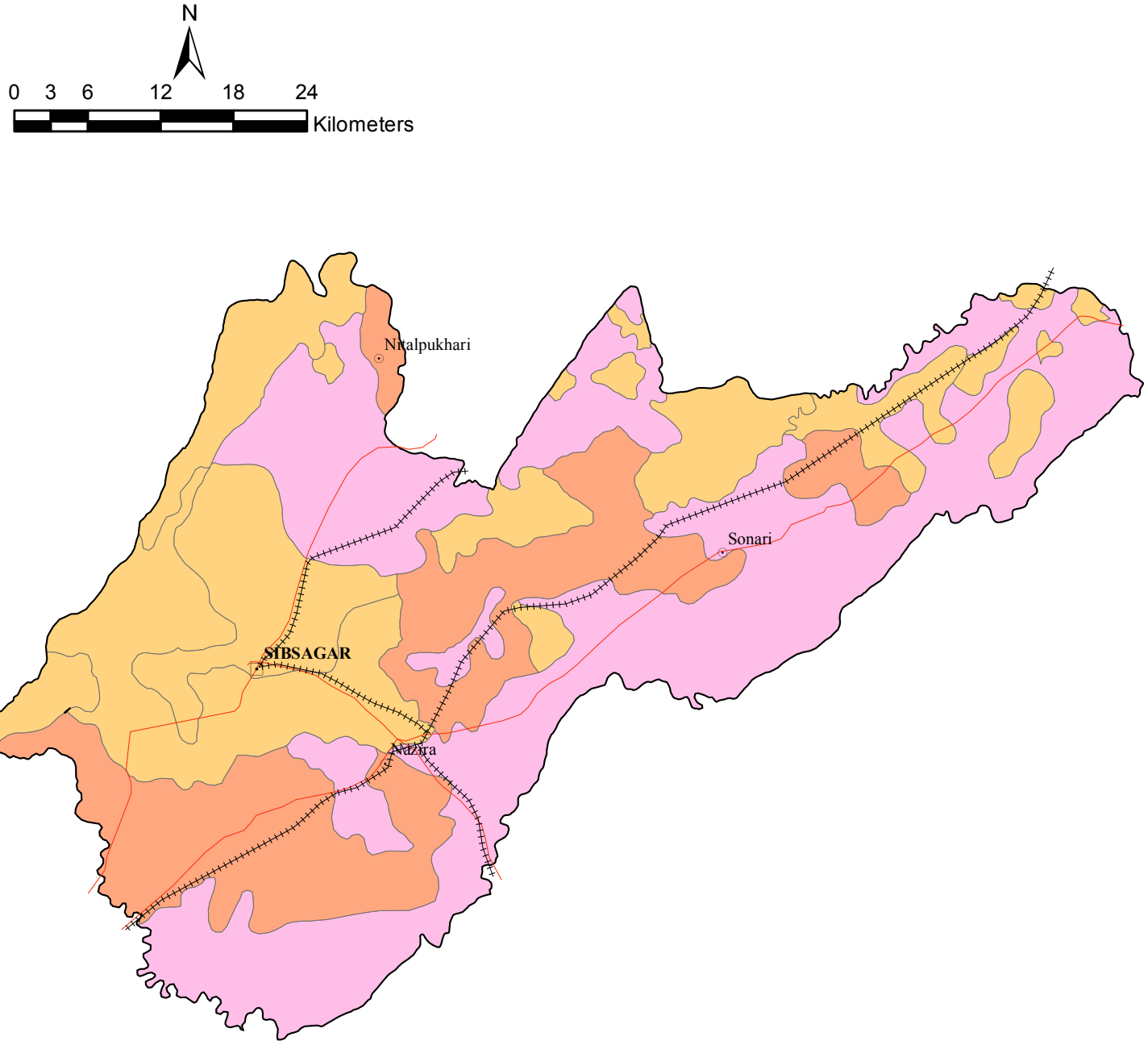
References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

Fig. 14: Particle Size Class

SIBSAGAR

Soil Reaction (pH)



Legend

- Moderately Acidic
- Strongly Acidic-Moderately Acidic
- Strongly Acidic

References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

4.2 Soil physiographic relationship:

Soils on the upland are deep but normally do not possess aquic moisture regime. These are poorly developed entisols or inceptisols with poor base status. A relatively higher physiographic position along with high rainfall in the state may be the reason for lower base status of these soils.

By and large, floodplains do not possess soils with aquic moisture regime, The Betbari Degaon soils are exception due to the presence of "Dah" meaning depression which might have influence the soil moisture regimes.

It is the low land soils, which have the problems of drainage as indicated by gleying, and mottles. The physiographic soil relationship is represented through a transect in Fig.16

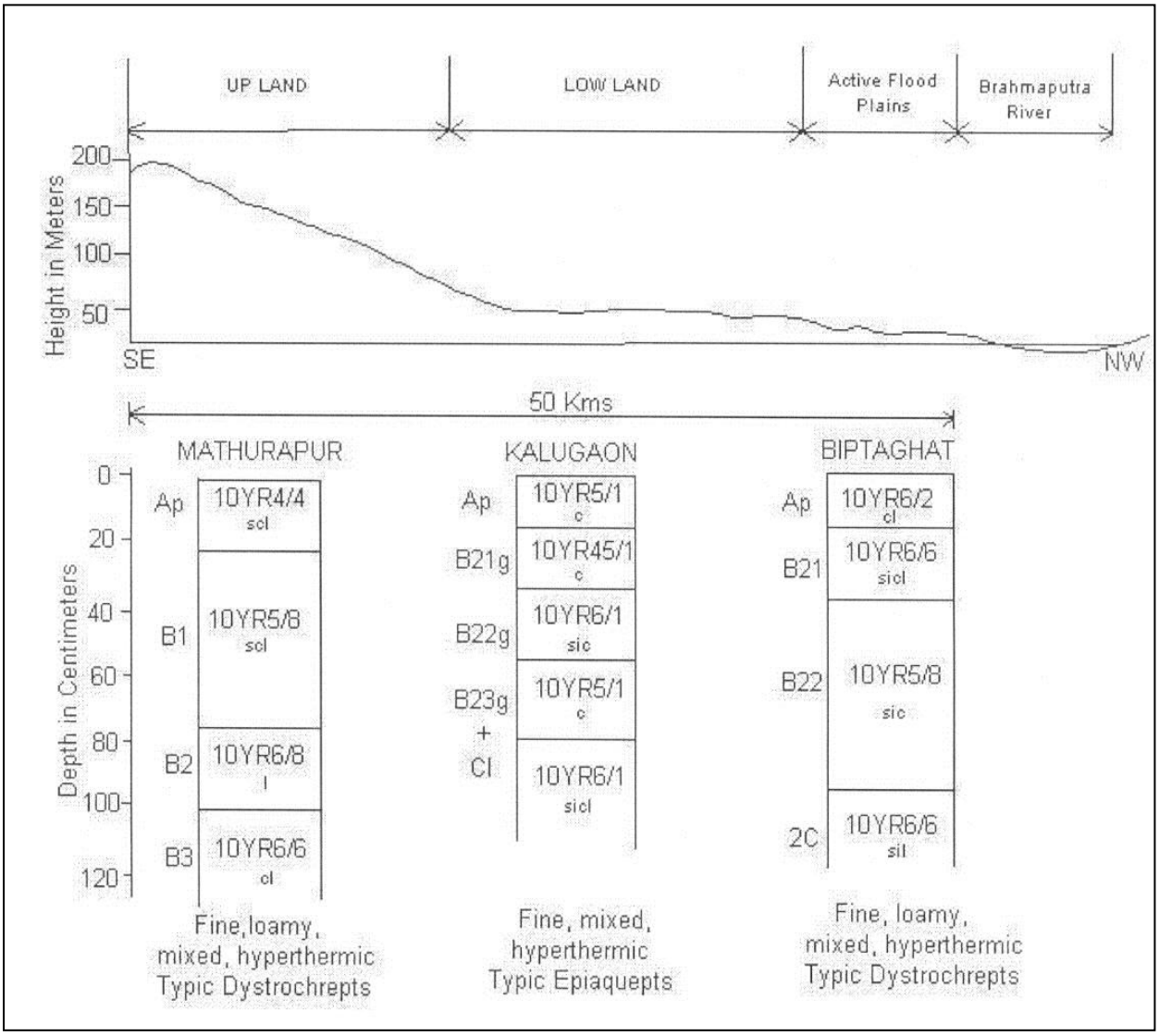


Fig. 16: Soil Physiographic Relationship in Sibsagar District, Assam

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4.3 Soil genesis and morphology:

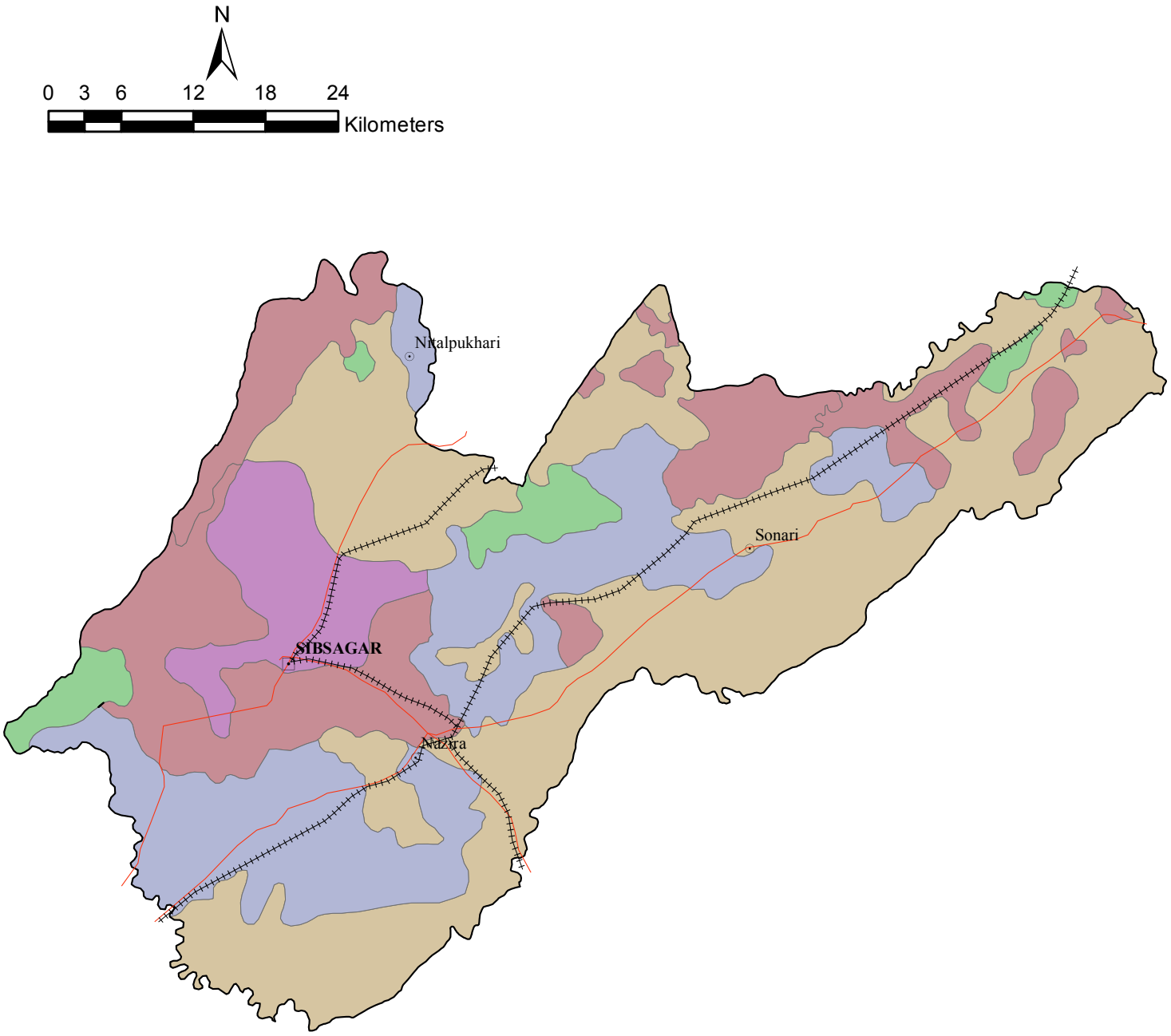
The uplands of the district have in places very deep weathering due to heavy rainfall and depending on the degree of profile development have developed either entisols or inceptisols. The soils are very deep but the level of base saturation is less probably due to leaching of bases down the profile, Most of these soils have been influenced by the colluvium deposits of the Naga hills. In general these areas are subject to annual and/or perennial water logging which is further aggravated by annual flooding by the Brahmaputra and its tributaries. The soil control section remains saturated with moisture due to topographical variations as well as the proximity of river and a reducing regime virtually free of dissolved oxygen is developed with characteristics redoximorphic features viz, gleying and mottles, Since these soils are saturated with water in one or more layers within 200 cm (in other words one or more layers remain unsaturated within that depth) this is termed as episaturation (Soil Survey Staff, 1994). Presence or absence of the well-developed structural B horizon indicates these soils to be grouped, under epiaquepts or epiaquents.

4.4 Soil classifications:

The different categories of Soil Taxonomy are orders, suborders, great groups, subgroups and families. They are differentiated according to the key shown in Table 4 and figure 17.

SIBSAGAR

Soil Taxonomy



Legend

- Dystric Eutrochrepts-Typic Fluvaquents-Typic Udorthents
- Dystric Eutrochrepts-Typic Udorthents
- Typic Dystrochrepts-Typic Kanhapludults
- Typic Epiaquepts-Typic Dystrochrepts
- Typic Fluvaquents-Typic Epiaquepts-Aquic Eutrochrepts

References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

Fig. 17: Soil Taxonomy

Orders are identified by the presence of one or more diagnostic horizons for mineral soils. The Suborders are characterized by the presence or absence of properties associated with wetness, soil moisture regime, major parent material and vegetation effects indicated by key properties. The great-groups are identified by the kind, arrangement and degree of expression of horizons with emphasis on the upper sequum, base status, soil temperature, soil moisture regimes and the presence or absence of diagnostic layers, The subgroups are based on properties indicating an intergradation to other great groups, suborders or orders. The soil series is a group of soil having soil horizons similar in differentiating characteristics and arrangement in the Profile and developed from the same or similar parent material, The soils within a series are essentially similar in all characteristics except in the texture of the surface horizon, slope, erosion and topographic position when these factors do not modify greatly the arrangement of horizons.

The soils occurring in the district with their taxonomic hierarchies are shown in Fig. 18.

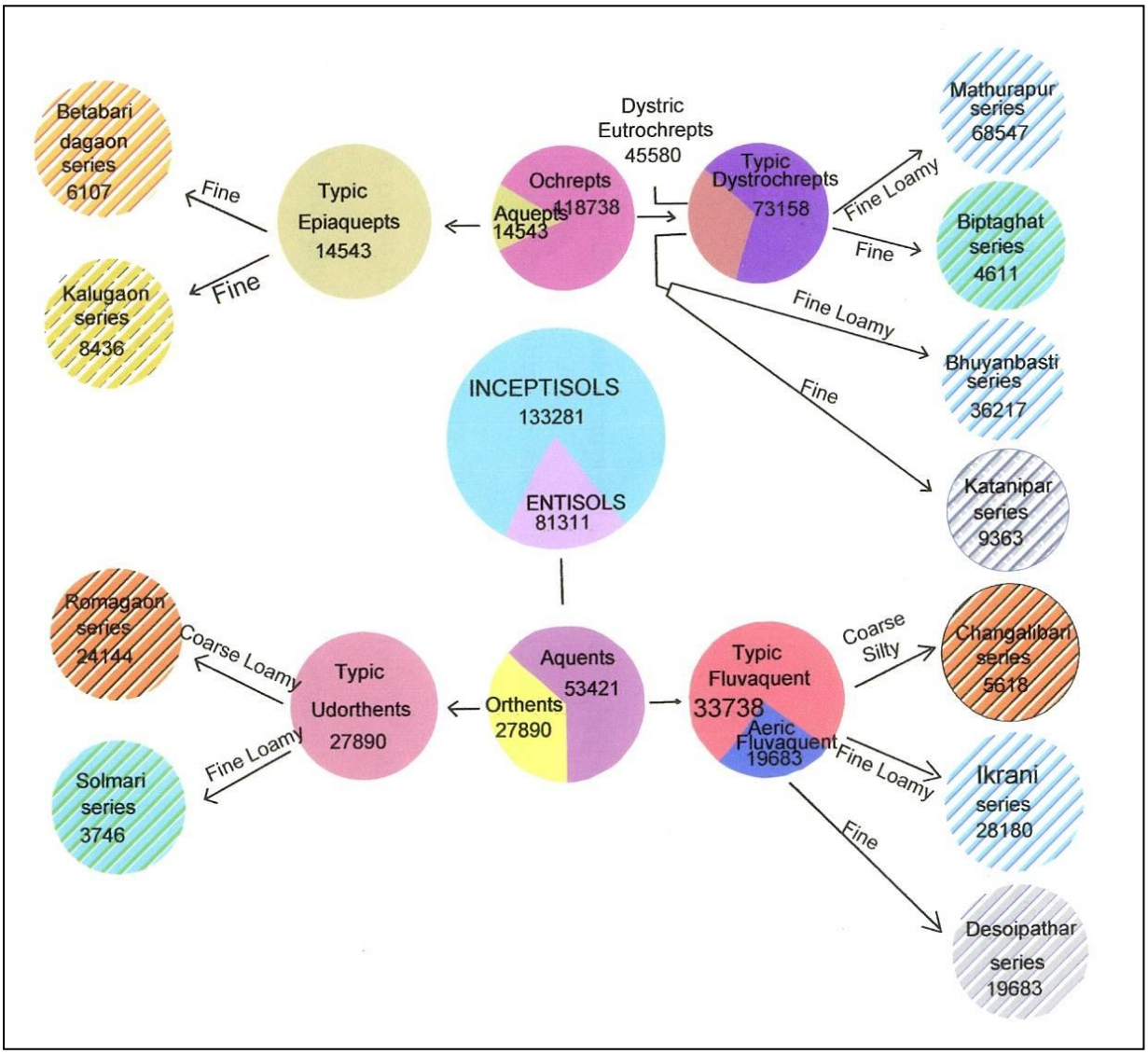


Fig 18: Soil and their taxonomy groupings in Sibsagar district,Assam(Area are in hectare)

Table-4. Simplified key to soil orders

If the soil has:	
1. More than 30% organic matter up to a depth of 40 cm	Histosols
2. Andic soil properties throughout sub horizons	Andisols
3. A spodic or placic horizon without plaggen epipedon	Spodosols
4. An oxic horizon within 2 m but has no argillic or natric horizon overlying the oxic horizon	Oxisols
5. Swell-shrink type clays having 30% or more clay to 1 m depth or to lithic/paralithic contact with deep cracks at 50 cm when dry/ slicknensides or gilgai micro-relief	Vertisols
6. An ochric or anthropic epipedon and either a calcic, gypsic, cambic or argillic horizon	Aridisols
7. An argillic or kandic horizon and base saturation of less than 35%	Ultisols
8. A dark colour and more than 50% base saturation with a mollic epipedon	Mollisols
9. An argillic or kandic horizon	Alfisols
10. An umbric, mollic or plaggen epipedon or a cambic horizon	Inceptisols
11. Other soils epipedon	Entisols

Orders occurring in the area studied are in bold letters. Sources: Sehgal, 1989 and Soil Survey Staff, 1994

5.

SOIL SURVEY INTERPRETATION FOR LAND USE PLANNING

5.1 principles of interpretations:

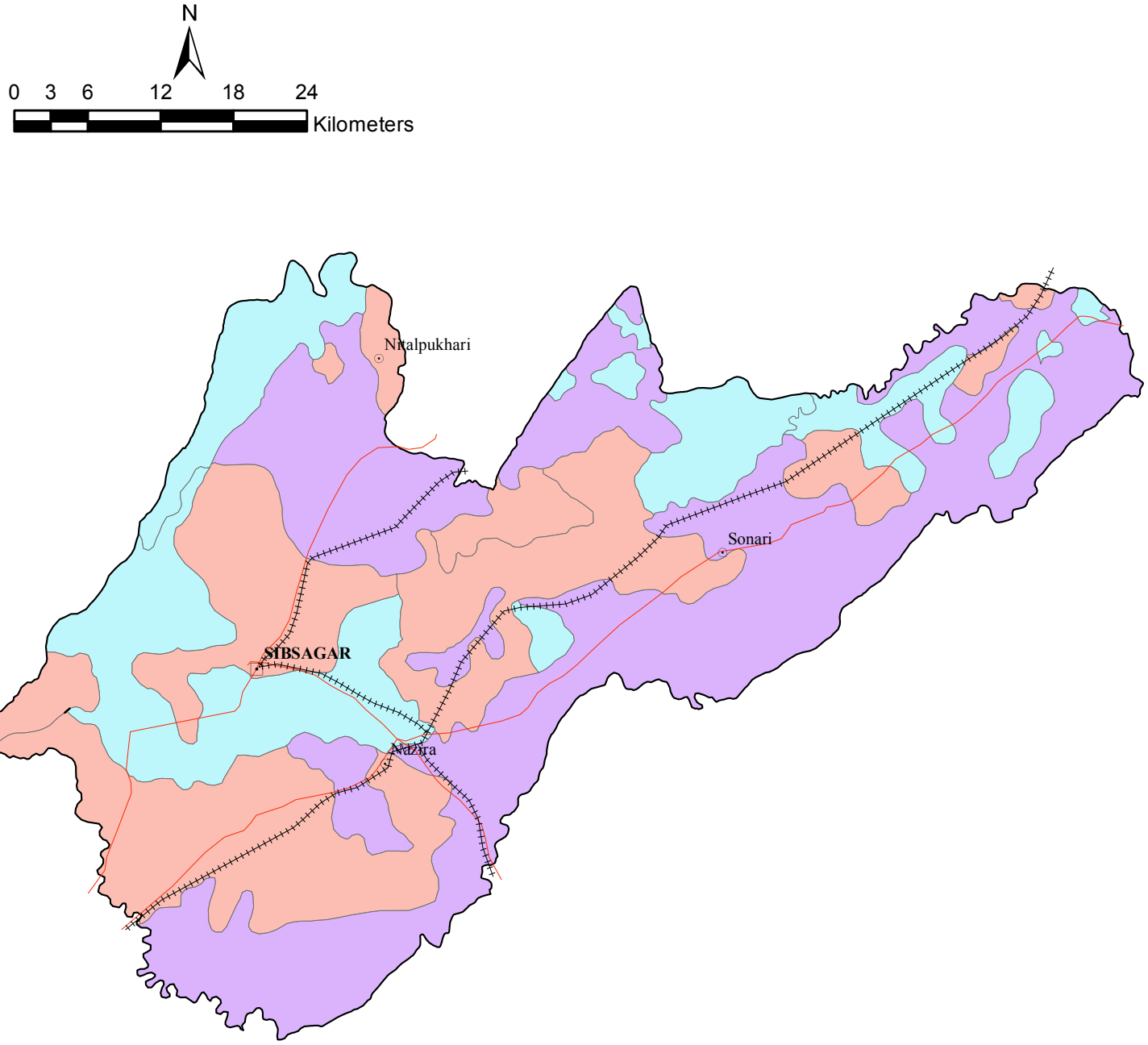
Reconnaissance soil surveys are carried out to identify and classify different soils occurring on different physiographic units and to prepare a soil map at the level of series associations. Soil series is the fundamental unit of soil classification as well as the basic unit for most soil mapping projects. This is also regarded as the largest landscape unit about which all features relevant to soil formations are distinguished. Soil series are distinguished on the basis of differentiating characteristics such as colour, texture, structure, consistence, reaction and other chemical and mineralogical properties of the horizons. These differentiating characteristics, which influence moisture and fertility status of the soils are important to assess different management responses and manipulation needed for growing crops or putting them under other uses. Soil survey usually includes interpretations of the finding for land use planning in the form of land capability or suitability classifications. The aim of these classifications is to guide planners in such a way that the resources of the environment are put to the most beneficial use. The role of soil survey is normally concerned with the physical assessment of land resources although this should always be seen in the broader context of land evaluation which is the process of estimating the potential of land for alternate uses.

5.2 Land capability classification:

The land capability classification is an interpretative grouping of different soil units and serves as an important role in land use planning to show the relative suitability of soils for cultivation of crops, pasture, forestry etc, in addition to focussing the problems, which need conservation measures. This also provides information for the management and improvement of different soils for increasing production. Class I to Class IV lands are suitable for cultivation, whereas class V to class VIII lands are unsuited to cultivation, but these can be utilised for pastures, plantations, forestry, recreation etc. Land capability classes are divided into subclasses to indicate the dominant limitation for agricultural use, such as ‘e’ for erosion and run off, 'w' for wetness, ‘s' for rootzone limitation and 'c’ for climatic limitation. The class and subclass provide the map use information about degree of limitations and kinds of problems for planning, conservation and similar purposes. Table 5 shows the land capability grouping, their description and extent of occurrence. Most of the lands are limited by the wetness of soils as evidenced by water logging due to depressions, poor drainage and consequent flooding by the river Brahmaputra and its tributaries, and are, therefore, grouped under class II land: depending on the severity of the wetness the land units were further subdivided into 1, 2 and 3 (Dent and Young, 1981). Most of these lands are suited for paddy and need drainage improvement (Fig. 19).

SIBSAGAR

Land Capability



Legend

- IIIes-IIIs
- IIw2-IIIw1
- IIw3

References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

Fig. 19: Land Capability

Table-5. Land capability classification, in Sibsagar District, Assam

Land capability grouping	Description	Soil series association	Area	
			ha	percent
IIIes-IIIs	Very deep, loam soils on moderately sloping undulating uplands with moderate erosion and poor base status, and very deep, clayey soils on gently sloping soils with poor base status with moderate erosion. These lands can be used for plantation crops.	Mathurapur-Naharbari	114245	43.9
IIw2-IIIw1	Very deep, silty clay to clay on nearly level to low-lying lands in the Brahmaputra floodplain subject to moderate stagnation of water during rainy season. Part of the low-lying lands experiences prolonged water stagnation and are limited by relatively high ground water table. The choice of crop is restricted to paddy only. These lands require immediate drainage improvement.	Betbari Degaon-Biptaghat Katanipar-Chengelibari-Solmari Bhuyanbasti-Romagaon	89806	34.5
IIw3	Very deep, silty clay loam to clay on nearly level to level old Brahmaputra alluvium subject to severe stagnation of water especially during the rainy season. These lands are limited by depressions (more so in the areas dominated by Kalugaon soils) and high ground water table, The choice of crops is restricted to paddy only. These lands require immediate drainage improvement.	Ikarani-Kalugaon-Desoipather	56239	21.6

5.3 Land irrigability classification:

The interpretations of soils and land conditions is concerned primarily with predicting the behaviour of soils under the greatly altered water regime brought about by introduction of irrigation. For irrigation projects, special interpretations and classification of soils for sustained use under irrigation are often required. The soils are first grouped into soil irrigability classes according to their limitations for sustained use under irrigation, regardless of their location. Soil irrigability classes are useful to make groupings of soils according to their suitability for sustained use under irrigation. The classes are defined in terms of the degree of soil limitations.

Soil irrigability classification is made on the basis of important soil characteristics viz, soil texture, depth, available water holding capacity, infiltration and permeability. Definitions of the five soil irrigability classes are as follows:

Soil irrigability class	Definitions
A	None to slight soil limitations for sustained use under irrigation
B	Moderate soil limitations for sustained use under irrigation
C	Severe soil limitations for sustained use under irrigation
D	Very severe soil limitations for sustained use under irrigation
E	Not suited for irrigation.

Criteria for classes are quantitatively defined and are exclusive in such a way that a soil can qualify for only one class. (All India Soil and Land Use Survey Organization, 1970, Booker Tropical Soil Manual 1984). The most limiting property is determined for classification. For example, a soil may have all the properties of the most desirable class except ones but on the basis of this one undesirable property it is assigned to a lower class.

The suitability of land for irrigation depends on physical and economic factors in addition to the soil irrigability class. The basic system is intended to reflect the payment capacity of the land to support agricultural production. Ideally as is illustrated in FAO, farm budgets are used for evaluating the costs and benefits, initially for the best land (class I). Less suitable land is then downgraded according to the economic effects of a number of physical land deficiencies acting singly or together these are considered under the basic headings soil (s), topography (t), and drainage (d).

The four main classes are

Class-1		
Class 2	Arable (Suitable for irrigation)	Increasing payment capacity from class 3 to class 1
Class-3		
Class 6	Non arable	

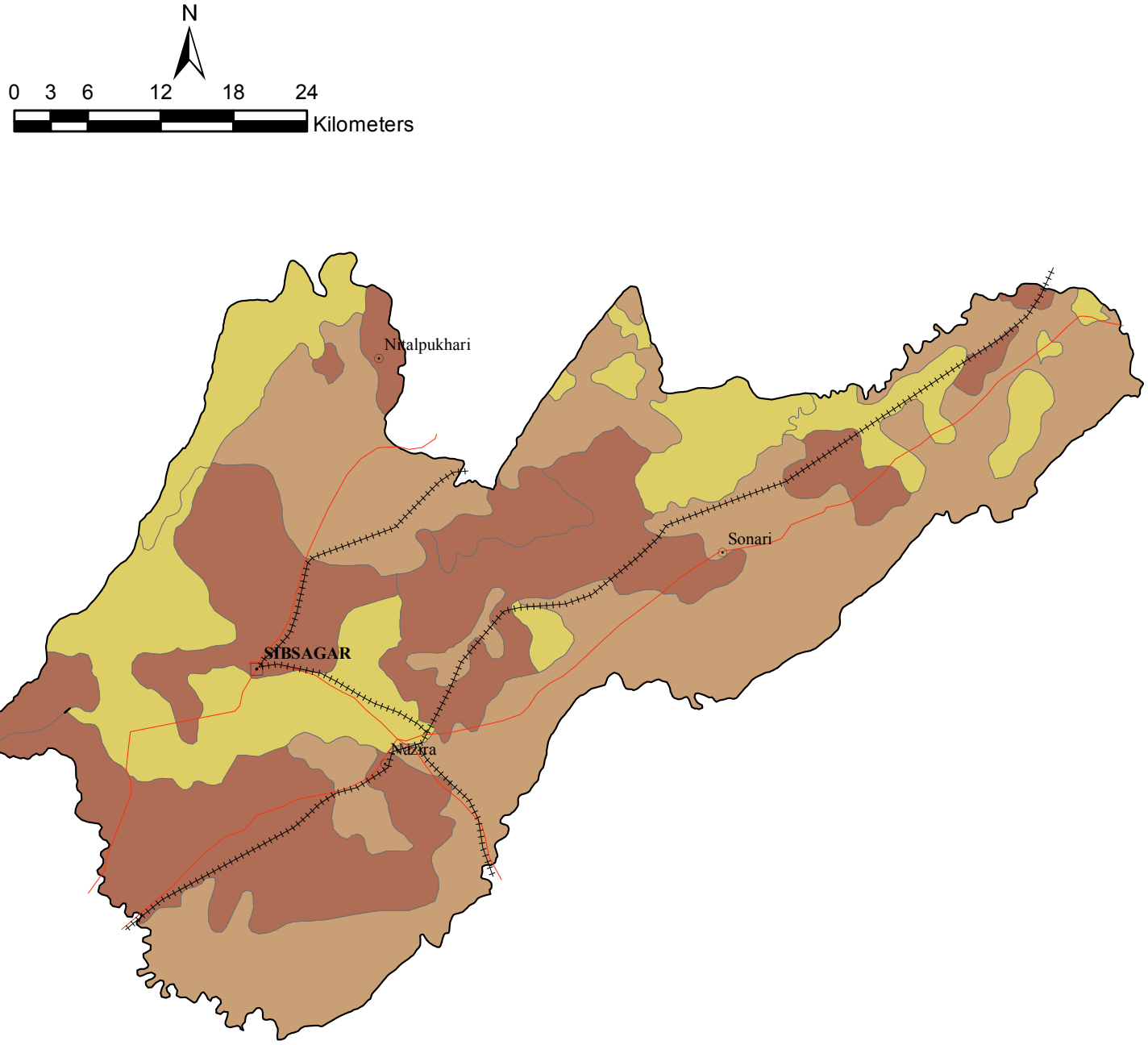
For detailed studies, two additional special classes are recognized

Class 4	Suitable for special use or restricted crop range.
Class 5	Temporarily non arable (Pending further study of problems)

In Sibsagar district three irritability subclasses were identified (Table 6). About 66 per cent area of the district comes under irritability class 2. Drainage is, by and large, the major limitation for irrigation. Both surface and subsurface drainage were restricted due to (1) very high ground water table due to depressions or due to the proximity of the drainage channels or other reservoirs and (2) sometimes poor infiltration rate of soils. About 44 per cent areas come under the uplands where slopes and soil limitations indicate the use of drop irrigation for profitable farming of tea. Fig.20 shows the land irritability groupings of the district

SIBSAGAR

Land Irrigability



Legend

- 2d
- 2ds
- 3st

References

- District HQ
- Tehsil HQ
- District Boundary
- Road
- Railway
- Drainage

Fig. 20: Land Irrigability

Table-6 Land Irrigability Classification in Sibsagar district, Assam

Land irrigability subclass	Soil irrigability class	Description	Soil series association	Area	
				ha	Percent
2d	B	Land with a gradual slope of 1-3%. The soils are very deep, friable and imperfectly to poorly drained. The top soils consist of loam to silty loam to a depth 20-30 cm. Available water holding capacity (AWC) is medium to high. Dry season ground water table (GWT) lies between 2-5 m. These lands are considered as moderately suitable for irrigated farming because of high GWT with high AWC.	Bhuyanbasti-Romagaon Betbaridegaon-Biptaghat Katanipar-Chengalibari-Solmari	89806	34.5
2ds	B	These lands possess moderate limitation of both drainage and soils; It consists of fine loamy to fine textured soils with imperfect to poor drainage. Hydromorphic features in the form of mottles and iron-manganese concretions are common due to prolonged reduced conditions, The soils have both medium to high AWC. Dry season ground water table (GWT) lies between 2-3 m and often strikes within 1.5 m. These soils are suited for paddy.	Ikarani-Kalugaon-Desoipather	56239	21.6
3st	B	These lands are suitable for irrigation with special arrangement of drips for the plantation crops viz, tea. Slope is the major limitation followed by poor base status of these soils	Mathurapur-Naharbari	114245	43.9

6.

PROBLEMS AND POTENTIALS

The soils of Sibsagar district can broadly be grouped into three so far as physiographic location is concerned. These are:

a. the soils of uplands

b. the soils of the lowlands and

c. the soils of the floodplains.

The problems and potentials of the soils are discussed under the following heads:

a. the soils of uplands:

These soils are prone to erosion at places and due to continuous leaching of the bases some of these soils require heavy fertilization especially for crops like tea and other plantation crops, Due to the physiographic location many of these areas are well drained and as such does not pose drainage problem. Tea crop are well suited for these areas.

b. the soils of the lowlands:

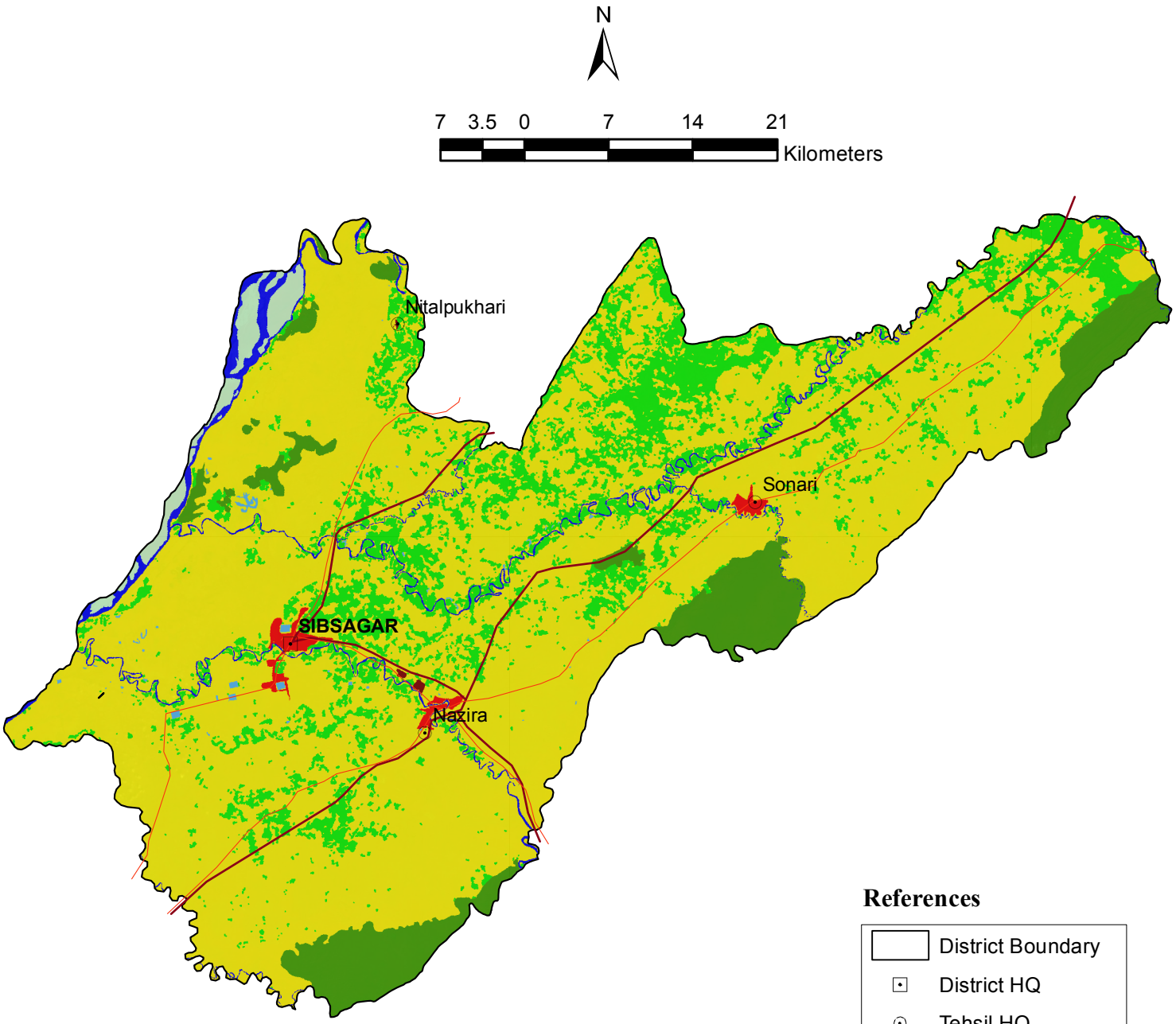
Perennial and seasonal water loggings are the major constraints of these soils. Besides, the high ground water level 'often adds to the problem of internal drainage. These soils are well suited for deep water paddy.

c. the soils of the floodplains:

Most of the soils fall in this category. The soils are loamy textured and in general, do not pose drainage problems. These are graneries of the district and are profitably used for the production of cereals. During the rabi season pulses and vegetables should have a good prospect if irrigation facilities are made available.

SIBSAGAR

Land Use/Land Cover
2003



References

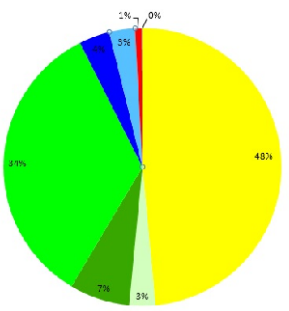
- District Boundary
- District HQ
- Tehsil HQ
- Road
- Railway

Legend

Classes	Area [sq.km]
Agriculture	
Agriculture, Cropland	1261
Builtup	
Built-up, Rural	2
Built-up, Urban	20
Forest	
Forest, Deciduous	885
Forest, Evergreen	182
Grass	79

Classes	Area [sq.km]
Water	
Wetlands/Water Bodies, Reservoir/Lakes/Ponds	78
Wetlands/Water Bodies, River/Stream/Canals	93

LULC (2003): Area Statistics for Sibsagar District
Total Geographic Area: 2600 sq.km



Note: Refer Legend for Category

Data Source: Landsat ETM+ Satellite data of Kharif (2003) and Rabi (2003), SRTM DEM, Existing Soil Maps & Reports (NBSS & LUP), and other Statistical Data

Fig. 21: Land Use/Land Cover 2003

7.

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8

LIST OF CONTRIBUTORS

Progressive Reconnaissance Soil Survey of Sibsagar District, Assam, 1: 50,000

G.S. CHAMUAH	Soil mapping, collection and organisation of data, correlation, classification, interpretation, review and write-up.
C.S. WALIA	Soil mapping, collection and organisation of data, soil analysis.
K. M. NAIR	Soil mapping, collection of data.
UTPAL BARUAH	Cartography and review of land forms.
T. BHATTACHARYYA	Reclassification of soils, compilation of data and maps, rewriting the report.

APPENDIX – I

1. MATHURAPUR SERIES Identified series

Mathurapur series is a member of fine loamy, mixed, hyperthermic Typic Dystrochrepts. Mathurapur soils have dark brown to dark yellowish brown very strongly acidic, silt loam A horizons and yellowish brown to brownish yellow strongly acidic silt loam B horizons.

Typifying pedon: Mathurapur sandy clay loam-cultivated

Ap 0-22 cm. --- Dark yellowish brown (10YR 4/4 M) sandy clay loam; moderate fine granular and sub angular blocky structure; friable, slightly sticky and plastic: many fine fibrous roots: pH 4.9; clear smooth boundary.

B1 22-77 cm --- Yellowish brown (10YR 5/8 M) sandy clay loam; moderate medium sub angular blocky structure; friable, sticky and plastic; many fine prominent yellowish red (5YR 4/6) mottles; common fine fibrous roots; pH 5.0, clear smooth boundary.

B2 77-100 cm --- Brownish yellow (10YR 6/8 M) loam; moderate, medium to coarse sub angular blocky structure; friable, sticky and plastic; many fine iron-manganese concretions; prominent light grey (10YR 7/1) mottles; few fine fibrous roots; pH 5.2; gradual smooth boundary.

B3 100-150 cm --- Brownish yellow (10YR 6/6 M) clay loam; strong medium sub angular blocky structure; friable, sticky and plastic common fine to medium distinct light grey (10YR 7/2) mottles; few fine fibrous roots; pH 5.0.

Type location: Mathurapur Tea Estate, P.S. Sonari, District Sibsagar, Assam.

Range in Characteristics: The thickness of the solum is more than 100. The A horizon is 20 to 40 cm thick. The colour is in hue 10YR, value 4 to 5 and chroma 4 to 6. The texture is silt loam and structure is granular to sub angular blocky. The B horizon is more than 60 cm thick. It has hue 10YR, value 5 to 6 and chroma 6 to 8. Distinct mottles and iron-manganese concretions are present. Its texture is silt loam to silty clay loam.

Competing series and their differentiae: These are soils of Biptaghat series which are fine loamy Typic Dystrochrepts,

Geographic settings: Mathurapur soils have developed on alluvium on nearly level lands at an elevation of 180 m above MSL. The climate is humid subtropical with mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7 °C MSST 27.6 °C and MWST is 17.9 °C. The water table is generally at a depth of about 1.5 m.

Geographically associated soils: These are soils of Naharbari series which are fine Typic Kanhapludalfs.

Drainage and permeability: Moderately well drained with moderately slow permeability.

Use and vegetation: Cultivated for tea, natural vegetation,

Distribution and Extent: Extensive in the flood plains of the district.

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretations: Mathurapur soils have good air-water relationship.

Interpretative grouping:

i) Land capability sub-class IIwl
ii) Irrigability sub-class 2sd
iii) Productive potential High

Soil Series: MATHURAPUR
Classification: Typic Dystrochrept

Location: District Sibsagar, Assam
Analysis at: NBSS & LUP Regional Centre, Jorhat
Sampling Date: 1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-22	50.5	25.6	24.5	-	0.6	22.7	14.4	12.7	21.0	3.9
B1	22-77	54.0	20.5	25.5	-	0.7	22.7	16.7	13.8	14.6	5.9
B2	77-100	43.5	30.5	26.9	-	0.5	14.4	16.0	12.4	17.3	13.2
B3	100-150	43.0	29.6	27.4	-	1.2	16.1	13.0	12.7	23.9	6.4

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	0.60	4.9	1.2	1.7	0.5	0.2	3.62	2.1	1.5	9.6	38
B1	0.37	5.0	1.2	1.4	0.4	0.1	3.1	2.5	1.6	8.8	35
B2	0.11	5.2	1.1	1.7	0.4	0.1	2.6	2.6	1.9	7.9	32
B3	0.19	5.0	1.2	1.1	0.4	0.1	2.8	1.3	1.8	8.4	44

2. NAHARBARI SERIES Identified series

The Naharbari series is a member of fine, mixed, hyperthermic family of Typic Kanhapludults. Naharbari soils have light yellowish brown to yellowish brown, acidic clay loam A horizon underlain by brownish yellow mottled, neutral silty clay loam C horizon.

Typifying pedons Naharbari clay loam-cultivated

Al 0-21 cm --- Light yellowish (10YR 6/4 M) clay loam; medium, moderate sub angular blocky structure; firm, sticky and plastic; many very fine roots: pH 4.8; abrupt smooth boundary.

B21 21-40 cm --- Brownish yellow (10YR 6/8) clay; medium moderate sub angular blocky structure; firm, sticky and plastic: many very fine roots; pH 4.7; clear smooth boundary.

B22 40-96 cm --- Light brownish grey (10YR 6/2) clay, medium moderate sub angular blocky structure; firm, sticky and plastic; common very fine roots; few soft iron ;manganese concretions; few fine faint light grey (7.5 YR 7/1) mottles; pH 4.8, gradual smooth boundary.

Clg 96-155 --- Light grey (7.5YR 7/1M) sandy clay loam; medium moderate sub angular blocky structure: friable, sticky and plastic; many hard iron concretions; many coarse prominent light olive brown (2.5YR 5/4) mottles; pH 4.9.

Type location: Naharbari Tea Estate, P.S. Naharbari, District Sibsagar, Assam.

Range in characteristics: The A horizon is about 30 cm thick. Its colour is in hue of 10YR, value ranges from 5 to 6 and chroma 4 to 6. Its texture ranges from silty clay to clay and structure is sub-angular blocky. The C horizon is variable in texture from silty clay loam to silty clay. The colour of the C horizon is in hue of 10YR to 7.5YR, value 6 to 7 and chroma 2 or less, Mottles are observed in C horizon,

Geographic setting: Naharbari soils have developed in alluvium on nearly level to gently sloping uplands at an elevation of about 50 m above MSL, The climate is humid subtropical with mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7 °C, MSST 27.6 °C and MWST is 17.9 °C.

Geographically associated soils: These are soils of Mathurapur which are sandy clay loam Typic Dystrochrepts.

Drainage and permeability: Imperfectly drained with slow permeability.

Use and vegetation: Cultivated for teat natural vegetation.

Distribution and extents: Extensive in the district of Sibsagar, Assam.

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretations: The soils are fine and situated in uplands. They are well drained and have good air-water relationship and the response to management is favourable. Under irrigation, they are suitable for wheat, vegetables and mustard.

Interpretative grouping:

i)	Land capability sub-class	IIs
ii)	Irrigability sub-class	2d
iii)	Productive potential	Medium

Soil Series: NAHARBARI

Classification: Typic Kanhapludult

Location: District Sibsagar, Assam

Analysis at: NBSS & LUP Regional Centre, Jorhat

Sampling Date: 1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-21	30.5	37.0	32.5	-	-	1.2	11.0	10.2	23.6	8.4
B21t	21-40	21.0	33.5	45.5	-	-	0.8	7.0	13.2	26.6	7.4
B22t	40-96	26.7	22.3	51.0	-	2.12	3.5	7.0	18.8	14.6	9.7
Clg	96-153	50.5	17.9	31.6	-	1.76	5.6	14.0	29.2	13.7	4.0

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	0.8	4.8	1.0	0.5	0.4	0.1	2.6	4.9	2.6	4.5	43
B21t	0.4	4.7	1.2	0.2	0.4	0.1	2.0	4.7	1.5	6.0	33
B22t	0.1	4.8	1.2	0.7	0.5	0.1	2.5	2.9	1.8	8.0	32
Clg	0.1	4.9	0.5	0.6	0.4	0.1	1.6	2.0	1.3	6.7	24

3. DESOIPATHER SERIES Identified series

The Desoipather series is a member of fine, mixed, hyperthermic Aquic Eutrochrepte, The soils have light brownish grey to yellowish brown slightly acidic silt loam to silty clay loam A horizons underlain by brownish yellow to very dark greyish brown distinctly mottled silty clay loam C horizons.

Typifying pedon: Desoipather loam-cultivated.

Ap 0-20 cm --- Light brownish grey (10YR 6/2 M) loam, weak medium sub angular blocky structure: firm and sticky: many fine and medium roots; pH 4.91 abrupt smooth boundary.

CI 20-56 cm --- Brownish yellow (10YR 6/6 M) silty clay loam; moderate medium blocky structure: firm, sticky and plastic; few very fine and fine roots; common fine to coarse hard iron manganese concretions; common medium prominent yellowish red (5YR 6/8) mottles; pH 5.5, gradual smooth boundary.

C2 56-89 cm --- Yellowish brown (10YR 5/8) silty clay loam, moderate medium sub angular blocky structure: firm, very sticky and very plastic; few fine to coarse slightly hard iron manganese concretions: common medium prominent yellowish red (5YR 6/8) mottles: pH 6.0; gradual smooth boundary.

C3 89-116 cm --- Yellowish brown (10YR 5/4 M) silty clay, moderate medium sub angular blocky structure: firm-, sticky and plastic; many dark brown soft iron manganese concretions; many coarse faint yellowish brown (10YR 5/8) mottles; pH 6.4; abrupt smooth boundary.

C4 116-130 cm --- Brownish yellow (10YR 6/6 M) silty clay loamy moderate medium sub angular blocky structure; firm, sticky and Plastic; few irregular iron manganese concretions; many coarse prominent yellowish red (5YR 5/8) mottles. pH 6.8.

Type locations Village Desoipather, P.S. Moran, District Sibsagar, Assam.

Range in characteristics: The A horizon is about 18 cm thick. Its colour is in hue of 10YR, value 5 to 6 and chroma 2 to 4. The texture ranges from silt loam to silty clay loam. The texture of the B horizon is silty clay loam to silty clay. Its colour is in hue of 101 YR, value 5 to 6 and chroma 4 to 6, Mottles and iron-manganese concretions are common in C horizons.

Geograpphic setting: Desoipather soils have developed in alluvium on the old floodplain of the Brahmaputra river on nearly level to level lands at an elevation of 105 m above MSL. The climate is humid sub-tropical with mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7 °C. MSST is 27.6 °C and MWST is 17.9 °C.

Geographically associated soils: These are the soils of Ikarani and Desoipather which are fine loamy Typic Fluvaqu ents and Aquic Eutrochrepts respectively.

Drainage and permeability: Imperfectly drained with slow permeability.

Use and vegetations: Intensively cultivated for paddy.

Distribution and extents: Extensive in the floodplain of the river Brahmaputra in Sibsagar district, Assam.

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional centre; Jorhat, Assam, 1984.

Interpretation: The soils are fine textured and situated in low-lying conditions. They are imperfectly drained and subject to hydromorphic conditions. These soils are better suited for paddy.

Interpretative grouping:

i)	Land capability sub-class	IIw2
ii)	Irrigability sub-class	2sd
iii)	Productive potential	High

Soil Series: DESOIPATHER

Classification: Aquic Eutrochrept

Location: District Sibsagar, Assam

Analysis at: NBSS & LUP Regional Centre, Jorhat

Sampling Date: 1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-20	29.9	46.1	24.0	-	-	3.5	7.4	19.0	23.4	22.6
B1	20-56	18.0	48.4	33.6	-	-	1.4	3.6	13.2	25.2	23.2
B21	56-89	14.0	44.7	41.3	-	0.41	0.9	3.3	9.4	23.8	21.0
B22	89-116	18.1	39.6	42.3	-	-	2.1	4.5	11.5	3.5	36.2
B23	116-130	9.0	52.6	38.4	-	-	1.0	1.4	6.5	17.5	35.1

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	2.5	4.9	1.0	3.9	0.6	0.2	5.7	1.4	2.0	6.8	82
B1	0.7	5.5	1.3	2.9	0.5	0.1	5,9	0.5	0.7	8.3	58
B21	0.5	6.0	1.4	3.4	0.6	0.1	5.5	0.1	0.2	3.2	60
B22	0.4	6.4	1.8	4.3	0.5	0.1	6.8	0.1	0.1	10.0	68
B23	0.2	6.8	1.9	4.9	0.7	0.1	7.7	Tr	Tr	12.3	62

4. IKARANI SERIES Identified series

The Ikarani series is a member of fine loamy, mixed, hyperthermic Typic Fluvaquents. Ikarani soils have grey to dark yellowish brown, mottled, strongly acid, silty A horizons over dark grey to very dark grey, mottled, slightly acidic to neutral, silty clay loam to clay loam C horizons.

Typifying pedons: Ikarani silt-cultivated.

Apg 0-18 --- Grey (10YR 5/1 M) silt; weak fine sub angular blocky structure; firm, sticky and plastic; many fine roots; many medium distinct brownish yellow (10YR 6/6) mottles; pH 4.8; gradual smooth boundary.

Al2 18-44 cm --- Dark reddish brown (5YR 3/2 M) clay, weak fine, sub angular blocky structure, firm and sticky; many fine roots; many coarse prominent reddish brown (5YR 5/6) mottles; pH 4.7; abrupt smooth boundary.

C1g 44-80 cm --- Very dark grey (5YR 3/1 M) clay; weak medium sub angular blocky structure; firm, sticky and plastic; few fine roots; many medium distinct dark grey (5YR 4/1) mottles; pH 4.9; gradual smooth boundary.

C2g 80-125 cm --- Grey (5YR 6/1 M) clay loam/ coarse medium, sub angular blocky structure, very sticky, many coarse prominent brownish yellow (10YR 6/8) mottles; pH 4.8.

Type location: Village Ikarani, P.S. Sorhat, district Sibsagar, Assam.

Range in characteristics: The soils are very deep and under udic moisture regime. The A horizon is about 18 cm thick. Its texture varies from sandy loam to silty clay loam. The colour of A horizon is in hue 10YR, value 5 to 6 and chrana 1 to 2. The underlying C horizon grades with different texture with lithological discontinuity, The colour of the C horizons ranges from grey to very dark grey in hue 5YR, value 3 to 6 and chroma 1.

Competing series and their differentiae: These are Chengalibari soils which are coarse silty Typic Fluvaquents.

Geographic setting: The soils of Ikarani are developed in alluvium and occur on nearly level floodplains at an elevation of 150 m above MSL. The climate is humid subtropical with mean annual air temperature of 23.7°C and mean annual rainfall of 2504 mm, The estimated MAST is 24.7°C MSST is 27.6°C and MSST is 17.9°C.

Geographically associated soils: These are soils of Kalugaon and Desoipather which are Typic Epiaquepts and Aerie Fluvaquents respectively.

Drainage and permeability: Imperfectly drained with moderately slow permeability.

Use and vegetation: Cultivated to paddy. Natural vegetation - babul, (Acacia sp). fig (Ficus sp.).

Distribution and extents: Extensive in the Sibsagar district, Assam,

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1986.

Interpretations: The soils are imperfectly drained and situated in low-lying lands suitable for rice cultivation in Kharif season.

Interpretative grouping:

i)	Land capability sub-class	IIw3
ii)	Irrigability sub-class	2sd
iii)	Productive potential	High

Soil Series: IKARANI

Classification: Typic Fluvaquent

Location: District Sibsagar, Assam

Analysis at: NBSS & LUP Regional Centre, Jorhat

Sampling Date: 1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Apg	0-18	11.5	85.1	3.36	-	0.7	0.24	1.2	9.4	10.6	74.0
A12	18-44	22.5	30.0	47.5	-	1.6	5.2	5.3	10.3	4.0	26.0
C1g	44-80	17.5	35.9	46.6	-	1.5	5.4	1.6	25.0	23.7	12.2
C2g	80-125	15.6	38.4	46.0	-	1.8	6.5	2.2	26.0	28.0	18.0

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Apg	2.2	4.8	1.9	4.0	0.2	0.5	6.7	4.0	3.9	8.2	81
A12	1.0	4.7	1.0	2.9	0.1	0.2	4.3	1.5	1.0	7.0	60
C1g	2.9	4.9	1.3	1.0	0.2	0.3	3.7	1.8	1.2	6.3	60
C2g	1.9	4.8	1.3	2.3	0.1	0.2	3.9	1.4	1.5	5.5	71

5. CHENGALIBARI SERIES Identified series

Chengalibari series is a member of coarse silty, mixed, hyperthermic Typic Fluvaquents. Chengalibari soils have grey strongly acid clay loam A horizon, grey to light brownish grey, moderately acid to slightly acid, silt loam to silty C horizon underlain with brownish grey to brownish yellow, silty to silt loam slightly acid C2 and C3 horizons.

Typifying pedon: Chengalibari clay loam-paddy.

Apg 0-15 cm --- Grey (10YR 5/1M) clay loam; medium moderate, sub angular structure, firm, sticky and plastic; polygonal 1-2 cm wide cracks, many fine and common medium roots; pH 5.3, clear wavy boundary.

Clg 15-32 cm --- Grey (10YR 6/1 M) silt loam; medium moderate sub angular structure, firm, sticky and plastic, few black Fe, Mn concretions; few fine distinct strong brown (7.5YR 5/6) mottles, common fine few medium roots, pH 5.6, clear wavy boundary.

C2g 32-57 cm --- Light brownish grey (10YR 6/2 M) silt; medium, moderate sub angular blocky structure, very firm, sticky and plastic; common fine roots; few black Fe, Mn concretions; many medium faint yellowish brown (10YR 5/6) mottles, pH 6.3, abrupt wavy boundary. •

C3g 57-125 cm --- Brownish yellow (10YR 6/6 M) silt loam, massive, very firm sticky and plastic, few fine roots; many orange red and black Fe, Mn concretions; common coarse distinct grey (10YR 6/1) mottles; pH 6.5.

Type location: Village Chengalibari, PS, Sibsagar, District Sibsagar, Assam.

Range in characteristics: The thickness of soil ranges from 50 to 57 cm. The A horizon ranges in thickness from 15 to 20 cm. The colour is in hue 10YR. value 5 to 6 and chroma 1. Its texture varies from clay loam to silty clay loam. The B horizon is about 40 cm thick. The colour is in hue 10YR, value 6, chroma 1 to 2. The texture is silt loam to silty clay loam. The iron-manganese concretions and mottlings are present in varying proportions. The C horizon is mostly brownish yellow with mottles of grey colour. Texture ranges from silt to silt loam. The orange and black nodules are common.

Competing series and their differentiae: These are soils of Desoipather series which are fine Aeric Fluvaquents.

Geographic settings Chengalibari soils: developed from the alluvial deposits in nearly loyal recent floodplains at an elevation of 50 m above MSL. The climate is, humid subtropical with mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7° C MSST is 27.6 °C end MWST is 17.9 °C.

Geographically associated soils: These are soils of Katanipar and Solmari which are Dystric Eutrochrepts and Typic Udorthents respectively.

Drainage and permeability: Imperfectly drained with moderately low permeability.

Use and vegetations: Cultivated to rice, natural vegetation. Distribution and extents: Extensive around the Disang river flood plains of district Sibsagar, Assam,

Series proposed: National Bureau of Soil Survey and Land Use Planning. Regional Centre, Jorhat, Assam, 1984.

Interpretation: Chengalibari soils have Aquic moisture regime with a poor aeration. The soils are suitable only for paddy during Kharif season.

Interpretative grouping:

i) Land capability sub-class IIw2
ii) Irrigability sub-class 2d
iii) Productive potential Medium

Soil Series: CHENGALIBARI
Classification: Typic Fluvaquent
Location: District Sibsagar, Assam
Analysis at: NBSS & LUP Regional Centre, Jorhat
Sampling Date: 1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-15	34.0	35.0	31.0	-	6.0	6.3	7.9	14.8	13.3	21.7
C1g	15-32	17.7	57.6	24.5	-	2.6	1.0	3.8	10.3	21.0	36.8
C2g	32-57	9.5	85.9	4.6	-	2.5	1.8	2.8	2.6	29.5	56.2
C3g	57-125	8.0	86.5	5.5	-	-	2.1	2.9	3.0	21.2	65.3

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	1.6	5.3	3.4	5.3	0.4	0.2	9.4	1.9	2.3	16.8	56
C1g	0.7	5.6	3.6	5.4	0.5	0.2	9.7	0.9	0.7	14.6	66
C2g	0.6	6.3	4.3	7.0	0.5	0.2	12.1	0.1	0.1	15.6	77
C3g	0.4	6.5	9.2	9.2	0.6	0.2	10.1	-	-	12.4	82

6. SOLMARI SERIES Identified series

Solmari series is a member of fine loamy, mixed, hyperthermic Typic Udorthents, The soils have greyish brown, strongly acidic silt loam A horizon underlain by yellowish brown, strongly acidic mottled silt loam C horizons.

Typifying pedon: Solmari silt loam-cultivated.

Ap 0-14 cm --- Greyish brown (10YR 5/2 M) silt loamy weak medium sub angular blocky structure; friable and sticky; many medium roots; pH 4.7; clear smooth boundary.

A12 14-32 cm --- Light grey (10YR 7/2 M) silt loam; week medium sub angular blocky structure: sticky and plastic; many fine roots; pH 5.0; gradual smooth boundary.

C1 32-61 cm --- Yellow (10YR 7/8 M) silt loam; moderate medium sub angular blocky structure: firm, sticky and plastic; few medium and fine roots, few fine distinct strong brown (7.5YR 5/8) mottles; pH 4.3; gradual smooth boundary.

C2 61-102 cm --- Brownish yellow (10YR 6/6 M) silt loam; moderate medium sub angular blocky structure: friable, sticky and plastic, few medium and fine roots; few fine distinct yellowish red (5YR 5/8) mottles; pH 4.4; clear smooth boundary.

C3 102-125 cm --- Light yellowish brown (10YR 6/4 M) silt loam; moderate medium sub angular blocky structure: firm, sticky and plastic, few dark brown iron manganese concretions; few fine distinct yellowish red (5YR 4/6) mottles: pH 4.7.

Type location: Village Solmari, P.S. Moran; district Sibsagar, Assam.

Range in characteristics: The colour of the surface soil ranges from light grey to grayish brown; texture ranges from sandy loam to silt loam; subsoil colour ranges from light yellowish brown to yellow, texture ranges from loam to silt loam with strong brown mottles.

Competing series and their differentiae: These are the soils of Romagaon series which are coarse loamy Typic Udorthents.

Geographic setting: Solmari soils have developed from alluvium in nearly level floodplain. The climate is humid subtropical with mean annual air temperature of 23.7 °C and mean annual, rainfall of 2504 mm. The estimated MAST is 24.7 °C, MSST is 27.6 °C and MWST is 17.9 °C.

Geographically associated soils: These are the soils of Chengalibari and Katanipar series which are coarse silty Typic Fluvaquents and fine Dystric Eutrochrepts respectively.

Drainage and permeability: Imperfectly drained with moderate permeability.

Use and vegetations: Cultivated to paddy. Natural vegetation - babul (*Accacia* sp.), fig (*Ficus* Sp.).

Distribution and extent: Extensive in the Sibsagar district, Assam. Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretation: Solmari soils have poor soil-air-water relationship and are subject to water logging during the rainy season. They are suitable for paddy cultivation. Rabi crops may also be grown with assured irrigation.

Interpretative grouping:

i)	Land capability sub-class	IIw2
ii)	Irrigability sub-class	2d
iii)	Productive potential	Medium to High

Soil Series:	SOLMARI	Classification:	Typic Udorthent
Location:	District Sibsagar, Assam	Analysis at:	NBSS & LUP Regional Centre, Jorhat
		Sampling Date:	1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-14	51.5	34.1	14.4	-	-	7.2	15.9	28.4	32.8	1.3
A12	14-32	65.5	24.3	19.2	-	-	8.7	19.2	28.6	20.0	4.3
C1	32-61	45.0	33.9	21.1	.-	-	4.7	12.6	27.6	7.8	26.1
C2	61-102	45.0	26.6	28.3	-	-	4.1	16.3	24.5	23.6	3.0
C3g	102-139	46.0	24.7	29.2	-	-	3.4	19.5	23.1	16.3	8.4

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg-1								
Ap	1.7	4.7	2.3	0.6	0.1	0.5	3.2	1.0	0.9	5.7	56
A12	0.3	5.0	2.3	0.6	0.1	0.4	3.1	0.4	0.5	3.6	85
C1	0.2	4.3	3.1	1.2	0.2	0.1	4.6	0.8	0.6	6.2	75
C2	0.1	4.4	4.7	1.3	0.3	0.1	5.7	0.3	0.9	7.1	80
C3g	0.1	4.7	3.5	5.7	0.3	0.1	9.6	Tr	Tr	10.9	88

7. BIPTAGHAT SERIES Identified series

Biptaghat series is a member of fine loamy, mixed, hyperthermic Typic Dystrochrepts. Biptaghat soils have pale brown to grey, acidic silt loam A horizons, brownish yellow to yellowish brown, moderately alkaline silt loam to clay B horizons over brownish yellow acidic silt loam C horizons.

Typifying pedons: Biptaghat clay loam-cultivated.

Ap 0-18 cm --- Pale brown (10YR 6/2 M) clay loam; weak medium, sub angular blocky structure; firm, slightly sticky and slightly plastic, many very fine roots; pH 4.3; clear smooth boundary.

B21 18-39 cm --- Brownish yellow (10YR 6/6 M silty clay loam; moderate medium sub angular blocky: firm, slightly sticky and slightly plastic; common very fine roots; few fine olive brown (2,5Y 4/4) mottles; pH 4.5; clear smooth boundary.

B22 39-97 cm --- Yellowish brown (10YR 5/8 M) silty clay, moderate, medium sub angular blocky) friable sticky and plastic; few very fine roots; many red and dark brown Fe- mn concretions; few fine red (2.5 YR) mottles; pH 4.70, clear smooth boundary.

2C 97-125 cm --- Brownish yellow (10YR 6/6) silt loam; massive: firm and sticky; few very fine roots; common fine red (2.5YR 6/8) mottles; pH 4.7.

Type locations: Village Bipatghat, P.S. and district Sibsagar, Assam.

Range in characteristics: The thickness of the solum is about 70 to 80 cm, The A horizon is 12 to 20 cm thick. Its colour is in hue of 10YR, value 5 to 6 and chroma 2 to 4. The texture ranges from silt loam to silty clay loam. The colour of the B horizon is in hue of 10 YR, value 5 to 6 and chroma 4 to 6. The texture ranges from silty to clay loam to silty clay. The colour of the underlying C horizons is in hue of 10YR, value 4 to 6 and chroma 2 to 6.

Competing series and their differentiae: These are the soils of the Mathurapur series which are fine loamy Typic Dystrochrepts.

Geographic settings: Biptaghat soils are formed in alluvium on low lands of the district at an elevation of 130 m from MSL, The climate is humid subtropical with mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7 °C MSST is 27.6 °C and MWST is 17.9 °C.

Geographically associated soils: These are the soils of Betbari Degaon series which are fine Typic Epiaquepts.

Drainage and Permeability: Moderately well drained with moderate permeability.

Use and vegetations: Cultivated to rice in Kharif, pulses and oil seeds in Rabi.

Distribution and extents: Extensive in the floodplain of the river Brahmaputra in the district Sibsagar, Assam.

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretations: Biptaghat soils are subject to flooding and water stagnation during the rainy season. These are suitable for paddy. However, pulses and oilseeds may also be grown during the winter.

Interpretative grouping:

i)	Land capability sub-class	IIIwl
ii)	Irrigability sub-class	2d
iii)	Productive potential	Medium

Soil Series: BIPTAGHAT

Classification: Typic Dystrochrept

Location: District Sibsagar, Assam

Analysis at: NBSS & LUP Regional Centre, Jorhat

Sampling Date: 1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-18	36.5	36.4	27.1	-	-	0.4	8.9	13.6	5.8	20.5
B21	18-39	21.5	39.1	39.9	-	0.3	0.5	6.1	4.0	14.3	24.8
B22	39-97	22.5	35.2	42.3	-	-	6.7	9.0	6.7	29.4	5.7
2C	97-125	48.0	23.2	28.8	-	0.6	10.0	16.6	20.7	18.6	4.5

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	1.1	4.6	3.7	2.1	0.2	0.2	6.2	3.2	5.4	18.0	34
B21	0.5	4.5	2.9	4.4	0.2	0.1	7.6	0.6	0.9	12.4	60
B22	0.3	4.7	2.6	3.9	0.2	0.1	6.9	0.1	-	14.3	47
2C	0.1	4.7	3.0	4.2	0.2	0.1	7.5	-	-	10.8	69

8. KATANIPUR SERIES Identified series

Katanipar series is a member of the fine, mixed, hyperthermic Dystric Eutrochrepts. The Katanipar soils have greyish, strongly acidic, loam to silty clay loam A horizon, brownish yellow to reddish yellow, medium acidic, clay loam to clay B horizon with intensive grey mottles underlain by brownish yellow, medium acidic, loam C horizon.

Typifying pedon: Katanipar loam-cultivated.

Ap 0-13 cm --- Grey (10YR 6/1 M) loam: weak, fine, sub angular structure, firm, sticky and plastic; common rusty specks strong brown (7.5YR 5/8) around the decomposing roots; many fine and medium roots, polygonal 0.2-0.5 cm wide cracks; pH 5.1; clear wavy boundary.

821 13-38 cm --- Brownish yellow (10YR 6/8 M) clay, strong medium sub angular blocky structure; friable, sticky and plastic, common and few medium roots; many coarse distinct grey (10YR 6/1) mottles; pH 5.6; clear wavy boundary.

822 38-65 cm --- Brownish yellow (10YR 6/1 M) clay loam; moderate medium sub angular blocky structure; firm, sticky and plastic, common pin headed size nodules, few fine roots; common coarse distinct grey (10YR 6/6) mottles; pH 5.9, gradual smooth boundary.

C 65-125 cm --- Brownish yellow (10YR 6/6 M) loam; week fine sub angular blocky structures firm, slightly sticky and plastic, common hard, dark brown more than 1 mm nodules, pH 5.7.

Type location: Village Katanipar, P.S. Sibsagar, District Sibsagar, Assam.

Range in characteristics: The thickness of solum ranges from 65 to 75 cm. The A horizon is 13-18 cm thick. Its colour is in hue of 10YR, value 4 to 6 and chroma 1 to 2. Its texture ranges from silty clay loam to loam. The B horizon is about 50-55 cm thick. Its colour is in hue of 10YR, value 5 to 6 and chroma 6. Its texture is clay loam to clay. grey mottles are common, The C horizon is clay loam to loam with dark brown nodules.

Competing series and their differentiae: These are the soils of Bhuyabasti series which are fine loamy Dystric Dutrochrepts.

Geographic setting: Katanipar soils are developed in alluvium and occur on slightly undulating floodplain of Disang River. The climate is humid subtropical with mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm., The estimated MAST is 24.7 °C MSST is 27.6 °C and MWST is 17.9 °C.

Geographically associated soils: These are the soils of Chengalibari and Solmari series which are coarse silty Typic Fluvaquents and fine loamy Typic Udorthents respectively.

Drainage and permeability: Moderately well drained with moderately slow permeability.

Use and vegetation: Mostly under paddy cultivation. Occasionally under forest.

Distribution and extent: Limited to the slightly undulating floodplain at Sibsagar.

Series proposed: National Bureau of Soil survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretation: Katanipar Soils have poor soil-air-water relationship. They are productive and crops respond to managements.

Interpretative grouping:

i)	Land capability sub-class	IIIwl
ii)	Irrigability sub-class	2d
iii)	Productive potential	Medium

Soil Series:	KATANIPAR	Classification:	Dystric Eutrochrept
Location:	District Sibsagar, Assam	Analysis at:	NBSS & LUP Regional Centre, Jorhat
		Sampling Date:	1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-13	39.7	43.7	16.6	-	-	13.3	11.3	15.1	33.3	10.4
B21	13-38	27.0	32.0	41.0	-	-	9.2	9.3	8.5	23.5	8.5
B22	38-65	33.5	30.7	35.8	-	-	12.0	8.6	12.9	24.6	6.1
C	65-125	44.1	30.3	25.6	-	-	15.3	13.0	15.8	22.4	7.9

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg-1								
Ap	2.0	5.1	2.4	3.9	0.3	0.1	6.8	2.1	2.2	12.2	50
B21	0.3	5.6	4.1	7.9	0.2	0.1	12.4	1.4	1.3	16.1	77
B22	0.3	5.9	3.7	6.0	0.3	0.1	10.2	0.9	0.8	14.9	68
C	0.2	5.7	3.4	5.0	0.3	0.1	8.9	0.1	0.4	13.8	64

9. KALUGAON SERIES Identified series

Kalugaon series is a member of fine, mixed, hyperthermic Typic Epiaquepts. Kalugaon soils have dark grey to grey, strongly acidic, clay A horizon underlain by dark grey to grey strongly to moderately acidic clay C horizon.

Typifying pedons: Kalugaon clay-paddy.

Ap 0-15 cm --- Grey (10YR 5/1 M) clay; weak, medium, sub angular, blocky structure; firm, sticky and plastic; 2-5 cm wide horizontal cracks; many fine and few medium roots; pH 5.1; abrupt wavy boundary.

B21g 15-35 cm --- Grey to dark grey (10YR 5/1M) clay; moderate, medium sub angular blocky structure; firm, sticky and plastic; 0.5-1 cm wide polygonal cracks; few medium and common fine roots; rusty speck of decomposing roots; pH 5.6; clear smooth boundary.

B22g 35-57 cm --- Light grey (10YR 6/1 M) silty clay: moderate medium angular blocky, structure: firm, sticky and plastic; few fine roots: few faint yellowish brown (10YR 5/6) mottles; pH 6.8; abrupt smooth boundary.

B23g 57-80 cm --- Grey (10YR 5/1 M) silty clay; moderate medium angular blocky structure; firm, sticky and plastic; few 1-2 mm brown iron concretions; common medium distinct yellowish brown (10YR 5/8) mottles; pH 5.4; clear smooth boundary.

C1g 80-125 cm --- Grey (10YR 6/1 M) silty clay loam; massive very sticky and plastic, many brown to dark brown Fe-Mn concretions, few coarse distinct yellowish brown (10YR 5/8) mottles; pH 6.8.

Type locations: Village Kalugaon, P.S. Sibsagar, District Sibsagar, Assam.

Range in characteristics: The thickness of solum ranges from 80-100 cm. The A horizon is 13-20 cm thick. Its colour is in hue of 10YR, value 4 to 5 and chroma 1. Its texture ranges from clay loam clay. The colour of C horizon is in hue of 10YR, value 5 to 6 and chroma 6 to 8. It is silty clay loam to clay in texture and structure is blocky. Mottling and Fe-Mn nodules are common due to high water table.

Competing series and their differentiae: These are the soils of Betbari Degaon series which were regular distribution of organic carbon and low content of clay.

Geographic settings: Kalugaon soils have developed on alluvial deposits on level low lands in the Assam valley. The climate is humid subtropical with Mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7 °C, MSST is 27.6 °C and MWST is 17.9 °C.

Geographically associated soils: These are the soils of Ikarani and Desoipather which are fine loamy Typic Fluvaquents and fine Aeric Fluvaquents respectively.

Drainage and permeability: Poorly drained with very low permeability.

Use and vegetation: Mostly cultivated for paddy and some of the areas are wastelands.

Distribution and extents: Extensive in low land in Sibsagar district, Assam.

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretations: Kalugaon soils are fine textured with an aquic moisture regime. They have problems of poor drainage. These Soils are best suitable for paddy cultivation during the Kharif season.

Interpretative grouping:

i)	Land capability sub-class	IIIwl
ii)	Irrigability sub-class	2ds
iii)	Productive potential	Medium

Soil Series:	KALUGAON	Classification:	Typic Epiaquept
Location:	District Sibsagar, Assam	Analysis at:	NBSS & LUP Regional Centre, Jorhat
		Sampling Date:	1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-15	9.7	31.5	58.8	-	-	2.2	3.0	4.5	11.8	19.7
B21g	15-35	6.7	33.0	60.3	-	-	-	2.4	4.3	12.4	20.6
B22g	35-57	5.3	52.0	42.7	-	-	-	2.7	2.6	24.9	27.1
B23g	57-80	12.6	52.0	35.4	-	-	6.2	2.4	4.0	32.9	19.1
C1g	80-125	14.5	55.0	30.5	-	-	6.3	3.2	5.0	35.0	20.0

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	2.6	5.1	3.3	5.6	0.4	0.1	9.5	3.8	3.5	20.1	47
B21g	0.9	5.6	4.4	6.7	0.5	0.2	11.8	2.3	2.2	22.8	51
B22g	0.5	6.8	5.9	7.4	0.7	0.3	14.4	0.1	0.2	18.7	77
B23g	0.5	5.4	4.6	6.9	0.6	0.3	12.5	3.2	3.0	19.8	63
C1g	0.9	6.8	3.0	6.2	0.7	0.4	10.3	0.5	0.3	14.6	70

10. BETBARI DEGAON SERIES Identified series

Betbari Degaon series is a member of fine, mixed, hyperthermic Typic Epiaquepts. Betbari Degaon soils have greyish, strongly acidic, clay loam to silty clay A horizon, greyish to greyish brown, medium acidic, clay to clay loam B horizon with yellowish brown mottles underlain by a brownish yellow, medium acidic silty clay loam C horizon with grey mottles.

Typifying Pedons: Betbari Degaon silty clay-cultivated.

Ap 0-24 cm --- Grey (10YR 6/1 M) silty clay; weak, medium sub-angular blocky structure; firm, sticky and plastic; common rusty specks of decomposing roots in yellowish brown (10YR 5/6); many medium and fine roots; more than 1 cm wide polygonal cracks; pH 5.2, clear smooth boundary.

B21g 24-50 cm --- Grey (10YR 6/1 M) clan moderate medium sub-angular blocky structure; firm, very sticky and plastic, common fine few medium roots; few fine faint yellowish brown (10YR 5/3) mottles; pH 5.6, abrupt wavy boundary.

B22g 50-75 cm --- Grey (10YR 6/1 M) clay, moderate fine sub-angular blocky structure, friable, sticky and plastic, many coarse brownish yellow (10YR 6/5) mottles, few yellowish brown nodules, pH 6.0, gradual wavy boundary.

Clg 75-125 cm --- Grey (10YR 6/1 M) silty clay loam; massive, sticky and plastic; many coarse prominent brownish yellow (10YR 6/5) mottles; common soft orange red nodules; few pH 5.9.

Type locations: Village Betbari Degaon, PS, Sibsagar, District Sibsagar, Assam.

Range in characteristics: The soils have 60-85 cm thick solum. The A horizon is 13-24 cm thick. Its colour is in hue of 10YR, value 5 to 6 and chroma 1 to 2. Its texture is silty clay loam to silty clay. The B2 horizon is about 50-55 cm. Its colour is in hue of 10YR, value 5 to 6 and chroma 1 to 2, Texture ranges from clay to silty clay with yellowish red nodules, Mottles are present in B horizon. The C horizon is silty clay loam to clay loam in texture and massive. Its colour is in hue of 10YR, value 5 to 6 and chroma: 6 to 8. Grey mottles are common in this horizon.

Competing series and their differentiae: Competing series are those of Kalugaon soils with higher and irregular distribution of organic carbon and more clay in the B horizon. These are also fine Typic Epiaquepts.

Geographic setting: Betbari Degaon soils have developed on alluvium on a nearby gently to very gently sloping active floodplain of the Brahmaputra valley. The climate is humid subtropical with mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7 °C MSST is 27.6 °C and MWST is 17.9 °C.

Geographically associated soils: These are soils of Biptaghat series which are fine loamy Typic Dystrochrepts.

Drainage and permeability: Imperfectly to poorly drained with slow to very slow permeability.

Use and vegetations: Cultivated to rice and lying as wasteland.

Distribution and extent: Extensive in active floodplain of Sibsagar district, Assam.

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretations: Betbari Degaon soils are fine textured and have aquic moisture regime. They have inherent problems of poor aeration due to imperfect drainage. The soils are suitable for paddy cultivation during the Kharif season.

Interpretative grouping:

i)	Land capability sub-class	IIw2
ii)	Irrigability sub-class	2d
iii)	Productive potential	Medium

Soil Series:	BETBARI DEGAON	Classification:	Typic Epiaquept
Location:	District Sibsagar, Assam	Analysis at:	NBSS & LUP Regional Centre, Jorhat
		Sampling Date:	1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-24	12.0	47.5	40.5	-	1.3	1.9	2.3	6.5	16.0	31.5
B21g	24-50	12.9	38.5	48.7	-	-	2.2	2.8	7.9	13.7	24.8
B22g	50-75	17.0	39.4	44.6	-	-	-	5.3	11.7	19.1	21.3
C1g	75-125	20.3	50.2	29.5	-	-	4.5	5.4	10.4	9.2	41.0

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	2.0	5.2	3.4	6.3	0.2	0.1	10.1	3.2	2.6	16.0	63
B21g	0.7	5 .6	5.1	7.8	0.3	0.2	10.4	2.5	2.2	19.5	68
B22g	0.4	6.0	5.6	8.1	0.4	0.1	14.1	1.2	0.9	16.0	88
C1g	0.3	5.9	6.5	9.8	0.7	0.2	17.2	1.2	0.8	21.0	82

11. BHUYABASTI SERIES Identified series

Bhuyabasti series is a member of fine loamy, mixed, hyperthermic Dystric Eutrochrepts. Bhuyabasti soils have light grey to olive brown medium acidic loam to clay loam A horizons, yellowish medium acidic clay loam mottled B horizon and yellowish brown medium acidic sandy loam to loam C horizon.

Typifying pedon: Bhuyabasti clay loam-cultivated.

Ap 0-14 cm --- Grey (10YR 5/1 M) clay loam; weak medium sub-angular blocky structure; hard, firm and sticky; many fine and medium roots; pH 5.7; abrupt smooth boundary.

B1 14-37 --- Yellowish brown (10YR 5/8 M) clay loam, moderate medium sub-angular blocky structure; fine, very sticky and very plastic; many fine and medium roots; many coarse distinct red (2.5YR 5/8) mottles; pH 5.6; clear smooth boundary.

Cl 37-73 cm --- Yellowish brown (10YR 5/6) loam, moderate medium sub-angular blocky structure, firm, very sticky and very plastic, common medium prominent reddish yellow (7.5YR 6/6) mottles, pH 5.6, gradual smooth boundary.

C2 73-120 cm --- Yellowish brown (10YR 5/6) sandy loam, weak medium sub-angular blocky structure; extremely firm, very sticky and very plastic, common fine strong brown (7.5YR 5/8) mottles; pH 5.9.

Type locations: Village Bhuyabasti, P.S. and District Sibsagar, Assam.

Range in characteristics: The thickness of the solum is more than 120 cm. The A horizon is 15-18 cm thick and its colour is in hue of I0YR, value 5 to 6 and chroma, The texture varies from silt loam to silty clay loam. The colour of the B horizon is in hue of 10YR, value to 6 and chroma 6. The texture is loam to clay loam. It is mottled.

Competing series and their differentiae: These are the soils of Katanipar series which are fine Dystric Eutrochrepts.

Geographic settings: Bhuyabasti soils have developed in alluvium on the old floodplain of the river Brahmaputra. The soils occur on nearly level to level lands at an elevation of 150 m above MSL. The climate is humid subtropical with mean annual air temperature of 23.7 °C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7 °C MSST is 27.6 °C and MWST is 17.9 °C.

Geographically associated soils: These are the soils of Romagaon series which are coarse loamy Typic Udorthents.

Drainage and permeability: Imperfectly drained with slow permeability.

Use and vegetations: Mostly cultivated for paddy.

Distribution and extents: Extensive in the floodplain in the district.

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretations: The soils of Bhuyabasti series are subject to flooding during rainy season. They are, therefore, suitable for paddy cultivation. They can, however, support pulses during winter season as well as winter vegetables.

Interpretative grouping:

i)	Land capability sub-class	IIw2
ii)	Irrigability sub-class	2d
iii)	Productive potential	Medium

Soil Series:	BHUYABASTI	Classification:	Typic Eutrochrept
Location:	District Sibsagar, Assam	Analysis at:	NBSS & LUP Regional Centre, Jorhat
		Sampling Date:	1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-14	35.6	32.4	31.0	-	-	3.6	15.4	16.6	20.6	11.9
B1	14-37	32.8	24.6	42.6	-	-	5.8	12.8	14.2	16.2	7.6
C1	37-73	36.2	44.2	19.6	-	6.2	6.4	16.0	7.6	14.5	30.7
C2	73-120	54.5	36.0	10.5	-	14.8	7.2	22.0	10.5	12.6	24.0

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	1.6	5.7	4.3	1.2	0.5	0.1	6.3	0.8	1.2	10.6	59
B1	1.1	5.6	3.6	1.1	0.5	0.1	5.4	0.5	0.8	8.5	63
B2	0.6	5.6	3.0	0.9	0.4	0.1	4.4	0.3	0.2	7.2	62
B3	0.4	6.9	2.4	0.7	0.3	0.1	3.6	Tr	Tr	5.4	67

12. ROMAGAON SERIES Identified series

Romagaon series is a member of coarse loamy, mixed, hyperthermic Typic Udorthents. Romagaon soils have grey moderately silt loam to clay loam A horizons, brown to brownish yellow moderately acidic clay loam to silty clay loam B horizons and brownish yellow medium acidic loam to sandy loam C horizons.

Typifying pedon: Romagaon silt loam-cultivated.

Ap1 0-13 cm --- Grey (10YR 6/1 M) silt loam; weak medium sub angular blocky structure; firm, sticky and plastic; 0.2-5 cm wide polygonal cracks; many fine common medium and few coarse roots; pH 5.6 abrupt smooth boundary.

Ap2 13-26 cm --- Brown (10YR 5/3 M) clay, loam, moderate medium sub angular blocky structure; friable, sticky and plastic; common fine and few medium roots; pH 5.6; clear wavy boundary.

Cl 26-53 cm --- Brownish yellow (10YR 6/6 M) clay loam; weak medium sub angular blocky structure; slightly sticky and Plastic; friable, common fine roots; pH 5.8; clear smooth boundary

C2 53-120 cm --- Brownish yellow (10YR 6/6 M) loam, weak fine sub angular blocky structure, friable, slightly sticky and Plastic; few fine roots; many orange red nodules; pH 6.0.

Type location: Village Romagaon, P.S. Moran, District Sibsagar, Assam.

Range in characteristics: The soils are deep, A horizon is 20 to 30 cm thick. Its colour is in hue of 10YR, value 5 to 6, and chroma 1 to 3. Its texture is clay loam to silty clay loam. The C horizon is in hue of 10YR, value 5 to 6 and chroma 6 to 8. It is sandy loam to loam with Fe, Mn concretions.

Competing series and their differentiae: These are the soils of Solmari soils which are fine loamy Typic Udorthents.

Geographic settings: Romagaon soils are developed from alluvium in the lowland of the district. The climate is humid subtropical with mean annual air temperature of 23.7°C and mean annual rainfall of 2504 mm. The estimated MAST is 24.7°C, MSST is 27.6°C and MWST is 17.9°C.

Geographically associated soils: These are the soils of the Bhuyabasti series which are fine loamy Dystric Eutrochrepts.

Drainage and permeability: Imperfectly to moderately well with moderate permeability.

Use and vegetation: Mostly cultivated for paddy.

Distribution and extents: Extensive in floodplain of the district.

Series proposed: National Bureau of Soil Survey and Land Use Planning, Regional Centre, Jorhat, Assam, 1984.

Interpretations: Romagaon soils have aquic moisture regime and have the problem of poor aeration. They are subject to surface flooding during the rainy season and are suitable for paddy during Kharif season.

Interpretative grouping:

i)	Land capability sub-class	IIIw1
ii)	Irrigability sub-class	2d
iii)	Productive potential	Medium

Soil Series: ROMAGAON

Classification: Typic Udorthent

Location: District Sibsagar, Assam

Analysis at: NBSS & LUP Regional Centre, Jorhat

Sampling Date: 1984

Horizon	Depth	Size class and Particle diameter (mm)									
		Total			Sand					Silt	
		Sand 2-0.05	Silt 0.05-0.002	Clay 0.002	Very coarse 1.0-1.0	Coarse 1-0.5	Medium 0.5-0.25	Fine 0.25-0.10	Very Fine 0.1-0.05	Coarse silt 0.05-0.02	Fine silt 0.02-0.002
		--- % of <2 mm ---									
Ap	0-13	15.2	64.6	20.2	-	-	4.8	6.2	4.2	16.6	48.0
A2	13-26	21.2	45.8	33.0	-	-	6.0	6.5	8.7	18.2	27.6
C1	26-53	24.2	43.0	32.8	-	-	6.4	8.2	9.6	20.5	22.5
C2	53-120	40.5	40.4	20.0	-	4.8	7.2	12.5	16.0	24.6	15.8

Horizon	Organic Carbon %	pH(1:2.5)H_2O	Extractable bases					H	A1	CEC NH_4OAC	Base Saturation%
			Ca	Mg	Na	K	Sum				
			Cmol(+)kg^{-1}								
Ap	1.3	5.6	2.2	9.6	0.2	0.1	4.2	2.4	1.0	7.8	54
A2	0.8	5.6	2.0	0.6	0.1	0.1	2.9	2.8	1.2	6.4	45
C1	0.5	5.8	0.6	0.5	0.1	0.1	1.4	1.6	1.2	5.6	25
C2	0.4	6.0	0.5	0.3	0.1	0.1	1.0	1.0	1.1	5.0	22