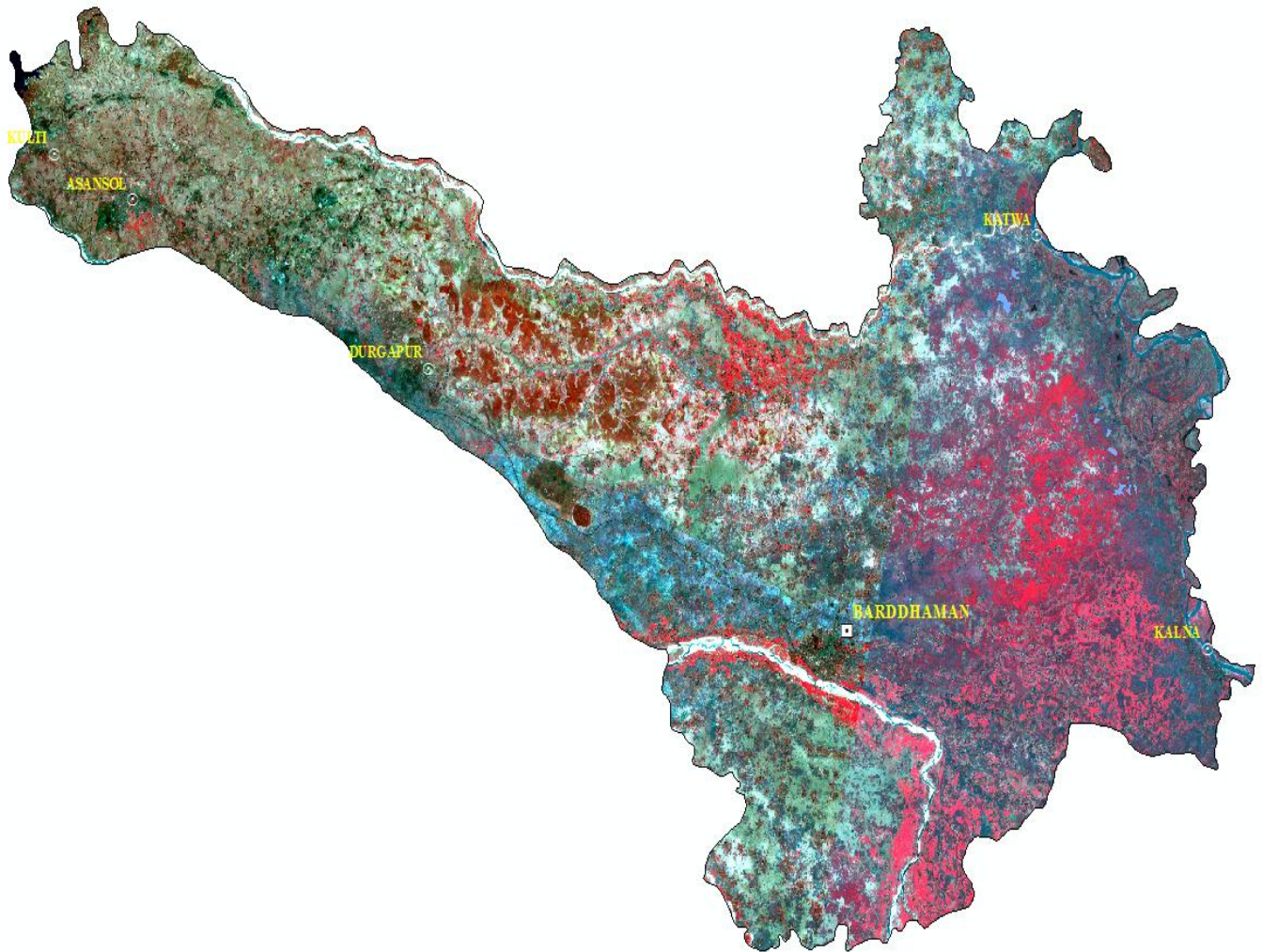


# SOIL SURVEY AND LAND USE PLAN OF BARDDHAMAN DISTRICT (WEST BENGAL)



REGIONAL CENTRE

CALCUTTA

National Bureau of Soil Survey & Land Use Planning

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## Soil Survey and Land Use Plan of Bardhaman District, West Bengal

### Meta Data for Bardhaman District, West Bengal

Sr.No.	Elements	Scheme	Value
1.	Identification Information	Name of the Dataset	Reconnaissance Soil Survey, Mapping Correlation and Classification of Soils of Bardhaman District
		Contents	Soil Survey Reports, Maps and Imagery
		Keywords	Soil Survey Report
		Report/Map Language	English
		Map Scale	1:63360
		Survey Year	1973-1974
		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	88°25' E
		Bound Right	88°48' E
		Bound Top	23°53' N
		Bound Bottom	22°56' N
		Area/Coverage	7, 2,800 ha.
		Projection	UTM
		Datum	WGS 1984
		Unit	Meter
		Administrative Location	State: West Bengal, District: Bardhaman
4.	Citation	Data Prepared By	NBSS & LUP, Kolkata (Regional Centre)
		Associated Project	S. Digar
		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\Bardhaman
		Download Location	-
6.	Quicklook	Graphic file in jpg format	Y
7.	Image Data	Name of the Satellite	Landsat
		Sensor	ETM+
		Date of Image	15 February 2002 and 29 October 2002
		File Format	TIFF
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# 1.

## INTRODUCTION

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Reconnaissance soil survey of Barddhaman district, West Bengal was conducted by the Regional Centre, Calcutta of the National Bureau of Soil Survey and Land Use Planning (ICAR) with the following objectives : (i) to prepare reconnaissance soil map on a scale of 1:50000, characterise the soils and delineate their location and extent, evaluate their problems and potentials (ii) to correlate and establish the various soil series and classify them according to Soil Taxonomy (iii) to develop interpretations based on present land use, inherent soil properties, soil management interactions, soil and water management needs and prepare interpretative maps on soil and land resources of the district with suitable legend and obtaining data on soil plant relationship (iv) to prepare small scale maps for use by the planners and Scientists at National and International levels by correlating the soils with recognised systems of soil and land capability classification.

Soil survey was mostly carried out during the years 1973 and 1974. However, progressive field reviews, correlation and revision were continued till 1979.

## 2.

### **GENERAL DESCRIPTION OF THE AREA**

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#### **2.1 Location and Extent**

The district Bardhaman is situated in the Western part of West Bengal between 22°56' to 23°53' N Latitudes and 88°48' to 88°25' E Longitudes and comprises an area of 7,2,800 ha (Fig.1). It is bounded on the north by Birbhum and Mursidabad districts on the south by Hooghly and Bankura districts, on the east by Nadia district and west by Bihar State.

#### **2.2 Population**

Total population of district is 48, 08,861 and Police Station wise population is presented in Plate 3. The district is rather densely populated among other districts. The occupation of the people is largely agriculture.

#### **2.3 Physiography, Relief and Drainage**

Bardhaman district consists of two major physiographical divisions viz. 1) Low dissected plateau interspersed with hillocks, mounds and low-lying valleys 2) Alluvial plain with meander plain.

The general slope of the district is from North West to south east with the highest altitude 220 m above MSL in Maithon and the lowest 7 m MSL in Hooghly.

The low dissected plateau, an extension of Chotanagpur plateau extends onwards west. The differential relief is Bed mostly on lithology. The area is lateritic and is interspersed with valleys. The alluvial plain extends from the 80 m contour in west to 40 m contour in the east and formed of alluvium brought by the rivers Damodar and Ajoy and their tributaries. Successive floods and depositions gradually raised the area above flood level.

The meander flood plain below 20 m contour is of recent formation and is due to the river Bhagirathi. The area is intersected by a number of rivers and streams inadequate drainage system leads to water logged areas in this zone.

The western part of the district comprises the interfluvium of the rivers. River Bhagirathi has changed its course often and has left disused channels all along its western bank creating a string of marshes and swamps.

#### **2.4 Climate**

Climatic data is given in Table 1 and Table 2. The climate of the area is humid tropical. The summer is hot and humid and winter is moderate. May is generally the hottest month. The mean maximum and minimum temperatures are 42.1°C and 21.5°C, respectively. Rain is common in the months of April and May. Cool season sets in by November. The mean annual rainfall is 1400 mm. Most of the precipitation falls in the months June to September.

# LOCATION MAP

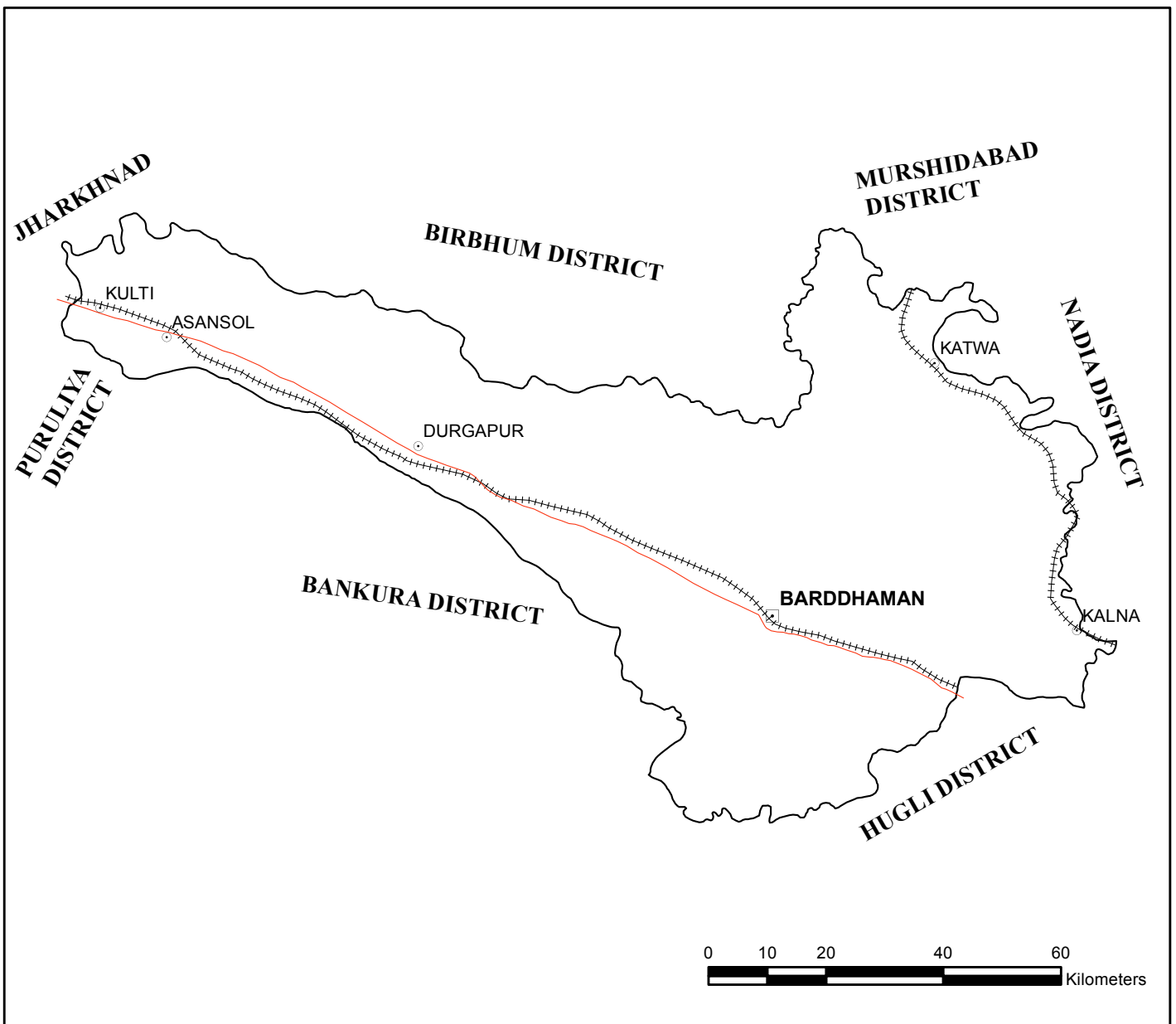
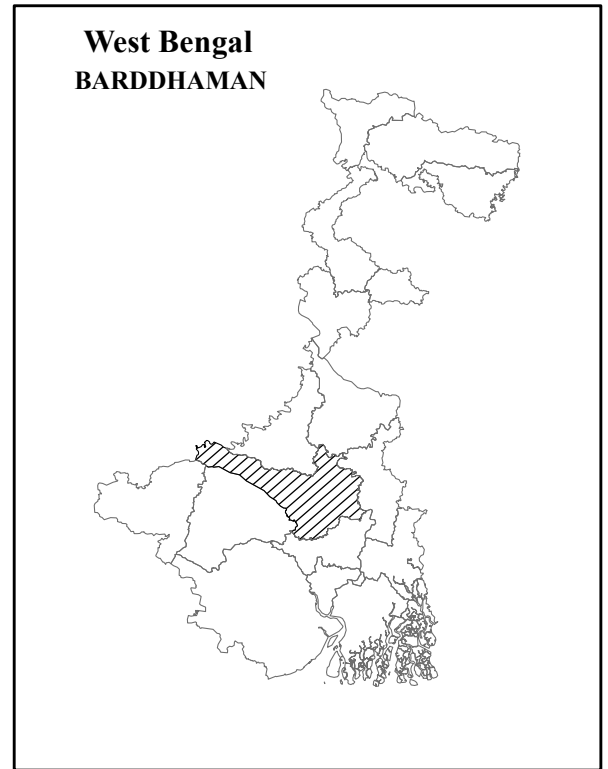
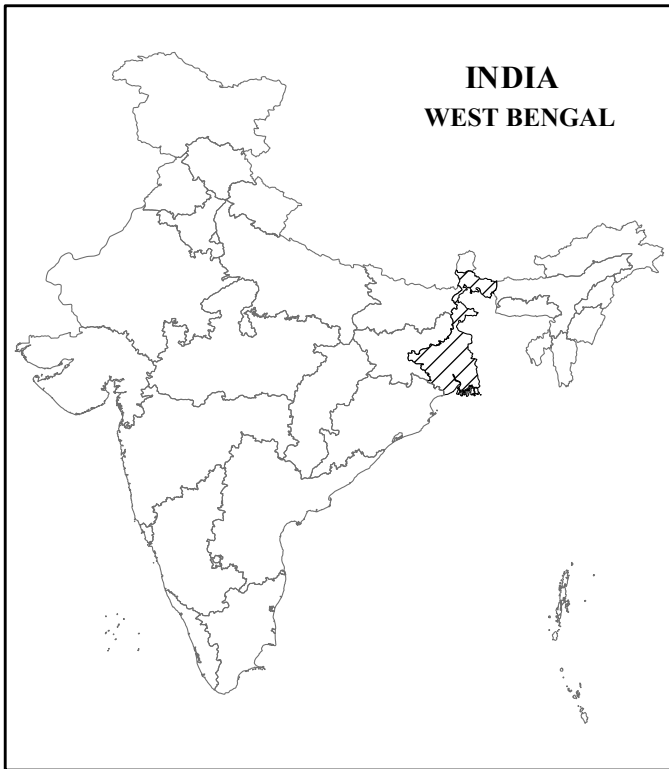


Fig. 1: Location Map

**Table 1. Climatic data (1931-60)**

Month	Temperature in °C		Rainfall in mm	No. of rainy days	Humidity	
	Mean Max.	in mm.			Relative humidity %	Vapour pressure
Jan.	30.1	9.3	11.2	0.9	69	13.6
Feb.	33.5	10.6	24.6	1.8	65	15.2
March	38.5	15.1	25.0	1.7	64	19.2
April	41.4	20.1	46.1	3.0	67	26.2
May	42.1	21.5	114.8	6.5	74	31.5
June	39.7	23.0	196	10.6	80	33.3
July	34.7	23.7	314.4	15.9	85	33.1
Aug.	34.4	24.0	301.2	16.3	85	33.0
Supt.	34.5	23.4	236.5	11.5	83	32.7
Oct.	34.1	19.7	106.8	5.2	78	27.9
Nov.	31.8	14.1	23.0	1.1	72	18.3
Dec.	29.3	10.4	4.3	0.2	70	14.3
Total			1403.9			

(Source –Climatological tables of observation in India, 1931-1961)

**Table 2:-Rainfall data in mm.**

Month	Years			
	1975	1976	1977	1978
Jan.	10.75	-	10.37	1.58
Feb.	12.19	28.73	24.2	15.48
March	6.56	9.87	4.6	37.3
April	18.02	68.68	88.2	51.1
May	70.00	109.21	187	141.3
June	90.3	125.91	464.93	269.24
July	320.02	274.41	307.5	211.76
Aug.	151.44	223.02	197.41	273.62
Sept.	197.75	136.06	139.59	734.9
Oct.	125.08	48.47	42.6	150.9
Nov.	24.81	13.13	46.2	4
Dec.	-	-	42.98	18
Total	1025.92	1037.49	1541.53	1909.18

(Source - Annual Plan of work on Agriculture for the year 1980-81. Bardhaman district)

## 2.5 Geology

The district can be divided into two principal zones, namely (a) Bhagirathi - Damodar - Ajoy alluvial tract and (b) the Gondwana zone stretching mainly in the western part of the district Bardhaman and is in the Asansol subdivision.

Alluvium occupies the major portion of the district. Most of the alluvial deposits belong to the older alluvial formations which are composed of argillaceous beds or coarse materials of pale reddish brown colour containing calcareous limonite and pisolitic ferruginous concretions occupying higher positions.

Alluvium of Sub-Recent to Recent origin consist alternate beds of compacted clay, silt and sand and mostly confined to the banks and beds of present day river channels. The soils are darker in colour having more organic matter content.

The easterly extension of the Chotanagpur Peninsular mass extends over the western portion of the district. The predominating rock is Granite which in some places become Gneissic. These rocks contain Quartz, Felspar, Tourmalin and Biotite. Later phase of these rocks are Pegmatites, Apatites and Quartz veins.

The Gondwana system of rocks (Carboniferous - Permian in age) is scattered over the western part of the district and extends over most areas under alluvium cover. The Gondwanas comprise enormously thick deposits as seen in the Ranigunj intercalations of coal seams. These are intruded by a large number of igneous intrusions comprising the Dolorite or Basaltic types and Ultrabasic Mica Peridotite and temprophyre dykes and sills.

The existence of Tertiary rocks like sandstones, shales, fossiliferous limestones are also found.

Laterites occur in the central part of the district. Distribution of laterites capping rock types of all ages from Archaean to the Tertiary Grits is fairly wide and as such Laterites are considered to be younger in age than Tertiary formations and range possibly upto Pleistocene.

## 2.6 Natural Vegetation

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

### Trees

*Albizzia lebbek* (Sirish); *Aegle marmelos* (Bel); *Acacia arabica* (Babul); *Azadiracta indica* (Neem); *Artocarpus integrifolia* (Jack fruit); *Anona squamosa* (Ata); *Baisica latifolia* (Mahua); *Butea monosperma* (palas); *Borassus flabellifer* (Tel); *Ficus cunea* (Fig); *Ficus glomerate* (Jagya dumur); *Ficus hispida* (Kakdumur); *Caesalpinia pulcherrira* (Krishnachuda); *Cassia fistula* (Sonali); *Dendrocalamus strictus* (Bamboo); *Dyospyros melanexylon* (Rend); *Dalbergia sisso* (Sisso); *Liblica officianalie* (Amloki); *Eucalyptus* spp.; *Ficus bengalensis* (Banyan); *Jambulana indica* (Jam); *Jerminalis arjuna* (Arjun); *Terminalia tomentosa* (Plan); *Ficus religiosa* (Peepal); *Mangifera indica* (Mango); *Madivika latifolia* (Mohul); *phoenix sylbestris* (Date palm); *Odina wodier* (Jiyal); *Pasidium guava* (Guava); *Tamarindue indica* (Tamarind); *Glvcosmis pentanhyla* (Ash shaora); *Tectona grandis* (Teak); *Shorea robasta* (Sal).

### Shrubs and herbs

*Agave sisslina* (Mogra/Ageve); *Calotropis procera* (Shet Akanda); *Clerodendron infortunatum* (Ghetu); *Flacontid nemontchi* (Boinchi); *Jatropha hossynifolia* (Lal bharenda); *Clerodendron inerma* (Bonjui); *imnea azZiziphus iulube* (Kul/Jujube); *Vitex neaundo* (Nishinda);

**Grasses**

*Cynodon dactylon* (Doob); *Bragrostis* sp; *Dicanthium annulatum*; *Saccherum munja* (Ser); *Solanum niahram* (Kakmachi).

**Weeds**

*Cynurus rotundus* (Muthe); *Chenomdium album* (Goose foot); *Saccharum anontaneum* (Kens); *Commlina benghalensis* (Kansira/Dholapata);

**2.7 Present Land Use**

The total geographical area of Bardhaman district is 7,00,426 ha of which nearly 96.88 per cent is rural, while the remaining 3.12 per cent is urban. Detailed data on land use is given in Table 3. From the table it is seen that forest area is very little and this is due to the fact that in the past the deforestation was continuously going on for rehabilitation and bringing more lands under plough.

The Kharif crops occupy 3,37,867 ha of net cropped area, while Rabi crops occupy 1,57,938 ha. of net cropped area.

Rice is the most important crop of the district. Generally, three crops of paddy are taken as aus, aman and boro in a year if irrigation water is available covering about 85 per cent of the total gross cropped area. Potato, wheat, oilseeds, pulses, jute, vegetables etc. are also grown. The crop rotation followed in the district is - (a) Paddy-Paddy-Paddy; (b) Jute-Paddy-Wheat; (c) Jute-Pulses-Potato; (d) Paddy-Wheat/Pulses/Till (e) Paddy-Potato-Pulses and (f) Paddy-Pulses (Pyra crop).

Area under different crops and their production during the years 1974-75 and 1977-78 are shown in tables 4 and 5 respectively. It is seen from these tables that in case of rice, there has been a gradual increase in the production, though there is not much change in cropped area. This may be due to increase in rainfall as well as better management practices.

**Table 3:-Land Use (1983-84)**

S. No.	Classification	Area in ha
1	Geographical area	702800
2	Area under forest	31000
3	Area not available for cultivation	
	a) Area under non-Agril. Uses	147100
	b) Barren & Undulated land	40506
4	Other uncultivated excluding fallow land	
	a) Permanent pasture & other grazing land	3500
	b) Land under Miscellaneous tree groves not included in net area	9194
5	Culturable waste	11100
6	Fallow land other than current fallow	2400
7	Net cropped area	455300
9	Gross cropped area	729650
10	Cropping intensity	160%

(Source - Department of Agriculture, Government of West Bengal)

**Table 4:-Distribution of Major Crops (1981-82) (Area In ha)**

S. No.	Crops	1981-82
1	Rice (Aus, Amon, Boro)	447.3
2	Wheat	18.7
3	Pulses(kharif)	2.18
4	Pulses (rabi)	10.9
5	Mustard	22.16
6	Jute	8.88
7	Sugarcane	2.54
8	Potato (winter)	30.67

(Source - Department of Agriculture, Government of West Bengal)

**Table 5:-Crop Production (In, 000 Quintal) (1981-82)**

S.No.	Crops	Production
1	Rice (Aus, Amon, Boro)	8512119
2	Wheat	397001
3	Pulses (kharif)	16503
4	Pulses (rabi)	58860
5	Mustard	232458
6	Jute	675
7	Sugarcane	1267815
8	Potato (winter)	7560467

(Source - Department of Agriculture, Government of West Bengal)

## 2.8 Irrigation

Water resources in the area are generally satisfactory. Ground water is relatively at shallow depth except in areas around Asansol subdivision. Details regarding irrigation sources and area under irrigation are given in table 6. It is seen from this table that the farmers of the district get irrigation water 70 per cent from canals, 16 per cent from minor irrigation projects 13 per cent from small Irrigation Projects like tanks etc. and other sources.

**Table 6:-Irrigation sources and area under irrigation (1981-82)**

S.No.	Source of Irrigation	No. installed	Gross irrigated area
1	River valley Projects a) D.V.C. b) Mayurakshi	2	265637
2	Deep Tube Wells	369	31860
3	River Lift Irrigation	262	28440
4	Shallow Tube Wells	16005	70710
5	Tanks (Vested Private)	44193	38000
6	Dug Wells	435	806
7	Other sources (Bandh, Jheels, beels.etc. by lifting devices)	-	66410

(Source - Department of Agriculture, Government of West Bengal)

### 3.

## SOILS

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### 3.1. Soil Survey Technique

Soil mapping was done using survey of India toposheets scale of 1" = 1 mile (1163, 360). The field operation includes preliminary study of terrain analysis, delineation of physiographic units, identification, soil-physiographic relationship and selection of sites for pedons. Soil pedons were determined for morphological characteristics in different positions. Identification of legend was prepared with initial field review and correlation. Soils were then examined at an interval of 1 to 2 km or less depending upon change in terrain conditions. Soil series are identified as per the criteria and soil samples from each soil series were collected for chemical analysis.

Soil series associations which form the mapping units were established according to landforms. These were then delineated by drawing boundaries on the map and are shown there by appropriate symbols along with an index legend briefly describing the soils.

### 3.2. General Description of Soil Legend

Soils have been mapped as associations of soil series. The associations are of two or more soil series occurring in the same general area. Soil Series other than the named series in the association in any defined physiographic unit is common. The soil series in mapped associations are briefly described below (Fig.2).

#### 3.2.1 Sankarpur - Kalyaneswar Association

The soils of this association occur on strongly sloping low dissected plateau. Sankarpur soils generally occur on the surrounding of the plateau on 5 to 15 per cent slope and Kalyaneswar soils on the top and the upper slopes having 15 to 25 per cent slopes. Both Sankarpur and Kalyaneswar soils are loamy skeletal family. Surface soil texture in Sankarpur series varies from loamy sand to sandy loam whereas it varies from gravelly loamy sand to gravelly sandy loam in Kalyaneswar series. Sankarpur soils are underlain by massive conglomerates of nodular ferruginous beds quartz gravel and stone pieces and Kalyaneswar soils are underlain by weathered sandstone. The estimated moisture capacity of Sankarpur soils is 5.9 cm for 60 cm depth soil profile and Kalyaneswar soils is 2.1 cm for 30 cm depth soil profile. These soils are under thin forest bushes and shrubs are barren at places. They are subject to severe erosion resulting formation of deep gullies.

#### 3.2.2 Sankarpur - Beldanga Association

The soils of this association occur on moderately to strongly sloping low dissected plateau interspersed with upper old alluvial plain. Sankarpur soils occur on the dissected plateau on 5 to 15 per cent slopes and Beldanga soils occur on the upper old alluvial plain on 3 to 8 per cent slopes in between the dissected plateau. Sankarpur soils are loamy-skeletal i.e. sandy loam to gravelly loam in the profile depth and Beldanga soils are fine loamy i.e. clay loam to gravelly clay in the profile depth. The surface soil texture of both the soils varies from loamy sand to sandy loam. Available moisture capacity of Sankarpur soils is 5.9 cm in 60 cm depth soil profile. It is 18.2 cm in 100 cm depth of Beldanga soils. Sankarpur soils are either barren or under bushes and shrubs, but Beldanga soils are partly under Sal forest and partly under dry lend crops. Sankarpur soils are subject to severe soil erosion resulting formation of gullies whereas Beldanga soils are subject to moderate soil erosion.

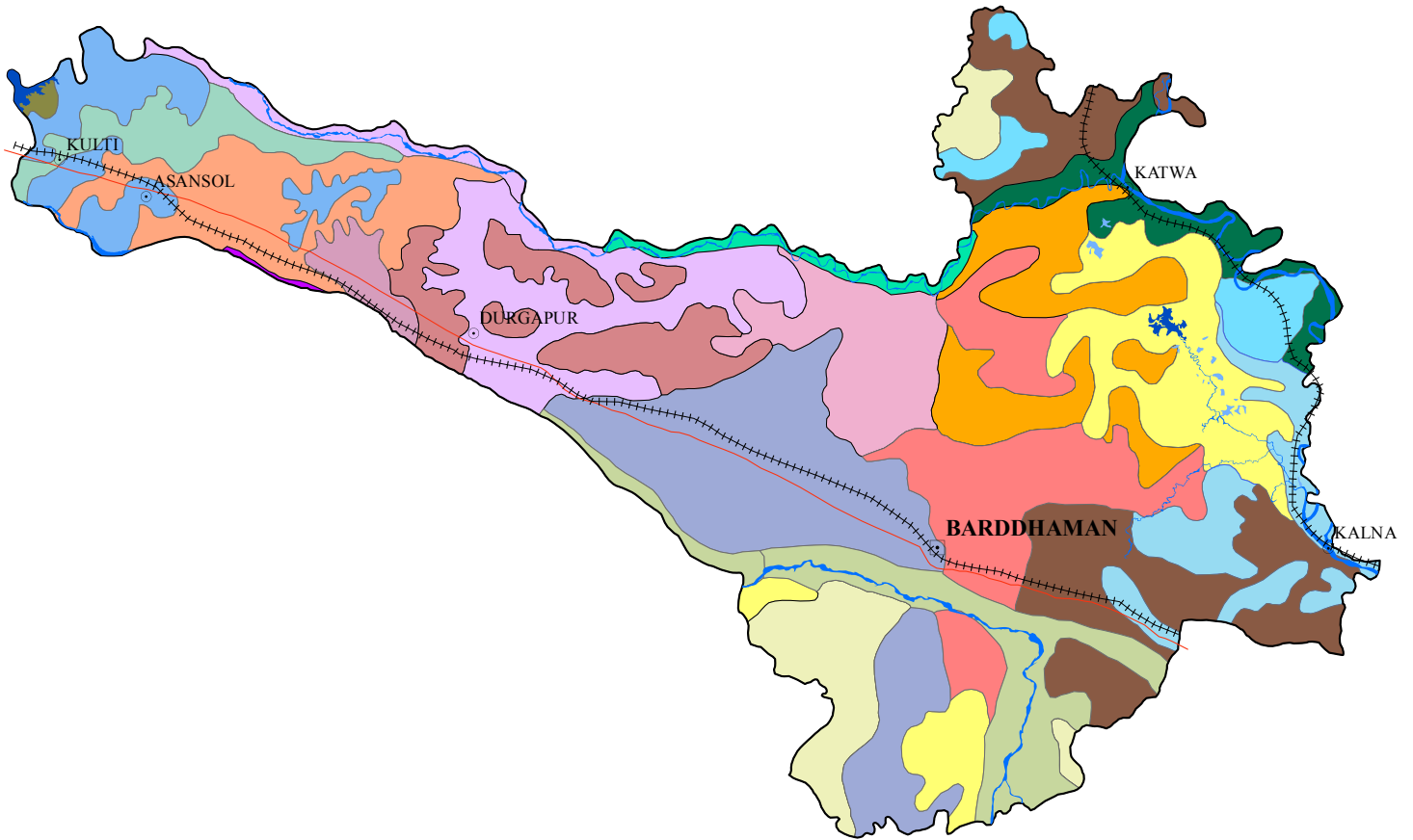
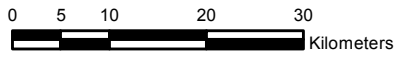
#### 3.2.3 Majiara - Chanda Association

The soils of this association occur on very gently to gently sloping low dissected plateau with toe slopes and valleys. Majiara soils are fine i.e. clay loam to clay and Chanda soils are fine-loamy i.e. clay loam. Surface soil



# BARDDHAMAN

## Soil Series Association



### Legend

	Balidanga-Kutubpur		Madhpur-Hanrgram
	Banpara-Anantapur		Madhpur-Kuldiha
	Banpara-Hanrgram		Majiara-Chalbalpur
	Banpara-Kuldiha		Majiara-Chanda
	Beldanga-Bistupur		Majiara-Ghoshat
	Ghoshat-Silampur		Majiara-Kanksa
	Kanksa-Kuldiha		Nabagram-Konarpara
	Konarpara-Srirampur-Multi		Sankarpur-Beldanga
	Krishnadevpur-Balidanga-Sardanga		Sankarpur-Kalyaneswar
	Kutubpur-Multi		Totpara-Sasanga

### References

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texture of Majiara and Chanda varies from sandy loam to sandy clay loam. Available moisture capacity of Majiara and Chanda series are 18.6 cm and 18.1 cm for 100 cm depth soil profile, respectively. Both the soils of this association are cultivated to paddy and Rabi crops.

### **3.2.4 Mallara-Chalbalour Association**

The soils of this association occur on gently sloping to moderately sloping low dissected plateau. Majiara soils occur on the dissected plateau on 3 to 5 per cent slopes and Kanksa soils occur on the lower old alluvial plain on 1 to 3 per cent slopes. Both Majiara and Kanksa soils are fine i.e. clay loam to clay. Surface soil texture varies from sandy loam to sandy clay loam in Majiara series whereas it varies from loam to clay loam in Kanksa series. Available moisture capacity of Majiara and Kanksa soils are 18.6 cm and 18.7 cm respectively for 100 cm depth soil profile. Both the soils are under paddy cultivation and in some areas; Rabi crops are also grown after paddy where irrigation facilities are available.

### **3.2.6 Ghoshat - Bilamnur Association**

The soils of this association occur on low-lying area of dissected plateau adjacent to river side. Ghoshat soils occur along the riverside and Silampur soils on low-lying area on 3 to 5 per cent slopes. Ghoshat soils are coarse loamy becoming lighter in texture with depth. Surface soil texture varies from loam to clay loam in both Ghoshat and Silampur series. Available moisture capacity of Ghoshat soils is 13.5 cm in 100 cm depth soil profile. It is 18.6 cm in Silampur series for same soil depth. Both the soils are under paddy cultivation. Rabi crops are also grown where irrigation facilities are available.

### **3.2.7 Beldanga - Bistupur Association**

The soils of this association occur on upper old alluvial plain. Both the soils generally occur on 3-5 percent slope and ranges to 8 per cent. Beldanga soils are fine-loamy i.e. sandy loam to clay loam and Bistupur soils are clayey skeletal i.e. gravelly clay loam to gravelly clay. Surface soil texture varies from loamy sand to sandy loam in Beldanga series, whereas it varies from sandy clay loam to clay loam in Bistupur series. Available moisture capacity of Beldanga series is 18.2 cm in 100 cm depth soil profile. It is 10.7 cm for the same soil depth in Bistupur series. Both the soils are under forest cover with sal and other mixed forest trees. Some parts of the soils under Beldanga series is under cultivated crops.

### **3.2.8 Kanksa - Kuldiha Association**

The soils of this association occur on valleys in upper alluvial old part on 0 to 3 per cent slopes. Both the soils are fine in texture i.e. clay loam to clay. Surface soil texture varies from loam to clay loam in both the soil series. Available moisture capacity of Kanksa series is 18.7 cm and of Kuldiha series is 18.3 cm for 100 cm depth soil profile. Soils are intensively cultivated to paddy.

### **3.2.9 Madhair - Kuldiha Association**

The soils of this association occur on nearly level to very gently sloping lower alluvial plain (old and recent). Madhpur soil generally occurs on 1 to 3 per cent slopes and Kuldiha soil on 0 to 3 per cent slopes. Madhpur and Kuldiha soils are fine i.e. loam to clay and clay loam to clay respectively. Surface soil texture varies from silty clay loam to clay loam in Madhpur series whereas it varies from loam to clay loam in Kuldiha series. Available moisture capacity of Madhair series is 16.9 cm in 100 cm depth soil profile and 18.3 cm for the same depths in

Kuldiha series. Both the soils are under paddy cultivation. Rabi crops are also grown where irrigation facilities are available.

**3.2.10 Banpara - Anantapur Association**

The soils of this association occur on nearly level to very gently sloping lower alluvial plain. Both Banpara and Anantapur soils occur on 0 to 3 per cent slopes. Banpara soils are fine loamy i.e. loam to clay loam and Anantapur soils are fine i.e. clay to silty clay. Surface soil texture varies from sandy loam to loam in Banpara series whereas it varies from sandy clay loam to clay loam in Anantapur series. Available moisture capacity of Banpara series is 19.6 cm in 100 cm depth soil profile and 16.5 for same depths in Anantapur series. Both the soils are under paddy cultivation Rabi crops are also grown where irrigation facilities are available.

**3.2.11 Banpara - Kuldiha Association**

The soils of this association occur on nearly level to very gently sloping lower alluvial plain on 0 to 3 per cent slopes. Banpara soils are fine loamy i.e. loam to clay loam and Kuldiha soils are fine i.e. clay loam to clay.

Surface soil texture varies from sandy loam to loam in Banpara soils whereas it varies from loam to clay loam in Kuldiha series. Both the soils are under intensive paddy cultivation. But Rabi crops are also grown where irrigation water is available.

**3.2.12 Madhpur - Hanrgram Association**

The soils of this association occur on nearly level to very gently sloping lower alluvial plain (old and recent). Madhpur soil generally occurs on 1 to 3 per cent slopes and Hanrgram soil on 0 to 3 per cent slopes. Both Madhpur and Hanrgram soils are clayey in control section. Surface soil texture varies from silty clay loam to clay loam in Madhpur series and loam to clay loam in Hanrgram series. Available moisture cap city of Madhpur series is 16.n cm in 100 cm depth soil profile. It is 15.5 cm for same depth in Hanrgram series. Both the soils are under paddy cultivation. Rabi crops are also crown where irrigation facilities are available.

**3.2.13 Banpra - Hanrgram Association**

The soils of this association occur on nearly level to very gently sloping lower alluvial plain. Banpara soils are fine i.e. clay loam to clay. Surface soil texture varies from sandy loam to loam in Banpara series whereas it is loam to clay loam in Manrgram series. Both the soils are under intensive paddy cultivation. Rabi crops are also grown where irrigation facilities are available.

**3.2.14 Nabaoram - Konarpara Association**

The soils of this association occur on nearly level to very gently sloping meander flood plain on 0 to 2 per cent slope. Nabagram soils are fine i.e. clayey all through and Konarpara soils are fine loamy i.e. sandy clay loam to clay loam. Surface soil texture varies from clay loam to clay in Nabagram series whereas it varies from fine sandy loam to sandy loam in Konarpara series. Available moisture capacity of Nabagram series is 15.0 cm in 100 cm depth soil profile and it is 13.3 cm for the same soil depth in Konarpara series. Both the soils are cultivated to paddy.

**3.2.15 Kutubpur - Multi Association**

The soils of this association occur on nearly level to very gently sloping meander flood plain with marshy areas- on 0 to 3 per cent slopes. Kutubpur soils are fine with variable textures and Multi soils are very fine with clayey texture all through. Surface soil texture of Kutubpur soil varies from silt loam to silty clay loam whereas it varies from clay loam to clay in Multi series. Available moisture capacity of Kutubpur series is 16.9 cm in 100 cm depth soil profile and it is 15.00 cm for the same depths in Multi series. Both the soils are intensively cultivated to paddy.

### **3.2.16 Balidanga - Kutubpur Association**

The soils of this association occur on nearly level to very gently sloping meander flood plain on 0 to 3 per cent slopes. Balidanga soils are fine loamy i.e. clay loam to sandy clay loam and Kutubpur soils are fine with variable textures, sandy to silty clay loam to silty clay. Surface soil texture varies from sandy clay loam to clay loam in Balidanga series whereas it varies from silt loam to silty clay loam in Kutubpur series. Available moisture capacity of Balidanga series is 16.9 cm for the same depths in Kutubpur series. Both the soils are under paddy and Rabi crops.

### **3.2.17 Konarpara - Srirampur - Multi Association**

The soils of this association occur on nearly level to very gently sloping meander flood plain with marshy areas on 0 to 3 per cent slopes. Konarpara and Srirampur soils are fine i.e. loam to clay in Konarpara series and silty clay in Srirampur series and Multi series is very fine i.e. clay althrough. Surface soil texture in Konarpara series varies from fine sandy loam to sandy loam, in Srirampur series from silty clay loam to silty clay and in Multi series from clay loam to clay. Available moisture capacity of Konarpara series is 13.3 cm in 100 cm depth soil profile. It is 17.0 an in Srirampur series and 15.0 cm in Multi series for the same depth soil profile. All the soils are intensively cultivated to paddy.

### **3.2.18 Majiara - Ghoshat Association**

The soils of this association occur on flood plain of river Ajoy. Majiara soils are fine i.e. clay loam to clay and Ghoshat soils are coarse loamy becoming lighter in texture with soil depth. Surface soil texture varies from sandy loam to sandy clay loam in Majiara series and loam to clay loam in Ghoshat series. Soils of this association are cultivated to paddy and Rabi crops.

### **3.2.19 Totpara - Sasanga Association**

The soils of this association occur on nearly level to very gently sloping flood plain of river -Damodar. Totpara soils are fine-loamy i.e. silty clay loam to silt loam and Sasanga soils are also fine-loamy i.e. silty clay loam to clay loam. Surface soil texture of Totpara soil varies from fine sandy loam to silt loam whereas it varies from sandy loam to silt loam in Sasanga series. Available moisture capacity of Totpara series is 18.8 cm in 100 cm depth soil profile. It is 19.0 cm for the same depths in Sasanga soils. Both the soils are under paddy cultivation. Rabi crops are also grown.

### **3.2.20 Krishnadevpur - Balidanoa - Sardanga Association**

The soils of this association occur on nearly level to very gently sloping flood plain of river Bhagirathi. Krishnadevpur soils are fine-loamy i.e. silt loam to loam to silt loam, Balidanga soils are fine-loamy i.e. clay loam to sandy clay loam and Sardanga soils are fine i.e. clay loam to clay in the profile depth. Surface soil texture varies from loam to silty clay loam in Krishnadevpur series, sandy clay loam to clay loam in Balidanga series and loam to clay loam in Sardanga series. Available moisture capacity of Krishnadevpur series is 20.0 cm in 100 cm depth soil profile and 16.4 cm in Balidanga series and 17.4 cm in Sardanga series for same depth soil profile. All the soils are cultivated to paddy as well as Rabi crops if irrigation facilities are available.

The salient features of the different units mapped are given in table 7.

Table 7. Soils Legend

Physiographic Unit	Soil Series association (symbol)	Description of Soil Series	Area in ha	Percentage
Low dissected Plateau	1	<b><u>Sankarpur – Kalyaneswar</u></b> Sankarpur: Deep, well drained, yellowish red to red, loamy skeletal (sandy loam to gravelly loam) soils on 5-15% slopes. Kalyaneswar: Moderately deep, well drained, yellowish red, loamy skeletal (gravelly sandy clay loam) soils on 10-25% slopes.	2,079.08	0.3
	2	<b><u>Sankarnur - Beldanga</u></b> Sankarpur: As under 1. Beldanga: Very deep, well drained, reddish yellow to yellowish red, fine loamy (clay loam) soils on 3-10% slopes.	29,107.16	4.1
Low dissected Plateau (toe slopes with valleys)	3	<b><u>Majiara – Chanda</u></b> Majiara: Very deep, moderately Well drained, light olive brown to light yellowish brown, clayey (clay loam to clay) soils on 3-5% slopes. Chanda: Very deep, moderately well drained light yellowish brown to strong brown, fine loamy (clay loam) soils on 1-5% slopes.	38,090.37	5.4
	4	<b><u>Majiara –Chalbalpur</u></b> Majiara: As under 3. Chalbalpur: Very deep, imperfectly drained, dark yellowish brown to yellowish brown, clayey (clay) soils on 3-10% slopes.	18,005.64	2.6
	5	<b><u>Majiara - Kanksa</u></b> Majiara: As under 3. Kanksa: Very deep, imperfectly drained, very pale brown to gray, clayey (clay loam to clay) soils on 1-3% slopes.	8,669.38	1.2
Low dissected Plateau (flood plains & valleys)	6	<b><u>Ghoshat – Silampur</u></b> Ghoshat: Very deep, moderately well drained, yellowish brown, coarse loamy (loam to sandy loam) soils on river side Silampur: Very deep, moderately well drained, yellowish brown to dark yellowish brown, fine loamy (loam to clay loam to silt loam) soils on 1-3% slopes.	2,745.96	0.4
Upper alluvial plains	7	<b><u>Beldanga – Bistupur</u></b> Beldanga: As under 2. Bistupur : Very deep, well drained, reddish yellow to yellowish red, clayey skeletal (gravelly clay loam to gravelly clay) soils on 3-10% slopes	35,030.59	5

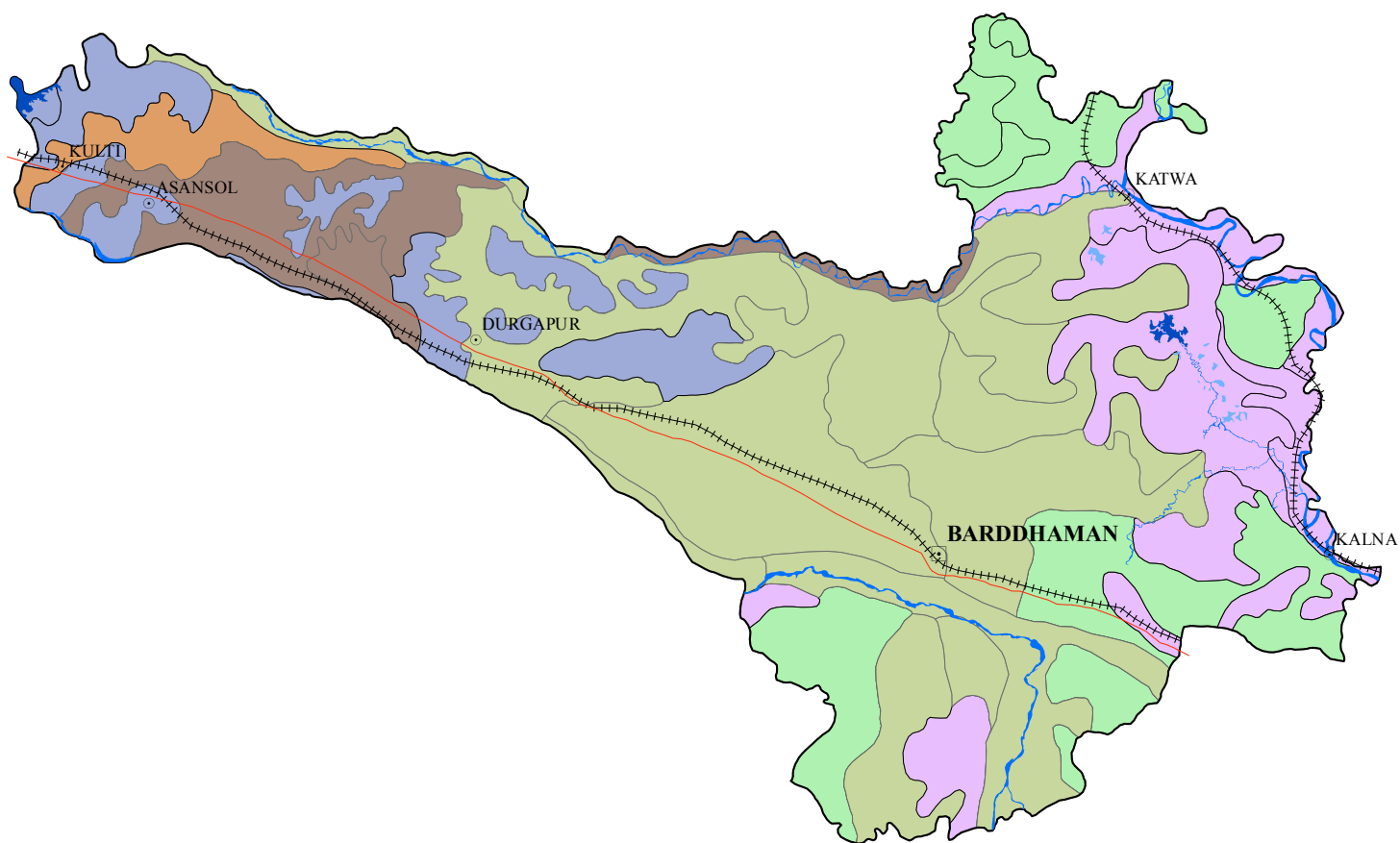
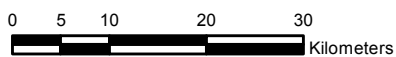
Physiographic Unit	Soil Series association (symbol)	Description of Soil Series	Area in ha	Percentage
Valleys in upper alluvial plain	8	<b><u>Kanksa – Kuldiha</u></b> Kanksa: As under 5 Kuldiha: Very deep, imperfectly drained, grayish brown to gray, clayey (clay loam to clay) soils on 1-3% slopes.	47,308.94	6.7
Lower alluvial plain	9	<b><u>Madhpur – Kuldiha</u></b> Madhpur: Very deep, imperfectly drained, olive gray to gray, clayey (clay loam to clay) soils on 1-3% slopes. Kuldiha : As under 8	93,903.31	13.4
	10	<b><u>Banpara – Anantapur</u></b> Banpara: Very deep, imperfectly drained, olive gray to gray, fine loamy (clay loam) soils on 0-3% slopes. Anantapur: Very deep, imperfectly drained, gray, silty clay (silty clay loam to silty clay) soils on 0-3% slopes.	30,480.14	4.3
	11	<b><u>Banpara – Kuldiha</u></b> Banpara: As under 10 Kuldiha: As under 8.	30,715.51	4.4
	12	<b><u>Madhour - Hanrgram</u></b> Madhpur: As under 9. Hanrgram : Very deep, imperfectly drained, grayish brown to gray, clayey (clay) soils on 0-1% slopes	65,824.55	9.4
	13	<b><u>Banpara – Hanrgram</u></b> Banpara: As under 10. Hanrgram: As under 12.	45,386.77	6.5
Meander flood plain	14	<b><u>Nabagram – Konarpara</u></b> Nabagram: Very deep, poorly drained, gray, clayey (clay) soils on 0-3% slope. Konarpara: Very deep, imperfectly drained, light olive gray to gray, fine loamy (clay loam to sandy loam) soils on 0-3% slope.	67393.67	9.6
Meander flood plain(with marshy area)	15	<b><u>Kutubpur –Multi</u></b> Kutubpur: Very deep, moderately marshy well drained to imperfectly drained, dark gray to light grey, fine loamy (silty clay loam to clay loam) soils on 0-3% slopes. Multi: Very dean. Poorly drained, gray, clayey soils on 0-1% slopes.	14,710.49	2.1
Meander flood plain	16	<b><u>Baliadanga – Kutubpur</u></b> Balidanga: Very deep, imperfectly drained, dark gray to gray, fine loamy (clay loam to clay) soils on 0-1% slopes. Kutubpur: As under 15.	29695.58	4.2

Physiographic Unit	Soil Series association (symbol)	Description of Soil Series	Area in ha	Percentage
Meander flood plain(with marshy area)	17	<b><u>Konarpara - Srirampur – Multi</u></b> Konarpara: As under 14. Srirampur: Very deep, imperfectly to poorly drained, darkgray, fine silty (silty clay loam to silty clay) soils on 0-3% slopes. Multi: As under 15.	61587.93	8.8
Flood plain(Ajay)	18	<b><u>Majiara – Ghoshat</u></b> Majiara: As under 3. Ghoshat: As under 6.	15,848.10	2.3
Flood plain(Damodar)	19	<b><u>Totpara – Sasanga</u></b> Totpara: Very deep, moderately well drained, dark gray to olive gray, fine loamy (silty clay loam to silt loam) soils on 1-5% slopes. Sasanga: Very deep, moderately well drained to imperfectly drained, grayish brown to light gray, fine loamy (silt loam to clay loam) soils on 0-3% slopes,	14,249.16	6.3
Flood plain (Bhagirathi)	20	<b><u>Krishnadevpur - Balidanaa – Sardanga</u></b> Krishnadevpur: Very deep, moderately well drained, light brownish gray to dark grayish brown, fine loamy (silt loam to clayloam) soils on 0-3% slopes. Balidanga: As under 16. Sardanga: Very deep, imperfectly to poorly drained, light brownish gray to pale brown, fine loamy (clay loam to loam) soils on 0-3% slopes.	21,967.67	3

Thematic maps on slope, parent material, surface form, depth, drainage, particle size, surface texture and soil taxonomy were shown in figure 3 to 10.

# BARDDHAMAN

## Slope



### Legend

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

### References

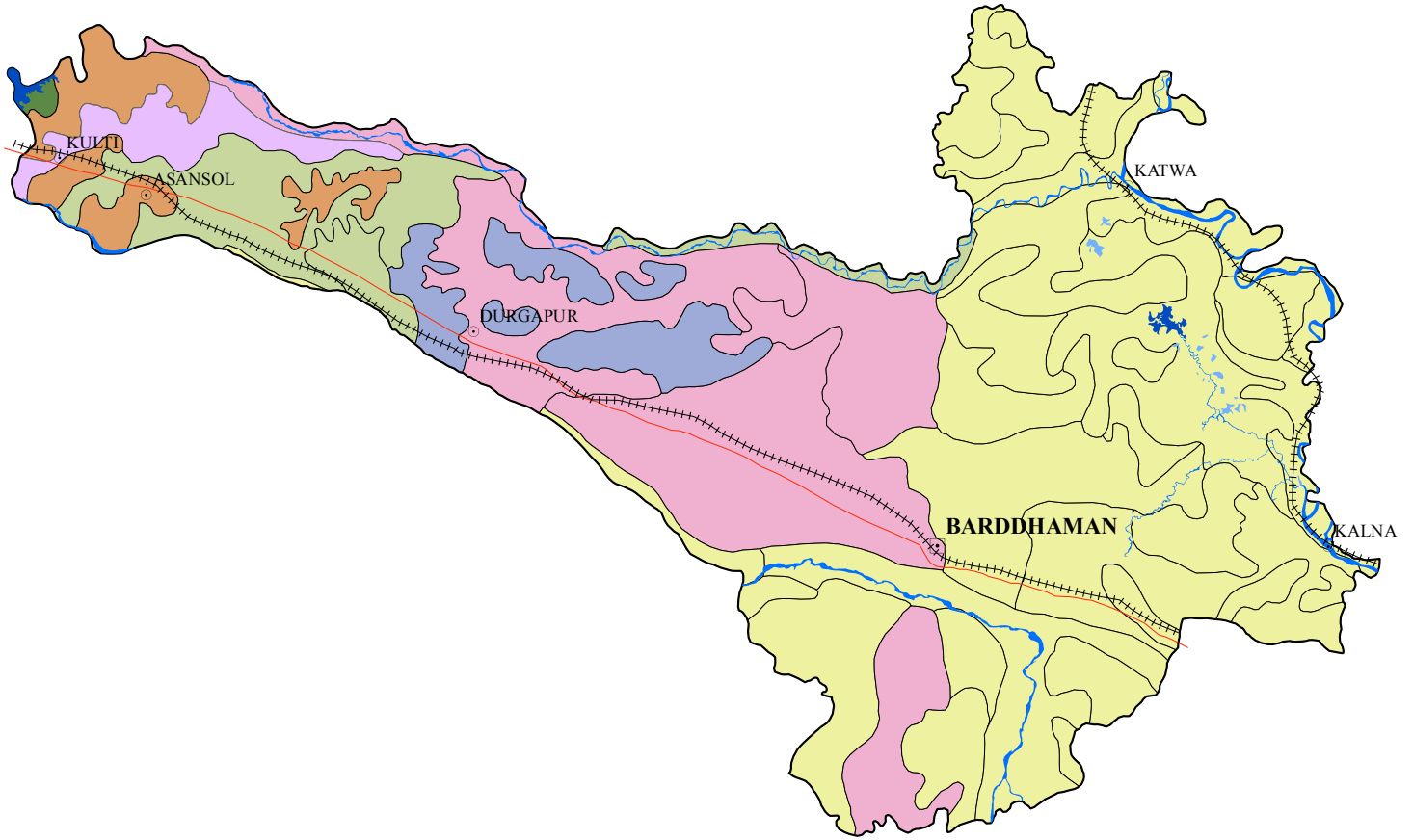
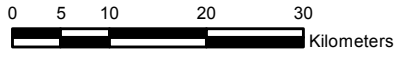
	District HQ
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	Road
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# BARDDHAMAN

## Parent Material



### Legend

	Alluvium
	Alluvium-GraniteGneiss
	ColluviumAlluvium
	ColluviumAlluvium-Shale
	Gneiss-Alluvium
	GraniteGneiss
	GraniteGneiss-Sandstone

### References

	District HQ
	Tehsil HQ
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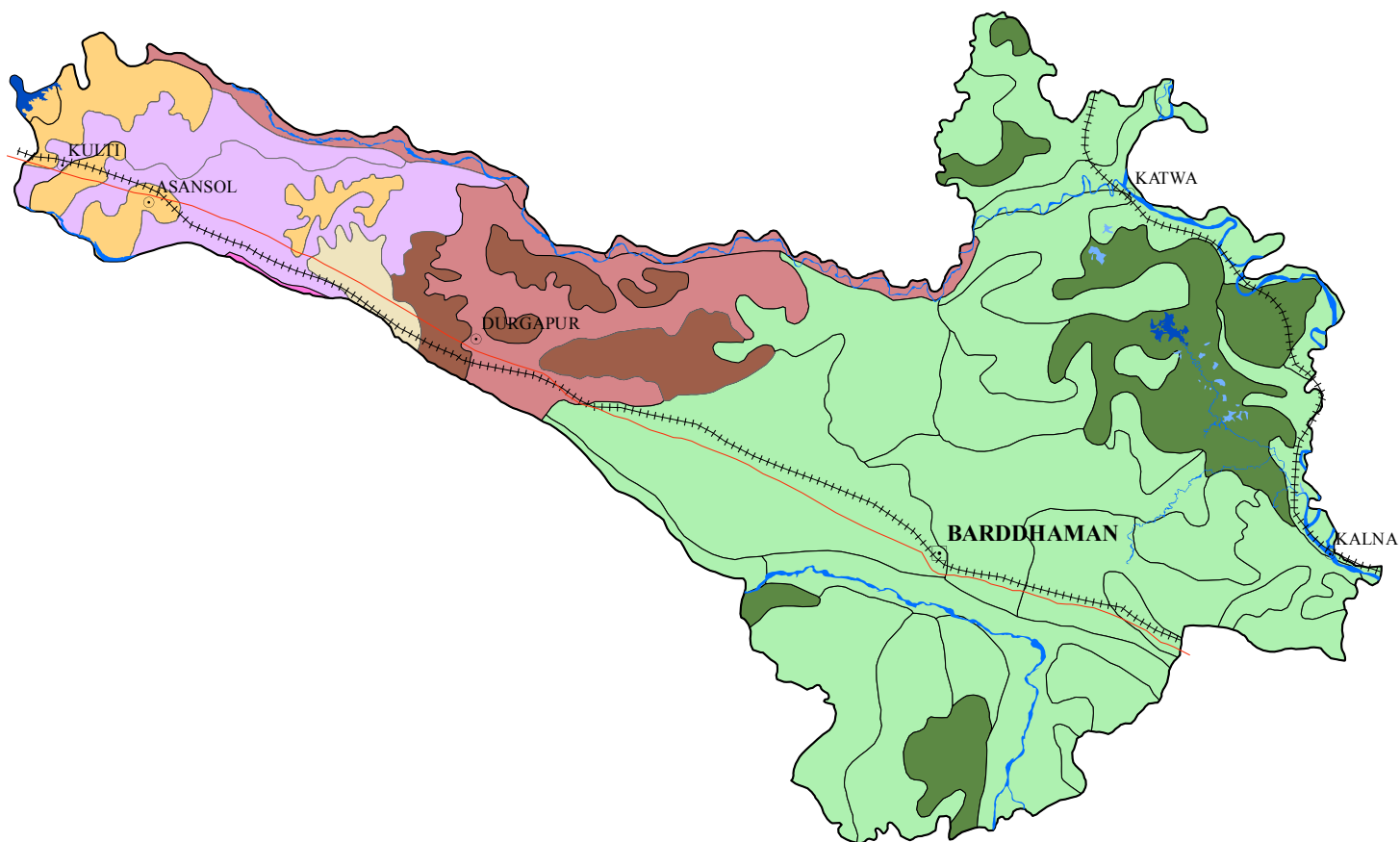


# BARDDHAMAN









## Surface Form












0 5 10 20 30  
Kilometers



### Legend

	Dissected		Level-Marshes
	Dissected-Level		Valleys-Dissected
	Level-Dissected		Valleys-Level
	Level		Valleys

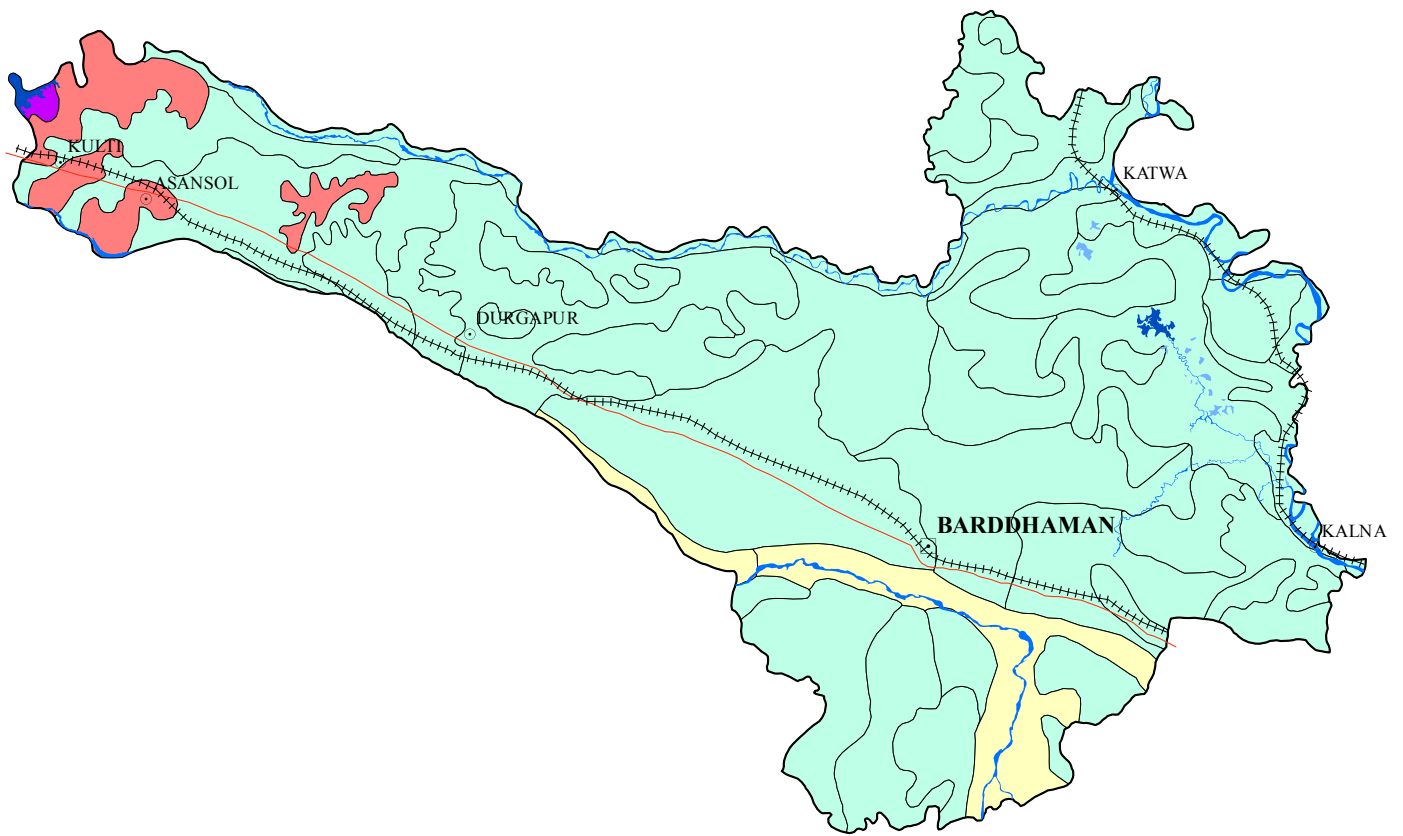
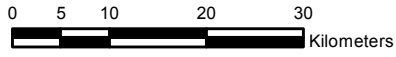
### References

	District HQ
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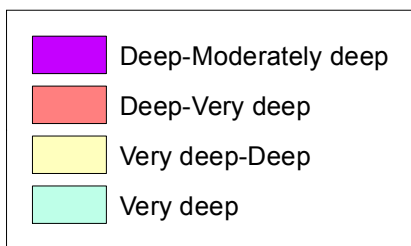


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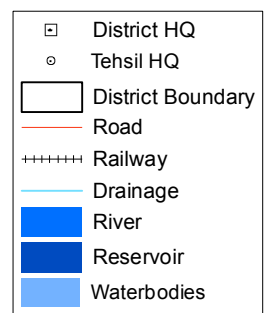
## Soil Depth



### Legend

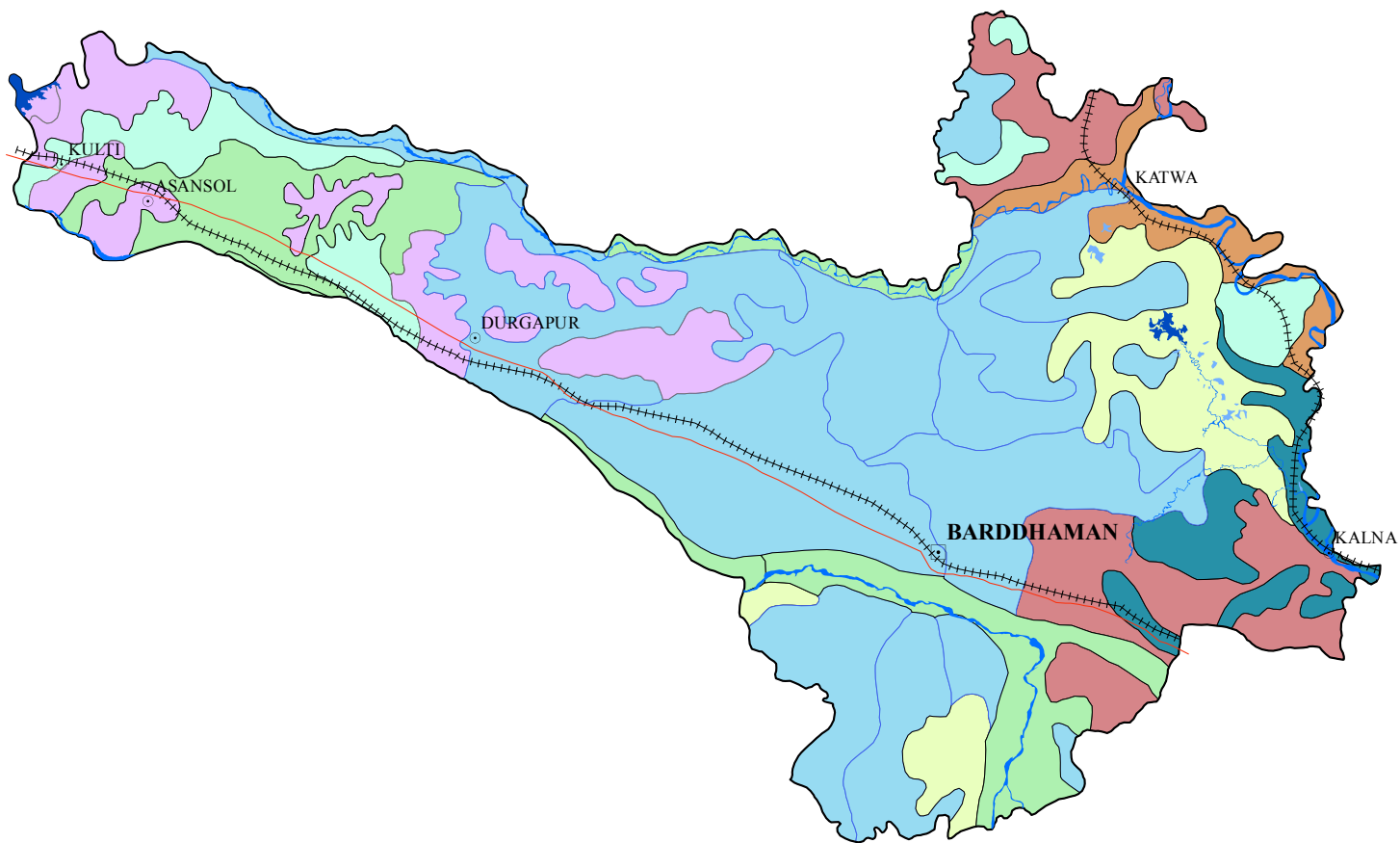
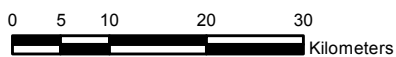


### References



# BARDDHAMAN

## Soil Drainage



### Legend

	Imperfect		Poor-Imperfect
	Imperfect-Poor		Mod well-Imperfect
	Imperfect-Mod well		Mod well
	Mod well-Imperfect		Well

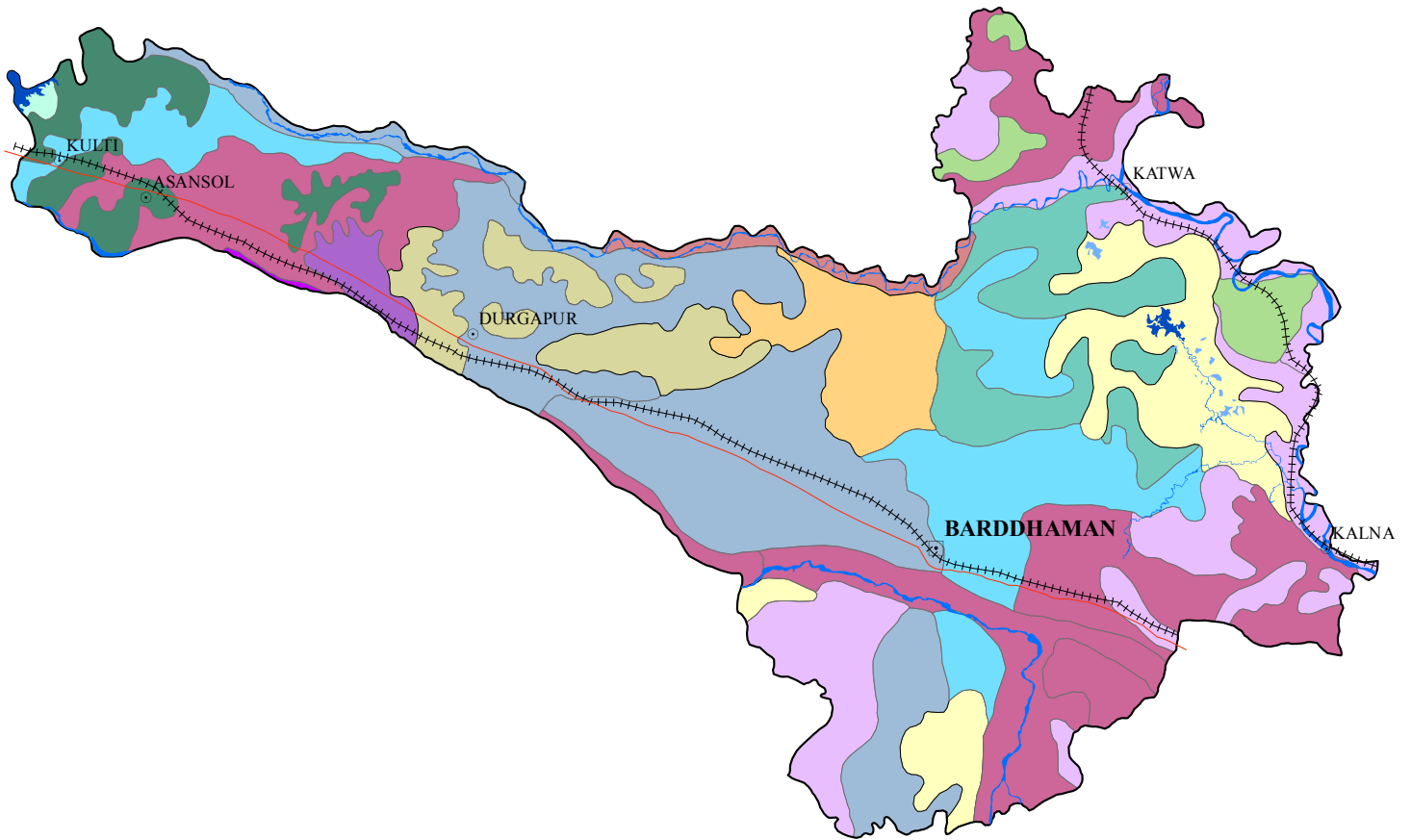
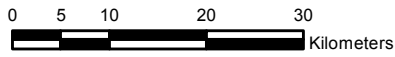
### References

	District HQ
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# BARDDHAMAN

## Particle Size Class



### Legend

	Coarse loamy-Fine loamy		Fine-Clayey
	Fine loamy-Clayey		Fine-Coarse loamy
	Fine loamy-Clayey skeletal		Fine
	Fine loamy-Fine		Fine-Fine loamy
	Fine loamy		Fine-Loamy
	Fine loamy-Fine silty		Loamy skeletal-Fine loamy
	Fine loamy-Loamy		Loamy skeletal-Loamy skeletal

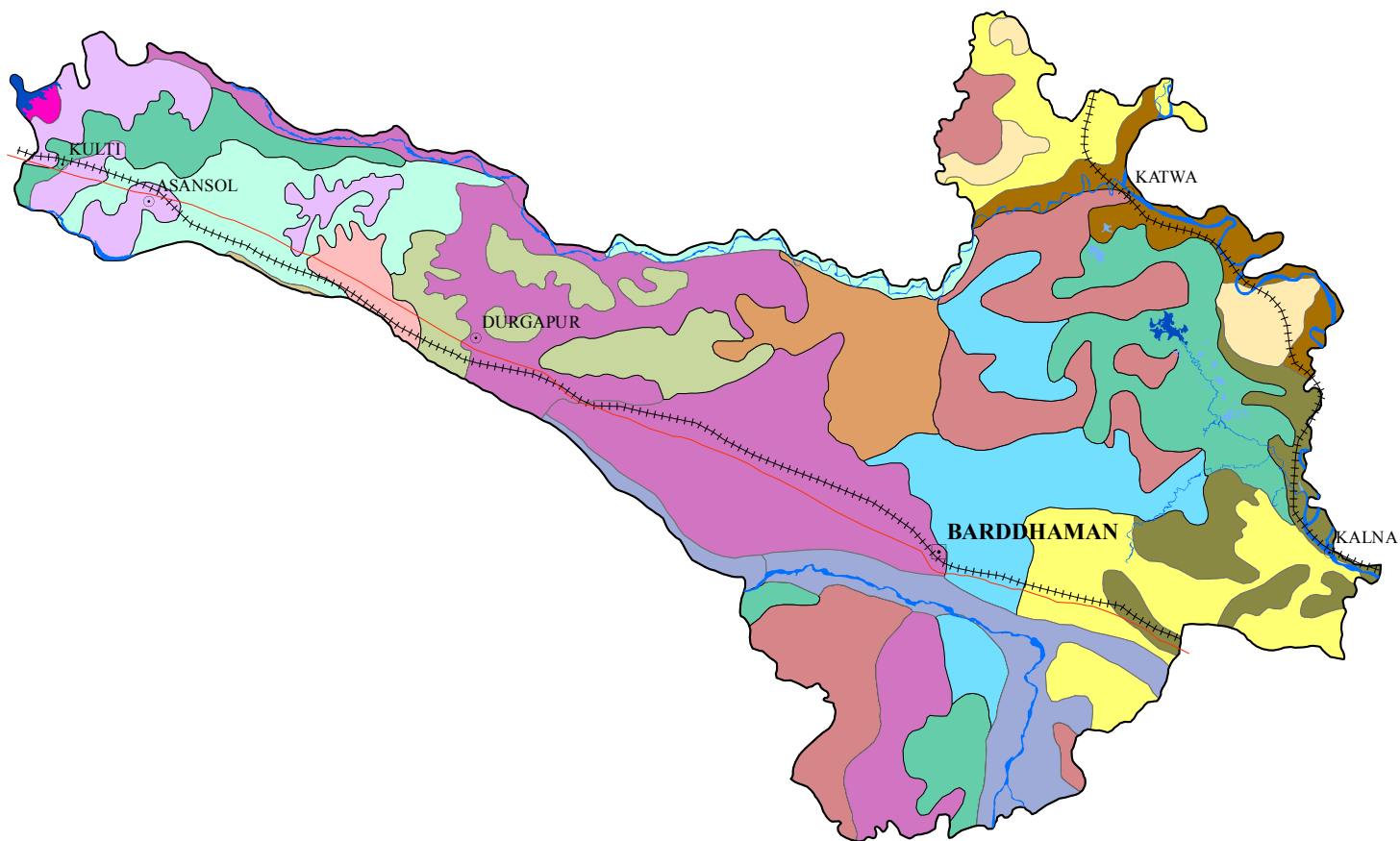
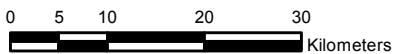
### References

	District HQ
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	Road
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	River
	Reservoir
	Waterbodies



# BARDDHAMAN

## Surface Texture



### Legend

	Clayey loam-Clayey		Sandy loam-Gravelly sandy loam
	Clayey loam		Sandy loam-Loamy-Clayey
	Clayey loam-Silty loam		Sandy loam-Loamy-Clayey loam
	Clayey-Sandy clay loam		Sandy loam-Sandy clay loam
	Loamy		Sandy loam
	Sandy clay loam-Clayey loam		Silty loam-Silty clay loam-Clayey
	Sandy clay loam-Clayey		Silty-Loamy
	Sandy clay loam		Silty-Loamy-Silty-Loamy-Clayey

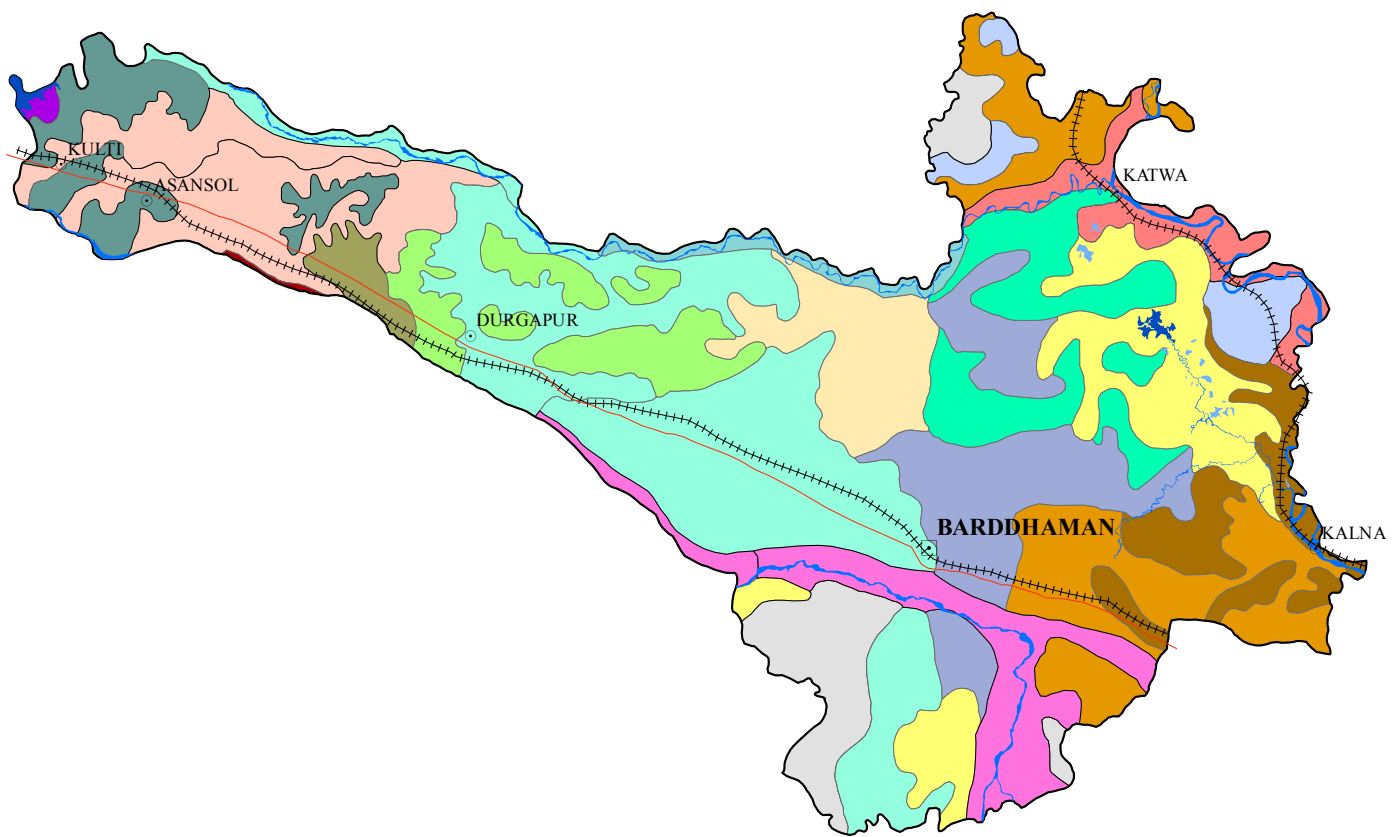
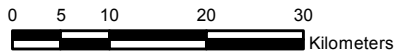
### References

	District HQ
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	Road
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	River
	Reservoir
	Waterbodies



# BARDDHAMAN

## Soil Taxonomy



### Legend

	Aeric Ochraqualfs-Typic Ochraqualfs		Typic Hapluquepts-Typic Ochraqualfs
	Aeric Ochraqualfs-Typic Ustifluvents		Typic Hapluquepts-Typic Udifluvents
	Aeric Ochraqualfs-Udic Haplustalfs		Typic Hapluquepts-Vertic Eutrochrepts
	Fluventic Eutrochrepts-Typic Hapluquepts-Aquic Udifluvents		Typic Hapluquepts-Vertic Ochraqualfs
	Plinthustalfs-Lithic Ustochrepts		Typic Ochraqualfs-Vertic Eutrochrepts
	Plinthustalfs-Ultic Paleustalfs		Typic Ochraqualfs-Vertic Ochraqualfs
	Typic Fluvaquents-Typic Hapluquepts		Typic Ustifluent-Typic Ustochrepts
	Typic Hapluquents		Ultic Paleustalfs
	Typic Hapluquepts		Vertic Fluvaquents-Typic Fluvaquents

### References

	District HQ
	Tehsil HQ
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	River
	Reservoir
	Waterbodies



## 4.

**INTERPRETATIONS**

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**4.1 Principles of Interpretations**

Reconnaissance soil survey has been carried out to delineate the soil series associations, which are named units, but inclusion of other soils to the extent of 20 per cent is admissible in reconnaissance soil maps. Soil series are distinguished on the basis of differentiating characteristics such as effective depth, texture, structure and according to landforms etc. These differentiating characteristics which influence moisture and fertility status of the soils become important to assess management responses and manipulations needed for growing crops or putting them under other uses.

The interpretative groupings of the soils of the district are made for land capability clarification and irrigability classification up to sub-class levels based on the differentiating characteristics of the identified and mapped soils. The soil map along with the land capability and land irrigability maps of the district will help to ascertain the properties and qualities of different soils or to locate them with reference to the interpretations that are important for utilization of the soils/land.

**4.2 Land Capability Classification**

The land capability classification is an interpretive grouping of different soil units and serves as an important role in land use planning to show the relative suitability of the soils for cultivation of crops, pasture forestry etc. in addition to problems which need conservation measures.

This also provides clue to the management and improvement of different soils and lands 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 can be utilized for pastures plantation, forestry, recreation etc.

Land capability classes are divided into Sub-classes to indicate the dominant limitation for agricultural uses, such as 'e' for erosion and run off, 'w' for excess water, 'a' for root zone limitations and 'c' for climate limitation.

The class and Sub-class together provide the map user information about both the degree of limitation and kinds of problems involved for broad programme planning, conservation need studies and similar purposes.

Influence of climate in land use classification has to be considered when the soil conditions are considered favorable. In Burdwan district where the rainfall is 140 cm a land capability classification starts from II and goes up to VI depending upon the limitations. The limitations identified in the area are wetness, erosion due to slope and low available moisture capacity due to soil texture and situation.

Since associations of soil units are mapped, the interpretive groupings will be also in associations both for land capability and irrigability classes (Fig.11).

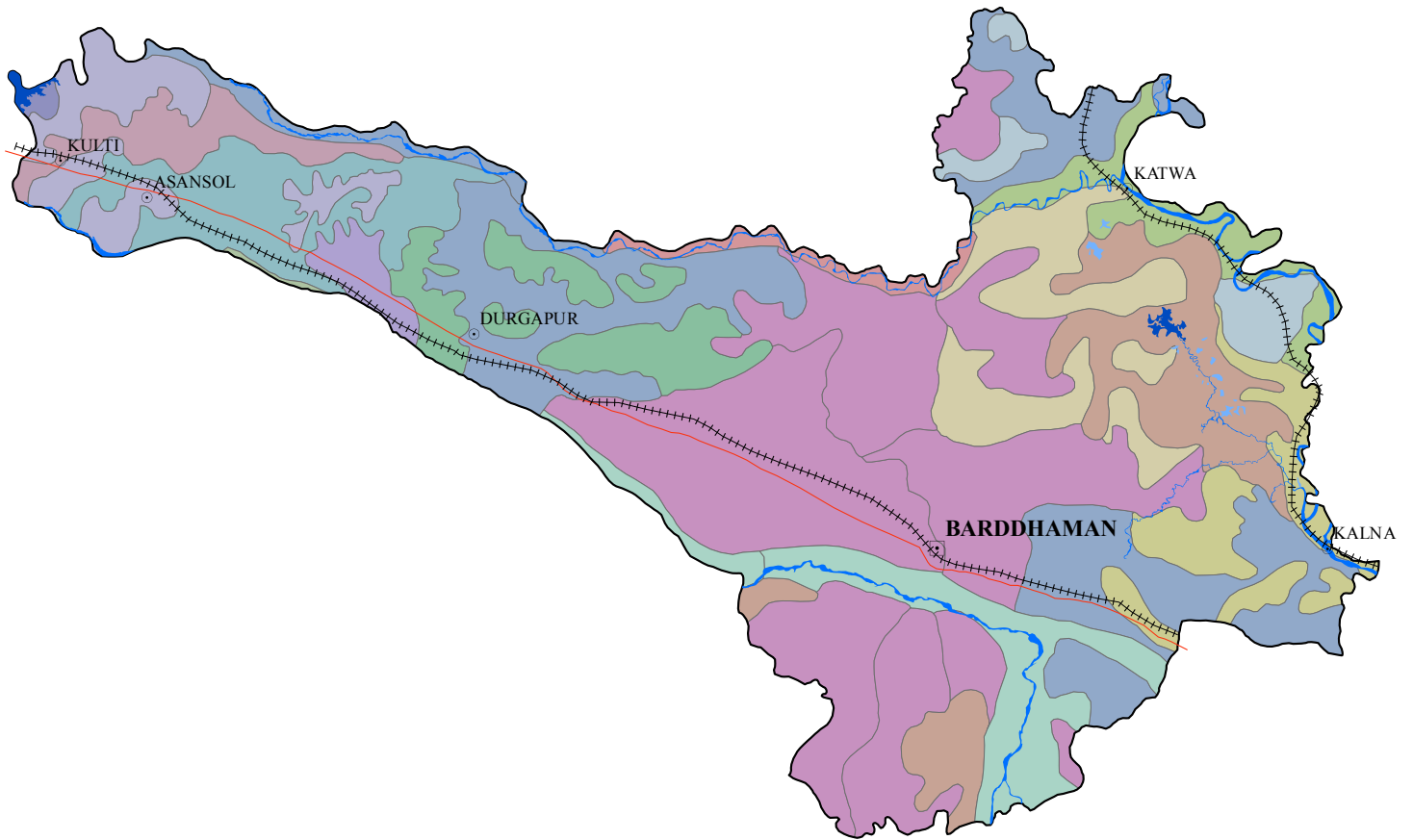
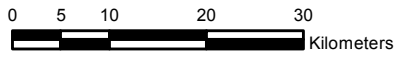
**4.2.1 Land Capability Sub-class IIe: 50564.87 ha; 7.2%**

Class IIe lands include very deep, fine-loamy soils. The lands are very gently sloping to gently sloping and susceptible to erosion. Estimated available moisture capacity is 10.65 to 12.00 cm in 60 cm depth and 18.65 to 20.00 cm in 100 cm depth profile. There is enough moisture from rainfall to support kharif crops if run-off is checked. The soils can grow all climatically adapted crops of the region. Their responses to alternative management are expected to be good.



# BARDDHAMAN

## Land Capability



### Legend

	IIIe-IIIe		IIs-Ile
	IIIw-IIw		IIw-IIIw
	Ile-IIIe		IIw-IIs
	Ile-IIIw		IIw-IIs-IIw
	Ile-Ile		IIw-IIw
	Ile-IIs		IIw-IIw-IIIw
	Ile-IIw		IVe-IIIc
	IIs-IIIw		IVe-VIe

### References

	District HQ
	Tehsil HQ
	District Boundary
	Road
	Railway
	Drainage
	River
	Reservoir
	Waterbodies



Mapping units grouped in Ile is Majiara - Chanda and Majiara - Kanksa series association.

#### **4.2.2 Land Capability Sub-class IIw: 342020.27 ha; 48.6%**

Class IIw lands include very deep, fine and fine-loamy soils. The lands are nearly level to very gently sloping and susceptible to wetness during rainy season. Climatically adapted crops can also be grown during Rabi season with good rains in September or with irrigation water. Mapping units grouped in IIw are Madhpur-Hanrgram, Banrra-Kuldiba, Madhpur-Kuldiha, Kanksa-Kuldiha, Banpara-Anantapur, Banpara-Hanrgram and Krishnadevpur-Balidanga-Sardanga series associations.

#### **4.2.3 Land Capability Sub-class Association IIe-IIw: (40247.90 ha; 5.8%)**

IIe and IIw lands include very deep, fine and fine-loamy soils. The lands are nearly level to gently sloping and subject to temporary stagnation during rainy season and erosion if there is no vegetative cover. These are among the best soils of the area with good fertility status and high productivity. Estimated available moisture capacity ranges from 10.18 to 11.13 in 60 cm depth 16.18 to 19.08 in 100 cm depth in IIe lands and 10.85 to 12.00 cm in 60 cm depth and 16.85 to 20.00 cm in 100 cm depth in IIw lands.

Mapping units included are Totpara -Sasznga series associations.

#### **4.2.4 Land Capability Sub-class Association IIw-IIs: (32088.49; 4.6%)**

IIw and IIs lands include potential soils with good available moisture capacity described under IIw and soils with problem of low available moisture capacity with variable texture in the profile described under IIs. The lands include very deep, fine to fine-loamy soils on nearly level to very gently sloping lands.

Estimated available moisture capacity is 10.90 cm in 60 cm depth and 14.92 cm in 100 cm depth in IIw lands and 9.32 cm in 60 cm depth and 15.76 cm in 100 cm depth in IIs lands. Mapping unit grouped is Balidanga-Kutubpur series association.

#### **4.2.5 Land Capability Sub-class Association IIe and IIIe: (17574.14; 2.5%)**

IIe and IIIe lands include very deep, fine soils on gently sloping to moderately sloping lands susceptible to erosion. Estimated available moisture capacity is 10.18 cm in 60 cm depth and 16.18 cm in 100 cm depth in IIe lands and 9.88 cm in 60 cm depth and 15.88 cm in 100 cm depth in IIIe lands. IIIe lands require appropriate treatment to conserve soil and water by contour bunding.

Mapping unit grouped is Majira-Chalbalpur series association.

#### **4.2.6 Land Capability Sub-class Association IIe-IIs: (15298.91; 2.2%)**

IIe and IIs lands include highly potential lands with good available moisture capacity described under IIe and soils with problem of low available moisture capacity and dryness due to situation under IIs. Estimated available moisture capacity is 10.18 cm in 60 cm depth and 16.18 cm in 100 cm depth in IIe lands and 10.80 cm in 60 cm depth and 14.50 cm in 100 cm depth in IIs lands. Separation of units of individual subclasses will be necessary for specific management.

Mapping unit included is Ghoshat-Silampur series association.

#### **4.2.7 Land Capability Sub-class Association IIw-IIIw: (135140.38; 19.2%)**

IIw and IIIw lands include potential lands with little problem of temporary stagnation described under IIw and soils with problem of continued stagnation and low infiltration described under IIIw. Estimated available moisture capacity ranges from 7.74 to 10.60 cm in 60 cm depth and 13.74 to 17.00 cm in 100 cm in class IIw lands and 9.00 cm in 60 cm a depth 15.00 to 15.02 cm in 100 cm depth in class IIIw lands.

The soils grouped under IIIw are those which are clayey (fine to very fine) situated in low micro relief (concave relief) with low to very low infiltration and subject to continued stagnation for a long period restricting the choice of crops.

With good rains in September, some of these soils can support rabi crops.

Mapping units included are Nabagram-Konarpara and Konarpara-Srirampur-Multi series associations.

#### **4.2.8 Land Capability Sub-class Association II<sub>s</sub>-III<sub>w</sub>: (5688.06 ha; 0.8%)**

II<sub>e</sub> lands include very deep, fine soils with variable texture in the profile having available moisture capacity 8.66 to 9.98 cm in 60 cm depth and 14.76 to 16.76 cm in 100 cm depth.

The soils grouped under III<sub>w</sub> are those, which are clayey (very fine) with very low infiltration and subject to continued stagnation for a long period restricting the choice of crops. These lands are generally left fallow after kharif as sowing of seeds are very much delayed due to wetness during the early part of the rabi season.

Mapping unit grouped in this Sub-class is Kutubpur-Multi series association.

#### **4.2.9 Land Capability Sub-class III<sub>e</sub>: (33696.84 ha; 4.8%)**

III<sub>e</sub> lands include very deep, clay loam to gravelly clay (loamy skeletal to fine loamy) soils on very gently to gently sloping lands susceptible to severe erosion. These soils are underlain by clay mixed with ferruginous concretions. The available moisture capacity ranges from 8.34 to 10.21 cm in 60 cm depth and 11.82 to 17.59 cm in 100 cm depth profile. The lands are under dry land crops or thin forest and left fallow. The lands require appropriate treatment to conserve soil and water by contour bunding.

Mapping units grouped is Beldanga-Bistupur series association.

#### **4.2.10 Land Capability Sub-class Association IV<sub>e</sub>-III<sub>e</sub>: (28440.29 ha; 4.0%)**

III<sub>e</sub> and IV<sub>e</sub> lands include very deep, fine-loamy with medium available moisture capacity described under III<sub>e</sub> and deep loamy-skeletal soils with low available moisture capacity, described under IV<sub>e</sub>. Estimate available moisture capacity is 10.21 cm in 60 cm depth and 17.59 cm in 100 cm depth in III<sub>e</sub> lands and 5.66 cm in 60 cm depth in IV<sub>e</sub> lands. The lands are susceptible to severe to very severe erosion due to slope. Separation of units of individual sub-classes will be necessary for specific management.

Mapping unit included is Sankarpur-Beldanga series association.

#### **4.2.11 Land Capability Sub-class Association IV<sub>e</sub>-VI<sub>e</sub>: (2039.85 ha; 0.3%)**

IV<sub>e</sub> and VI<sub>e</sub> lands includes deep to moderate deep loamy-skeletal soils on strongly sloping dissected lands in IV<sub>e</sub> and shallow to moderately deep, loamy-skeletal soils on strongly sloping to steep lands on hill sides in VI<sub>e</sub>. Estimated available moisture capacity is 5.66 cm in 60 cm depth in IV<sub>e</sub> and 2.43 cm in 30 cm depth in VI<sub>e</sub>.

Mapping unit grouped is Sankarpur-Kalyaneswar series association.

### **4.3 Land Irrigability Classification**

From the land use data of the district it is seen that during kharif season about 74% of net cropped area receives irrigation water. During rabi season 34% of net cropped area is irrigated. The farmers of the district get 70% of irrigation water from Canals, 17% from minor irrigation like Deep tube wells, River lift irrigation and shallow tube wells and 13% from tanks and other sources.

Irrigability classification is made taking note of the fact that temperature and sunshine conditions are favorable throughout the year for climatically adapted crops. Soil irrigability classification is made on the basis of important soil characteristics namely soil texture, depth, and available moisture holding capacity of soils, infiltration and permeability. There is no salinity problem in any part of the district. Availability of irrigation water is assumed adequate. Irrigation water of all sources are of good quality.

Irrigability class I lands do not have any limitation. Hence, they are not divided into subclasses. These include soil series that have good available moisture capacity, soil depth and texture and which do not pose the problems of drainage and topography.

Assumptions made in classifying are that within irrigability sub-class, soils have similar limitations. Three kinds of limitation which come across at the sub-class level are 's' for soil limitation and, 'd' for drainage limitation, and 't' for topography limitation. Land irrigability map of the district is shown in figure 12.

### **4.3.1 Irrigability Class I lands: (132080.60 ha; 18.8%)**

These include soils which are deep to very deep occurring on nearly level to very gently sloping lands with available moisture capacity of more than 12 cm/100 cm depth soil profile. These have no unfavorable soil, topography or drainage conditions. Under irrigation, these lands can support all climatically adapted crops of the region. They will respond to the recommended irrigation schedule. The soils are expected to show the most favorable response to management.

Mapping units included in this class are associations of Totpara-Silampur, Balidanga-Kutubpur, Krishnadevpur-Balidanga-Sardanga and Ghoshat-Silampur and Totpara-Sasanga series associations.

### **4.3.2 Irrigability Sub-class 2d lands: (350022.78 ha; 49.8%)**

Irrigability sub-class 2d lands include soils which have problem of temporary stagnation due to heavier texture, low infiltration and low relief. They limit the choice of crops and may need surface drainage during rainy season. The soils are well suited to paddy crop under irrigation.

Mapping units included are Madhpur-Hanrgram, Banpara-Anantapur, Banpara-Hanrgram, Nabagra-Konarpara, Madhpur-Kuldiha and Banpara-Kuldiha series associations.

### **4.3.3 Irrigability Sub-class 1-2t lands: (13769.02 ha; 2.0%)**

These include very good class I irrigable lands in association with good irrigable lands under 2t with problems of slope and erosion. On these lands soil conservation measures to check erosion are recommended. Mapping unit included is Majiara-Ghoshat series association.

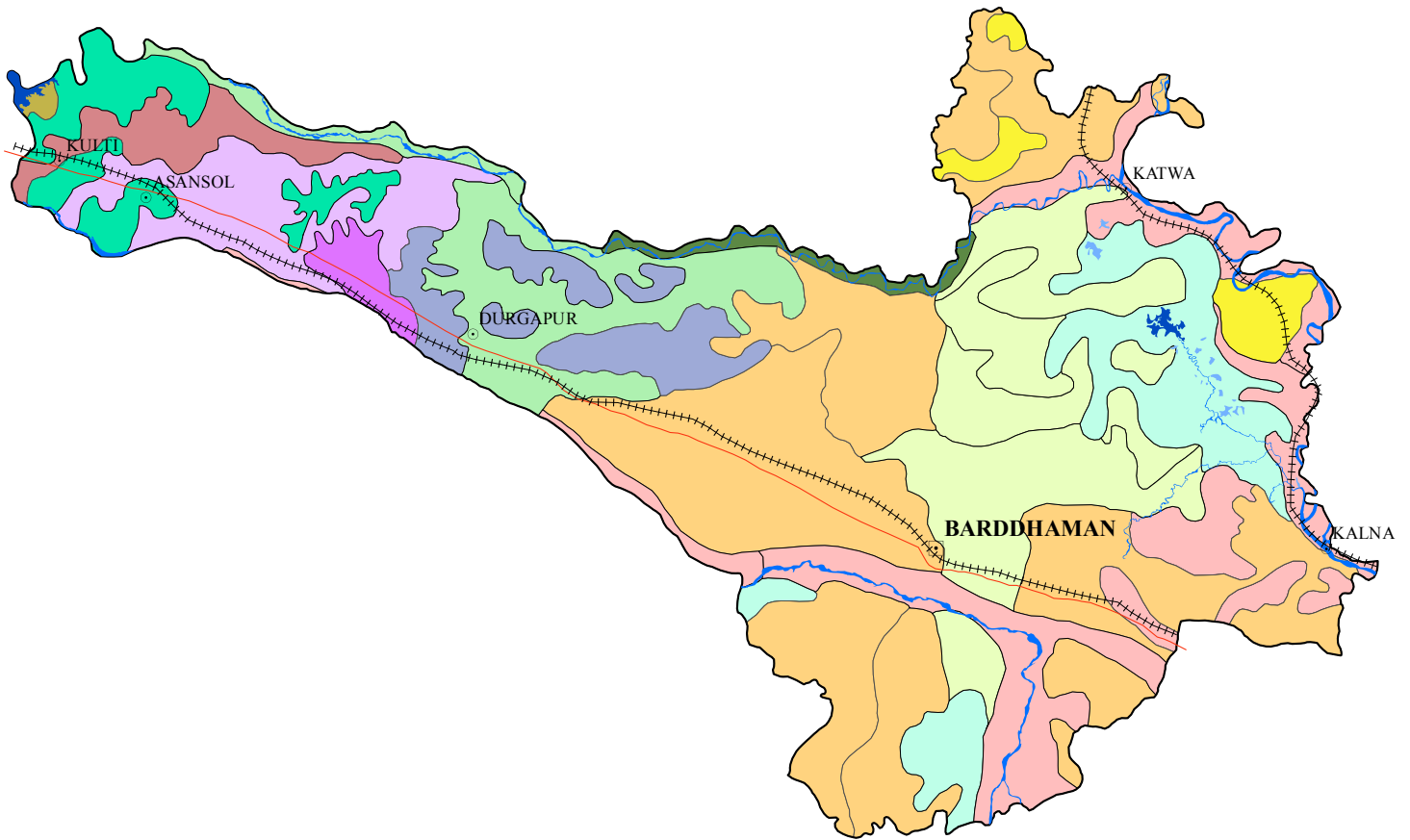
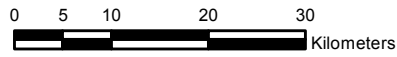
### **4.3.4 Irrigability Sub-class 1-3d lands: (14710.49 ha; 2.1%)**

Irrigability sub-class 1-3d lands include soils of very good class I lands in association with soils of moderately good 3d lands with problems of stagnation due to very fine texture, very low infiltration and very low relief. 3d lands, the choice of crop is limited and only paddy can be grown with care.














Mapping unit included is Kutubpur-Multi series association.

# BARDDHAMAN










## Land Irrigability



### Legend

	1		2t-3d
	1-3d		2t-3t
	2d		3d-2d
	2d-3d		3t
	2d-3d-2d		4t-3t
	2t-1		4t-6t
	2t		

### References

	District HQ
	Tehsil HQ
	District Boundary
	Road
	Railway
	Drainage
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**4.3.5 Irrigability Sub-class 2t lands: (44013.80 ha; 6.3%)**

These include soils of good irrigability class 2t lands with problems of slope and erosion in association with soils of good irrigability class 2d lands with problems of temporary stagnation during rainy season due to fine texture and low relief. Mapping units included are Majiara-Chanda and Majiara-Chanda series associations.

**4.3.6 Irrigability Sub-class 3t lands: (33696.84 ha; 4.8%)**

Irrigability sub-class 3t lands include deep to very deep soils with low to medium available moisture capacity on gently sloping to moderately sloping lands with slope and erosion problems.

Mapping unit is Beldanga-Bistupur series association.

**4.3.7 Irrigability Sub-class 2d-3d lands: (57782.81 ha; 8.2%)**

These include soils of very deep, fine to very fine soils which are moderately or excessively wet during rainy season due to low relief. The very fine soils are also subjected to high ground water. Cultivation under irrigation is not possible without providing surface drainage.

Mapping unit is Konarpara-Srirampur-Multi Kanksa Kuldiha series association.

**4.3.8 Irrigability Sub-class 2t-3t lands: (17574.14 ha; 2.5%)**

These include very deep fine soils of good to moderately good irrigable lands with problems of slope and erosion and medium available moisture capacity.

Mapping unit is Majiara-Chalbalpur series association.

**4.3.9 Irrigability Sub-class 3t-4t lands: (28440.29 ha; 4.0%)**

These include very deep, fine-loamy soils of moderately good irrigable lands occurring on moderately sloping to sloping lands under 4t with problems of very low moisture holding capacity, strong slope and severe erosion. On 4t lands, soil conservation measures to check erosion are recommended.

Mapping unit included is Sankarpur-Beldanga series association.

**4.3.10 Irrigability Sub-class 4t-6t lands: (2039.85 ha; 0.3%)**

These include moderately deep to deep, loamy-skeletal soils on small hills and strongly sloping dissected lands. They are severely eroded due to strong to steep slopes and are not suited for use under irrigation. Construction of check dams, growing forest and grass species and proper land shaping to check soil erosion are recommended.

Mapping unit is Sankarpur-Kalyaneswar series association.

**4.3.11 Irrigability Sub-class 2t-3d lands: (8669.38 ha; 1.2%)**

These include deep to very deep, bendy clay loam to clay soils with problems of slopes, erosion, drainage, low available moisture and seasonal water stagnation.

Mapping unit is Majiara-Kanksa series association.

#### 4.4 Productivity and yield prediction

After assessing the land capability and land irrigability classes for the different soils on the basis of soil and land characteristics, productivity and yield prediction estimate in respect of these soils is a further step for developing interpretation of soils for land use planning.

Soil productivity is the capacity of a soil in its normal environment to produce crops under a specified system of management. This may be expressed in terms of yield of crops grown in the area.

In the district, amen paddy is the most important crop. This crop is grown in nearly all the soils mapped. There is more awareness to use the improved technology for obtaining better yields of these crops. Hence, yield prediction for these crops in respect of the different soil series and management information were generated from the interviews with the farmers and also State Agricultural Officers.

The farmers of the area are quite conscious about improved agricultural practices and most of them use improved seeds, adequate manures and fertilizers to grow paddy crops. Dependable data on crop yield etc. could be obtained from these types of farmers. The levels of management they practice can be termed medium and high levels of management. Low level of management is not well defined for paddy crop and yield data from such management varies considerably. Hence, yield data under low level of management have not been considered.

Following are the two levels of management defined on the basis of information collected from the farmers:

**(a) Medium level of management:**

Use of improved varieties of paddy (H.Y.V.): 25 to 30 kg N/ha, 15 to 20 kg P<sub>2</sub>O<sub>5</sub>/ha, 15 to 20 kg K<sub>2</sub>O/ha, 2 to 3 weeding, average irrigation and some plant protection measures.

**(b) High level of management:**

Use of improved varieties of paddy (HYV): 50 to 55 kg N/ha, 25 to 30 kg P<sub>2</sub>O<sub>5</sub>/ha, 25 to 30 kg K<sub>2</sub>O/ha 3 to 4 weeding, adequate irrigation and plant protection measures.

The predicted yield of amen paddy in respect of the different soil series under the above two levels of management are given at the end of description of each soil series in the Annexure.

It is observed that in general, crop yield is less in the Asansol sub division as compared to other areas of the district. Broadly speaking, yield of amen paddy depends more on soil moisture relationship than any other factors. Hence the lower yield in Asansol sub-division may be due to the fact that the soils remain drier for a greater period specially in the higher situation in the undulating terrain and also that the soils are not under the command area of any river valley project.

Table 8 gives the information on predicted yield of amen paddy on fine and fine-loamy soils. It is observed that in the district excluding Asansol sub division fine and fine-loamy soils produce similar Yield of paddy crops, whereas in the Asansol sub division fine-loamy soils produced better yields than the fine soils. Obviously higher yields in case of fine soils in Asansol sub division are due to higher available moisture capacities of these soils. In the other areas of the district, due to adequate irrigation facilities, there is practically no difference in yield of amen paddy crop in the two categories of soils.

**Table 8. Predicted Yield of Aman Paddy (Q/ha)**

Levels of Management	Management definitions	Bardhaman district excluding Asansol sub- division		Asansol Sub-division	
		Fine soil	Fine loamy soil	Fine soil	Fine loamy soil
Medium	Improved variety 25-30 kg N 15-20 kg P <sub>2</sub> O <sub>5</sub> 15-20 kg K <sub>2</sub> O 2 to 3 weedings: irrigation and some plant protection measures.	32-36	32-36	26-30	27-31
High	Improved variety 50-55 kg N 25-30 kg P <sub>2</sub> O <sub>5</sub> 25-30 kg K <sub>2</sub> O 3-4 weedings irrigation and plant protection measures.	45-49	45-49	39-43	41-45

It is predicted that yield of aman paddy can be increased considerably by high level of management over medium level of management, the increase being about 48 per cent in Asansol subdivision and about 35 per cent in other parts of the district.

Comprehensive Area Development Corporation has summarized the results of several fertilizer experiments on aman paddy in the district. The compiled results of these experiments are shown in table 9. It is observed from there that by application of plant nutrients as per recommendations based on results of soil testing, yield of paddy can be increased from 33 to 45 per cent. Though these cannot be correlated with the definite individual soil, it gives an indication that the soils of the district in general are responsive to additional inputs by way of addition of nutrients which appears to be quite promising.



**Table 9 Profit from Application of Fertilizers on Paddy**

<b>A. Local improved varieties of paddy : (Average results of 299 experiments)</b>					
Treatments	Yield Q/ha	Cost of cultivation including fertilizers Rs/ha	Price of produced crop Rs/ha	Net profit	Ratio of Additional expenditure to Additional income
Farmers' own manorial practice	28.42	740.77	1860.95	1120.18	-
Fertilizer application as per recommendation based on results of soil testing	37.85	941.60	2521.25	1579.65	1:8.37
<b>B.High yielding varieties of paddy: (Average results of 132 experiments)</b>					
Farmers' own manorial practice	34.15	1053.37	2430.15	1376.78	-
Fertilizer application as per recommendation based on results of soil testing	49.45	1404.27	3513.40	2109.13	1:9.18

*Source: Fertilizer Hand Book for Project Extension Workers of West Bengal Comprehensive Area Development Corporation. 1980.*

## 5.

**LAND USE AND MANAGEMENT RECOMMENDATIONS**

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Reconnaissance soil survey has provided information on the distribution of different soils in the district, their inherent characteristics and qualities. Adapted crops on different soil series are given in table 10. Management of the soils under different land capability and land irrigability classes has also been discussed. Information on productivity and yield prediction would make it possible to choose package of practices for projected yields or to make contingency plans. Recommendations are given below for use and management of soils in different parts of the district.

**5.1 Cropping Practices and General Management**

The ultimate purport of soil survey is utilization of soils of the district. From the land use figures it is seen that (64.98) percent of the total area of the district is cropped.

Important cropping seasons of the district are

- |               |   |                   |
|---------------|---|-------------------|
| 1. Pre-Kharif | - | March to May      |
| 2. Kharif     | - | June to December  |
| 3. Rabi       | - | December to March |

Important crops grown in the district are - paddy (Aus, Aman, Boro), wheat, barley, maize, gram, masur, khesari, arhar, mug, mustard, til, vegetables, Jute, potato, chillies sugarcane, onion, garlic, tobacco and Various crops of horticultural importance.

Intensification of agriculture needs proper care and management of soils in the growing of crops by proper land use, crop rotation and application of manures and fertilizers.

In the western portion of Bardhaman district, generally soil is poor in fertility, rainfall is less and land surface is undulating. From January to June, the area looks almost devoid of any effective vegetative cover. The pre-monsoon heavy thundershowers remove considerable quantity of soil by sheet erosion. Formation of deep gullies in the areas is not an uncommon sight. Soil erosion is very acute in the Asansol sub-division than in other parts of the district.

Soil conservation measures appropriate for the soil type and the cropping pattern should be adopted for proper use of the soils. Intensive soil and water conservation measures by mechanical and vegetative means. viz. contour bunding, terracing, trenching etc. are needed. Farm forestry and pasture development may be encouraged. Agronomical measures like manuring, mulching, crop rotation etc. may be followed.

Conservation of surplus run off during monsoon season and preservation of soil moisture are essential for soils of Asansol Sub-division. This may be done by constructing tanks to collect surplus run off from the catchment areas of seasonal stream channels. These water conservation structures can supply water for irrigation and livestock during the periods of dry spell even during the main monsoon season. This will ensure at least one crop during the monsoon. Besides, surplus water available after the monsoon can also be used for agriculture, animal husbandry. The tanks den favourably influences the sub-surface water storage capacity of the soil. Effective measures may be taken for keeping the land under permanent vegetation to prevent the soil erosion by wind and water. Farm forestry may also be developed to prevent harmful effects of wind erosion and cyclonic disturbances.

Table 10: Crops on Different Soil Series

S. No.	Soil series and texture family	Av. Moisture Cap. in cm in 100 cm depth	Kharif			Rabi and Summer		
			Unirrigated	Irrigated		Unirrigated	Irrigated	
			Cereal & other crops	Cereal & other crops	Vegetable	Cereal & other crops	Cereal & other crops	Vegetable
1	2	3	4	5	6	7	8	
1.	Anantapur (Clayey)	16.57	Aman paddy	Aus and Aman	Brinjal, Chillies,	Gram, Til or left	Boro paddy	Chillies. Brinjal,
2.	Banpara (Fine loamy)	9.61	Kharif pulses	paddy (H.Y.V.),	Ladies finger	fallow	(H.Y.V.), Wheat,	Cucurbits,pea, Ladies-
3.	Hanrgram (Clayey)	15.50	Mesta	Jute, Masts,			lientil, Arhar, Til	finger
4.	Madhpur (Clayey)	16.85		Sugarcane				
5.	Balidanga (Fine-loamy)	14.92	Aman paddy,	Aus and Aman	Radish, Brinjal,	Gram, Mustard,	Boro paddy	Cauli flower, Cabbage,
6.	Krishnadevpur (Fine-loamy)	18.14	Moong, Til,	paddy (H.Y.V.),	Onion, Water-Mellon,	Khesari, Til,	(H.Y.V.), Wheat,	Palwal. Ladies-finger,
7.	Sardanga (Fine-loamy)	14.67	Castor, Arhar,	Jute, Masts,	Chillies, Ladies-	Lentil.	Lentil. Sugarcane.	Cucumber, Pea,
8.	Sasanga (Fine-loamy)	20.00	Dhaincha	Sugarcane	finger, Cucumber,		Mustard,Moong,	Cucurbits, Groundnut
9.	Srirampur (Fine-silty)	17.00			Pampkin, Arum		Sayabean,Til	
10.	Konarpara (Fine-loamy)	13.74	Aus and Aman	Aus and Aman		Khesari, Til,	Boro paddy	
11.	Multi (Fine-clayey)	15.00	paddy	paddy (H.Y.V.),			(H.Y.V.)	
12.	Nabagram (Clayey)	15.02		Jute				
13.	Ghoshat (Coarse loamy)	11.08	Aman paddy,	Aus and Aman	Radish Onion,	Mustard, thesari,	Boro paddy	Cauliflower, Cabbage,
14.	Kutubpur (Clayey)	15.76	Moong, Til,	paddy (H.Y.V.),	Cucumber,	Til or Fallow	(H.Y.V.), Wheat,	Palwal, Cucumber, Pea,
15.	Silampur (Fine-loamy)	18.65	Arhar,	Masts,	WaterMellon,		Mustard, Moong,	Cucurbits
16.	Totpara (Fine-loamy)	20.00	Groundnut,	Sugarcane	ChIllies, Pumpkin,		Potato	
			Dhaincha		Arum			
17.	Beldanga (Fine-loamy)	17.59	Aus	Aus and Aman	ChIllies, Pumpkin	Mustard, thesari,	Boro paddy	Chillies, Brinjal
18.	Chalbalpur (Clayey)	15.88	paddy,Tur, Til,	paddy (H.Y.V.)		Gram	(H.Y.V.), Wheat,	Cucumber, Ladies-finger
19.	Chanda (Fine-loamy)	18.13	Linseed,				Mustard	
20.	Kanksa (Clayey)	18.7	Fallow					
21.	Knldiha (Clayey)	18.30						
22.	Majiara (Clayey)	16.18						
23.	Bistupur (Clayey-skeletal)	11.82	These soils are either under thin forest or bushes, shrubs and grasses.					
24.	Kalyaneawar (Loamy skeletal)	2.43	These are very seldom cultivated					
25.	Sankarpur (Loamy skeletal)	5.66	These are very seldom cultivated					

In the eastern part of the district, soils are under more favourable moisture condition. This helps them to remain under vegetative cover most of the time and soil erosion is less. Multi, Srirampur, Kutubpur, Nabagram and Konarpara series occurring in depressions need effective drainage system for the safe disposal of excess water. Proper surface drainage will also mitigate the problem of high ground water table and stagnation.

### **5.2 Irrigation Facilities and Management of soil:**

Supply of timely and adequate quantity of water plays a vital role in the crop production. Water table is neither too low nor too high in most of the soils of alluvial tracts of Kalna, Katwa and Sadder sub-divisions. It is recorded low in Asansol Sub-division.

By and large, rainfall regulates the agriculture of the district. Cultivation of Jute and Ate paddy starts by the onset of monsoon in June. This is followed by the Kharif crop and aman paddy. The vagaries of monsoon often adversely affect the agriculture. It is not uncommon that excessive rains and floods adversely affect soils like Balidanga, Kutubpur, Krishnadevpur, Multi, Nabagram, Ghoshat, Sardanga, Srirampur, Sasanga and Silampur series. Again most of the soils suffer from droughty condition during summer season and even for short periods during monsoon season.

This calls for assured water supply for successful crop yield by supplementing precipitation by artificial irrigation from rivers, canals, tanks, wells etc and underground water by deep tube wells, shallow tube wells, wells etc.

Of the total cultivated land of the districts, 3,26,938 hectares in Kharif season and 1,14,227 hectares in rabi season get the benefit of irrigation from canal system of the two rivers valley projects (D.V.C. and Mayurakshi) and other irrigation resources. Irrigation facilities are well developed in the eastern part of the district.

While exploiting water resources, care should be taken for the judicious use of irrigation water according to the land irrigability classes.

### **5.3 Fertility Management**

Soils can be broadly grouped into two categories one that of sedentary origin mostly in the west and the second of alluvial origin in the eastern part. They behave differently in their fertility status and soil-plant relationship. Twenty four soil series are identified in the district. Physio-chemical properties of different soils are provided in the Annexure.

Mostly soils of western portion of the district (mainly Asansol Sub-division) are poor in fertility. They are deteriorated due to deforestation and erosion. Besides Asansol, these types of soils are also found in Ausgram Police station and northwestern parts of Galsi police station. Alluvial soils of the eastern part of the district have the influence of Bhagirathi river (P.S. Katwa, Purbarathali and Kalna) and Damodar, Ajoy, Konoor etc. (P.S. Ketugram, Mangalkote, Manteswar, Memari, Rayna, Khandagosh, Jamalpur, Burdwan Sadar, Bhatar and parts of Galsi and Ausgram). Alluvial deposits of rivers of Clotonagpur origin are less fertile than the gangetic alluvium.

Mostly soils are fine-loamy and fine in texture. General distribution of clay in the soils is of Medium range. Soil series Beldanga, Bistupur, Kalyaneswar and Sankarpur have gravel in the soil profile. Soil acidity varies from strongly acid (pH 4.5) to nearly neutral (pH 6.9). The soils range from moderately acid to slightly acid. Organic carbon of the soils is in tree medium status except series - Chanda, Mediara, Ghoshat, Matubpur and Silampur which record low status. Cation Exchange Capacity of soils is of medium range except Multi, Nabagram series having high and Beldanga, Bistupur, Banpara, Chanda, Kalyaneswar, Konarpara, having low Cation Exchange Capacity. Available nitrogen content in most of the soils lies on border between low and medium. Both organic carbon and available nitrogen status indicate that soils have insufficient reserve of nitrogen for good crop yield. Available P<sub>2</sub>O<sub>5</sub> in all the soils is low except in Chalbelpur, Sasanga, Silampur and Brirampur where it is

medium. Available  $K_2O$  in general is medium except for Anantapur, Beldanga, Bistupur, Chanda, Kuldiha, Kalyaneswer, Kamalpur, Multi, Nabagram and Sankarpur soil, where it is low. Electrical conductivity in all the soils except Konarpara is low and is not likely to pose any hazard. Moisture regime in the soils is generally medium. Fertilizer trials conducted by the State Agricultural Department, Fertilizer Corporation of India and West Bengal Comprehensive Area Development Corporation indicate that the soils of Bardhaman district respond well to application of N, P and K fertilizers for increasing yield of paddy and other crops. Hence, addition of plant nutrients based on soil testing results is recommended. Addition of organic matter especially to the soils of western part of the district is essential. The soils indicating acidic reactions should be ameliorated and brought to required pH value by application of lime.

The soil analysis data which are given along with the description of each soil series in the Annexure will serve as a guideline for manurial schedule for the individual soil series. Recommendations for marginal land holders may be modified so as to apply fertilizer for maximum return per unit of applied fertilizer to keep down the input need.

### 5.4 Soils of High Productive Potential for Paddy

Soils of Nabagram, Madhpur, Hanrgram, Konarpara, Sardanga, Srirampur, Kutubpur series are high in productive potential for paddy. These soils will perform well under all levels of management. Multi soil series is also very good for paddy, but during seasons of high rainfall, crop may be damaged due to submergence.

Next in importance are Salidanga, Samara, Krishnadevpur and Mangra series when high crop yield is obtained during the years of optimum rainfall. All the above soils perform very well under irrigated condition under medium and high level of management.

Chalbalpur, Beldanga, Majiara, Kuldiha, Kanksa, Chanda and Ghoshat soils are also productive soils for paddy under irrigated condition and high level of management.

### 5.5 Alternate Crops

In the western part of the district, the irrigation facility is very limited. The irrigation sources are mostly few tanks in the villages. Hence the present agriculture is mainly tainted failure of crop is common due to drought in some years. Hence, measures like alternate crops are required to be taken to make up loss due to such happenings to some extent.

Following suggestions are made in this regard:-

1. In unirrigated areas kharif pulses, mustard etc. may be alternate crops if paddy fails due to drought.
2. Jute may be grown under irrigation followed by paddy during the kharif as alternate to paddy only.
3. Black gram, gram kulthi and mustard may be alternative for wheat under limited irrigation during rabi seasons.
4. Mixed cropping may be encouraged where crop failure is of common occurrence. On marginal land holding suitable vegetable crops may also be encouraged besides mixed cropping.

### 5.6 Engineering Use of soils

The information furnished are generalized and may be used for planning more detailed survey to determine the in place condition of the soil at proposed sites of constructions.

The information in the Soil Survey Report can be used for:-

1. Soil and Land Use Studies in the selection and development of industrial, business, residential and recreational sites.

2. Preparation of preliminary estimates of runoff and erosion, for use in designing drainage structures, planning of the construction of dams and other structures for water and soil conservation conduct.
3. Preliminary evaluation of soil and ground conditions for the construction of roads for planning detailed soil survey for the intended locations.
4. Identification of areas of availability for gravel, rock etc. for construction work.
5. Correlate performance of engineering structures with soil mapping units and thus developing information that will be useful in designing and maintaining the structures.

Information furnished in the table 11 has reference to Soil identification and Classification for general engineering purposes as per Indian Standards Institution.

Table 11. Relative Suitability of Different Soils of Bardhaman District for General Engineering Purposes

Soil series	For identifications Tests		For Earth Dams				For Roadways			For Foundations		
	Dry strength	Net and manipulated strength	Homogenous embankment	Zone 1 impervious	Zone 2 semi pervious	Zone 3 free drainage	Embankment	Race course	Wearing course	Canal lining (compact ed)	Storage Dams	Structure
1	2	3	4	5	6	7	8	9	10	11	12	13
1.Anantapur	Low to medium	Moderately plastic	Poor	Fair	U.S.	U.S.	P	P	U.S	V.P	P	V.P
2.Balidanga	Medium to high	Highly plastic	Poor	Fair	U.S.	U.S.	P	P	U.S	V.P	P	V.P
3.Banpara	Medium to light	Moderately to highly plastic	Fair	Fair	U.S.	U.S.	F	F	P. to F	F	M.F	V.P
4.Beldanga	-do-	Moderately to highly plastic	Fair	Fair	U.S.	U.S.	F	F	P. to F	F	M.F	V.P
5.Bistupur	Nil	Not applicable	U.S.	U.S.	G.	G. if gravelly	G	F	P	U.S	Permeable U.S	G
6.Chalbalpur	Low to medium	Moderately plastic	Fair	Fair	U.S.	U.S.	F	F	P. to F	F	P	P
7.Chanda	Medium to Slight	Moderately to highly plastic	U.S.	U.S.	G.	G. if gravelly	P	P	U.S	U.S	P	P.
8.Ghoshat	Medium to high	Very plastic	Fair	M.G.	U.S.	U.S.	F	P to F	P. to F	F	M.F	B.P
9.Hanrgram	Medium to high	Highly plastic	Poor	Fair	U.S.	U.S.	P	F	U.S	V.P	P	V.P
10.Kalyaneawa	Nil	Not applicable	U.S.	U.S.	G.	F. if gravelly	G	G	P	U.S	Permeable U.S	G
11. Konarpara	Nil	-do-	U.S.	U.S.	G.	G. if gravelly	G	G	P	U.S	Permeable U.S	G
12.Krishnadevpur	None to slight	Slightly plastic	Poor	Fair	U.S.	U.S.	P	P	U.S	V.P	P	V.P
13.Kuldiha	Medium to Slight	Moderately to highly plastic	M.G.	M.G.	U.S.	U.S.	M.F to F	M.F. to F	F	F to G	F to G	P to M.P
14.Kutubpur	Nil to Slight	Practically non-plastic	M.F.	Fair	M.G.	U.S.	P	P	U.S	U.S	F	P
15.Madhpur	Low to medium	Moderately plastic	M.G. to G	M.G. to G.	U.S.	U.S.	M.F to F	MF to F	F	F. to G	F. to G	P. to M.F
16.Majiara	Medium to high	Very plastic	Fair	M.G.	U.S.	U.S.	F	P to F	P to F	F	M.F	V.P
17.Multi	Very high	Very plastic	M.F.	M.F.	U.S.	U.S.	V.P	V.P	U.S	V.P	P	V.P
18.Nabagram	Medium to high	Highly plastic	Poor	Fair	U.S.	U.S.	P	P	U.S	V.P	P	V.P
19.Sankarpur	Nil	Not applicable	M.G.	Fair	U.S.	U.S.	P	P	U.S	U.S	F	P
20.Sardanga	Low to medium	Moderately plastic	Fair	M.G.	U.S.	U.S.	F	P to F	P. to F	F	M.F	V.P
21.Sasanga	None to slight	Slightly plastic	Poor	Fair	U.S.	U.S.	P	P	U.S	V.P	P	V.P
22.Silampur	Low to medium	Moderately plastic	Fair	M.G.	U.S.	U.S.	P	P to F	P to F	F	M.F	V.P
23.Srirampur	Medium to high	Highly plastic	Poor	Fair	U.S.	U.S.	P	P	U.S.	V.P	P	V.P
24.Totpara	None to slight	Slightly plastic	Poor	Fair	U.S.	U.S.	P	P	U.S.	V.P	P	V.P

**6.****GENESIS, MORPHOLOGY AND CLASSIFICATION OF SOILS**

Soils are formed by the action of the soil forming factors like climate, vegetation etc. which acts on the parent material as conditioned by relief over period of time.

**6.1 Climate**

The climate of Bardhaman district is humidtropical. The district experiences hot humid summer from April to May and moderate winter from December to January. The mean annual temperature of the district is 26.5°C. The mean summer and mean annual temperatures are 31.5°C and 20.2°C, respectively. The difference between mean summer and mean winter temperature is therefore more than 5°C, which qualifies the area to be placed under hyperthermia temperature regime.

The mean annual rainfall based on 30 years record (1931-60) at Bardhaman meteorological station is 1403.9 mm North-west monsoon associated with severe storm and rains are common in the soothe of April and May. Monsoon starts in June and the rainfall continues up to September when humidity ranges from 65-85 per cent July and August are the months of highest rainfall and about 75 per cent of the total rainfall is then received. During the months of high precipitation and under high temperature condition, actions of the soil forming factors are intensive.

**6.2 Physiography, Relief and Drainage**

The district consists of four major physiographic zones namely i) Low dissected plateau ii) Upper alluvial plain iii) Lower alluvial plain iv) Meander flood plain.

**6.2.1 Low dissected plateau**

This region constitutes the western part-of the district and is the extension of Chotanagpur plateau. The area has the highest relief and extends from 80 metre contour and above in the west. The region is highly eroded and dissected. Topography ranges from undulating to hilly with broad valley representing alluvial plains in between the higher lands. This region may be further subdivided as below

a)	Low dissected plateau and isolated hillocks	Kalyaneswar series
b)	Low dissected plateau and upper alluvial plain	Sankarpur, Beldanga series
c)	Low dissected plateau (moderate sloping to gently sloping)	Chalbalpur, Majiara series
d)	Low dissected plateau and lower alluvial plain	Majiara, Madhpur series
e)	Low dissected plateau (Top slope with valleys)	Majiara, Kuldiha and Chanda series
f)	Low dissected plateau (Lowlying pediment extending to reiver side)	Ghoshat, Totpara and Silampur series

**6.2.2 Upper alluvial plain**

This region extends from 80 meter contour in the West to 40 metre contour in the East ad is formed of alluviumbrought by the river Damodar and Ajoy. The surface is undulating interspersed with low ridges and valleys particularly in Faridpur and Kanksa police station.

a)	Upper Alluvial plain (very gently sloping to undulating)	Beldanga, Bistupur series.
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### 6.2.3 Lower alluvial plain

This region extends from 40-metre contour in the west to 20 meter contour in the East. This region is built up of the deltaic fans of the streams flowing from the western hills. Successive floods and deposition gradually raised the tract above flood level. This region may be further subdivided as bellows:

- |   |                                     |
|---|-------------------------------------|
| a) Lower alluvial plain (very gently sloping)                 | Madhpur series                      |
| b) Lower alluvial plain (nearly level to very gently sloping) | Henrgram, Banpara, Anantapur series |

### 6.2.4 Meander flood plain

This region is below 20-metre contour and consists of recent alluvium deposited by a number of sluggish rivers and streams. Lack of drainage facilities in the waterlogged areas result in stagnation of flood water. A chain of low lying depressions are marked just to the west of the Bhagirathi river. This is due to the fact that this river has changed its course often and has left long loops of disused channels all along its western bank creating a string of marsh of swamps.

This region may be sub-divided into the following:-

- |   |   |
|---|---|
| a) Meander flood plain (nearly level with gently sloping) | Nalidaaga, Kutubpur: Krishnadevpur, Sardanga, Silampur, Sasanga series. |
| b) Meander flood plain (lower lying)                      | Nabagram, Konarpara series  |
| c) Meander flood plain with marshy area                   | Srirampur, Konarpara, Xutubpur, Multi series                            |

## 6.3 Natural Vegetation and Biotic Activity

The natural vegetation can be broadly distinguished as of low dissected plateau and alluvial plains.

The natural vegetation in the low dissected plateau areas consists of Trees :*Acacia Arabica* (Babul), *Basica pitifoliei* (Hahne), *Butea monosperma* (Palas), *Borassus flabilifer* (Tap), *Betos bengalensis* (Pal), *Buchanania latifolia* (Piyal), *Bombax malabaricum* (Shimool), *Bambusa rodesa* (Bamboo), *Dendrocalamus strictus* (Baraboo), *Dyospyros melanoylon* (Rend), *Emplica Officianalie* (Amloki), *Eucalyptus hybrid* (Eucalyptus), *Jerminalis arjuna* (Arjun), *Madbuka latifolia* (Mohul), *Phoenix sylveetris* (date palm), *Shores robusta* (Sal), *Terminalia* (Pial).

*Shrubs: Agave Sissflina* (Mugra/Agave), *Calotrovis Vicente* (Akanda), *Calotiovis procera* (Shet Akanda), *cleroderdron inerme* (Bonju), *Croton sperciflorum* (Bontulsi), *Opuntia dillenii* (Prickly pear), *Solanum torvum* (Titeibegun), *Urania lobate* (Ban-okra), *Ziziphus jujuba* (Jujuba).

*Grasses and weeds: Cynodon dactylon* (Doob), *Eragrostis sp*, *Setaria glance* (Kaun), *Dicanthium arinulatum*, *Argemone mexicana* (Shial kanta), *Solanum niagram* (Kak machth), *Scoperia dubis* (Bond honey).

In the alluvial plain: the natural vegetation consists of Trees: -*Albizzie lebbek* (Sirish), *Aeolis mammies*, *Acacia arabica* (Bahal), *Azadiracta indica* (Seem), *Artocarpus integrifoils* (Jack fruit), *Anona squamosa* (Ata), *Borasus flablifer* (Tall), *Bambusa rodesa* (Bamboo), *Caesalpinia puicherrima* (Krishna aloft), *Cassia fistula* (Sonali): *Dendrocalamos strictus* (Bamboo), *Eugonia jambolana* (Jamun), *Seebergia sisso* (Sisso), *Ficus bengalensis* (Banyan), *Jambulans indica* (Jamas), *Ficus religiosa* (Peepal), *Glycosmis pentaphyla* (Ash Shaora), *Mangifera indica* (Mango), *Odina wodier* (Jiyal), *Phoenix sylvestris* (Date palm), *Tamarindus indica* (Tamarind), *Pasidium guava* (Guava), *Tectchla grandis* (Teak).

*Shrubs and herbs: Amaranthus spinosus* (Kantanotry), *Calotropis procera* (Shet Akanda), *Clerodendron infortunatum* (Ghetu), *Flacontia nemontchi* (Boinchi), *Jatro gossypifolie* (Lal Bharenda), *Sidarhom bifolia* (Lal barela), *Ipomea vitex nequundo* (Nishinda), *Ziziphus jujuba* (Jujube).

Grasses and weeds: *Cynodon dactylon* (boab), *Cyprus rotundus* (Mutha), *Chenopadium album* (Goose foot), *Comelina bengalensis* (Dholapata), *Medicagc denticuleta* (Punarnabe), *Saccharum spontaneuro* (Kans).

### 6.4 Soil Forming Material

Soil forming material of major portion of the district consists of alluvium of the rivers Damodar, Ajoy and Bhagirathi. Dominant influence of Damodar alluvium is apparent in the southern half and of Ajoy alluvium in the northern half of the district. In the easternmost part of the district, influence of Bhagirathi River is dominant. However, influence of the mixed alluvium of Damodar and Ajoy River should be expected in some parts of the central portion and that of Damodar, Ajoy and Bhagirathi in the eastern part of the district.

Most of the alluvial deposits belong to the older alluvial formations and these occupy higher grounds. Alluvium is of sub-recent to recent age consisting of alternate beds of loosely compacted clay, silt and mostly confine to the banks and beds of the present day river channels. Texture of the materials and occurrence of mica, ferruginous and calcium carbonate concretions distinguishes the soils developed from different types of alluvium.

Over the western part of the district, the predominating parent rock is granite, which in some places becomes gneissic. These rocks contain quartz, felspar, tourmalin and biotite. Gondwana deposits are mainly located in the Raniganj coal field area, but are also found scattered over other places in the western part of the district under alluvium cover. Older alluvium, laterite, sandstone, conglomerate and grit are found in the eastern part of Asansol sub-division which also extends to the adjacent areas in the eastern part of the district.

Research works on soils of Bardhaman district indicate that in the alluvial soils, illite is the dominant clay mineral and kaolinite and illite are associated clay minerals. Thus mineralogy of the soils may be described as mixed.

### 6.5 Time

Soils in the western part of the district have been formed from older to younger tertiary formation and Gondwana and are considered to be of Miocene age. The deposition of alluvium sediment commenced after first upheaval of the Himalayas and continued all through the Pleistocene time. Landforms described may have relationship with their age and time as a factor of soil formation and are important to differentiate the soils of the area.

### 6.6 Morphology and classification

The profile study reveals that the soils are heterogeneous in their morphological characteristics such as soil depth, colour, texture, structure, drainage, slope etc.

Morphology of the soils of the area is distinguished by the nature of the soil forming material. The characteristics of dominant morphological differentiation are stratification of soil and relief and presence of ferruginous and/or lime concretions. Each soil profile has a specific arrangement of soil layers or horizons. The soils that have major horizons which are similar in important characteristics and in their arrangement within the profile and are developed from the same parent material are grouped into a soil series. The soils within a series are homogeneous in all characteristics except in texture of surface horizon.

Soil series have been the fundamental units of classification which are shown as delineation of series associations in the map. The soils have been grouped under 24 soil series and 17 soil series associations. At the

family level of classification all, the soil series have hyperthermic temperature regime, the soil minerals are classed as mixed. Textural groups at the family level are indicated as gravelly skeletal, loamy-skeletal, clayey skeletal, fine-loamy over coarse-loamy, fine-loamy, fine and very fine, which are based on the percentage of clay contained in the control section. With the knowledge of moisture regime through meteorological and soil morphological data and the laboratory analysis, soil classification into higher categories is made by developing suitable keys to the soil in Soil Taxonomy as per U.S.D.A. Soil classification. Detailed descriptions of soil series are given in the annexure.

Three orders, six suborders and seventeen subgroups have been recognized.

### **6.6.1 Entisols**

Entisols are primarily soils that lack diagnostic horizons other than Ochric epipedon. Two suborders Aquepts and Fluvents were identified. Aquepts - These are wet Entisol. Typic subgroup of Haplaquent, Typic and vertic subgroup of Fluvaquent were identified. Fluvents - These are soils that have finer textures in some subsurface horizon. The organic carbon content decreases irregularly with depth or remain above 0.2 per cent at a depth of 1.25 m. Typic subgroup of Ustifluent, Typic and Aquic subgroup of Udifluent were identified.

### **6.6.2 Inceptisols**

Inceptisols are soils which have disco-nestle surface and subsurface horizons with Ochric epipedon. It lacks illuvial horizon but have a cambic horizon that may be formed by leaching, gleying etc. Two suborders, Aquepts and Ochrepts are identified. Aquepts - It includes strongly gleyed inceptisol. Typic subgroup of Haplaquent has been identified. Ochrepts - Soils with an Ochric epipedon and a cambic horizon. The colours are in shades of brown and yellow. Two sub-orders are identified. Eutrochrepts - These are base rich ochrepts. Ustrochrepts - These are ochrepts of dry summer and humid winter climate and mostly have young geomorphic surfaces. Vertic and Fluventic subgroup of Eutrochrepts and Typic and Lithic subgroup of Ustrochrepts have been identified.

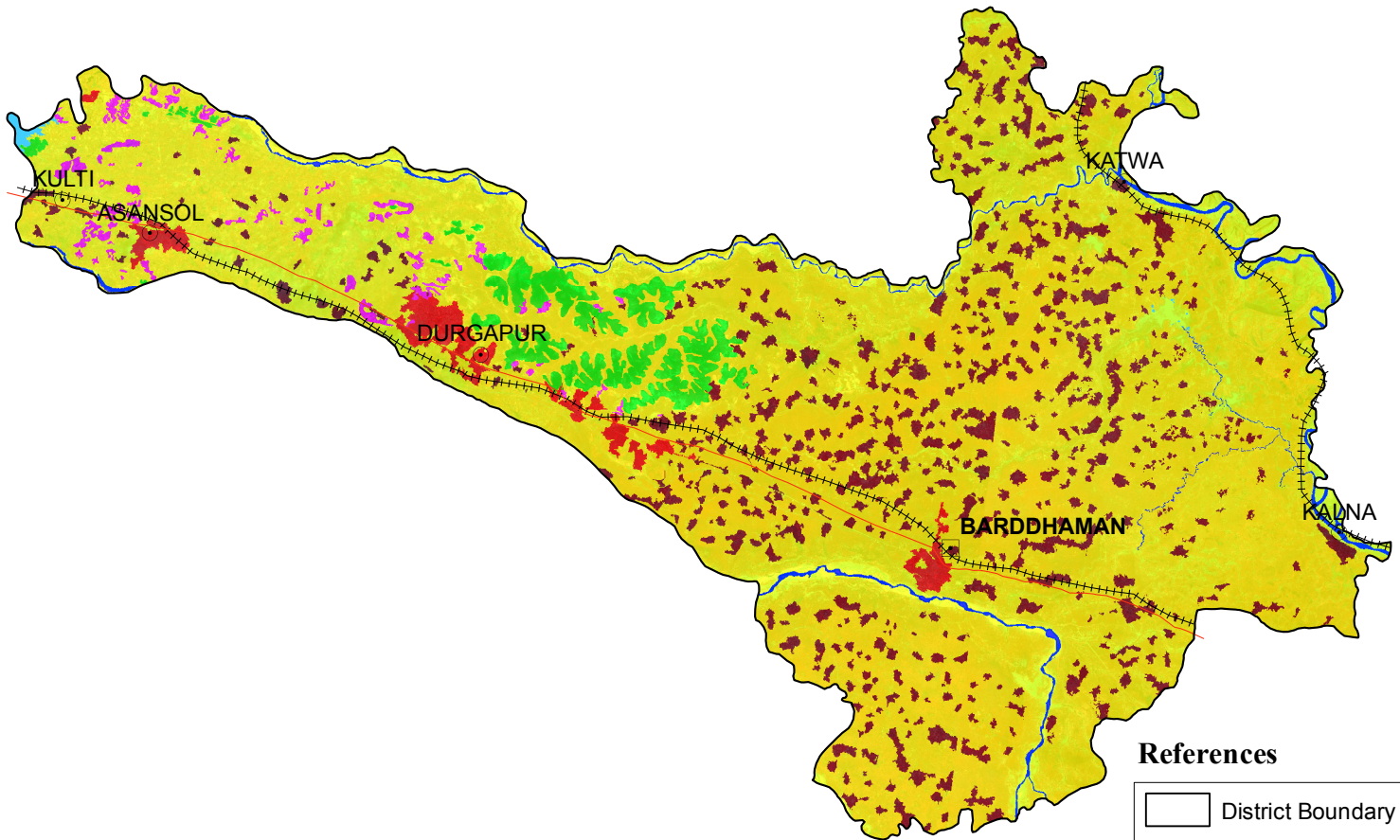
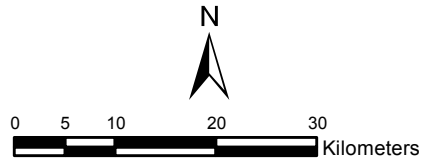
### **6.6.3 Alfisols**

These are soils that are usually moist, have Ochric epipedons, argillic horizons with medium to high base status. Two suborders have been identified. Aqualfs - These are wet Alfisol. The water table fluctuates in these soils. Ustalfs - These are Alfisols of climatic that have pronounced warm dry seasons. Typic and Vertic subgroup of Ochragualfs, Aeric and Ultic subgroup of Paleustalfa, Udic subgroup of Haplustalfs and Plinthustalfs have been identified. Classifications are presented in the Table 12.

Land use/land cover map of the district generated based on the interpretation of temporal ETM+ satellite data (2002) is shown in figure 13.

# BARDDHAMAN

## Land Use/Land Cover 2002



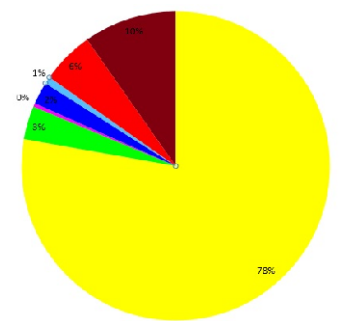
### References

	District Boundary
	District Hq
	Tehsil Hq
	Road
	Railway

### Legend

Classes	Area [sq.km]	Classes	Area [sq.km]
Agriculture		Uncultivable	
Agriculture, Cropland	5465	Barren/Uncultivable/Wastelands, Scrub Land	25
Builtup		Water	
Built-up, Rural	685	Wetlands/Water Bodies, Reservoir/Lakes/Ponds	52
Built-up, Urban	387	Wetlands/Water Bodies, River/Stream/Canals	165
Forest			
Forest, Deciduous	245		

LULC (2002): Area Statistics for Bardhaman District  
Total Geographic Area: 7024 sq.km



Note: Refer Legend for Category

Data Source: Landsat ETM+ Satellite data of Kharif (2002) and Rabi (2002), SRTM DEM, Existing Soil Maps & Reports (NBSS & LUP), and other Statistical Data

Table 12 Soil Classification

Order	Suborder	Great group	Sub-Group	Family	Series		
1	2	3	4	5	6		
Entisols	Aquente	Haplaquents	Typic Haplaquents	Clayey	Kutubpur		
		Fluvaquents	Typic Fluvaquents	Fine loamy	Konarpara		
			Vertic Fluvaquents	Clayey	Nabagram		
	Fluvents	Udifuvents	Typic Udifuvents	Fine loamy	Sasanga		
			Aquic Udifuvents	Fine loamy	Sardanga		
		Ustifuvents	Typic Ustifuvents	Coarse loamy	Ghoshat		
Inceptisols	Aquepts	Haplaquents	Typic Haplaquepts	Fine silty	Srirampur		
				Fine silty	Banpara, Balidanga, Totpara		
				Fine silty	Multi		
	Ochrepts	Eutrochrepts	Fluventic Eutrochrepts Vertic Eutrochrepts		Fine loamy	Krishnadevpur	
					Calcareous clayey	Hanrgram	
					Fine loamy	Silampur	
		Ustochrepts	Typic Ustochrepts Lithic Ustochrepts			Loamy skeletal	Kalyaneswar
						Fine loamy	
Alfisols	Aqualfs	Ochraqualfs	Typic Ochraqualfs Vertic Ochraqualfs	Clayey	Anantapur, Kanksa, Madhpur		
				Clayey	Kuldiha		
	Ustalfs	Paleustalfs	Aeric Ochraqualfs Ultic Paleustalfs		Clayey	Majiara	
					Fine loamy	Beldanga	
		Haplustalfs	Udic Haplustalfs			Clayey skeletal	Bistupur
						Fine loamy	Chanda
	Plinthustalfs	Plinthustalfs			Clayey	Chalbalpur	
					Loamy skeletal	Sankarpur	

## ANNEXURE

### 1. Anantapur Series

Tentative Series

The Anantapur Series is a member of fine mixed hyperthermic family of Typic Ochraqualfs. Anantapur soils have gray strong acid clay loam A-horizon and gray slight acid to neutral silty clay loam to silty clay B-horizon. They have developed on alluvium and occur on nearly level to very gently sloping lower alluvial plain. Principal associated soil is Banpara series which is a Typic Haplaquepts.

**Typifying Pedon:** Anantapur clay loam-cultivated.

- Ap 0-12 cm --- Gray (10YR 5.5/1 M) clay loam; puddled; friable and slightly sticky; rusty specks of brown to dark brown (7.5YR 4/4) and yellowish red (2.5YR 5/6) colour; few consir; frequent, fine roots; common, medium pores and root channels; clear smooth boundary.
- A12 12-21 cm --- Gray (10YR 5/1 M) silty clay loam; moderate fine sub-angular blocky structure; friable and sticky: common, medium faint mottlings of dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) colour; common less than 2 mm size soft Pert nodules; common fine roots; common fine and medium inped pores; abrupt smooth boundary.
- B21t 21-48 cm --- Gray (N 5/0 M) silty clay; moderate fine sub-angular blocky structure/ firm when moist, sticky and plastic when wet; thin continuous clay cutans on ped faces: common, faint mottlings of light olive brown (2.5Y 4/6) colour; few soft Fe Mn nodules; few to common fine roots; common fine inped pores; pH 7.0; clear smooth boundary.
- B22t 48-99 cm --- Gray (N 5/0) silty clay; strong coarse angular blocky structure; firm, on moist and sticky on wet; thick clay cutans on soil peas; common, fine, faint mottlings of olive brown (2.5Y 4/4) colour; few soft and hard Fens nodules: few fine roots; few medium pores and root channels: gradual smooth boundary.
- B3 99-150 cm --- Gray (N 4/0) silty clay strong coarse angular blocky structure; very firm when moist and very sticky when wet; many fine roots; faint mottlings of light olive brown (2.5Y 5/4) colour, common (2 mm).

**Range in characteristics:** The thickness of the solum is more than 150 cm. Within the depth of 15 cm to 1.0 m content of coarser fragments larger than 2 mm varies from 2 to 3 percent while clay content ranges from 26 to 50 per cent. Clay content increases with depth, reaching a maximum of 46 per cent in B22t horizon and then decreases through depth of the profile. The moisture regime is aquic.

A horizon is 12-15 cm thick. The texture of fine earth in a horizon varies from sandy clay loam to clay loam and the colour from gray to light brownish gray in hum 10YR to 2.5Y with values 5 to 6 and chromas 0 to 2. The thickness of B-horizon is more than 100 cm. The texture of fine earth in B-horizon varies from silty clay loam to silty clay and sometimes to clay. Its colour is in hue of 5 N with value varying from 5 to 6 and chroma from 0 to 2. Fe Mn nodules are present throughout the profile with staring proportion. B-horizon is faintly mottled with light olive brown colour.

Available moisture capacity is 10.17 cm in 60 cm depth and 16.57 cm. in 100 cm depth soil profile.

**Competing series and their differentiae:** Kanksa series which is distinctly mottled. It is also a Typic Ochraqualf.

**Drainage and permeability:** Imperfectly drained with moderately slow permeability.

**Use and vegetation:** Cultivated to paddy, Natural Vegetation consists of *Artocarpus integrifolia* (Jackfruit), *Phoenix sylvestris* (date palm), *Dendrocalamus strictus* (Bamboo), *Aegle marmaloea* (Bel) etc.

**Distribution and extent:** Extensive in Ketugram and Khandaghosh Police Stations.

**Type location:** Village Anantapur, P.S. Ketugram. District Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning, Regional Centre, Calcutta.

**Interpretation:** The soils of Anantapur Series are aquic and clayey in nature and they have poor soil air-water relationship. In rainy season, they are subject to surface flooding and as such they are suited only to paddy in Kharif. In rabi on conserved moisture pulses and oilseed can be grown. The soil can support wheat also if irrigation is provided.

**(a) Interpretive grouping:**

- |  |       |
|--|-------|
| 1. Land capability sub-class   | IIw   |
| 2. Irrigability sub-class  | -2d   |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -High |
| 4. Management potential/productivity   | -High |

**b) Yield:Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	30-34
High	46-50

## Soil Survey and Land Use Plan of Bardhaman District, West Bengal

Soil Series: Anantapur

Classification: Typic Ochraqualfs

Location: P.S. Katugram

Analysis at: NBSS & LUP

Dist. Bardhaman

Regional Centre: Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-12	29.8	17.2	25.5	27.5	Nil
A12	12-21	20.2	25.8	26.5	27.5	2.00
B21t	21-48	16.3	16.7	26.5	40.5	3.00
B22t	48-99	13.6	16.4	24.5	45.5	3.00
B3	99-150	11.6	18.4	27.5	42.5	2.00

Depth(cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-12	0.49	0.052	5.1	0.32	1.4
12-21	0.3	0.031	6.1	0.38	1.4
21-48	0.14	0.014	6.7	0.27	2.0
48-99	0.13	0.014	7.0	0.21	2.4
99-150	0.00	0.008	6.4	0.19	2.0

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-12	4.2	2.2	1.0	0.5	8.0	13.6	58.8	0.49
12-21	5.2	2.8	1.0	0.6	9.6	13.6	70.6	0.49
21-48	8.4	6.2	1.6	0.6	16.8	21.8	77.1	0.54
48-99	10.8	8.0	2.1	0.8	21.7	26.6	81.6	0.58
99-150	7.2	4.4	0.9	0.2	10.7	17.0	62.9	0.40



**2. Balidanga Series**

Tentative Series

The Balidanga Series is a member of fine loamy mixed hyper-thermic family of Typic Haplaquepts. Balidanga soils have light brownish gray strong acid clay loam A horizon, dark gray to gray slight acid clay loam to clay B horizons and sandy C horizon. They have developed on old alluvium indepressions on nearly level to very gently sloping meander flood plain. Principal associated soils are Krishnadevpur series and Sardanga series, which are Typic Haplaquent and Typic Heplaquept respectively.

**Typifying Pedon:** Balidanga clay loam - cultivated.

- Ap 0-16 cm --- Light brownish gray (2.5Y 6/2 M) clay loam: light gray (2.5Y 7/2) dry, puddled soft when dry, firm when moist, slightly sticky when wet; rusty specks of yellowish brown (10YR 5/6) colour; very few (2 mm) soft ferruginated nodules; few fine and few medium roots; many coarse, few medium pores; gradual smooth boundary.
- B21g 16-37 cm--- Dark gray (N 4/0 M) clay loam; moderate coarse as very coarse sub angular blocky tending to angular blocky structure; firm when moist. Sticky when wet; few, fine, distinct yellowish brown (10YR 5/6) mottlings; few soft (5 mm) and common (2 mm) ferromanganese nodules; few fine roots; many medium pores; gradual smooth boundary.
- B22g 37-53 cm --- Gray (N 5/0 M) clay; moderate coarse and very coarse sub-angular blocky; firm when moist, slightly sticky when wet; few fine distinct yellowish brown (10YR 5/6) mottlings; common soft (2 mm) and few (5 mm) ferromanganese nodules; few fine roots; few coarse, common medium pores; diffuse, smooth boundary.
- B3 53-94 cm --- Gray (N 5/0 M) sandy clay loam; massive; firm when moist, slightly sticky when wet; common fine distinct yellowish brown (10YR 5/6) mottlings; plentiful soft (2 mm) and common (5 mm) ferromanganese nodules; very few fine roots; few coarse, common medium pores; clear, smooth boundary.
- Cl 94-110 cm --- Layer of fine sand of gray colour.

**Range in characteristics:** The thickness of the solum varies from 80-95 cm. Within the depth of 15 cm to 95-cm. clay content ranges between 24 and 43 per cent. The moisture regime is aquic.

A horizon is 15-18 cm thick. The texture of fine earth in A horizon varies from sandy clay loam to clay loam and the colour from light olive to brownish gray in hue 2.5Y to 5Y with value 5 to 6 and chroma of 2 or less. The thickness of B-horizon ranges from 70 to 80 cm. The texture of fine earth in the B-horizon ranges from clay loam to clay. Its colour varies from dark gray to gray in hue 2.5Y to 5Y with value 4 to 6 and chroma 0 to 2. Structural development in B-horizon is moderate to strong. B-horizon is mottled with distinct mottling of yellowish brown (10YR 5/6) colour, C horizon is sandy although Ferruginated nodules are present throughout the profile.

Available moisture capacity of Balidanga series is 10.9 cm in 60 at depth and 17.9 cm in 100 cm depth soil profile.

**Competing series and their differentiae:** Banpara series which is olive gray in colour with prominent mottles. It is also a Typic Haplaquept.

**Drainage and permeability:** Imperfectly drained with moderate to moderately slow permeability.

**Use and vegetation:** Mainly under paddy cultivation. Rabi crops are also grown if irrigation water is available. Natural vegetation consists of *Borassus flabelifer* (Palmyra Palm), *Dendrocalamus strictus* (Bamboo); *Ficus religiosa* (Peepal); *Calotropis gigantea* (Akanda); *Ipomea* spp., *Saccharum spontaneum* (Kens) etc.

**Distribution and extent:** Extensive in Kalna, Purbasthali and Katwa Police Stations.

**Type location:** Village -Ranibandh, P.S. Kalna, District Bardhaman, West Bengal.

**Interpretation:** The soils of Balidanga series are aquic and subject to flooding and stagnation during rainy season. Hence, they are suitable only for growing paddy. They can support crops like lentil and gram during winter on conserved moisture.

**a) Interpretive grouping:**

- |  |              |
|--|--------------|
| 1. Land capability sub-class   | -IIw         |
| 2. Irrigability sub-class  | -I           |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium High |
| 4. Management potential/productivity   | -High        |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Medium	34-38
High	48-48

Soil Series: Balidanga

Classification: Typic Haplaquepts

Location: P.S. Kalna

Analysis at: NBSS & LUP

Dist.: Bardhaman

Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-16	42.9	8.2	22.8	26.1	Nil
B21	16-37	24.4	12.9	20.1	42.6	Nil
B22g	37-53	30.5	12.4	17.8	39.3	Nil
B3	53-94	47.5	13.0	10.0	29.5	Nil

Depth(cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-16	0.55	0.05	5.2	0.11	1.3
16-37	0.26	0.03	6.5	0.1	1.3
37-53	0.18	0.09	6.9	0.1	2.3
53-94	0.12	0.09	7.0	0.08	2.3

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-16	4.4	3.2	1.0	0.6	9.2	14.4	63.9	0.55
16-37	9.6	7.2	0.7	0.3	17.8	22.4	79.5	0.53
37-53	9.1	5.2	0.7	0.1	15.1	18.8	80.3	0.48
53-94	5.6	2.4	0.7	0.1	8.8	10.1	87.1	0.34

**3. Banpara Series**

Tentative series

The Banpara series is a member of fine loamy mixed hyperthermic family of Typic Haplaquepts. Banpara soils have light brownish gray to olive gray slight acid sandy loam to loam A horizon, light grey to olive gray natural sandy clay loam to clay loam horizons and gray neutral clay loam to clay C horizon. They have developed on old alluvium on nearly level to very gently sloping lower alluvial plain and meander flood plain. The Principal associated soils are Hanrgrem series, a Vertic Eutrochrept and Anantapur series, a Typic Ochraqualf.

**Typifying Pedon:** Banpara loam - cultivated.

- Ap 0-15 cm ---Olive gray (5Y 5/2 M) loam: puddled; moist friable, wet slightly sticky; many medium prominent yellowish brown (10YR 5/8) mottling; moderately rapid permeability; plentiful fine roots; moderate biological activity; many coarse pores; clear smooth boundary.
- B21g 15-32 cm --- Olive gray (5Y 5/2 M) clay loam; weak medium sub-angular blocky; moist friable, slightly sticky when wet; many coarse prominent yellowish brown (10YR 5/8) mottlings; many soft and semi-hard ferruginous concretions; moderate permeability; week biological activities; many fine roots: clear smooth boundary.
- B22g 32-80 cm --- Olive gray (5Y 5/2 M) clay loam; moderate medium sub angular blocky, moist firm, sticky when wet; many coarse prominent yellowish brown (10YR 5/6) mottlings: many soft and semi hard ferruginous concretions: moderately slow permeability; very weak biological activity; gradual and smooth boundary.
- B23g 80-140 cm --- Gray (5Y 5/1 M) clay loam; moderate medium sub angular blocky, moist firm, wet sticky; many coarse prominent dark grayish brown (10YR 4/2) mottlings; many soft and semi hard ferruginous concretions; slow permeability.

**Range in characteristics:** The thickness of the solum ranges between 130 and 140 cm. Within the depth of 15 cm to 1.0 m, clay content varies from 31 to 34 per cent. Moisture regime is aquic.

A horizon is 15 to 20 cm thick. The texture of fine earth in a horizon varies from sandy loam to loam and sometimes to clay loam and the colour from light brownish gray to olive gray, in hues 2.5 to 5Y with value from 5 to 6 and chrome 2 or less. B-horizon is 60-65 cm thick. The texture of fine earth in B-horizon ranges from sandy clay loam to clay loam and sometimes to clay and the colour from light gray to olive gray in the hues 2.5Y to 5Y with value from 5 to 6 and chrome 2 or less. B-horizon is 60-65 cm thick. The texture of fine earth in B-horizon ranges from sandy clay loam to clay loam and sometimes to clay and the colour from light gray to olive gray in the hues 2.5Y to 5Y with value from 5 to 6 and chrome from 0 to 2. B-horizons have moderately developed structure and are prominently mottled with yellowish brown (10 YR 5/6) and dark yellowish brown (10YR 4/2) colour. Ferruginous concretions are found throughout the soils.

Available moisture capacity is 11.61 cm in 60 cm depth and 19.61 cm in 100 cm depth soil profile.

**Competing series and their differentiae:** Competing series is Balidanga a poorly drained gray aquept, which often has a sand layer below 90 cm.

**Drainage and permeability:** Imperfectly drained with moderately slow to very slow permeability.

**Use and vegetation:** Under intensive paddy Cultivations, Rabi crops are also grown where irrigation facility is available. Natural vegetation consists of *Borassus flabilifer* (Tal), *Dendrocalamus strictus* (Bamboo), *Ficus hispida* (Fakdumur), *Ficus bengalensis* (Bot), *Aegle marmelos* (Bel) etc.

**Distribution and extent:** Extensive in Mangalkot, Bhatar and Khandaghosh Police Stations.

**Type location:** Village - Banpara, P.S. Mengalkot, Dist. Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning, Regional Centre, Calcutta.

**Interpretation:** Banpara soils have aquic moisture regime and so have the inherent problem of poor aeration. The soils are suited only for paddy in kharif season. They can support climatically adopted crops pulse etc. on conserved soil moisture and wheat with supplemental irrigation during rabi season.

**(a) Interpretive grouping:**

1. Land capability sub-class	-IIw
2. Irrigability sub-class	-2d
3. Fertility management potential (Potential to retain fertilizer elements)	-High
4. Management potential/productivity	-High

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	32-36
High	44-48

## Soil Survey and Land Use Plan of Bardhaman District, West Bengal

Soil Series: Banpara

Classification: Typic Haplaquepts

Location: P.S. Katugram

Analysis at: NBSS & LUP

Dist.: Bardhaman

Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-15	39.5	20.4	20.0	20.1	6.0
B21g	15-32	21.2	22.7	23.1	33.0	7.5
B22g	32-80	24.2	25.2	17.8	32.8	10.0
B23g	80-140+	25.0	28.1	16.0	30.9	11.2

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	0.39	0.05	6.1	0.23	2.3
15-32	0.23	0.03	5.7	0.11	2.3
32-80	0.23	0.03	7.0	0.17	1.4
80-140+	0.18	0.02	7.1	0.19	1.4

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	3.0	1.8	0.57	0.23	5.6	8.2	68.3	0.41
15-32	8.0	4.0	1.03	0.37	13.4	16.0	83.7	0.48
32-80	8.8	4.0	1.17	0.58	14.8	16.0	92.5	0.49
80-140+	7.6	3.4	1.07	0.53	12.4	13.5	91.8	0.44

**4. Beldanga Series**

Established series

The Beldanga series is a member of the fine loamy, mixed hyperfermic family of Ultic Paleustalfs. Beldanga soils have reddish yellow, strongly acid sandy loam A-horizon, reddish yellow to yellowish red strong to medium acid clay loam to gravelly clay B-horizons. They have developed on weathered gneiss and occur on dissected plateau as also on undulating upper alluvial plain. Ferruginous concretions are present throughout the profile. Principal associated soils are Bistupur series, a Uitic Paleustalf and Sankarpur series, a Plinthustalf.

Typifying pedon: Beldanga sandy loam - partially cultivated and partially under forest.

- A1 0-22.5 cm --- Reddish yellow (7.5YR 7/6 D) sandy loam; weak medium crumb structure; dry loose, moist friable end non-sticky when wet; very few ferruginous concretions; common small quartz gravels; frequent fine roots; clear smooth boundary.
- B21t 22.5-62.5 cm --- Reddish yellow (7.5YR 6/6 D) clay loam; weak, medium sub angular blocky structure; slightly hard when dry, moist firm, sticky when wet; few fine and medium faint mottling of brown (7.5YR 5/4) colour; few 2 mm and reddish brown ferruginous concretions and small size quartz gravels; common fine roots; thin patchy clay films; clear smooth boundary.
- B22t 62.5-87.5 cm --- Yellowish red (5YR 5/8 M) clayloam; moderate medium subangular blocky structure; firm on moist and sticky when wet; semi hard 2 mm and bigger than 2 mm size ferruginous concretions mixed with quartz gravels; few fine roots; thick continuous clay cutans on worm tracts and also on root channels; few coarse and common medium pores; moderate biological activities; worm tracts of medium size present; gradual wavy boundary.
- 823t 87.5-180 cm --- Yellowish red (5YR 5/8 M) gravelly clay loam; moderate, medium subangular blocky structure; moist firm, sticky on wet; streaks of red (2.5YR 4/6) and light brownish gray (2.5Y 6/2) are present; thick continuous clay cutans on ped faces as also on worm tracts; moderate biological activity, worm tracts of small size present; ferruginous concretions mixed with quartz gravels and very small undecomposed feldspar pieces present.

**Range in characteristics:** The thickness of the solum is more than 150 cm. The contents of coarser fragments larger than 2 mm concentrate below the depth of 80 cm. The content of clay within 20 cm to 1.5 m ranges between 28 and 36 per cent. The reaction throughout the depth is acidic. Moisture regime is Ustic.

The A horizon ranges in thickness from 15 to 25 cm. Its texture ranges from loamy sand to sandy loam and sometimes loam. Its colour ranges from reddish yellow to yellowish brown in hue 7.5YR to 10YR values 5 to 7 and chroma 5 to 8. The B-horizon is more than 1.5 m thick. Its texture ranges from clay loam to gravelly clay and its colour ranges from yellowish red to reddish yellow in hue 7.5YR and 5YR value 4 to 6 and chroma 6 to 8. Quartz gravel and ferruginous concretions are present throughout the profile in different proportions. CEC in argillic horizons is less than 24 meq per 100 gm of clay. Base saturation percentage in the Bt horizon ranges between 50 and 70.

Available moisture capacity of the soil is 10.21 cm for 60 cm and 17.59 cm for 100 cm profile depth.

**Competing series and their differentiae:** Bistupur series is gravelly in control section. It is also an Ultic Paleustalf.

**Drainage and permeability:** Well drained with moderately rapid to moderate permeability. Surface runoff is high.

**Use and vegetation:** Partly under forest and partly under dry land crops. Natural vegetation consists of *Shorea robusta* (Sal); *Butea frondosa* (Palash); *Basica latifolia* (Nana), *Jambulana indica* (Jam); *Dyospyros melanexylon* (Kend) etc.

**Distribution and extent:** Extensive in Kanksa. Ausgram, Faridpur, Harapur, Kulti and Salanpur Police Stations.

**Type location:** Village Beldame, P.S. Kanksa., District Bardhaman. West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning. Regional Centre, Calcutta.

**Interpretation:** Beldanga soils are agriculturally important. They have good air-water relationship. Conservation of moisture and measure to check run off are essential. Under irrigation, the soils respond to intensive input crops like vegetables etc.

**(a) Interpretive grouping:**

- |  |         |
|--|---------|
| 1. Land capability sub-class   | -IIIe   |
| 2. Irrigability sub-class  | -3t     |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium |

**b) Yield: Based on data from farmers fields:**

Management level	Yield (Q/ha) Aman paddy
Medium	26-30
High	41-45



Soil Series: Beldanga

Classification: Ultic Paleustalfs

Locatio: P.S. Kanksa

Analysis at: NBSS & LUP

Dist.: Bardhaman

Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
A1	0-22.5	54.3	19.1	9.8	16.8	12.5
B21t	22.5-62.5	39.0	17.7	14.5	28.8	12.0
B22t	62.5-87.5	34.6	18.9	14.6	31.9	15.0
B23t	87.5-180	34.5	16.9	12.8	35.8	39.0

Depth(cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-22.5	0.52	0.051	5.2	Trace	0.4
22.5-62.5	0.41	0.032	5.2	„	0.4
62.5-87.5	0.29	0.014	5.8	„	0.9
87.5-180	0.15	0.012	5.9	„	0.4

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-22.5	1.2	0.4	0.07	0.04	1.7	3.2	53.1	0.19
22.5-62.5	2.8	0.6	0.23	0.07	3.7	6.7	55.2	0.23
62.5-87.5	3.4	1.0	0.41	0.19	5.0	7.6	65.8	0.24
87.5-180	4.0	1.0	0.4	0.11	5.5	8.4	65.5	0.23

**5. Bistupur Series**

Tentative series

The Bistupur Series is a member of clayey skeletal mixed hyperthermic family of Ultic Paleustalf. Bistupur soils have reddish yellow strong acid sandy clay loam A-horizon and yellowish red strong to medium acid gravelly clay loam to gravelly clay 8 horizons. They have developed on old alluvium in the undulating upper alluvial plain, Slope, is up to 8 per cent. Principal associated soil is Beldanga Series, an Ultic Paleustalf.

**Typifying Pedon:** Bistupur sandy clay loam - Forested land.

- A1 0-15 cm --- Reddish yellow (7.5YR 6/6 M) sandy clayloam; granular; loose and friable when dry and slightly sticky when wet; very frequent fine roots; few quartz pieces are present; clear smooth boundary.
- B21t 15-52.5 cm --- Yellowish red (5YR 4/6 M) gravelly clay loam; weakly blocky; sticky when wet and hard when dry; dark colored clay films on peds; common indurated 2 mm size ferruginous concretions and quartz gravels present; roots many; clear smooth boundary.
- B22t 52.5-102.5 cm --- Yellowish red (5YR.4/6 M) gravelly clay; blocky; firm and sticky when wet and hard when dry; many indurated ferruginous concretions of 2m size and quartz gravels present: thick dark red colour clay skins on ped faces; roots few; coarse light gray(5YR 7/1) mottling and stray red (10YR 4/8) streaks present: gradual smooth boundary.
- B3 102.5-152.5 cm --- Yellowish red (5YR 5/6) gravelly clay mixed with indurated ferruginous beds: massive when wet and blocky when dry; many coarse light gray (5YR 7/1) end black (10YR 3/6) streaks common.

**Range in characteristics:** The thickness of the solum varies from 130 to 140 cm. Within the depth of 15 cm to 1.0 m coarse fragments larger than 2 mm size varies from 28 to 40 per cent. Moisture regime is Ustic. The thickness of a horizon ranges from 15 to 20 cm. Its texture varies from sandy loam to loam. Its colour is reddish yellow in 5YR to 7.5YR hues with value of 6 and & Chroma of 6 to 8.

B-horizon is more than 100 cm thick. Its texture varies from clay loam to clay. Its colour is yellowish red in 5YR hue with value of 5 and chrome of 6 to 8. Fe Mn concretions of size 2-5 mm are found throughout the soil depth. Clay content increases with depth reaching maximum at B22t horizon then decreasing with depth. CEC value remains less than 24 me per 100 gm clay. Base maturation percentage in the argillic horizon varies between 50 and 70.

Available moisture capacity of Bistupur Series is 10.43 cm in 60 cm depth and 16.43 cm in 100 cm depth soil profile.

**Competing series and their differentiae:** Baldanga series which is fine loamy. It is also an Ultic Paleustalf.

**Drainage and permeability:** Well drained with moderate permeability.

**Use and vegetation:** Forested land (*moderately dense*) Sal - (*Shorea robusta*); other trees are *Butea frondosa* (Palash), *Basica latifolia* (Mahn.), *Dyospyros melanexylon* (Kend) etc.

**Distribution and extent:** Extensive in Kanksa and Faridpur Police Stations.

**Type location:** Village Bistupur, P.S. Faridpur, District Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning. Regional Centre, Calcutta.

**Interpretation:** Bistupur Soils have good air-water relationship. The soils are gravelly and subject to drought and the fertility, land is low. It is best suited for permanent vegetation under proper management.

**(a) Interpretive grouping:**

- 1. Land capability sub-class -IIIe
- 2. Irrigability sub-class -3t
- 3. Fertility management potential (Potential to retain fertilizer elements) -Low
- 4. Management potential/productivity -Low

Soil Series: Bistupur

Classification: Ultic Paleustalfs

Location: P.S. Faridpur

Analysis at: NBSS & LUP

Dist.: Bardhaman

Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
A	0-15	58.7	9.2	10.3	21.8	10.0
B21t	15-52.5	56.6	21.1	20.3	33.0	28.0
B22t	52.5-102.5	17.6	26.1	14.2	42.1	39.5
B3	102.5-152.5	14.1	30.7	15.2	40.0	58.5

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	0.45	0.045	5.2	Trace	0.46
15-52.5	0.21	0.029	5.4	„	0.69
52.5-102.5	0.16	0.026	5.4	„	0.69
102.5-152.5	0.1	0.019	5.6	„	0.93

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	1.2	0.6	0.17	0.03	2.8	5.2	53.8	0.24
15-52.5	2.4	0.8	0.28	0.11	3.6	7.0	51.4	0.21
52.5-102.5	4.8	1.4	0.42	0.18	6.8	10.2	66.7	0.24
102.5-152.5	4.4	1.2	0.41	0.18	6.2	8.8	70.5	0.22

**6. Chalbalpur Series:**

Established series

The Chalbalpur series is a member of fine mixed hyperthermic family of Udic Haplustalfs. Chalbalpur soils have brown medium acid clay loam A-horizon, dark yellowish brown to yellowish brown slight to neutral acid clayey B horizons. They have developed from shales and occur on gently to moderately sloping land in dissected plateau. Principal associated soil is Majiara Series - an Aeric Ochraqualf.

**Typifying Pedon:** Chalbalpur clay loam - cultivated.

- Ap 0-17.5 cm --- Brown (10YR 5/3 M) clay loam/ moderate sub-angular blocky structure; firm and very sticky; frequent fine roots present; diffuse smooth boundary.
- B1 17.5-65 cm --- Dark yellowish brown (10YR 4/4 M) clay; weak medium blocky structure; firm and very sticky; FeMn nodules and broken pieces of clay iron stones present: few roots; abrupt smooth boundary.
- B21t 65-85 cm Yellowish brown (10YR 5/6 M) clay, moderate medium blocky structure; firm and very sticky; small pieces of clay iron stones present; root absent; thin patchy clay films on ped faces; clear smooth boundary.
- B22t 85-155 cm --- Yellowish brown (10YR 5/6 M) clay; whitish (10 YR 8/2) mottling; strong blocky structure; very firm and very sticky; thin discontinuous clay skin; broken pieces of clay iron stones present; roots absent.

**Range in characteristics:** The thickness of the solum is more than 150 cm. Within the depth of 15cm to 1.0 m coarse fragments larger than 2 mm varies from 10 to 20 per cent while the clay content varies from 40-58 per cent. Moisture regime is Ustic.

A horizon is 17 to 20 cm thick. The texture of fine earth of soil material in A horizon varies from loam to clay loam and the colour is brown in 7.5YR to 10YR hues with value 5 and chroma of 3 to 4. The thickness of B-horizon is 100 cm or more. The texture of soil material in B-horizon ranges from sandy clay to clay and the colour varies from dark Yellowish brown to yellowish brown in 10YR hue with value of 4 to 5 and chroma 4 to 6. Broken pieces of clay ironstone of variable sizes are common in B-horizons. Structure of B horizon is angular blocky with continuous clay cutans.

Available water capacity of Chalbalpur series is 9.88 cm for 60 cm depth and it is 15.88 cm for 100 cm depth.

**Competing series and their differentiae:** Chanda series which is also an Udic Haplustalf. It has less clay in series control section.

**Drainage and permeability:** Imperfectly drained soil with slow permeability.

**Use and vegetation:** Cultivated to paddy. Natural vegetation consists of *Butea frondosa* (Palash), *Albizia lebbek* (Birish), *Aegle marmelos* (Bel), *Ficus bengalensis* (Bot), *Janbulana indica* (Jam), *Ficus religiosa* (Peepal), *Tamarindus indica* (Tentul) etc.

**Distribution and extent:** Extensive in Barabani and Jamuria Police stations.

**Type location:** Village Chalbalpur, P.S. Kulti, District Bardhaman.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning, Regional Centre, Calcutta.

**Interpretation:** Chalbalpur soils are fine textured with shrinking and swelling properties. They are susceptible to erosion. They can support variety of crops. Crops respond to management under both rainfed and irrigation condition. When slopes are more bonding will be necessary to avoid loss of soils and fertilizer.

(a) Interpretive grouping:

- |  |         |
|--|---------|
| 1. Land capability sub-class   | -IIIe   |
| 2. Irrigability sub-class  | -3t     |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium |
| 4. Management potential/productivity   | -Medium |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	25-29
High	39-43

Soil Series: Chalbalpur  
Location: P.S. Kulti  
Dist. Bardhaman

Classification: Udic Haplustalfs  
Analysis at: NBSS & LUP  
Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-17.5	34.3	6.8	22.8	36.1	2.0
B1	19.5-65	28.7	7.4	23.8	40.1	10.5
B21t	65-85	22.0	9.1	20.8	48.1	18.0
B22t	85-155	16.0	10.1	16.8	57.1	20.0

Depth(cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-17.5	0.78	0.079	6.0	0.15	0.52
19.5-65	0.49	0.068	6.4	0.15	0.94
65-85	0.24	0.031	6.6	0.1	0.94
85-155	0.14	0.02	6.6	0.19	1.24

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-17.5	4.0	1.8	1.0	0.39	7.2	10.2	70.6	0.28
19.5-65	4.6	2.6	1.1	0.14	8.4	10.6	79.2	0.26
65-85	5.6	3.0	1.2	0.21	10.0	13.3	75.2	0.28
85-155	6.8	4.0	1.2	0.39	12.4	16.2	76.5	0.28

**7. Chanda Series**

Tentative series

The Chanda series is a member of fine loamy mixed hyperthermic family of Udic Haplustalfs. Chanda soils have brown to dark brown medium acid sandy loam to sandy clay loam A horizon and dark yellowish brown to strong brown slight acid loam to clay loam Bt horizon with iron and manganese concretions on gravels and pebbles as C horizon. They have developed from alluvial and colluvial materials on gently sloping valleys in dissected plateau area. The principal associated soil is Majiara Series, an Aeric Ochraqualf.

**Typifying Pedon:** Chanda Sandy clay loam - cultivated.

- Ap 0-17 cm --- Brown to dark brown (10Y R 4/3 M) sandy clay loam; puddled; firm and sticky; few yellowish red (5YR 5/8) mottlings, few iron concretions; roots many; clear smooth boundary.
- B21t 17-45 cm --- Dark yellowish brown (10YR 4/4 M) clay loam; medium blocky; firm and sticky; common, fine faint strong brown (7.5YR 5/6) mottlings; thin discontinuous clay skins on pals; few (2 mm) iron concretions; diffuse irregular boundary.
- B22t 45-95 cm --- Strong brown (7.5YR 5/6 M) clay loam; moderate, strong angular blocky; firm and very sticky; common, coarse, distinct strong brown (7.5YR 5/8) mottlings; many (2 mm to 5 mm) iron concretions add broken gravels; thin patchy clay films on pad faces; abrupt irregular boundary.
- C 95 cm+ --- Layer of gravels and pebbles.

**Range in characteristics:** The thickness of the solum ranges between 80 cm to 100 cm. Within the depth of 15 cm to 1.0 m coarser fragments larger than 2 mm varies from 10 to 15 per cent while the content of clay varies from 30 to 37 per cent. The moisture regime is Ustic.

The thickness of A horizon is about 20 cm; the texture of fine earth fraction of soil material in A horizon varies from sandy loam to sandy clay loam and the colour ranges from brown to dark brown in 7.5YR to 10 YR hues with value of 4 to 5 and Chroma of 3 to 4. B-horizon is more than 80 cm thick. The texture of B-horizon varies from loam to clay loam and the colour from light yellowish-brown to brown and dark yellowish brown in 7.5YR to 10YR hues with value of 4 to 6 and chroma of 3 to 4. Clay content increases regularly with depth reaching a maximum of 36-38 per cent in B22t horizon. Fe Mn concretions of size 2 to 5 mm are found throughout the profile.

Available moisture capacity of Chanda Series is 11.13 cm in 60 cm depth and 18.13 cm in 100 cm profile depth.

**Competing series and their differentiae:** The Chalbapur series which is more clayey. It is also an Udic Haplustalf.

**Drainage and permeability:** Imperfectly drained soil with slow permeability.

**Use and vegetation:** Cultivated to paddy and rabi crops. Natural vegetation consists of *Allbizzia lebbek* (Sarish); *Accacia arabica* (Babul); *Cassia fistula* (Sonali) etc.

**Distribution and extent:** Extensive in Faridpur, Asansol, Ranigung, Jamuria and Ondal Police Stations.

**Type location:** Village Topsia, P.S. Ondal, District - Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** These are productive soils of the area. They are suited for a variety of crops which respond to management.

**(a) Interpretive grouping:**

- |  |         |
|--|---------|
| 1. Land capability sub-class   | -Ile    |
| 2. Irrigability sub-class  | -2t     |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium |
| 4. Management potential/productivity   | -Medium |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	27-31
High	41-45

Soil Series: Chanda  
Location: P.S. Ondal  
Dist. :Bardhaman

Classification: Udic Haplustalfs  
Analysis at: NBSS & LUP  
Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02- 0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-17	54.0	13.1	8.8	24.1	8.0
B21t	17-45	37.9	22.2	9.8	30.1	11.0
B22t	45-95	23.7	26.4	13.8	36.1	15.0

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-17	0.31	0.03	5.8	0.91	0.42
17-45	0.19	0.017	6.2	0.42	0.68
45-95	0.12	0.001	6.6	0.28	1.62

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-17	2.4	1.2	0.42	0.18	4.3	6.0	71.7	0.25
17-45	3.8	2.0	0.82	0.31	6.9	8.9	77.5	0.29
45-95	6.0	2.8	0.88	0.34	10.6	14.0	75.7	0.39

**8. Ghoshat Series:**

Tentative series

The Ghoshat series is a member of coarse loamy mixed hyper thermic family of Typic Ustifluent. Ghoshat soils have dark yellowish brown, neutral loam A horizon over dark yellowish brown to yellowish brown mild to moderate alkaline loamy to sandy C horizons. They have developed on alluvium and occur in low-lying pediment extending to riverside. Abundant mica particles are found throughout the soil profile. The principal associated soil series are Majiare series, an Aeric Ochraqualf and Silampur Series an Udic Ustochrept.

**Typifying Pedon:** Ghoshat loam - cultivated.

- Ap 0-15 cm --- Dark yellowish brown (10YR 4/4 M) loam; puddled moist firm, sticky when wet; many coarse pores; many roots; gradual smooth boundary.
- C1 15-30 cm --- Yellowish brown (10YR 5/4 M) loam, crumb structure; moist firm, wet sticky, common medium pores, few fine roots, clear wavy boundary.
- C2 30-70 cm --- Dark yellowish brown (10YR 4/4 M) sandy loam; crumb structure; moist friable, wet non-sticky; many coarse pores; many coarse prominent very dark grayish brown (10 YR 3/2) mottlings, abundant mica particles: few fine root; clear smooth boundary.
- C3 70-150 cm + --- Yellowish brown (10YR 5/4 M) sandy loam; moist loose; few fine pores; many coarse prominent dark brown (10YR 3/3) mottlings few mica particles.

**Range in characteristics:** Soils are very deep, the moisture regime is Vatic Moisture and control section is dry for more than 90 cumulative days.

A horizon is 15-20 cm thick. Its colour ranges from dark yellowish brown to yellowish brown in 10YR hue with value of 4 to 5 and chrome 4 to 6. The texture ranges from loam to sandy loam. C-horizon is more than 130 cm. thick. Colour of the C-horizon is in 10YR hue with value of 4 to 5 and chroma of 4. Textural claim to be sandy loam uniformly. Sand pockets are found in the upper part. Available moisture capacity of Ghoshat series is 0.70 cm in 60 cm depth and 12.50 cm in 100 cm depth soil profile.

**Drainage and permeability:** Moderately well drained soil with rapid to moderate permeability.

**Use and vegetation:** Cultivated to dry land paddy and rabi crops. Natural vegetation consists of *Artocarpus integrifolia* (Jackfruit), *Dominus flabelifer* (Tel), *Phoenix sylvestris* (Date palm), *Saccharum spontaneum* (Kens) etc.

**Distribution and extent:** Extensive in flood plain of river Ajoy.

**Type location:** Village Ghoshat, P.S. Mangalkot, District Burdwan, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning, Regional Centre, Calcutta.

**Interpretation:** The soils have climatic limitation. Under irrigation, they support a variety of crops which respond to management.

**(a) Interpretive grouping:**

- 1. Land capability sub-class -Ile
- 2. Irrigability sub-class -I
- 3. Fertility management potential (Potential to retain fertilizer elements) -Medium
- 4. Management potential/productivity -Medium



**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	27-31
High	41-45

Soil Serie: Ghoshat  
 Location: P.S. Mangalkot  
 Dist.: Barddhaman

Classification: Typic Ustifluent  
 Analysis at: NBSS & LUP  
 Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02- 0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-15	30.7	13.6	29.7	26	Nil
Cl	15-30	40	11.1	28.7	20	„
C2	30-70	71.2	6.1	10.7	12	„
C3	70-150	76.5	3.8	9.7	10	„

Depth(cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	0.31	0.032	6.8	0.71	2.05
15-30	0.28	0.026	7.4	0.14	2.33
30-70	0.29	0.021	7.7	0.14	2.33
70-150	0.20	0.01	8.0	0.14	3.14

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	9.6	4.0	1.69	0.32	15.6	17.6	88.6	0.68
15-30	7.2	4.0	1.69	0.31	13.1	15.6	83.9	0.78
30-70	5.6	2.4	0.97	0.15	9.1	10.4	87.5	0.87
70-150	4.8	2.4	0.54	0.1	7.8	9.0	86.7	0.9

**9. Hanrgram Series**

Tentative series

The Hanrgram series is a member of the fine, mixed, hyperthermic family of Vertic Eutrochrepts. Hanrgram soils have light gray to olive brown strongly to slightly acid clay loam to clay B-horizons which are distinctly mottled with strong brown to olive brown colours. They have developed on alluvium on the old flood plains of the Damodar River. Hanrgram soils occur on nearly level-to-level lands at an elevation of 20 to 30 m above MS. They are clayey throughout the profile; sphenoids are prominent below about 50 cm. The soils crack 1 cm wide up to 30 cm depth. Iron-manganese concretions are present throughout the profile. Principal associated soils are Balidanga series which is a Typic Haplaquept and Anantapur series a Typic Ochraqualf.

**Typifying Pedon:** Hanrgram clay - cultivated.

- Ap 0-11 cm--- Olive brown (2.5 Y 4/4 M) clay; hard, firm and sticky; few faint dark olive gray (5Y 3/2) mottles; few fine to coarse iron concretions; many fine and medium roots; many very fine discontinuous tubular pores; pH 5.5; abrupt smooth boundary.
- A3 11-25 cm --- Dark grayish brown (2.5Y 4/2 M) clay; strong coarse blocky structure; extremely firm, very sticky and very plastic; many coarse distinct yellowish brown (10YR 5/6) mottles; common fine to coarse hard and slightly hard iron-manganese concretions; many fine and medium roots; many very fine discontinuous tubular pores; pH 6.4 clear smooth boundary.
- B1 25-56 cm--- Grayish brown (2.5Y 5/2 M) clay; strong medium to coarse blocky structure with pressure faces: extremely firm, very sticky and very plastic; many medium distinct yellowish brown (10YR 5/6) mottles; 41 fine to coarse hard and slightly hard iron ganese concretions; few very fine and fine root.: ny very fine discontinuously tubular pores; pH 6.3 gradual smooth boundary.
- B21 56-84 cm --- Gray (5Y 5/1 H) clay: weak medium prismatic structure breaking to medium blocky peds with prominent sphenoid and pressure faces; extremely firm, very sticky and every plastic; common medium prominent strong brown (7.5YR 5/6) mottles; few fine to operas slightly hard to hard iron-manganese concretions; many very fine discontinuous tubular pores; pH 6.1; gradual smooth boundary.
- B22 84-106 cm --- Gray (5Y 5/1 M) clay; weak medium prismatic structure breaking to medium blocky pads with prominent sphenoid; extremely firm, very sticky and very plastics common fins distinct light olive brown (2.5Y 5/4) mottles; many fine to coarse slightly hard to hard iron-manganese concretions; many very fine discontinuous tubular pores; pH 6.31 diffuse smooth boundary.
- B23 106-131 cm + --- Grey (5Y 5/1 M) clay: tending to massive; extremely firm, very sticky and very plastic; common fine distinct light olive brown (2.5Y 5/4) mottles; many fine to coarse slightly hard to hard iron-manganese concretions; many very fine discontinuous tubular pores, pH 6.5.

**Range in characteristics:** The thickness of the solum ranges from 130 to 160 cm. The estimated MAST is 26.6°C. MBST is 31.5°C and MWST is 20.5°C. Moisture control section is aquic and the soils remain wet during the monsoon period.

The A horizon is about 30 cm thick. Its colour ranges from light gray to light brownish gray in hue 2.5Y to 5Y, value 4 to 6 and chroma 2 or less. The texture is clay loam to clay and structure sub angular blocky to angular blocky. The colour of the B-horizon is gray to dark gray and grayish brown in hue 2.5Y to SY, value 4 to 6 and chroma 2 or less. The texture of the B-horizon ranges from clay loam to clay, and structure is prismatic breaking to blocky peds. Pressure faces on ped surfaces are efident in the B-horizon. The B-horizon has distinct strong brown (7.5YR 4/6) and olive brown (2.5Y 5/4) mottles.

**Drainage and permeability:** Imperfectly drained with very slow permeability.

**Use and vegetation:** intensively cultivated to rice in Sherif, wheat is grown under irrigation, natural vegetation- *Ficus spp.*, *Solanum Spp.*, *palmyra* and silk cotton.

**Distrnbution and extent:** Extensive in Barddhaman Subdivision.

**Type location:** Village Shyamsundarpur, Barddhaman Sadar, District Barddhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning, Regional Centre, Calcutta.

**Interpretation:** Hanrgram soils are subject to flooding and stagnation during rainy season. Hence, they are suitable only for growing rice. However, lentil and gram may be grown in winter on conserved moisture and wheat may be grown with supplemental irrigation.

**(a) Interpretive grouping:**

- |                              |         |
|------------------------------|---------|
| 1. Land capability sub-class | -IIIw   |
| 2. Irrigability sub-class    | -3d     |
| 3. Productivity potential    | -Medium |

**(b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Medium	35-38
High	40-45

## Soil Survey and Land Use Plan of Barddhaman District, West Bengal

Soil Series: Hangram

Classification: Vertic Eutrochrept

Location: P.S. BarddhamanSadar

Analysis at: NBSS & LUP Regional

Dist.: Barddhaman

Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-11	17.5	6.3	29.8	46.4	-
A3	11-25	17.4	6.6	27.6	48.4	-
B1	25-56	17.3	7.6	27.1	48.0	-
B21	56-84	17.3	7.1	25.2	50.4	-
B22	84-106	17.0	7.5	19.2	56.3	-
B23	106-131	17.6	8.5	17.9	56.0	-

Depth (cm)	Organic Carbon %	Ext.iron as Fe %	pH (1:2.5) KC1	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Bulk density g/cc
0-11	1.26	0.81	4.4	5.5	1.56
11-25	0.27	1.16	5.6	6.4	
25-56	0.22	0.67	5.6	6.3	1.79
56-84	0.19	1.02	5.0	6.1	
84-106	0.18	0.46	5.8	6.3	1.68
106-131	0.17	0.37	5.7	6.5	

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-11	11.2	2.4	0.5	0.3	14.4	18.4	78	0.4
11-25	13.6	4.4	0.7	0.4	19.1	21.6	88	0.45
25-56	14.4	4.0	0.4	0.4	19.2	22.0	87	0.46
56-84	15.2	4.8	0.4	0.5	20.9	23.0	91	0.45
84-106	16.8	5.2	0.5	0.5	23.0	24.2	95	0.43
106-131	17.6	8.4	0.5	0.6	27.1	28.0	91	0.5

**10. Kalyaneswar Series:**

Tentative series

The Kalyaneswar series is a member of loamy skeletal mixed hypethermic family of Lithic Ustochrepts. Kalyaneswar soil have yellowish red medium acid gravelly sandy loam A horizon, yellowish red, medium acid sandy clay loam B horizon and gravelly C horizon. They have developed on weathered sand-stane on strongly sloping to moderately steep isolated hillocks in dissected plateau area. Principal associated soil series is Sankarpur Series a Plinthustalf.

**Typifying Pedon:** Kalyaneswar gravelly sandy loam - forest.

- A1 0-15 cm --- Yellowish red (5YR 5/6 M) gravelly sandyloam; weak medium crumb and few fine granular structure; friable and non-sticky; many ferruginous concretions and gravels; many roots; abrupt wavy boundary.
- B2 15-36 cm --- Yellowish red (5YR 5/8 M) gravelly sandy clay loam: moderate medium sub-angular blocky; firm and sticky; few roots present; many gravels and rock pieces; abrupt wavy boundary.
- C 36 cm+ --- Partially weathered sandstones.

**Range in characteristics:** The thickness of the solum is 25 to 30 cm, underlain by weathered sand stone. The moisture regime is Uqtic.

The A horizon is 15-18 cm thick. The texture of the fine earth in A horizon varies from gravelly loamy sand to gravelly sandy loam and its colour varies from yellowish red to reddish yellow in 5YR hue with value of 5 to 6 and 8/B chroma of 6 to 8. The B horizon with an abrupt upper boundary is nearly 22 cm thick. Its texture varies from gravelly sandy clay loam to gravelly sandy clay end colour varies from yellowish red to reddish yellow in hue 5YR with value 5 to 6 and chroma 6 to 8.

Available moisture capacity of the soil is 2.43 cm. in 30 cm depth, then the solum is underlain by weathered sandstone.

**Drainage and permeability:** Well drained with moderately rapid permeability.

**Use and vegetation:** Under thin forest, Natural vegetation consists of *Shore robusta* (Sal), *Bombax malaharicum* (Shimool), *Dendrocalamus strictus* (Bamboo), *Phoenix sivestris* (flute palm); *Buchanenie latifolia* (Piyal) etc.

**Distribution and extent:** Extensive in the north welt part of Salanpur Police station, Bardhaman District, West-Bengal.

**Type location:** village Kalyaneswar, P.S. Salanpur, Dist. Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR). Regional Centre, Calcutta.

**Interpretation:** The soils are gravelly with low moisture retentivity. They are very susceptible to erosion.

**(a) Interpretive grouping:**

- |  |       |
|--|-------|
| 1. Land capability sub-class   | -VIe  |
| 2. Irrigability sub-class  | -6t   |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Low  |
| 4. Management potential/productivity   | -Poor |

Soil Series: Kalyaneswar

Classification: Lithic Ustochrepts

Location: P.S. Salanpur

Analysis at: NBSS & LUP

Dist. Bardhaman

Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
A1	0-15	57.5	14.6	8.8	19.1	36.04
B2	15-30	12.8	6.8	6.8	28.1	46.00

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	1.2	0.081	5.8	Trace	0.36
15-30	0.91	0.059	8	Trace	0.44

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	2.0	0.8	0.22	-	3.0	5.8	51.7	0.3
15-30	3.0	1.0	0.36	0.04	4.5	7.1	63.4	0.25

**11. Konarpara Series:** Tentative series

The Konarpara series is a member of fine loamy mixed hyper-thermic family of Typic Fluvaquents. Konarpara soils have olive gray to light olive gray mottled, very strong acid sandy clay loam A-horizons over dark gray to gray mottled neutral to mild alkaline sandy loam to clay loam C horizons. They have developed on meander flood plain and occur on nearly level to very gently sloping lands at an elevation of 5-10 m above MS. Vertical cracks are present which extends up to 30 cm depth from surface in summer months. Principal associated soil series is Nabagram series, a Vertic Fluvaquent.

**Typifying Pedon:** Konarpara sandy clay loam - cultivated.

- Ap 0-15 cm --- Olive gray (5Y 5/2 M) sandy clay loam; weak fine sub-angular blocky structure firm and sticky; many medium distinct yellowish brown (10YR 5/8) mottling; plentiful fine roots; moderate biological activity; ferruginous concretions increase with depth; gradual smooth boundary.
- A12 15-42 cm --- Light olive gray (5Y 6/2 M) sandy clay loam, weak fine sub-angular blocky structure; firm and sticky; many coarse prominent reddish brown (5YR 5/6) mottling, many fine roots; weak biological activity; presence of micaceous particle; abrupt wavy boundary.
- Cl 42-110 cm --- Dark gray (5Y 4/1 M) sandy loam; weak medium crumbly; friable and non-sticky, many ferruginous concretions; many medium distinct dark yellowish brown (10YR 4/4) mottlings; few fine roots; very weak biological activity; gradual smooth boundary; few micaceous particles.
- IIC2 110-150 cm+ --- Gray (8 N 5/0) clay loam; coarse medium angular blocky; moist firm, wet very sticky; many coarse prominent brownish yellow (10YR 6/8) mottlings; abundant ferruginous concretions; slow permeability; few micaceous particles.

**Range in characteristics:** The soils are very deep and under Udic moisture regime.

A horizon is about 16 cm thick. The texture of fine earth in A horizon varies from fine sandy loam to sandy loam and its colour varies from olive gray to gray in 5Y hue with value of 5 to 6 and chroma of 1 to 2. The underlying C-horizon grades with different texture with lithological discontinuity. The colour of the C-horizons ranges from light olive gray to gray in hue 5Y with medium moist value and low chroma.

The available moisture capacity of Konarpara series is 8.46 an in 60 cm depth and 13.26 an in 100 cm depth soil profile.

**Competing series and their differentiae:** Nabagram series is a Vertic Fluvaquent which is more clayey.

**Drainage and permeability:** Imperfectly drained with moderately slow permeability.

**Use and vegetation:** Cultivated to paddy. Natural vegetation consists of *Ficus Cunea*, (Fig), *Cyperus rotundus* (Mutha).

**Distribution and extent:** Extensive in Memari and Jamalpur Police Stations, Bardhaman district, West Bengal.

**Type location:** Village Konarpara, P.S. Memari, Dist. Bardhaman, West Bengal.

**Series Proposed:** National Bureau of Soil Survey and Land Use Planning, Regional Centre, Calcutta.

**Interpretation:** Konarpara soils are imperfectly drained and situated in low-lying lands. This restricts the choice of crops in Kharif season. The soils respond fairly well to management.

**(a) Interpretive grouping:**

- |  |       |
|--|-------|
| 1. Land capability sub-class   | -IIw  |
| 2. Irrigability sub-class  | -2d   |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -High |
| 4. Management potential/productivity   | -High |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	32-36
High	45-49

Soil Series: Konarpara  
Location: P.S. Memari  
Dist. Barddhaman

Classification: Typic Fluvaquent  
Analysis at : NBSS & LUP  
Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-15	49.5	11.8	10	28.7	Nil
A12	15-42	50.3	12	10	27.7	Nil
C1	42-110	62.8	8	10	19.2	Nil
IIC1	110-150	33.7	12.6	18	35.7	Nil

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	0.45	0.04	4.7	1.42	0.69
15-42	0.28	0.02	4.6	0.23	0.69
42-110	0.2	0.02	6.8	0.33	0.93
110-150	0.1	0.01	7.7	0.26	1.39

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	4.4	2.8	0.85	0.1	8.2	14.8	55.4	0.52
15-42	4.4	2.6	0.55	0.1	7.7	14.8	52.0	0.53
42-110	3.6	1.8	0.64	0.15	6.2	9.4	65.9	0.49
110-150	6.2	3.8	0.96	0.15	11.1	15.0	74.0	0.42



**12. Krishnadevpur Series:**

Tentative series

The Krishnadevpur series is a member of fine loamy mixed hyperthermic family of Fluventic Eutrochrepts. Krishnadevpur soils have grayish brown, mild alkaline silt loam A horizon, light brownish gray to dark grayish brown mild alkaline silt loam to silty clay loam B horizons and light brownish gray silt loam C horizon. They are formed in mixed alluvium and occur on the Bhagirathi old flood plain with 0-1 per cent slope. The soils are calcareous throughout. Principal associated soil series is Balidanga, a non-calcareous Typic Haplaquept.

**Typifying Pedon:** Krishnadevpur silt loam - cultivated.

- Ap 0-12 cm --- Grayish brown (2.5Y 5/2 M) silt loam, puddled, moist firm and slightly sticky when wet, few fine faint mottlings of light olive brown (2.5Y 5/4) colour, frequent fine roots; strong effervescence, moderate biological activity; clear smooth boundary.
- B1 12-46 cm --- Light brownish gray (2.5Y 6/2 M) silt loam, weak medium sub angular blocky structure, moist firm slightly sticky on wet, few fine, distinct settlings of brown (10YR 5/3) and dark yellowish brown (10YR 4/4) colour; few medium and fine roots: strong effervescence; many medium and fine pores: moderately strong biological activity; abrupt smooth boundary.
- B2 46-88 cm --- Dark grayish brown (2.5Y 4.5/2 M) silt clay loam; massive structure; moist firm and sticky; few fine distinct mottling of brown (10YR 5/3) colour; few medium and fine roots; violent effervescence; common medium pores; weak biological activity; clear smooth boundary.
- Cl 88-150 cm --- Light brownish gray (2.5Y 6/2 M) silt loam; massive structure, moist friable and slightly sticky on wet; very few medium roots; medium effervescence; weak biological activity.

**Range in characteristics:** The thickness of the solum is about 90 cm. Soil is calcareous throughout. Moisture regime is Udic.

The Ap horizon is 10 to 14 cm thick. The texture of fine earth in A horizon varies from silt loam to silty clay loam and the colour from grayish brown to gray in 2.5Y hue with value 5 and chroma 1 to 2. B-horizon is about 80 cm thick. The texture of B-horizon ranges from silt loam to silty clay loam and its colour varies from light brownish gray to dark brown in hue 2.5Y, value 4 to 6, chroma 0 to 2. The C-horizon is of silt loam texture with light brownish gray colour. Micaceous sands are found in C-horizon.

Available moisture capacity of Krishnadevpur series is 11.98 in 60 cm depth and 19.98-in 100 cm depth soil profile.

**Drainage and permeability:** Moderately well drained with moderate permeability.

**Use and vegetation:** Cultivated to paddy and rabi crops. Natural vegetation consists of *Borassus flabelifer* (Palmyra Palm), *Dendrocalamus strictus* (Bamboo), *Mangifera indica* (Mango), *Saccharum munja* (Sar) etc.

**Distribution and extent:** Extensive in flood plain of river Bhagirathi (Hgli).

**Type location:** Mouza - Krishnadevpur. P.S. Kalna. District Bardhaman.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre Calcutta.

**Interpretation:** Krishnadevpur soils have good air-water relationship. The soils respond to management well. Under irrigation, they are suitable for wheat, vegetables and oilseed crops.

**(a) Interpretive grouping:**

- |  |       |
|--|-------|
| 1. Land capability sub-class   | -IIw  |
| 2. Irrigability sub-class  | -I    |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -High |
| 4. Management potential/productivity   | -High |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	32-36
High	45-49

Soil Series: Krishnadevpur

Location: P.S. Kalna

Dist. Bardhaman

Classification: Fluventic Eutrochrepts

Analysis at: NBSS &amp; LUP

Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-12	10.1	48.6	22.0	19.3	-
B1	12-46	20.6	29.1	28.0	22.3	-
B2	46-88	19.3	20.4	31.0	29.3	-
Cl	88-150	28.5	36.2	19.0	16.3	-

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2:5) H <sub>2</sub> O	E.C. (1:2:5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-12	0.49	0.05	7.7	0.94	2.33
12-46	0.26	0.02	7.5	0.58	2.05
46-88	0.15	0.02	7.8	0.58	1.65
88-150	0.24	0.03	7.6	0.87	2.03

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-12	5.2	2.8	0.21	0.15	8.4	11.0	76.4	0.57
12-46	6.4	3.2	0.26	0.1	10.0	12.8	78.1	0.57
46-813	7.0	4.0	1.14	0.42	12.6	15.2	82.9	0.52
88-150	4.6	1.0	0.34	0.15	6.1	8.0	76.3	0.49

**13. Kuldiha Series:**

Tentative series

The Kuldiha series is a member of fine mixed hyperthermic family of Vertic Ochraqualfs. Kuldiha soils have pale brown medium acid loam A-horizon and pinkish gray to gray slight acid clay loam to clay B horizons with distinct mottles of gray and light olive gray colour. They have developed in granite alluvium on gently sloping valley in upper alluvial plains. Iron concretions and quartz gravels are present throughout the profile. Principal associated soils are kanksa Series, a Typic Ochraqualf and Majiara Series, an Aeric Ochraqualf.

**Typifying Pedon:** Kuldiha loam - cultivated.

- Ap 0-15 cm --- Pale brown (10YR 6/3 D) loam; very pale brown (10YR 7/3 M) crumb; slightly sticky when wet and slightly hard when dry; few brownish yellow specks; few ferruginous concretions and quartz gravels; very frequent roots; gradual smooth boundary.
- B1 15-30 cm --- Grayish brown (10YR 5/2 M) clay loam, light brownish gray (10YR 6/2) dry; sub angular blocky; firm when moist, sticky when wet; patchy thin clay films on pad faces and on root channel; common strong brown (7.5YR 5/6) mottling; few roots; diffuse smooth boundary.
- B21t 30-75 --- Pinkish gray (7.5YR 7/2 M) clay loam; sub-angular blocky; firm when moist, sticky when wet; many distinct gray (10YR 5/1) mottlings; many semi hard ferruginous concretions and quartz gravels; patchy thin clay outline; very few roots; diffuse smooth boundary.
- B22t 75-150 an --- Gray (7.5YR 5/0 M) clay: medium strong angular blocky; moist firms very sticky and plastic when wet; patchy thick clay cutans on ped faces: distinct light olive gray (5Y 6/2) mottlings; many yellowish brown (10YR 5/8) spots; many brown ferruginous concretions mixed with quartz gravels.

**Range in characteristics:** The thickness of the solum is more than 150 cm. Although moisture regime is quic, soil remains dry for more than 90 cumulative days during summer months.

A horizon is 15-18 cm thick. The texture of A horizon varies from sandy loam to loam and its colour varies from light brown to very pale brown in 7.5YR hue, value 6 to 7 and chroma 2 to 3. Clay content increases with soil depth reaching a maximum value in Bt horizons. Bt horizon is more than 100 cm thick. The texture of the B horizon varies from clay loam to clay and the colour from pinkish gray to gray in 7.5YR hue, value 5 to 7 and chrome of 0 to 2. Concretion (2 to 4 mm size) varies from few to many a horizon is severely mottled with distinct gray and light olive gray colour.

Available moisture capacity of Kuldiha series is 11.55 cm in 60 cm depth add 18.30 cm in 100 cm profile depth.

**Drainage and permeability:** Imperfectly drained soil with slow permeability.

**Use and vegetation:** Cultivated to paddy and rabi crops share irrigation facilities are available. Natural vegetation consists of *Butea frondosa* (Palash), *Phoenix sylvestris* (date palm), *Jambulana indica* (Jam), *Albizzia lebeak* (Biriah) etc.

**Distribution and extent:** Extensive in Faridpur, Lanka and Ausgram Police stations, Bardhaman District, West Bengal.

**Type location:** Village Kuldiha P.S. Kanksa, District Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** The soils of Kuldiha series are aquic and clayey in nature. They have poor soil air-water relationship. During rainy season, surface flooding is a common occurrence. The soils therefore are suited only to paddy in Kharif. They can support rabi crops on conserved moisture.

**(a) Interpretive grouping:**

- |  |         |
|--|---------|
| 1. Land capability sub-class   | -IIw    |
| 2. Irrigability sub-class  | -2d     |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium |
| 4. Management potential/productivity   | -Medium |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	27-31
High	41-45

Soil Series: Kuldiha  
Location: P.S. Kanksa  
Dist. Bardhaman

Classification: Vertic Ochraqualfs  
Analysis at: NBSS & LUP  
Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-15	49.8	21.0	12.5	16.7	5.0
B1	15-30	38.5	15.2	17.8	28.5	7.21
B21t	30-75	29.0	13.8	18.7	38.5	10.0
B22t	75-150	29.1	13.2	16.7	41.0	12.0

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	0.7	0.056	4.5	0.61	0.39
15-30	0.31	0.038	5.5	0.12	0.42
30-75	0.25	0.021	6.1	Trace	0.93
75-150	0.18	0.01	6.2	Trace	0.93

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	3.2	2.4	0.65	0.15	6.0	9.6	62.5	0.57
15-30	6.0	3.8	0.65	0.15	10.6	14.6	73.6	0.51
30-75	10.0	4.8	1.03	0.57	16.6	21.2	78.3	0.55
75-150	11.8	6.0	1.20	0.80	19.8	25.4	77.9	0.62

**14. Kutubpur Series:**

Tentative series

The Kutubpur Series is a member of fine loamy mixed hyperthermic family of Typic Haplaquepts. Kutubpur soils have light gray strong to medium acid silty loamy silty clay loam. A horizon and gray colour sandy C horizons by lithologically discontinuous slight acid, silty to silty-clay loam IIc-horizons. They are formed on alluvium and generally occur on upland depressions at elevation of 10 to 30 m. above MSL in meander flood plain area. Principal associated soil series are Balidanga, Banpara and Multi series, which are all Typic Haplaquepts.

**Typifying Pedon:** Kutubpur silt loam-cultivated.

- Ap 0-14 cm --- Light gray (10YR 7/1 M) to pale brown (10 YR 6/3 D), gray to brown (10 YR 5/3) silt loam, puddled red when dry, firm when moist, slightly sticky when wet; yellowish brown (10 YR 5/6) when dry and yellowish brown (10 YR 5/8) when moist, rusty specks colour: very few (1-2 mm) hard ferromanganese nodules; few fine roots; few coarse and common, medium pores; very weak biological activity; clear smooth boundary.
- A12 14-46 cm --- Dark gray (10YR 4/1 M) silty clay loam, strong coarse and very coarse angular blocky structure breaking into sub-angular blocky; firm when moist, sticky and plastic when wet: common medium distinct yellowish brown (10YR 5/6) mottlings; common (2 mm) and few (5 mm) soft ferromanganese nodules: very few fine roots: few common medium pores: weak to moderate biological activity; gradual, noth boundary.
- Cl 46-66 cm --- Medium sand of colour gray (2.5Y 6/0).
- IIc2 66-91 cm --- Gray (2.5Y 6/0 M) clay loam; massive when wet; weak coarse sub angular blocky when dry; firm when moist, sticky when wet; common fine distinct yellowish brown (10YR 5/6) mottlings; common coarse pores; moderate biological activity; gradual, smooth boundary.
- IIIc3 91-115 cm+ --- Light gray (10 YR 6/1 M) clays massive when wet, weak coarse and very coarse subangular blocky when dry: firm when moist, sticky when wet, common fine faint yellowish brown (10 YR 5/6) mottling, common (1 mm) ferromanganese nodules; no roots observed; common medium pores.

**Range in characteristics:** The soils are very deep and have sand layer in between; moisture regime is Aquic.

A horizon is about 50 cm thick. The texture of the fine earth in A-horizon varies from silty loam to silty clay loam and its colour varies from light gray to dark gray hue, value 4 to 6 and chrome 0 to 1. Underlying C-horizon grades with different texture with lithological discontinuity.

Available moisture capacity of Kutubpur series is 11.80 cm in 60 cm depth and 19.30 cm in 100 cm depth soil profile.

**Drainage and permeability:** Moderately well to imperfectly drained with moderate to slow permeability.

**Use and vegetation:** Cultivated lands for paddy and rabi crops. Natural vegetation consists of *Mangifera indica* (Mango), *Artocarpus integrifolia* (Jackfruit), *Anona Squamosa* (Ata); *Tamarindus indica* (Tamarind), *Saccharum munja* (Sar) etc.

**Distribution and extent:** Extensive in Kalna, Purbathali and Memari Police Stations.

**Type location:** Village Kutubpur, P.S. Kalna, District Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** Kutubpur Soils are medium productive and crops respond to management. In some soils poor drainage may give rise to some problem.

**(a) Interpretive grouping:**

- |  |  |
|--|--|
| 1. Land capability sub-class   | -IIs   |
| 2. Irrigability sub-class  | -I   |
| 3. Fertility management potential due to (Potential to retain fertilizer elements) | -Medium, loss of fertilizer may present problem leaching |
| 4. Management potential/productivity -   | Medium   |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	32-36
High	44-48

Soil Series: Kutubpur  
 Location: P.S. Kalna  
 Dist. Bardhaman

Classification: Typic Haplaquents  
 Analysis at: NBSS & LUP  
 Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-14	23.5	26.8	28	22.9	-
A12	14-46	11.5	24.8	27.8	35.9	-
C1	46-66	-	-	-	-	-
11C2	66-91	26.2	9.1	24.8	39.9	-
11C3	91-115+	30.2	6.1	20.8	42.9	-

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2:5) H <sub>2</sub> O	E.C. (1:2:5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-14	0.44	0.05	5.2	0.28	0.93
14-46	0.32	0.05	6.1	0.28	0.93
46-66	-	-	-	-	-
66-91	0.19	0.02	6.2	0.19	1.3
91-115+	0.13	0.01	6.3	0.26	1.3

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-14	4.2	3.2	0.54	0.1	7.8	12	65	0.52
14-46	8.2	4.4	1.38	0.38	14.4	20.6	69.9	0.57
46-66	-	-	-	-	-	-	-	-
66-91	10.4	5.2	1.21	0.34	17.2	22.2	77.5	0.56
91-115+	11.2	7.2	0.97	0.3	16.6	24.8	67.7	0.58

**15. Kanksa Series:**

Tentative series

The Kanksa series is a number of fine mixed hyperthermic family of the Typic Ochraqualfs. Kanksa soils have light gray, medium and clay loam A-horizon and gray, neutral clay loam to clay B-horizons. They have developed in alluvium and are found to occur on gently sloping valley lands in undulating upper alluvial plain. Principal associated soils are Majiara series, an Aeric Ochraqualf and Kuldiha series, a vertic Ochraqualf.

**Typifying Pedon:** Kanksa clay loam - cultivated.

- Ap 0-15 cm --- Very pale brown (10YR 7/3 M), pale brown(10YR 6/3 D) clay loamy; puddled structure breaking to weak medium sub-angular blocky, friable and sticky; plentiful medium roots inside peck; yellowish brown (10YR 5/6) root stains, clear smooth boundary.
- B21t 15-75 cm --- Gray (10YR 6/1 14) clay loam; moderate medium sub-angular blocky structure; friable and sticky, few fine and medium roots; distinct brown (10 YR 5/3) colour mottles; few medium iron manganese concretions, patchy thick clay cutans, gradual smooth boundary.
- B22t 75-100 cm -- Gray (7.5YR 6/0 M) clay; moderate medium blocky structures firm, very sticky and vary plastic; distinct dark gray (10 YR 4/1) and black (10 YR 2.5/1) colour mottles; few medium to coarse iron manganese concretions, patchy moderately thick clay cutans.

**Range in characteristics:** The thickness of the solum is more than 150 cm. Moisture regime is aquic.

The A horizon ranges in thickness from 15 to 20 cm. Its colour is in hue 10YR, value 4 to 6 and chrome 2 or less. Its texture ranges from loam to clay loam. B-horizon is more than 100 cm thick. Its colour is in hue 10YR or redder, value 5 to 6 and chroma 2 or less. Distinct mottles of brown to dark gray colour are present through the solum. The B horizon ranges from clay loam to clay in texture. It has thick clay cutans on pad faces; Iron-manganese concretions ranging from 5 to 10 per cent by volume are present in the lower part of B-horizon. Available moisture capacity of Kanksa Soil is 12.0 cm for 60 cm depth and 18.75 cm for 100 cm depth profile.

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

**Use and vegetation:** Cultivated to rice. Natural vegetation consists of *Butea frundosa* (Palash); *Jambulana indica* (Jam), *Albizia lebbek* (Sirish) etc.

**Distribution and extent:** Extensive in valley area in Kanksa, Ondal and Faridpur Police Stations, Bardhaman District.

**Type location:** Village Kanksa, P.S. Kanksa, District Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** Kanksa soils have aquic moisture regime and have the inherent problem of poor aeration. They are subject to surface flooding during rainy season due to their position in this landscape. They are therefore suitable only for paddy during Kharif season. The soils may support climatically adapted crops on conserved soil moisture.

**(a) Interpretive grouping:**

- |  |         |
|--|---------|
| 1. Land capability sub-class   | -IIIw   |
| 2. Irrigability sub-class  | -3d     |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium |
| 4. Management potential/productivity   | -High   |



b) Yield:Based on data from farmers' fields.

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	31-35
High	41-45

Soil Series: Kanksa  
Location: P.S. Kanksa  
Dist.Bardhaman

Classification: Typic Ochraqualf  
Analysis at: NBSS & LUP  
Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-15	38.8	18.2	15.0	28.0	-
B21t	15-75	29.8	18.0	16.8	35.4	-
B22t	75-150	28.0	16.2	16.6	39.2	8.5

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	0.36	0.03	5.8	0.16	0.31
15-75	0.17	0.01	6.8	0.12	0.39
75-150	0.15	0.01	6.8	Trace	0.42

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	4.4	2.6	0.64	0.15	7.8	10.8	72.2	0.39
15-75	7.8	4.6	0.66	0.17	13.2	16.2	81.5	0.46
75-150	9.4	4.8	0.92	0.47	15.6	17.6	88.6	0.45

**16. Madhpur Series:**

Tentative Series

The Madhpur series is a member of fine mixed hyperthermic family of Typic Ochraqualfs. Madhpur soils have light brownish gray slight acid clay loam A horizon, olive gray neutral to mild alkaline clay loam to clay B horizons. They have developed in alluvium on very gently sloping to lower alluvial plains. Principal associated soils are Kuldiha series, a Vertic Ochraqualf and Hangram series, a Vertic Eutrochrept.

**Typifying Pedon:** Madhpur clay loam - cultivated.

- Ap 0-14 cm --- Light brownish gray (2.5Y 6/2 M) clay loam, puddled; moist friable, wet slightly sticky; common medium distinct reddish brown (5YR 5/4) mottling; very few ferruginous concretions; plentiful fine root clear smooth boundary.
- B1 14-38 cm --- Olive gray (5Y 5/2 M) clay loam/ medium, moderate angular blocky; moist firm, wet sticky, common medium brownish yellow (10YR 6/6) mottlings; many ferruginous concretions; many fine roots; gradual smooth boundary.
- B21t 38-98 cm --- Olive gray (5Y 5/2 M) clay coarse strong, angular blocky; moist very firm, wet very sticky, thin continuous clay cutans on ped faces; common medium distinct yellowish brown (10 YR 5/6) mottling, many ferruginous concretions; very slow permeability, very few, very fine roots, diffused smooth boundary.
- B22t 98-150 cm+ --- Grey (N 5/0 M) clay, coarse strong angular blocky, moist very firm, wet very sticky, many medium distinct yellowish brown (10 YR 5/6) mottlings; thick continuous clay cutans on pads, common ferruginous concretions: abundant CaCO<sub>3</sub> nodules.

**Range in characteristics:** The thickness of the solum varies from 140 to 170 cm. Soils pedons exhibit distinct mottling throughout and CaCO<sub>3</sub> nodules in deep sub-soil. Moisture regime is aquic.

A horizon is about 15 cm thick. The texture of earth fraction of soil material in A-horizon varies from clay loam to silty clay loam and its colour varies from light brownish gray to olive gray in hues 2.5Y to 5; Value 5 to 6 and chroma 0 to 2. B horizon is more than 100 cm thick. The texture of the fine earth in B -horizon ranges from clay loam to clay. Its colour varies from light gray to dark gray in 2.5Y to 5Y hues, value 5 to 6 and chroma 0 to 2. Bt-horizons are distinctly mottled with yellowish brown (10 YR 5/6) colour and base saturation ranges between 74 and 85 per cent.

Available moisture capacity is 10.85 cm in 60cm depth and 16.85 cm in 100 cm depth.

**Drainage and permeability:** Imperfectly drained with moderate to very slow permeability.

**Use and vegetation:** Mostly under intensive paddy cultivation, rabi crops are also grown where irrigation facilities are available. Natural vegetation consists of *Borassus flabilifer* (Tel); *Bambusa rodeo*. (Bamboo); *Cassipinia pulcherrima* (Krishnachura), *Tamarindus indica* (Tentul) etc.

**Distribution and extents:** Extensive in Galsi, Ausgram, Mangalkot, Bhatar, Rayna and Burdwan Police stations.

**Type location:** Village - Madhpur, P.S. Bhatar, Dist. Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** Madhpur soils are fine textured with high productivity. Crops respond to management under both, milled and irrigated agriculture.

**(a) Interpretive grouping:**

- 1. Land capability sub-class -IIw
- 2. Irrigability sub-class -2d
- 3. Fertility management potential (Potential to retain fertilizer elements) -High
- 4. Management potential/productivity -High

b) Yield:Based on data from farmers' fields.

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	31-35
High	46-50

Soil Series: Madhpur  
 Location: P.S. Bhatar  
 Dist.Bardhaman

Classification: Typic Ochraqualf  
 Analysis at: NBSS & LUP  
 Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-14	24.0	21.1	25.2	29.7	2.0
B1	14-38	27.7	17.4	21.2	33.7	5.0
B21t	38-98	18.6	14.5	19.2	47.7	8.0
B22t	98-150+	15.2	12.9	16.2	55.7	8.0

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H2O	E.C. (1:2.5) H2O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-14	0.48	0.05	6.4	0.18	0.48
14-38	0.20	0.02	6.9	0.12	0.93
38-98	0.19	0.02	7.2	0.21	1.39
98-150+	0.10	0.01	7.5	0.21	2.33

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-14	4.8	3.2	0.17	0.53	9.7	13.7	70.8	0.46
14-38	6.4	4.0	0.67	0.13	11.2	15.0	74.7	0.45
38-98	10.4	5.6	1.17	0.53	17.7	22.5	78.7	0.47
98-150+	10.4	8.8	2.03	0.53	21.8	25.6	85.2	0.46

**17. Majiara Series**

Tentative series

The Majiara Series is a member of fine mixed hyperthermic family of Aeric Ochraqualfs. Majiara soils have light olive brown medium acid sandy clay loam A-horizon and light yellowish brown neutral clay loam to clay Bt-horizons. They have developed from colluvial and alluvial deposits and are found to occur gently sloping valley in low dissected plateau. Calcium Carbonate nodules usually appear in the lower part of the B-horizon. Principal associated soils are Kanksa Series a Typic Ochraqualf and Chalbalpur and Chanda Series, both are Udic Haplustalf.

**Typifying Pedon:** Majiara sandy clay loam - cultivated.

- Ap 0-17.5 cm --- Light olive brown (2.5Y 5/6 M) sandy clay loam, puddled; moist very friable and wet slightly sticky, rusty specks present, roots many); diffuse wavy boundary.
- B1 17.5-37.5 cm --- Light olive brown (2.5Y 5/6 M) clay loam, moderate radium angular blocky structure: moist sticky and wet slightly plastic, many roots; few 2.5 mm size ferruginous concretions, diffuse wavy boundary.
- B2lt 37.5-90 cm --- Light yellowish brown (2.5Y 6/4 M) clayloam, strong coarse angular blocky, moist firm and wetslightly plasticity clay films on ped faces, commonand distinct dark olive gray and dark gray (5Y 3/2 and 5Y 4/1) mottlings, few 2.5 mm size ferruginous concretions, diffuse wavy boundary.
- B22t 90-150 cm --- Light yellowish brown (2.5Y 6/4 M) clay, massive, moist very firm, wet very sticky, thick continuous clay skins on ped faces, dark olive gray and very dark gralish brown (5Y 3/2 and 10YR 3/2) mottling, common to many calcium carbonate (ghootings) nodules.

**Range in characteristics:** The thickness of the solum is more than 150 cm. Within the depth of 15 cm to 1.0 m, the content of coarser fragments larger than 2 mm varies from 2 to 7 per cent, while clay content varies from 35 to 45 per cent. Moisture regime is Aquic.

A-horizon is 17 to 20 cm thick. The texture of the fine earth inAP horizon varies from sandy clay loam to clay loam and its colour varies from light olive brown to olive in 2.5Y to 5Y hues, value of 5 and chrome of 4 to 6. B horizon is more than 100 an thick. The texture of the finearth in B-horizon varies from clay loam to clay. The clay pick up in the form of clay films is discernible from the depth of 15 cm through the column. The chrome is much higher thantypic Agnepto. The structural development in B-horizon is moderate and the major portion of it remains saturated with water for longer period in growing season. Ite colour varies from light olive brown to light yellowish brown in 2.5Y hue, value of 5 to 6 and chrome of 4 to 6. CaCO<sub>3</sub> nodules are found at the lower part of Bt horizon. Available water capacity of Majiara series is 11.10cm for 60 cm. depth and 18.50 cm for 100 cm depth.

**Drainage and permeability:** Moderately well drained soil with moderate slow to slow permeability.

**Use and vegetation:** Cultivated to paddy, rabi crops are also grown where irrigation facilities are available. Natural vegetation consists of *Butea frondosa* (Palos), *Borassus flabilifer* (Tal), *Phoenix sylvestris* (date palm), *Ficus bengalensis* (Banyan) etc.

**Distribution and extent:** Extensive in Barabani, Jamumria, Ranigunj, Ondal and Faridpur Police Stations.

**Type location:** Village Bhaskerpore, P.S. Barabani, District Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR) Regional Centre, Calcutta.

**Interpretation:** Majiara Soils have aquic moisture regime and so have the inherent problem of poor aeration. The soils are suited for paddy in Kharif season. With proper moisture conservation, the soils support a variety of climatically adapted crops.

**a) Interpretive grouping:**

- 1. Land capability sub-class -IIe
- 2. Irrigability sub-class -2t
- 3. Fertility management potential (Potential to retain fertilizer elements) -Medium High
- 4. Management potential/productivity -Medium High

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	26-30
High	42-46

Soil Series: Majiara  
 Location: P.S. Barabani  
 Dist. Barddhaman

Classification: Aeric Ochraqualfs  
 Analysis at: NBSS & LUP  
 Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-17.5	55.7	12.4	8.8	23.1	-
B1	17.5-37.5	29.9	15.2	18.8	36.1	2.5
B21t	37.5-90	22.2	14.9	23.8	39.1	5.5
B22t	90-150	23.5	12.6	19.8	44.1	8.0

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-17.5	0.39	0.04	5.9	0.15	0.44
17.5-37.5	0.18	0.02	6.5	0.16	0.98
37.5-90	0.16	0.02	6.8	0.22	1.44
90-150	0.09	0.01	7.0	0.24	3.02

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-17.5	3.0	1.8	1.03	0.52	6.04	8.4	71.9	0.36
17.5-37.5	5.0	3.0	1.1	0.31	9.4	13.2	71.2	0.36
37.5-90	9.4	4.4	1.37	0.43	15.6	19.4	80.4	0.49
90-150	11.4	6.8	1.8	0.37	20.8	24.0	86.7	0.54

**18. Multi Series:**

Tentative series

The Multi series is a member of very fine, mixed hyperthermic family of Typic Haplaquepts. Multi soils have dark gray medium acid clayey Ap horizon, gray to very dark gray neutral to mild alkaline clayey B horizons. The soils have developed in fine alluvium on very gently sloping marshy areas within the meander flood plain. Principal associated soils are Konarpara Series, a Typic Fluva and Kutubpur and Srirampur Series, both Typic Haplaquepts.

**Typifying Pedon:** Multi clay - cultivated.

- Ap 0-13 cm -- Dark gray (N 4/0 D) clay very dark gray (N 3/0 M), puddle d; dry very hardmoist very firm and very sticky on wet, rusty specks of dark yellowish brown (10YR 4/4), frequent paddy roots; clear smooth boundary.
- B21g 13-45 cm --- Gray (N 6/0 M) clay; strong angularblocky structure; moist very firm and wet very sticky, common, medium faint mottling of light gray (N 7/0); common to many fine roots, common medium and fine pores; gradual smooth boundary.
- B22g 45-87 cm --- Very dark gray (N 3/0 M) clay, strongangular blocky structure, moist very firm and wet very sticky, few fine distinct mottling of dark grayish brown (2.5Y 4/2); very few soft consir, few fine roots, gradual smooth boundary.
- B3g 87-105 cm+ --- Gray (N 5/0 M) clay, weak fine sub-angular blocky structure; firm when moist, sticky when wet, common medium distinct mottling of grayish brown (2.5Y 5/2) glei colour, medium fine Linopedpores.

**Range in characteristic:** Thickness of the solum is morethan 150 cm. Within the depth of 15 cm to 1 m coarser fragments larger than 2 mm varies from nil to very few while clay content varies from 60 to 77 per cent. Moisture regime is Aquic.

A-horizon is about 15 cm thick. The texture of fine earth fraction of soil materiel in Ap-horizon varies from clay loam to clay and its colour varies from dark gray to gray in 2.5Y to 5Y hues, value 4 to 5 and chroma 1 or less. B-horizon is more than 100 cm thick. The texture of the fine earth in B-horizon ranges from silty clay to clay. The B-horizons have strong blocky structure and with distinct grayish brown (2.5Y 4/2) coloured mottles. Its colour varies from very dark gray to gray in 2.5Y hue value 3 to 5 and chroma 1 or less.

Available moisture capacity is 9.00 cm in 60 cm depth and 15.00 cm in 100 cm depth soil profile.

**Drainage and permeability:** Poorly drained with very slow permeability.

**Use and vegetation:** Cultivated to paddy. Natural vegetation consists of *ficus cunea*; *Cyprus rotundus* (smiths); *Hygraphyla spinosa*; *Ipomea dentate*; *Hydrile verticillata* (Jhanji); *Reeds* etc.

**Distribution and extent:** Extensive in Purbasthali, Ketugram and Manteswar Police stations.

**Type location:** Village Biswarambha, P.S. Purbasthali, Dist.Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Ladd Use Planning (ICAR), Regional Centre, Calcutta, 1973.

**Interpretation:** Multi soils are poorly drained with very slow permeability. They are subjected to flood damage. Paddy is the main crop in Kharif season.

**a) Interpretive grouping:**

- |  |       |
|--|-------|
| 1. Land capability sub-class   | -IIIw |
| 2. Irrigability sub-class  | -3d   |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -High |
| 4. Management potential/productivity   | -High |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	32-36
High	44-48

Soil Series: Multi  
Location: P.S. Purbasthali  
Dist. Bardhaman

Classification: Typic Haplaquepts  
Analysis at: NBSS & LUP Regional  
Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-13	3.0	8.5	19.1	69.4	-
B21g	13-45	2.3	6.2	15.1	76.4	-
B22g	45-87	3.0	6.5	12.1	78.4	-
B3g	87-150+	9.4	10.1	19.1	61.4	5.0

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-13	1.82	0.19	5.6	0.7	0.48
13-45	1.52	0.18	7.0	0.39	0.93
45-87	0.82	0.09	7.2	0.41	1.66
87-150+	0.06	0.06	7.4	0.42	2.33

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-13	11.2	8.1	1.33	0.21	20.8	32.0	65.0	0.46
13-45	14.2	9.6	1.86	0.32	26.0	36.8	70.6	0.48
45-87	16.8	9.7	1.69	0.57	28.8	38.0	75.8	0.48
87-150+	15.2	7.3	1.02	0.51	24.0	32.4	74.1	0.53

**19. Nabagram Series:**

Tentative series

The Nabagram series is a member of fine mixed hyperthermic family of Vertic Fluvaquents. Nabagram soils have grayish brown gray medium acid clayey A horizon underlain by gray slight acid clay to silty clay C horizons. They have developed in fine alluvium on nearly level to very gently sloping meander flood plain. Cracks of 1 cm or more wide are found which extends to depths of 40-50 cm in summer months. Principal associated soil series is Ronarpara series a Typic Fluvaquent.

**Typifying Pedon:** Nabagram clay - cultivated.

- Ap 0-13 cm --- Grayish brown (2.5Y 5/2 M) clay puddled, firm and sticky, rusty specks of yellowish brown to dark yellowish brown (10 YR 4.5/4 M) colour; vertical cracks of 1-2 cm; frequent fine roots, pore space disturbed, gradual smooth boundary.
- A12g 13-42 cm -- Gray (10 YR 5/1 M) clay; strong mediumsub-angular blocky structure; very firm; very sticky; few fine faint mottling, of brown (10 Y R 5/3) colour, vertical cracks of 1-2 cm wide; few less than 2 mm soft consir fine and medium root, few medium pores, clear wavy boundary.
- Clg 42-98 cm -- Gray (10 YR 5/1 M) clay; moderate coarseangular blocky structure; firm and sticky; few medium faint mottlings of yellowish brown (10 YR 5/4); vertical cracks of 1 cm wide extends upto 46 cm from the surfacecommon 2 to 5 mm Fe Me nodules presents few fine roots; common fine inped pores: clear wavy boundary.
- C2g 98-150 cm+ --- Gray (2.5 Y 5/0 M) silty clay, strongangular blocky structure, very firm and sticky, few medium faint, mottling, of yellowish brown (10 YR 5/4), few to common less than 2 mm soft crop nodules, weak biological activity.

**Range in characteristics:** The thickness of the soil is more than 100 cm moisture regime is Aquic.

A horizon is 40-45 cm thick. The texture of fine earth in A horizon value from clay loam to clay and colour varies from grayish brown to gray in 10YR to 2.5Y hues, 4 to 5 and chroma 2 or loss. The maximum concentration of clay is in A horizon below which clay content dec C-horizon is more than 100 cm thick. The texture of C-horizon varies from silty clay to clay, colour from gray to dark grayishbrown in 10YR to 2.5Y hues, value 4 to 5 and chroma 1 or less.

Available moisture capacity of Nabagram series is 9.00cm in 60 cm depth and 15.02 cm in 100 cm depth.

**Competing series and their differentiae:** Konampara series – loamy Typic Fluvaquent.

**Drainage and permeability:** Poorly drained with slow permeability.

**Use and vegetation:** Cultivated to Aman paddy. Natural vegetation consists of *ficus cunea* (Fig), *Ipomea sp*, *Clerodendron infortunatum* (ghetu); *Cyprus rotundus* (Mutha); *Hygrophyla spinosa*, *Hydrile verticillate* (Jhanji), etc.

**Distribution and extent:** Extensive in Ketugram Police station.

**Type location:** Village Nabagram, P.S. Ketugram, Dist.Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** The soils of Nabagram series are aquic and clayey in nature and have poor soil water air relationship Soils are suited only to paddy in Kharif. They can support pulses and oilseed on conserved moisture and wheat on supplement irrigation.



**a) Interpretive grouping:**

- 1. Land capability sub-class -IIIw
- 2. Irrigability sub-class -2d
- 3. Fertility management potential -High  
(Potential to retain fertilizer elements)
- 4. Management potential/productivity -High

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha.) Aman paddy
Low	-
Medium	34-38
High	47-51

Soil Series: Nabagram  
Location: P.S. Ketugram  
Dist. Bardhaman

Classification: VerticFluvaquents  
Analysis at: NBSS & LUP  
Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-13	14.8	7.2	19.7	58.3	-
A12g	13-42	12.6	8.4	18.7	60.3	-
C1g	42-98	11.0	13.0	25.7	50.3	-
C2g	98-150	1.8	18.2	27.7	44.3	3.0

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-13	0.5	0.10	5.5	0.20	0.69
13-42	0.32	0.03	6.0	0.26	0.69
42-98	0.27	0.03	6.2	0.27	0.47
98-150	0.19	0.16	6.2	0.24	0.93

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-13	12.8	4.4	1.82	0.34	19.4	30.4	63.8	0.52
13-42	13.6	4.8	1.6	0.51	20.5	30.8	66.6	0.51
42-98	11.6	4.0	1.69	0.34	17.5	27.0	64.8	0.54
98-150	9.2	4.0	1.06	0.31	14.6	24.8	58.9	0.56

**20. Sankarpur Series:**

Tentative series

The Sankarpur Series is a member of loamy skeletal mixed hyperthermic family of PlinthustalFs. Sankarpur soils have reddish yellow strong acid sandy loam A horizon, yellowish red to dark red medium to light acid sandy loam to gravelly loamy B horizon underlain by massive conglomerate of nodular ferruginous beads, quartz gravels and small pieces of stone as C horizon. They have developed on weathered granite gneiss on strongly sloping dissected plateau. Principal associated soils are Kalyaneswar series, a Lithic Ustochrept and Beldanga series, an Ultic Paleustalf.

**Typifying Pedon:** Sankarpur sandy loam - Barren land.

- Al 0-20 cm --- Reddish yellow (7.5YR 7/6 D), reddish yellow(7.52R 6/6 M) sandy loam massive, slightly hard and friable when dry and slightly sticky when wet; few mustard and pea-size hard ferruginous concretions and quartz grains; roots plentiful; clear smooth boundary.
- B1 20-35 cm -- Reddish yellow (7.5YR 7/6 D) to yellowishred (5YR 5/6 M) sandy loam; weak medium Sub-angular blocky structure; slightly hard when dry, friable when moist and slightly sticky when wet, many pea size hard nodular ferruginous concretions mixed with quartz grains: few roots; gradual irregular boundary.
- B2t 35-62.5 cm --- Red (2.5YR 5/6 M) gravelly loam, sub-angular blocky; coarse reddish quartz gravels common; thin dark colour clay films on pad faces; sticky when wet and hard when dry; moderately rapid permeability, gradual irregular boundary.
- Ccn 62.5 cm + --- Massive conglomerate of nodular ferruginous beads, quartz gravels and stone pieces.

**Range in characteristics:** The thickness of the solum ranges between 60 to 70 cm within the depth of 15 cm to 1 m the coarser fragments larger than 2 mm vary from 10 to 60 per cent while clay content varies from 10 to 18 per cent.

The moisture control section remains dry for more than 90 cumulative days. Moisture regime is Ustic. A horizon is usually 20 cm thick. The texture of the fine earth in A horizon varies from loamy sand to sandy loam and its colour is reddish yellow in 7.5YR hues with high moisture and chrome. B-horizon is 40 to 50 cm thick.

The texture of the fine earth in B-horizon varies from loam to gravelly clay loam and its colour varies from yellowish red to red in 7.5YR to 2.5YR hues, value 5 to 7 and chroma 5 to 6. The thickness of the argillic horizon varies from 25 to 30 cm, which is underlain by massive conglomerate of nodular ferruginous beads, quartz gravels and stone pieces. Available moisture capacity of Sankarpur soil is 8.00 cm in 60 cm depth profile.

**Drainage and permeability:** Well drained with rapid permeability.

**Use and vegetation:** Barren lands, shrubs. Natural vegetation consists of trees - *Shorea robusta* (Sal), *Phoenix sylvestris* (date palm), *Dendrocalamus strictus* (Bamboo) etc and shrubs *Agave sissalina* (Agave); *Ipomea sp.*; *Ziziphus jujuba* (Kul) etc. and Grasses - *Cynodon dactylon* (Doob), *Saccharum munja* (Sar) etc.

**Distribution and extent:** Extensive in Salanpur, Barabani, Kulti, Hirapur and Ondal Police Stations.

**Type location:** Mouza: Sankarpur, P.B. Ondal, Dist. Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

Interpretation: Sankarpur soils have good air-water relationship but they are highly erosive in nature and strong slope causes run off during rains. With proper soil conservation measures, the soils support forest vegetation.

a) Interpretive grouping:

- 1. Land capability sub-class -IVe
- 2. Irrigability sub-class -4t
- 3. Fertility management potential (Potential to retain fertilizer elements) -Low
- 4. Management potential/productivity -Poor

Soil Series: Sankarpur  
 Location: P.S. Ondal  
 Dist. Bardhaman

Classification: Plinthustalfs  
 Analysis at: NBSS & LUP  
 Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
A1	0-20	65.3	14.4	9.0	11.3	50.
B1	20-35	61.9	16.2	9.8	12.1	22.5
B2t	35-62.5	51.9	18.2	12.4	17.5	60.0
Ccm	62.5+	----- Murrum ----- Mass -----				

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-20	0.29	0.04	5.5	0.02	0.43
20-35	0.25	0.02	6.6	0.04	0.42
35-62.5	0.11	0.01	6.5	0.4	0.42
62.5+	----- Murrum ----- Mass -----				

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-20	4.2	2.1	0.07	0.03	6.4	9.4	68.1	0.83
20-35	5.6	3.0	0.16	0.06	8.0	10.5	76.2	0.86
35-62.5	8.4	5.2	0.36	0.08	14	15.3	91.5	0.87
62.5+	----- Murrum ----- Mass -----							

**21. Sardanga Series:**

Tentative series

The Sardanga Series is a member of fine loamy mixed hyper-thermic family of Aquic Udifluvents. Sardanga soils have brown to light brownish gray loam to clay loam medium acid A horizon over light brownish gray to pale brown strong acid sandy loam C horizons. They have developed in fine alluvium on nearly level to very gently sloping Bhagirathi flood plain. Principal associated soils are Balidanga Series, a Typic Haplaquept and Krishnadevpur series, a Fluventic Eutrochrept.

**Typifying Pedon:** Sardanga loam - cultivated.

- Ap 0-12 cm -- Brown (10 YR 5/3 M) loam; puddled, moist friable and wet slightly sticky; frequent fine and medium roots; abrupt smooth boundary.
- A12 12-48 cm -- Light brownish gray (10YR 6/2 M) clayloam; moderate medium angular blocky structure; very firm and very sticky; common medium faint mottles of very dark gray (10YR 3/1) colour canyon fine roots, common fine pores; gradual smooth boundary.
- C1 48-76 cm --- Light brownish gray (10YR 6/2 M) fine loam; weak fine sub-angular blocky structure; friable and slightly sticky; common medium faint very dark gray (10YR 3/1) mottles few fine roots; few medium and fine pores; gradual smooth boundary.
- C2 76-93 cm -- Pale brown (10YR 6/3) loam; massive; friable and non-sticky; few soft ferruginous nodules; very few fine roots; clear smooth boundary.
- C3 93-100 cm +--- Very fine sand.

**Range in characteristics:** The thickness of the soil is very deep and more than 100 cm. Moisture regime is Udic. Sardanga soils are moist soils that are not dry for longer period, which affects plant growth.

A horizon is about 50 cm thick. The texture of fine earth in the A horizon varies from loam to clay loam and its colour varies from brown to grayish brown in hues 10YR and 2.5Y, value 5 to 6 and chroma 2 to 3. Underlying C-horizons grades with different texture having colour light brownish gray to pale brown in hue 10YR with values 4 to 6 and chroma 0 to 4.

The available moisture capacity of Sardanga Series is 10.48 cm in 60 cm depth and 17.28 cm in 100 cm depth.

**Drainage and permeability:** Imperfectly drained with slow to moderate permeability.

**Use and vegetation:** Cultivated for paddy and rabi crops. Natural vegetation consists of *Sorassus flabilifer* (Palmyra) palms, *Dendrocalamus stricutus* (Bamboo), *Saccharum spontaneum* (kans) etc.

**Distribution and extent:** Extensive along riverbank in Katwa, Purbasthali and Ketugram Police Stations.

**Type location:** Mouza - Sardanga, P.S. Purbasthali, district Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta,

**Interpretation:** Sardanga soils are highly productive. They have good soil air-water relationship. The soil possesses some problem due to leaching loss of fertilizer.

**a) Interpretive grouping:**

- |                              |      |
|------------------------------|------|
| 1. Land capability sub-class | -IIw |
| 2. Irrigability sub-class    | -I   |

3. Fertility management potential - Medium High  
 (Potential to retain fertilizer elements)  
 4. Management potential/productivity -High

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	32-36
High	45-49

Soil Series: Sardanga  
 Location: P.S. Purbasthali  
 Dist. Bardhaman

Classification: Aquic Udifluvents  
 Analysis at: NBSS & LUP  
 Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-12	38.3	18.2	20.2	23.3	-
A12	12-48	28.3	20.4	20.5	30.8	-
C1	48-76	48.6	22.1	18.5	20.8	-
C2	76-93	34.3	20.9	20.5	23.8	5
C3	93-110+	... Layer of very fine sand ...				

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-12	0.49	0.05	5.6	0.14	0.39
12-48	0.38	0.04	5.6	0.10	0.93
48-76	0.30	0.04	6.1	0.26	1.39
76-93	0.33	0.04	6.5	0.12	1.66
93-110+	... Layer of very fine sand ...				

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-12	4.4	2.8	0.68	0.12	8.0	12.8	62.5	0.55
12-48	6.4	3.4	0.71	0.25	10.8	16.0	67.5	0.52
48-76	5.0	2.8	0.51	0.13	8.4	12.0	70.0	0.58
76-93	6.0	3.0	0.62	0.13	9.8	13.2	74.2	0.55
93-110+	... Layer of very fine sand ...							

**22. Sasanga Series:**

Tentative Series

The Sasanga series is a member of fine loamy mixed hyperthermic family of Typic Udifluvents. Sasanga soils have light brownish gray to grayish brown slight acid silt loam to loam A horizon and brown slight acid silt loam C horizon underlain by lithologically discontinuous light gray neutral clay loam IIC horizon, They have formed in mixed alluvium and are found to occur on old flood plain. Principal associated soil is Totpara Series, a Typic Haplaquept.

**Typifying padon:** Sasanga silt loam - cultivated.

- Ap 0-15 cm --- Light brownish gray (2.5Y 6/2 D) and grayish brown (2.5Y 5/2 M) silt loamy puddled, firm when moist, slightly sticky when wet; few fine and medium roots; strong brown (7.5YR 5/8) rusty specks, few medium discontinuous oblique pores; clear wavy boundary.
- A12g 15-48cm --- Grayish brown (2.5 Y 5/2 M) loam, moderate medium sub-angular blocky structure; firm when moist, slightly sticky when wet, common medium prominent strong brown (7.5 YR5/6 ) mottlings; few (5 mm) soft ferruginous nodules, very few fine roots, few coarse and medium oblique discontinuous pores; gradual smooth boundary.
- Cl 48-71 cm --- Brown (10 YR 5/3 M) silt loam, weak fine sub-angular blocky structure; friable, slightly sticky, common fine distinct yellowish brown (10 YR 5/6) mottling, very few soft ferruginous concretions; very few fine roots, few coarse, common medium continuous pores, clear smooth boundary.
- IIC2g 71-101 cm+ --- Light gray (2.5Y 7/0 M) clay loam (gritty), massive lending to subangular blocky.

**Range in characteristics:** The thickness of the soil is more than 100 cm. Moisture regime is Udic. A horizon is about 50 cm thick. The texture of fine earth in A horizon is mostly either sandy loam or silt loam but at places silty clay loam is also met with. Soil colour varies from light brownish gray to grayish brown in 10YR to 2.5Y hues with value of 5 to 6 and chroma of 2 or less. Underlain C-horizons grade with different texture with lithological discontinuity.

Available moisture capacity of Sasanga soils is 11.01 cm for 60 cm depth and 18.11 cm for 100 cm depth.

**Drainage and permeability:** Moderately drained soil with moderate permeability.

**Use and vegetation:** Cultivated for paddy and rabi crops.

**Distribution and extent:** Fairly extensive in upland depression in Shandaghosh, Mina and Jamalpur Police Stations.

**Type location:** Mouza Sasanga, P.S. Khandaghosh, Dist. Barddhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** Sasanga soils have good air-water relationship and respond well to management. Beside paddy, they are suitable for wheat, pulses and vegetables under irrigation.

a) Interpretive grouping:

- |  |              |
|--|--------------|
| 1. Land capability sub-class-  | IIw          |
| 2. Irrigability sub-class  | -I           |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium-High |
| 4. Management potential/productivity-  | High         |

## b) Yield: Based on data from farmers' fields.

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	32-36
High	46-50

Soil Series: Sasanga  
Location: P.S. Khandaghosh  
Dist. Bardhaman

Classification: Typic Udifluvents  
Analysis at: NBSS & LUP  
Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02- 0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-15	23.1	25.7	26.2	25.0	-
A12g	15-43	25.8	23.0	25.0	26.2	-
C1g	43-71	28.1	30.4	13.0	20.5	-
IIC2g	71-101+	26.0	22.3	21.2	30.5	-

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	0.59	0.06	6.4	0.174	0.93
15-43	0.36	0.03	6.2	0.261	0.43
43-71	0.17	0.01	6.3	0.612	0.43
71-101+	0.29	0.02	6.8	0.146	0.43

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	8.8	3.2	0.51	0.17	12.7	14.6	86.9	0.58
15-43	9.6	4.0	0.68	0.25	14.53	16.8	86.5	0.64
43-71	4.4	3.6	0.61	0.22	9.8	12.4	79.0	0.68
71-101+	11.2	6.4	0.94	0.3	18.8	21.2	88.7	0.69

**23. Silampur Series:**

Tentative series

The Silampur series is a member of fine loamy mixed hyperthermic family of Typic Ustochrepts. Silampur soils have yellowish brownslight acid loamy A horizon dark yellowish brown slight acid loam to clay loam B horizon and yellowish brown medium acid silt loam C horizon. They have developed from alluvium and are found to occur on gently sloping low dissected plateau. Mottles are common in subsoil. Principal associated soil is Ghoshat Series - a Typic Ustifluent.

**Typifying Pedon:** Silampur loam - cultivated.

- Ap 0-15 cm --- Yellowish brown (10YR 5/4 M) loam: puddled, moist very friable, wet slightly sticky, many coarse pores; rapid permeability; many fine root gradual smooth boundary.
- B1 15-45 cm --- Dark yellowish brown (10YR 4/4 M) loam, crumby; moist friable, wet slightly sticky, common medium pores, moderately rapid permeability, few fine roots; diffuse smooth boundary.
- B2 45-80 cm --- Dark yellowish brown (10 YR 4/4 M) clayloam, weak medium sub-angular blocky; moist friable, wet sticky, many coarse prominent dark brown (7.5YR 4/4) mottling, few fine pores; moderately slow permeability, very few and very fine roots, clear smooth boundary.
- C1 80-150cm+--- Yellowish brown (10YR 5/6 M) silt loam; weak fine sub angular blocky; moist friable, wet sticky; many coarse prominent very dark grayish brown (10 YR 3/2) mottlings; few fine pores; moderate permeability.

**Range in characteristics:** The thickness of the solum range between 80 and 100 cm. Moisture regime is Ustic.

A horizon is about 16 cm thick. The texture of A horizon varies from loam to clay loam and its colour varies from dark yellowish brown to light olive brown in 10YR hue, value 4 to 5 and chroma 4 to 6. B horizon is about 80 cm thick.

The texture of the B horizon varies from loam to clay loam and sometime to silty clay loam and the colour from yellowish brown to olive brown in 10YR hue, value 4 to 5 end Chroma 4 to 8.

Available moisture capacity of Silampur series is 10.65 cm in 60 a depth and 18.60 cm in 100 cm depth soil profiles.

**Drainage and permeability:** Moderately well drained with rapid to moderate permeability.

**Use and vegetation:** Cultivated for paddy and rabi crops. Natural vegetation consists of *Artocarpus intigrifolia* (Jackfruit); *Mangifera indica* (Mango), *Glycoside pentaphyla* (Ashshaora); *Beos, bengalensis* (Palmyra palm); *Cynodon dactylon* (Doob) etc.

**Distribution and extant:** Moderately extensive in riversides of Durgapur, Ondal and Ranigunj Police stations.

**Type location:** Village Silampur, P.R. Durgapur, Dist. Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** Silampur soils have good air-water relationship. Soils are under Ustic moisture regime. Moisture conservation is essential under irrigation. Soils responds to varieties of climatically adapted crops in post kharif season.



**a) Interpretive grouping:**

- |  |         |
|--|---------|
| 1. Land capability sub-class   | -Iie    |
| 2. Irrigability sub-class  | -1      |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium |
| 4. Management potential/productivity   | -Medium |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	30-34
High	42-46

Soil Series: Silampur  
 Location: P.S. Durgapur  
 Dist. Bardhaman

Classification: Typic Ustocherpts  
 Analysis at: NBSS & LUP Regional  
 Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-15	47.3	17.2	16.4	19.1	-
B1	15-45	40.9	18.6	18.4	22.1	-
B2	45-80	27.1	18.4	24.4	28.1	-
C1	80-150+	28.1	24.4	27.4	20.1	-

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2:5) H <sub>2</sub> O	E.C. (1:2:5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-15	0.24	0.03	6.4	0.17	0.93
15-45	0.2	0.02	6.4	0.17	0.93
45-80	0.16	0.01	6.3	0.16	0.43
80-150	0.13	0.01	5.9	0.14	0.43

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-15	4.0	2.4	0.59	0.2	7.2	9.6	75.0	0.5
15-45	6.4	4.0	0.59	0.2	11.2	14.4	77.8	0.65
45-80	7.2	4.0	1.29	0.3	12.8	16.6	77.1	0.59
80-150	4.5	3.0	0.37	0.1	8.0	12.4	64.5	0.62

**24. Srirampur Series:**

Tentative series

The Srirampur series is a member of fine silty mixed hyperthermic family of Typic Haplaquepts. Srirampur soils have grayish brown very strong acid silty clay loam Ap horizon and gray to dark gray medium to slight acid silty clay loam to silty clay B horizons. They have developed in alluvium on nearly level to very gently sloping meander flood plain and marshy area. Principal associated soils are Konarpara series a Typic Fluvaquent and Multi series, Typic Haplaquept.

**Typifying Pedon:** Srirampur Silty clay loam - cultivated.

- Ap 0-11 cm -- Light brownish gray (2.5Y 6/2D) and grayish brown (2.5Y 5/2 M) silty clay loam, puddled; hard when dry, firm when moist, sticky when wet; trusty specks of yellowish brown (10YR 5/8) colour; very few (2 mm) hard consirs; common medium and few fine roots; few coarse, common medium pores; gradual smooth boundary.
- B1 11-25 cm -- Gray (N 5/0 M), silty clay loam; moderate coarse sub-angular blocky structure; very firm when moist, sticky and plastic when wet; common fine distinct light olive brown (2.5Y 5/6) mottlingst few (2 mm) and (5 mm) soft consirs few fine roots; common medium pores diffuse smooth boundary.
- B21g 25-68 cm --- Dark gray (1 4/0 M) silty clay, moderats coarse and very coarse angular blocky structure; very firm when moist, sticky and plastic when wet, common fine distinct yellowish brown (10 YR 5/6) mottling, very few roots, fow to common medium pores, diffuse smooth boundary.
- B22g 68-101 cm+ --- Dark gray (8 4/0 M) silty clay, strongvery coarse angular blocky structure; very firm when moist, slightly sticky and plastic when wet; common fine distinct yellowish brown (10 YR 5/6) mottlings: common (5 mm) and few (2 mm) soft consirs; few medium pores: no roots observed.

**Range in characteristics:** The thickness of the solum is very deep and ranges between 130 and 150 cm. Moisture regime is Aquic. A horizon is about 12 cm thick. The texture of fine earth in A horizon varies from silty clay loam to clay loam and the colour from light brownish gray to olive gray in 2.5Y to 5Y hues with values of 5 to 6 and chroma of 0 to 2. B-horizon is more than 100 cm. The texture of fine earth in B-horizon varies from silty clay loam to silty clay and the colour from dark gray to dark grayish brown in 2.5Y hue with values of 4 to 5 chromas of 0 to 2. Clay content increases with soil depth and reach maximum value in B-horizon. Base saturation in this horizon ranges between 84 add 85 per cent.

Available moisture capacity is 10.60 cm in 60 cm depth and 17. 00 cm in 100 cm depth soil profile.

**Drainage and permeability:** Imperfectly to poorly drained soils with slow permeability.

**Use and vegetation:** Cultivated to paddy. Natural vegetation consists of *Borassus flabelifer* (palmyra palm); *Dendrocalamus strictus* (Bamboo); *Ficus canca* (Fig), *Cyperus rotundus* (Mutha) etc.

**Distribution and extent:** Occurs in considerable areas at Kalna, Katwa end Manteswer Police Stations.

**Type location:** Mouza Kakuria, P.S. Kalna, Dist. Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** Srirampur soils are poorly drained with slowpermeability and situated in low lying area. The soils are under water during iarif season which restricts choice of crops except paddy during kharif. The soils respond fairly well to management.

**a) Interpretive grouping:**

- 1. Land capability sub-class -IIw
- 2. Irrigability sub-class -2d
- 3. Fertility management potential (Potential to retain fertilizer elements) -High
- 4. Management potential/productivity -High

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	32-36
High	44-48

Soil Series: Srirampur  
 Location: P.S. Kalna  
 Dist. Bardhaman

Classification: TypicHaplupsepts  
 Analysis at: NBSS & LUP  
 Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-11	11.4	6.9	43.0	38.7	-
B1	11-25	11.6	8.4	40.0	40.0	8.0
B21g	25-68	11.9	8.2	32.7	47.2	10.0
B22g	68-101+	6.9	3.6	39.5	51.0	12.0

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2:5) H <sub>2</sub> O	E.C. (1:2:5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-11	0.69	0.072	4.9	0.1	0.47
11-25	0.59	0.042	5.8	0.02	0.69
25-68	0.32	0.03	6.1	0.02	0.93
68-101+	0.31	0.03	6.3	0.05	0.93

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-11	8.0	2.4	1.33	0.3	12.0	19.5	61.5	0.5
11-25	13.8	3.2	1.33	0.25	18.6	22.9	81.2	0.57
25-68	16.4	4.0	1.82	0.34	22.6	26.5	85.3	0.56
68-101+	17.2	4.6	0.77	0.3	22.9	27.6	82.9	0.54

**25. Totpara Series:**

Tentative series

The Totpara series is a member of fine loamy mixed hyperthermic family of Typic Haplaquepts. Totpara soils have light olive brown very strong acid silt loam Ap-horizon, dark gray to olive gray medium to slight acid silty clay loam B-horizons and yellowish brown neutral silt loam C-horizon. They have developed in alluvium and are found to occur on very gently sloping flood plain of river Damodar. Principal associated soil series is Sasangaseries, a Typic Udifluent.

**Typifying Pedon:** Totpara silt loam - cultivated.

- Ap 0-20 cm --- Light olive brown (2.5Y 5/4 M) silt loam; puddled; moist friable, wet slightly sticky; common medium distinct strong brown (7.5YR 5/6) mottlingest; plentiful fine roots; clear wavy boundary.
- B2g 20-60 cm --- Dark gray (N 4/0 M) silty clay loam; moderate medium sub-angular blocky structure, moist firm, wet sticky; many medium distinct brown to dark brown (7.5YR 4/4) mottlins; many soft semi hard ferruginous concretions; many fine roots; clear wavy boundary.
- B3g 60-100 cm --- Olive gray (5Y 5/2) loam; medium weak sub-angular blocky; moist friable, wet slightly sticky, many medium distinct strong brown (7.5YR 5/6) mottlings; abundant soft and semi hard ferruginous concretions; very few fine roots; gradual smooth boundary.
- Cl 100-150 cm --- Yellowish brown (10YR 5/4 M) silt loam massive; several distinct strong brown (7.5YR 5/6) mottlings; abundant soft concretionary materials; abundant micaceous particle, mixed with soils.

**Range in characteristics:** The thickness of the solum is more than 150 cm. The content of clay through depth ranges between 20 and 40 per cent. The structure development in the solum is moderate and it is very distinct in B2g horizon. Moisture regime in Aquic.

Ap-horizon is rairly thick ranging from 18 to 25 cm. The texture of Ap-horizon varies from fine sandy loam to silt loam and its colour varies from yellow to light olive brown in 2,5Y hues with value 5 to 6 and chroma 3 to 4. B-horizon is more than 100 cm thick. The texture of fine earth in B2g horizon varies from clay loam to silty clay loam with moderately developed structure. The colour of the soil ranges from dark gray light olive gray in 2.5Y and 5Y hues with value 3 to 4 and chroma 2 or less. B2g-horizon is severely mottled by distinct mottling of brown to dark brown colour. The texture of the underlying C-horizon ranges between silt loam and sandy loam and its colour is 10 YR with medium moist value and chroma 5. C-horizon is severely mottled by distinct mottling of strong brown colour,

Available moisture capacity of Totpara series is 12 cm for 60 cm depth and 18.8 cm for 100 cm depth soil profile.

**Drainage and permeability:** Moderately well drained soil with moderate permeability.

**Use and vegetation:** Both paddy and rabi crops are grown. Natural vegetation consists of *Artocarpus intigrifolia* (Jackfruit), *Mengifera indica*; *Bachharum pontaneum* (Tans) etc.

**Distribution and extent:** Extensive in Jamalpur, Bardhaman Sadar and Raina Police Stations.

**Type location:** Mouza Totpara, P.S. Sadar, Dist. Bardhaman, West Bengal.

**Series proposed:** National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Calcutta.

**Interpretation:** Totpara soils have fairly good air-water relationship. During Kharif season they are best suited also paddy cultivation. Under irrigation, they support a variety of crops and respond well to management.

**a) Interpretive grouping:**

- |  |              |
|--|--------------|
| 1. Land capability sub-class   | -Ile         |
| 2. Irrigability sub-class  | -I           |
| 3. Fertility management potential<br>(Potential to retain fertilizer elements) | -Medium-High |
| 4. Management potential/productivity   | -Medium      |

**b) Yield: Based on data from farmers' fields.**

Management level	Yield (Q/ha) Aman paddy
Low	-
Medium	29-33
High	42-46

Soil Series: Totpara  
Location: P.S. Sadar  
Dist. Bardhaman

Classification: Typic Hapluquepts  
Analysis at: NBSS & LUP  
Regional Centre Calcutta

Horizon	Depth (cm)	Size class and Particle diameter (mm)				Coarse fragment >2mm% of whole soil
		Sand (2.0-0.05)	Coarse Silt (0.05-0.02)	Fine Silt (0.02-0.002)	Clay (<0.002)	
		% of <2 mm				
Ap	0-20	20.8	23.4	28.3	27.5	-
B2g	20-60	14.7	20.8	27.0	37.5	-
B3g	60-100	28.5	20.7	25.0	25.8	-
C1	100-150	29.5	26.4	23.9	20.2	-

Depth (cm)	Organic Carbon %	Total Nitrogen %	pH (1:2.5) H <sub>2</sub> O	E.C. (1:2.5) H <sub>2</sub> O mmhos/cm	Carbonate as CaCO <sub>3</sub> %
0-20	0.47	0.05	4.9	0.11	0.43
20-60	0.29	0.03	6.0	0.17	0.43
60-100	0.23	0.02	6.6	0.16	0.43
100-150	0.17	0.01	6.6	0.03	0.93

Depth (cm)	Extractable bases					C.E.C. NH <sub>4</sub> OAC	Base Sat % NH <sub>4</sub> OAC	Ratio C.E.C. Clay
	Ca	Mg	Na	K	Sum			
	me/100g							
0-20	3.5	2.4	0.57	0.23	6.7	12.2	54.9	0.63
20-60	7.0	4.0	0.77	0.63	12.4	14.2	87.3	0.38
60-100	4.8	3.2	0.57	0.23	8.8	10.4	84.6	0.4
100-150	4.0	2.6	0.57	0.23	7.4	10.0	74.0	0.49