CHAPTER - V

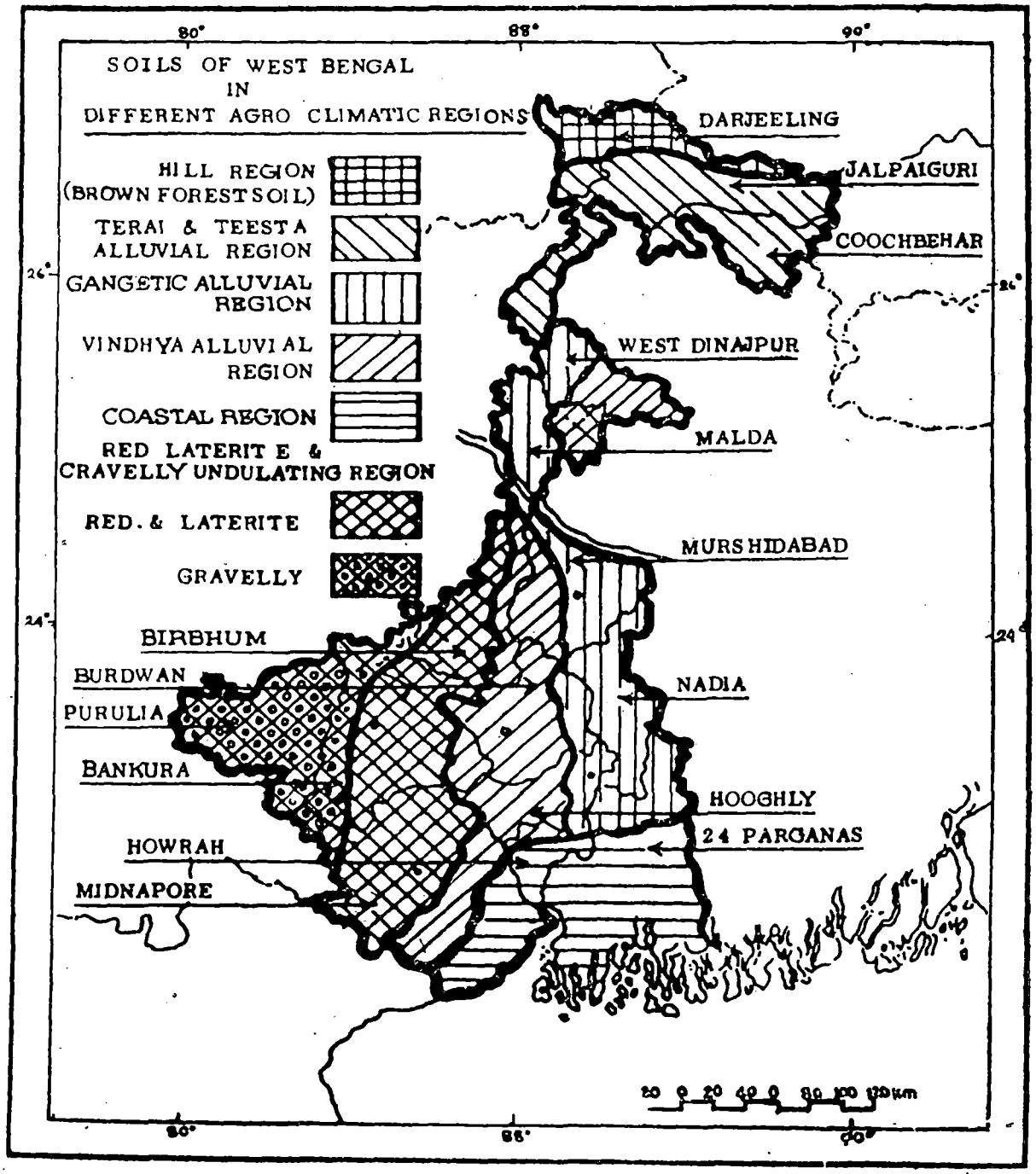
SOILS OF WEST BENGAL

5.1 INTRODUCTION

The soils of Bengal have been studied widely by different scholars. The studies carried out so far lead to the convenient grouping of soils as (i) Laterites, (ii) Red Earths, (iii) Tarai soils, (iv) Alluvial soils and (v) the Coastal soils, developed under their usual respective processes.(Map No. 8).

The lateritic soils (5,888 km²) are found in the undulating well--drained tract along the Chotanagpur highlands covering the western part of the region At places honeycombstructures of the rocks are exposed. Acidic in character (pH 5.5-6.5) and dificient in organic matter these are poorly aggregated and possess low water holding capacity; usually Sal forests thrive.

The transported laterites deposited on the castern flanks of the lateritic stretch are known as the Red soil (lateritic alluvium) and are found in the eastern margins of the Rarb Plain and the Barind tract of Malda and West Dinajpur covering about 4,963.6 km² area. Morum and feldspar and sometimes lime concretions are also observed in the bed. The shallow and coarse-textured soils are acidic in character (pH 6-6.6) and are poor in organic matters and plant nutrients (N) Mostly they have been brought under cultivation after deforestation which has accelerated the process of erosion. The unassorted materials deposited at the foot of the Darjeeling Himalaya are responsible for typical Tarai(Duar) soils in Jalpaiguri and Silivuri tahsil with an areal coverage of about 6,600 km². The deficiency of plant food and organic matter and acidity (pH 5.8-6.7) are common. By far the most important, arcally (28,921.3 km²) as well as agriculturally, are the alluvial soils. The minor differences in the parent materials distinguish the alluvial soils which, though at places inter digirated, have distinct spatial


SOILS OF WEST BENGAL
IN
DIFFERENT AGRO CLIMATIC REGIONS
HILL REGION
(BROWN FOREST SOIL)
TERAI & TEESTA
ALLUVIAL REGION
GANGETIC ALLUVIAL
REGION
VINDHYA ALLUVIAL
REGION
COASTAL REGION
RED LATERITE &
GRAVELLY UNDULATING REGION
RED. & LATERITE
GRAVELLY
DARJEELING
JALPAIGURI
COOCHBEHAR
WEST DINAJPUR
MALDA
MURSHIDABAD
NADIA
HOOGHLY
24 PARGANAS
BIRBHUM
BURDWAN
PURULIA
BANKURA
HOWRAH
MIDNAPORE
80°
88°
90°
26°
24°
20 0 20 40 0 80 100 120 km

Map. No. 8

locations. The narrow alluvial strip along the lateritic and red soils in parts of the districts of Murshidabad. Bankura, Burdwan, Hooghly and Midnapur are different from the Ganga alluvium which covers parts of the North Bengal Plain and the whole of the remaining West Bengal Delta excluding the coastal strips in 24 Parganas and Midnapur. In the former alluvial group the riverine tracts of the Damodar and the Kasai have alternating sands beds and immature and irregular stratification and hence ill-developed profiles. The soils are neutral (pH 6.5-7.2) and relatively poor in plant nutrients and organic matter. Relatively greated leaching of clay mottling, etc. characterise the flat land soils of the tract. These are mildly acidic in reaction (pH 5.8-6.8). Relatively mature profile and higher leaching have affected the uplands of the tract, leading thereby to acidity (pH 5.8-6.9) and deficiency of organic matter.

The Ganga alluvium is however, rich in plant nutrients and organic matter and is alkaline in reaction (pH 7.0-8.2), though the uplands i.e., the older alluvium is somewhat neutral in reaction. The riverine tracts are prone to frequent siltation which mars the proper development of profiles. The greyish colour owes to the existence of fine sands. The interfluvial zones are covered by soils, clavey to sandy in texture, depending on the location. With the altitude of the distance from the flood plain, the process of concretion accelerates, and profile developments are also fair.

The coastal soils are the outcome of the interaction of rivers and tides and have developed in the districts of 24 Parganas and Midnapur. The soils are saline and alkaline and contain deposits rich in Ca, Mg, and half decomposed organic matter.

5.2 SOIL CLASS OF WEST BENGAL

It is seen from the review of the past work on soil survey by P. Chakravorty and S. Digar that studies of soil in the field were taken up under the following schemes. This objective and findings are given below.

1. Mor irrigation (Birbhum): Soils of only small areas in the sistrict of Birbhum were studied for irrigation purposes covering a total area of 312 sq. miles.

2. Howrah-Hooghly flush irrigation scheme: Under the scheme, soils were studied for texture, pH and salt content of different soil profiles in certain areas of Howrah and Hooghly districts covering 900 sq miles.

3. Reconnaissance soil survey of Burdwan (excluding Asansol sub--division) and Hooghly districts. This survey was carried out under Stewart scheme by the department of agriculture. West Bengal in collaboration with ICAR from 1952-56 and soil map classifying the soils into series, association and number of types was prepared covering an area of 3,000 sq miles.

Simultaneously, a rapid reconnaissance soil survey scheme for the other districts of West Bengal was also taken up following the similar soil survey procedures as under stewart scheme, as there was no authentic soil map of the state at that time.

Under this system of survey, representative soil profiles were studied at six miles (i.e. nine and half kilometers) grid intersection points and up to a depth of 4 ft. (i.e. 120 cm). More than 900 soil profiles were studied in the field all over West Bengal by the trained officers about the important morphological properties of soil and other information around profile sites as detailed below. Laboratory analysis of the collected soil samples were done also for the required physical and chemical constituents. All such information were compiled and published in a printed book form. entitled classification, composition and description of soil profiles of West Bengal (Tech. Bulletin No. 6) in the year 1965. In addition to this four printed books about soil survey work in the districts, viz. Murshidabad, Nadia, 24 Parganas. Hooghly and Burdwan (excluding Asansol sub-division) and were published during the period from 1956 to 1966.

Morphological characteristics of soil profiles and other items of field study: (Items from 1 to 10 are related to each soil layer of horizon and others are related to the area around profile site).

1. Depth in inches from surface; 2 Degree of soil moisture; 3. Root penetration and its abundance; 4. Presence of insect holes; 5. Texture; 6. Presence of concretions and their nature; 7. Colour according to Mansell colour chart; 8. Hardness of soil; 9. Effervescence with dilute hydrochloric acid; 10. pH with pH paper; 11. Natural vegetation; 12. Relief of the area; 13. Agricultural practices in the area; 14. Any other special problem of the area; 15. Depth of water table in summer and rains; 16. Altitude of the area for Darjeeling district only).

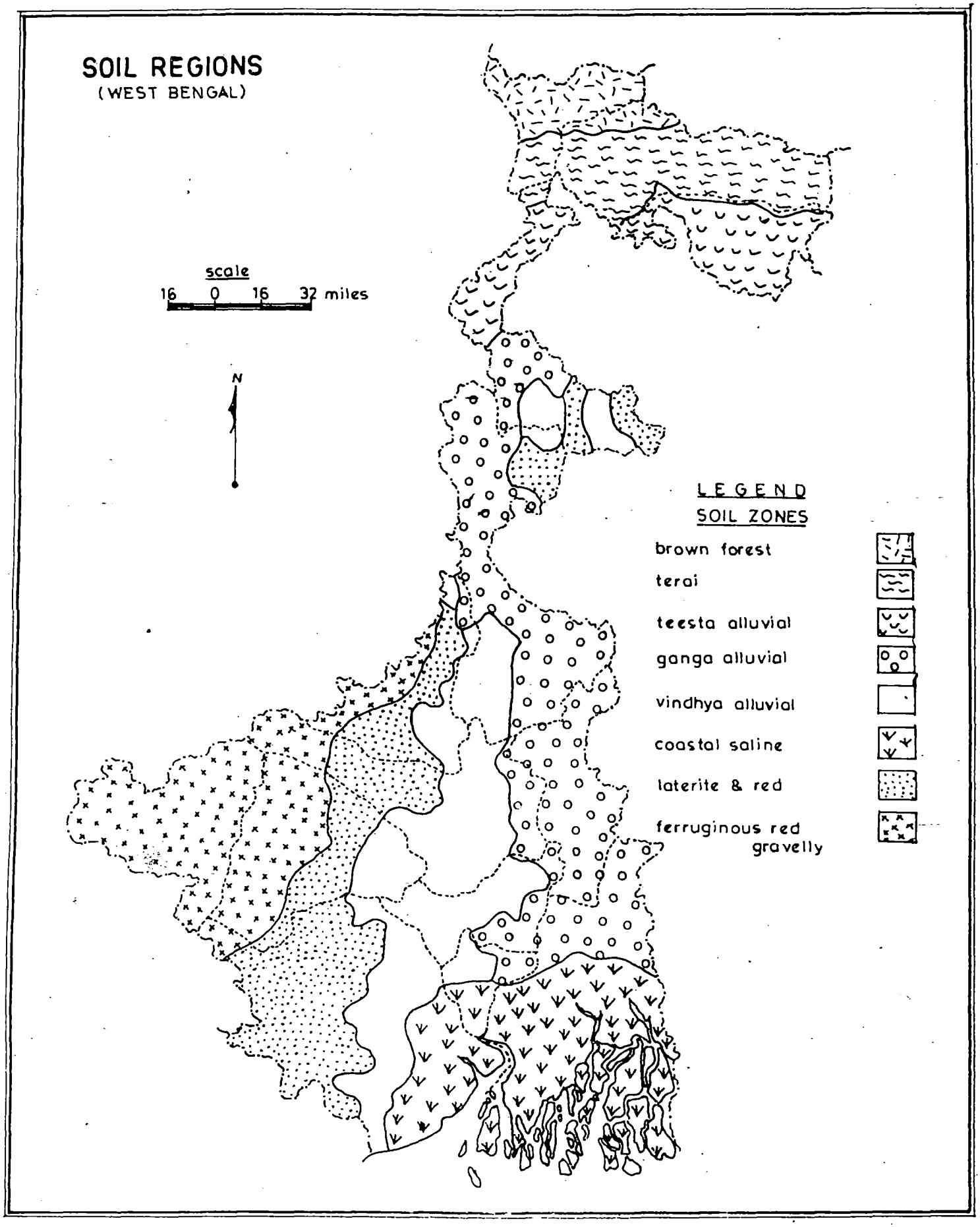
Chemical Study: Hydraochloric acid soluble Fe_2O_3, $R_2)_3$, Cao, K_2O and P_2O_5. Dilute acetic acid soluble bases and CaO. Carbon, nitrogen, soil reaction water soluble salts, coarse and fine sands silt and clay.

Based on the above information, the soils of West Bengal were classified according to old concept of soil classification as was prevailed at that time (Map No. 9). Soils were broadly divided into seven broadly divided into seven broad classes and some of these divisions were further sub-divided in the following manner into broad groups or families and again into small groups of soil association (i.e. predominant soil profile in a mapping unit). Naming of various classes of soils has been made a follows:

a) Alluvial soils

The alluvial soils of the state occupy the major area which is being drained by innumerable rivers rivulets, kandors (natural drainage way), etc.

The soils of the alluvial tract are divided into three families depending upon the nature of the parent material i.e. alluvium carried down and deposited by the principal river or rivers and its or their tributaries.


SOIL REGIONS
(WEST BENGAL)
scale
16 0 16 32 miles
N
LEGEND
SOIL ZONES
brown forest
terai
teesta alluvial
ganga alluvial
vindhya alluvial
coastal saline
laterite & red
ferruginous red gravelly

Map No. 9

Table V-1. Soils of West Bengal

Laterite and Lateritic Soil	Red Soil (5.6)	Alluvial Soil (39.4)	Coastal Soil (13.0)	Terai Soil (3.2)	Colluvial or Skeletal Soil (12.7)	Brown Forest Soil (2.2)
Surface Laterite	Buried Laterite		Saline Soil; Non-saline Alkali Soil; Saline Alkali Saline; Degraded Alkali Soil		Soils of transition seroes; Bengal Gondwana Soil	Bengal gnessis soil
	Soils of Tista Family (6.5); Soils of Vindhya Family (14.7); Soil of Ganga Family (18.2)					
	Vindhya sub-families viz., Rajmahal (Ra), Damodar (Da) and Cossaye (Co)		Ga riverine Soil; Ga flat land Soil; Ga up land Soil; Ga low land Soil			
Ra, Da, Co Riverine soil	Ra, Da, Co flat land soil	Ra, Da, Co high land soil				

NB.: Figures in parenthesis show percentage of area occupied by the broad soil classes and some families against total geographical area of 87.85,300 ha. Rest of the geographical area is barren and unavailable for cultivation. Areas of braod classes of soils under different districts are mentioned in Table 1.

The total area of this alluvial tract is about 34.57 lakh ha only. Out of this area Ganga alluvium, Vindhya alluvium and Tista alluvium, occupy 15,97,110 ha, 12,92,217 ha and 5,67,657 ha respectively. Accordingly, the soils are divided under Ganga. Vindhya and Tista families. Then, according to physiographic situation of the land the soils of each family are again subdivided into various groups of soil association viz, high land or upland, flat land, riverine land and low land. According to genetical character, high or uplands accur on old flood plains, flat lands occur on newly formed flood plains, riverine lands occur on very recently formed flood plains and low lands occur at depressions of abandoned river courses and marshy lands.

Ganga is the principal river of the middle and eastern part of the state. Hence the soils formed by the river and its tributaries are called as Ganga alluvium. Similarly, the principal river of North Bengal is Tista and hence the soils formed by it or its tributaries are called as Tista alluvium. In the case of western tract, the soils are formed by many principal rivers and their tributaries viz., Damoder Kangsabati, Silabati, Ajoy, Mayurakshi etc. and hence to put them under a common name, they are called as Vindhya alluvium since the catchment areas of all these rivers lie in Rajmahal hills and Chhotanagpur plateau, which may have some physiographic similarity or continuity of the Vindhya range (lying further west).

b) Colluvial and Skeletal soils

Next to the alluvial area is the area occupied by colluvial and skeletal soils of the western part of the state. The total area covered by these soils is about 11.14 lakh ha only. This area is physiographycally linked with the Rajmahal and Chhotanagpur plateau. In this area we wtill have hills of low altitude, domes and escarpments and rock outcrops etc. These various features of land withstand the weathering cycles of the world for a long long times and may remain as such for another million years from now. The area is undulating in nature and hence the upper convex slope has poor soil depth and are skeletal in nature, whereas the lower part of the valley has good soil depth and

is colluvial in nature. This region is again sub-divided into various subgroups of families according to main geological character and soil depth or both in the area under each broad group of family.

c) Coastal soils

Next to the colluvial and skeletal soils is the area occupied by coastal soils, which occur near the bay. The total area covered by this soil is about 11.42 lakh ha only. This area is influenced by the saline tidal water of the bay region, which comes into this area twice in a day. Since the land situation is below the high tidal level, the reclaimed agricultural area is protected by the earthern embankments. In spite of this, sometimestrom upsurge damages the embankment and allows the saline water to flood the field. This region is again subdivided into various broad groups or families, according to levels of salinity, alkalinity and acidity of the area, coming under each braod group of family.

d) Laterite and lateritic soils

Next to the coastal soils is the area occupied by laterite and lateritic soils, which occur at the western part of the state. This area is undulating in nature and is the catchment area of many small and big rivulets of the principal rivers. The total area occupied by the soils is about 5.89 lakh ha only. Laterite soils occur either at valley floor margine or at upper piedmont regions sometimes below a rock outcrop. The underlying laterite may be massive nodular or soft and sometimes establishment of their relationship with the overlying soil creates difficulty during field survey. This type of soil is light textured, porrous and acidic in nature regarding plant nutrients they are poor in organic matter, available phosphorous, available potassium and bases. Small nodules of iron concretion are found in the surface layer and its number increases with depth. This class is again subdivided into two broad groups, viz. surface laterite and buried laterite on the basis of occurrence of laterite layer within the depth of normal profile study or below this zone. This type of soil is well responsive to fertiliser

application with or without organic manure. Natural vegetation, e.g. Sal, Palas and Mahua trees, grow well in these soils.

e) Red soils

Next to the laterite and lateritic soils is the area occupied by the red soils, which not only occur in the western part but also in the northern part of the state. This area is also mildly undulating in nature and is the catchment area of many tiny rivulets nala or village drains. The total area occupied by this class of soils is about 4.96 lakh hactores only.

The soils are low in organic matter and medium to medium low in available phosphorous and potassium. In these soils, bath nodular iron concretions and calcium carbonte ghootings are found. The amount of clay progressively increases as we study the soul profile from surface to down-wards. The percentage of base saturation of red soil is more than the laterite and lateritic type of soil, because of higher base saturation and lamy texture the red soil becomes more responsive to fertiliser application than the laterite and latritic soil. Natural vegetation e.g. Sal and Palas trees grow well in this region.

f) Terai soils

Next to the red soils is the area occupied by Terai soils of the North Bengal districts. These soils are found only in the districts of Darjeeling and Jalpaiguri. The total area covered by this soil group is about 2.80 lakh hectares only. These occupy the foothill area of the mountain region of the Himalayas. These soils are found very close to the mountain region and over the deposit of the hilly rivers like Tista, Mahananda, Torsa, Jaldaka and their numerous tributaries. These rivers bring varieous types of soil and rock materials from heights of above 3,000 metres and deposit them at first in the area, which is now about 60 to 90 metres above mean sea level. The area is moderately undulating and during rains the rate of infiltration and surface flow is lower than the rate of precipitation and for this reason the are suffers from temporary water logging at places. These types of soils are

mostly lighter in texture with lower base status and contains a good amount of a mixture of partially and fully decomposed organic matter. For this reason the colour of the soil varies from deep black to grey black. Due to the above factors, the soil is acidic in nature and is poor in base status and available plant nutrients. It has been found that the soil is also deficient in micro-nutrients. There is a good prospect of suitable rabi crop with residual moisture after rainy season with proper application of soil conditioners and fertiliseers.

g) Brown forest soils

Next to the Terai soil is the area occupied by Brown Forests soils. These soils are found only in Darjeeling district which is the northern most part of West Bengal. The total area covered by this soil is about 2 lakh hectares.

This soil class is formed over Himalayan and sub-Himalayan ranges at altitudes of 500 m to about 2,500 m above mean sea level. The soil depth of this type of soil is variable and may be shallow or deep. Slope percentage of this area also ranges from 10% to 50%. The underlying rock structure is not very stable and due to steep slope, landslide and land slip often occur during rainy season. Most of the area is either covered by forest of tea plantation. The soil is acidic in nature and mostly lighter in texture. Due to low temperature and high rainfall, only some selected field and horticultural crops can be cultivated in this region. Plant nutrient status is low to medium. Fertiliser practices can only be sone under favourable weather condition.

5.3 SOIL MORPHOLOGY

Soil plays a vital role in the very existence of mankind. Study of soil system depicts highly organised physical, chemical and biological complex on which man depend for his basic needs of food clothing and welfare.

While investigation on soils were initiated in Russia during the later part of the nineteenth century, pedological study was taken up in the India and West Bengal, in particular during the middle of twentith century by launching Stewart scheme by the department of agriculture, West Bengal in collaboration with Indian Council of Agricultural Research from 1952-56 and a soil map was brought out on the basis of rapid of rapid reconnaissance survey based on 9.6 km grid system and broadly classified into eight units viz. Gangetic alluvium, Vindhya alluvium. Terai and Teesta alluvium, coastal, laterite, red, gravelly and brown forest (S.K. Mukherjee, 1965).

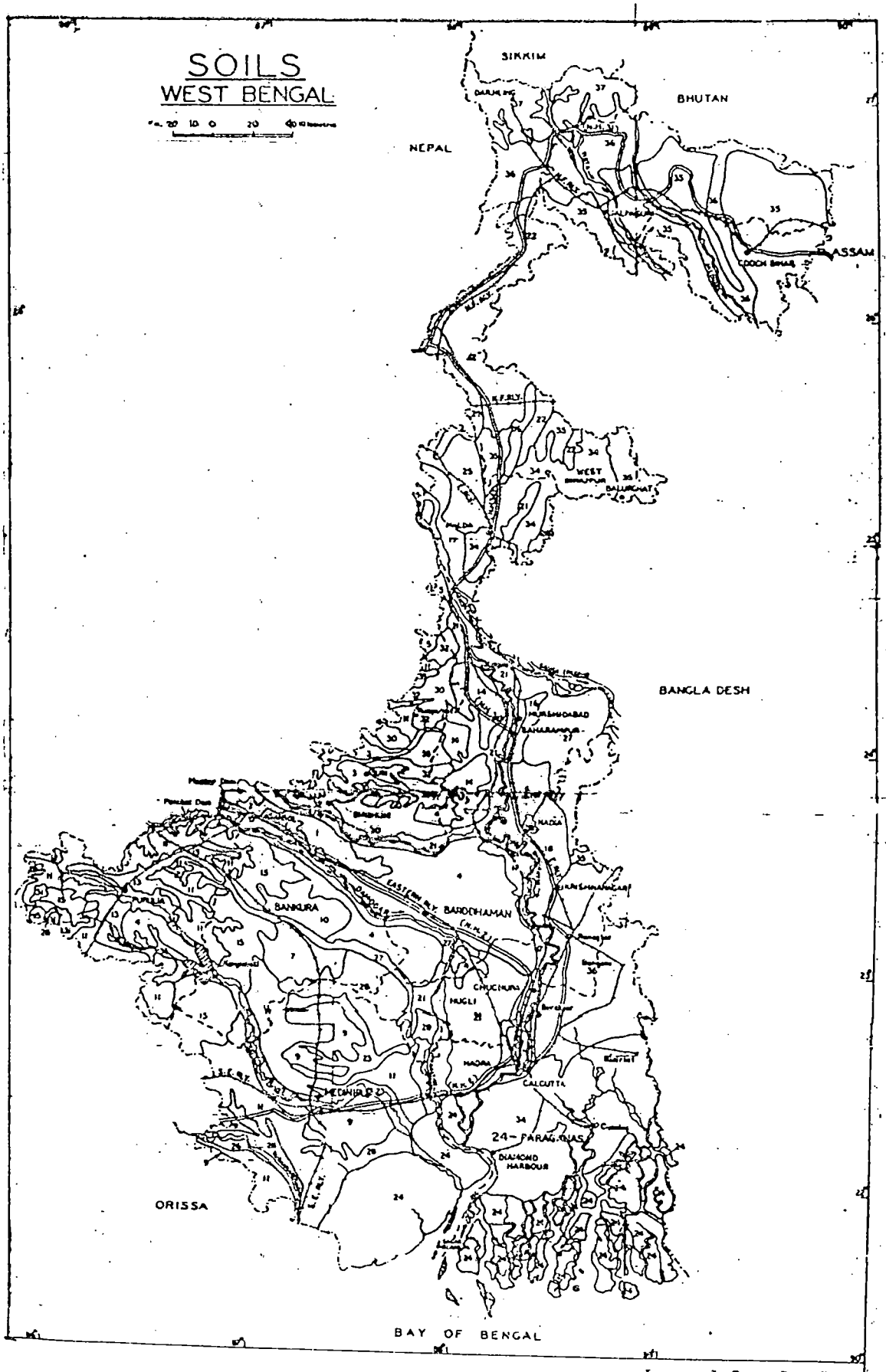
By the advancement of research and availability of more information it has been found that a correct presentation of different soils could not be made in a grid system because in nature they form of continuous, dominantly with geomorphic pattern of landscape. To make it more scientific. Raychaudhury and Mathur (1954) have prepared a soil map of India into 16 major soil regions and 108 minor basic soil regions by integrating the effects of climate, vegetation an topography on soil formation. Raychaudhury et al. (1963) have divided India into 27 major soil groups

They were more or less similiar to earlier classification Govindarajan (1973) further revised the soil map of India (1:7 million) and distinguished 25 broad soil units together with equivalent USDA 7th Approximation classification systems. By the increase in the generation of more data on soil survey, National Bureau of soil Survey and Land Use Planning updated the soil map of India in 1983 (R.S. Murthy et al., 1983) based on soil variation related to relief or physiography in different climatic zones. 101 suborder associations were recognised according to soil taxonomy (1975) in the soil map of 1:6.3 million scale 16 suborder associations are identified in West Bengal wherein dominant suborders recognised are Aqualfs, Aquepts, Aquents, Ochrepts, Fluvents, Ustalfs and Orthents. The present soil map of West Bengal is based on the soil map of 1983 which was largely on the data base generated by the bureau through reconnaissance and rapid reconnaissance soil survey and updated by incorporating up to date data generated by

Table V-2. Area of Broad Classes/Associations of Soils in Different Districts (Area in .000 ha)

District	Name of soil classes (or association)								
	Lateritic/ lateritic	Red	Vindhya alluvium	Ganga alluvium	Terai and Teesta	Coastal	Colluvial and skeletal	Brown forest	Total
Hooghly	-	6.80	184.95	58.57	-	-	-	-	250.32
Howrah	-	-	62.53	26.33	-	34.71	-	-	123.57
Burdwan	62.72	21.05	333.55	75.54	-	-	92.23	-	585.09
Birbhum	85.48	59.75	96.36	19.28	-	-	134.81	-	395.68
Midnapore	306.66	234.16	282.40	-	-	298.82	31.11	-	1,153.15
Bankura	133.96	39.92	90.62	-	-	-	345.32	-	609.82
Purulia	-	-	-	-	-	-	510.15	-	510.15
24 Parganas	-	-	-	365.67	-	808.17	-	-	1,173.84
Nadia	-	-	-	339.25	-	-	-	-	339.25
Murshidabad	-	-	147.80	301.27	-	-	-	-	449.07
Malda	-	77.77	17.13	243.54	-	-	-	-	338.44
West Dinajpur	-	56.90	76.88	167.66	134.12	-	-	-	435.56
Jalpaiguri	-	-	-	-	453.37	-	-	29.07	482.44
Cooch Behar	-	-	-	-	204.56	-	-	-	204.56
Darjeeling	-	-	-	-	55.73	-	-	165.26	220.99
Total	588.82	496.35	1,292.22	1,597.11	847.78	1,141.70	1,113.62	194.33	7,271.93

(i.e. 72.72 Lakh ha)



Legend Overleaf

Map. No. 10

Legend

1. Ochraqualfa-Paleustalfs
2. Ochraqualfs-Haplustalfs
3. Ochraqualfs-Ustifluvents
4. Ochraqualfs-Haplaquepts-Eutrochrepts
5. Ochraqualfs-Ustochrepts-Ustorthents
6. Ochraqualfs-Eutrochrepts-Fluvaquents
7. Paleustalfs-Plinthustalfs-Ochraqualfs
8. Paleustalfs-Plinthustalfs-Ustochrepts
9. Paleustalfs-Haplustalfs-Ustochrepts
10. Paleustalfs-Haplustalfs
11. Haplustalfs-Ochraqualfa-Ustochrepts
12. Haplustalfs-Paleustalfs-Ustochrepts
13. Heplustalfs-Ustochrepts
14. Haplustalfs-Ustochrepts-Haplaquepts
15. Haplustalfs-Ustochrepts-Ustorthents
16. Fluvaquents-Ochraqualfs-Haplaquepts
17. Ustifluvents-Fluvaquents-Ochraqualfs
18. Ustifluvents-Haplaquents
19. Ustifluvents-Ustorthents-Haplaquepts
20. Ustifluvents-Ustochrepts-Haplaquepts
21. Ustifluvents-Haplaquepts-Ochraqualfs
22. Ustorthents-Haplaquepts-Dystrochrepts
23. Ustorthents-Ochraqualfs
24. Haplaquepts-Fluvaquents
25. Haplaquepts-Ustochrepts
26. Haplaquepts-Haplaquents-Ustorthents
27. Haplaquepts-Ustifluvents-Ochraqualfs
28. Haplaquepts-Ochraqualfs
29. Haplaquepts-Ustorthents
30. Haplaquepts-Ustochrepts-Ustorthents
31. Ustochrepts-Haplaquepts-Haplustalfs
32. Ustochrepts-Haplaquents-Ustifluvents
33. Ustochrepts-Ustorthents-Haplaquents
34. Eutrochrepts-Dystrochrepts-Haplaquepts
35. Dystrochepts-Haplaquepts
36. Dystrochrepts-Udifluvents
37. Dystrochrepts-Udorthents

-----x-----

National Bureau of Soil Survey and Land use Planning, All India Soil and Land Use Survey, and Soil Survey Organisation, Govt. of West Bengal. As can be seen from the map and decriptions, there are altogether 14 great groups based on USDA taxonomy constituting 37 mapping units each consisting of great group soil association. The description of the representative soil series belonging to the different great groups are given mapping unitwise in the following pages. Traditional popular nomenclature followed earlier is also indicated for easy understanding.

The detailed morphological descriptions of the representative typing pedone (soil profiles) of these soil series along with the soil analysis data are furnished (Map No. 10)

Ochraqualfa-Paleustalfs (mapping unit-1)

This unit consists of two important soil groups with inclusions of some other soil groups Jagadishpur and Mrigindighi soil series represent said two soil groups.

Jagadishpur soils (B.M. soils of India 1982) have developed in granite alluvium on nearly level to very gently slopping old flood plains of the Dwaraka river in Birbhum district at an elevation of 30 to 50 m above MSL. They are very deep clayey, imperfectly drained soils and have light brownish gray to pale olive strongly acid to slightly acid silt loam to silty clay a horixon and gray medium acid silty clay loam to silty clay Bt horizon is more than 100 cm. The climate of the area is tropical moist subhumid with mean annual air temperature of 26.5°C and mean annual rainfall of 1,422 mm. The CEC ranges from 18 to 28 meq per 100 gm of soil. The moisture retention capacity is high. The lands are usually terraced, but susceptible to erosion if the terraces are not properly maintained. This soil is cultivated for rice in the kharif season and crops like wheat, pulses and oilseeds with irrigation in the rabi season. Their productivity potential is medium.

Mrigindihi soils (B.M. Soils of India, 1982) have developed in old alluvium in the undulating interfluve plains of western part of West Bengal at an elevation of 50-100 m above MSL Slope of land is up to five per cent. They are very deep, fine loamy somewhat excessively drained and have yellowish red, very strongly to very strongly acid, sandy loam. horizons, and yellowish red to red, strongly to very strongly acid, sandy clay loam Bt horizons. The thickness of A horizon ranges from 25 to 35 cm and that of Bt horizon is more than 100 cm. The climate of the area is tropical moist sub-humid with mean annual air temperature of 27°C and mean annual rainfall of 1,550 mm. The CEC ranges from 6 to 10 meq per 100 gm of soil. The moisture retention capacity is medium to low. The lands are cultivated to rainfed rice and vegetables, wheat potato and winter vegetables are raised under irrigation. Their productivity potential is low to medium depending on the availability of irrigation. In modern USDA classification system, Jagadishpur group soil was placed under ochraqualfs abd Mrigindihi group soils were placed under Paleustalfs at great group level. In earlier classification Jagadishpur group soils belong to Ganga upland and Mrigindihi group soil belong to belong to laterite (DA,WB* 1965).

Ochraqualfs-Haplustalfs (mapping unit-2)

This unit consists of two important soil groups, Jagadishpur group and Hensla group, with inclusions of some other soil group. Jagadishpur group soils have been discussed in mapping unit 1. Hensla series (NBSS-1982) a representative of Hensla group have developed on weathered granite geneiss in gently slopping peneplained plateau in Purulia district at an elevation of 200 to 260 m above MSL. Slope of the land is up to five per cent. They are moderately deep, fine loamy, well drained and have yellowish brown to reddish yellow, slightly acid, loamy sand to sandy loam A horizon, reddish yellow to strong brown sandy clay from loam to caly loam B horizonz over massive laterite Cir horizon. The thickness of A horizon ranges from 20 to 25 cm and that of Bt horizon between 20 to 25 cm. The climate is tropical dry sub-humid with mean air temperature of 26°C and mean annual rainfall of 1,307 mm. The CEC ranges from 8 to 13 meq per 100

gm soil. The moisture retention capacity is medium to low. Lands are cultivated to dry land crops and their productivity potential is low to medium depending on the availability of irrigation. Hensla group soils have been tentatively classified as Haplustalf at great group level as per USDA soil texanomy. The same soil group was classified earlier as Gandwana colluvial.

Ochraqualfs-Ustifluvents (mapping unit-3)

This unit consists of two important group of soils with inclusion of some other group of soils. One group is represented by Jagadishpur soil series which have been described under mapping unit-1. Another group is represented by Ghoshat soil series.

Ghoshat soils (NBSS-1984) have developed in recent alluvial materials on nearly level river terraces or on low lying lands along river bank of Ajoy in Birbhum district at an elevation of 20 to 25 m above MSL. They are very deep, well drained and have dark yellowish brown moderately fine textured neutral A horizon underlaing by layer of sandy deposit constituting C horizon. Abundant mica particles are present throughout the soil profile.

The climate is tropical moist subhumid with mean annual air temperature 26.6°C and mean annual rainfall 1.422 mm. The moisture retention capacity is medium to low. The soils are susceptible to river bank erosion and flood damage. These soils are culvated for paddy and other rabi crops if irrigation facilities are available and the productivity potential of the soils is medium. In modern USDA soil classification system Ghoshat group soils have been placed under Ustifluvent at great group level. In earlier classification (DA,WB-1965) the same soil group was under Gneissic colluvial.

Ochraqualfs-Haplaquepts-Eutrochrepts (mapping unit-4)

This unit consists of three important group of soils. Jagadishpur, Banpara and hanrgram group with inclusion of other soil groups. Jagadishpur soil group has been described under mapping unit-1.

Banpara series (NBSS-1984) which represents Banpara soil group have developed on old alluvium on nearly level to very gently sloping lower alluvial plain at an elevation of 40 to 50 m above MSL in Burdwan district. They are very deep, imperfectly drained and have light brownish gray to olive gray, slight acid, sandy loam to loam A horizon, light gray to olive gray neutral sandy clay loam to clay loam B horizon and gray neutral clay loam to clay C horizon. The soils have aquic moisture regime and so have the inherent problem of poor aeration. The climate is tropical moist sub-humid with mean annual air temperature 26.6°C and mean annual rainfall 1,529 mm. The CEC ranges from 8.0 to 16.0 meq per 100 gm soil. The soils are suited only for paddy kharif season. They can support climatically adapted crops, pulses, etc. on conserved soil moisture. The productivity potential of the soils is high. Banpara group soils have been classified as Haplaquepts as per USDA soil taxonomy in great group level. The same Banpara group soil was classified earlier as Vindhya flat lands (DA,WB-1965). Totpara soil series also belongs to this soil group and is intensively cultivated for rice crop.

Hanrgram series (B.M. soils of India - 1982) a representative of Hanrgram soil group was originally established in Burdwan district. These soils have developed in alluvium on old flood plain of river Damodar on nearly level to level lands at an elevation of 20 to 30 m above MSL. The soils are deep, imperfectly drained and have high gray to olive brown, strongly to slightly acid, clay loam to clay A horizon and gray to grayish brown, slightly acid, clay loam to clay B horizon which are distinctly mottled with strong brown to olive brown in colour. The climate is tropical moist sub-humid with mean annual air temperature of 26.6°C and mean annual rainfall of 1,400 mm. The soil cracks one cm wide up to about 30 cm depth. CEC ranges from 18 to 28 meq per 100 gm soil, Hanrgram soils are subjected to flooding and water 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 with supplementary irrigation. Productivity potential of this type of soil is medium, Hanrgram soil group have been classified as Eutrochrepts as per USDA soil taxonomy at great

group level. In earlier time Hangram group soil has been classified as Damodar flat lands.

Ochraqualfs-Ustochrepts-Ustorthents (mapping unit-5)

This mapping unit consists of three important soil groups Jagadishpur. Hatikheda and Amra groups. The characteristics of Jagadishpur soil group has already been discussed earlier in unit-1.

Hatikheda series (NBSS-unpublished) representative of Hatikheda group soils were originally established in Bankura district. These soils have developed on colluvial deposits on very gently sloping valleys of low developed plateau at an elevation of 120 to 140 m above MSL. They are very deep, imperfectly drained and have yellowish brown slight acid loam A horizon, yellowish brown neutral clay loam B horizon, underlain by massive clayey soil as C horizon with lithological discontinuity. The climate of the area is tropical dray sub-humid with annual air temperature of 2.7°C and mean annual rainfall of 1,422 mm. The CEC ranges from 15 to 21 meq per 100 gm soil. Hatikheda soils are moderately productive and crops respond to better management. In some soils poor drainage may give rise to some problems. Productivity potential of these soils is low. Hatikheda group soils have been placed under Ustochrept at great group level as per USDA soil classification. Earlier this soil group was placed under Gondwana colluvial (1965).

Amra series (AIS and LUS) which represents Amra soil group was originally identified in Purulia district. The soils have developed on granite gneiss on moderately steep to very steep hill slopes escarpment. They are shallow to very shallow well drained and have brown and dark brown slight acid gravelly clay loam A horizon over stones and pebbles as C horizon. The climate is tropical dry sub-humid with mean annual air temperature of 26°C and mean annual rainfall of 1,307 mm. The soils are highly erosive in nature and under proper soil conservation measures only forest species can grow. The productivity potential of soil is poor. Amra soil group has been placed under Ustorthent at great group level as per USDA taxonomy. The same soil group has been classified earlier (1965) as transition soils.

Ochraqualfs-Eutrochrepts-Fluvaquents (mapping unit-6)

This mapping unit consists of three major soil group - Jagadishpur, Madhupur and Kanagar groups with inclusion of other minor soil groups. The characteristics of Jagadishpur soils group has already been discussed earlier in unit-1.

Madhupur series (B.M. Soils of India-1982) representative of Madhupur soil group was originally established in Murshidabad district. These soils are formed in mixed alluvium and occur on the Bhagiriathi flood plain with usually less than one per cent slope at an elevation of 50 m above MSL. They are deep moderately well-drained and have brownish gray moderately alkaline silt loam horizons and dark grayish brown to dark brown moderately alkaline silt loam to silty clay loam B horizons and brown, moderately alkaline, silt loam C horizons underlain and lithologically discontinuous, moderately alkaline, silty clay loam LIC horizon. The soils are calcareous throughout. The climate of the area is tropical moist sub-humid with mean annual air temperature of 20.9°C and mean annual rainfall of 1,417 mm. The CEC ranges from 9 to 29 meq per 100 gm soil. Madhupur soil have good air-water relationship and response to management is expected to be favourable. Under irrigation, they are suitable for wheat, oilseeds, vegetable and orchards. Productivity protential of this type of soil is medium to high. In modern classification system Madhupur group soils have been placed under Eutrochrepts at great group level. This soil group was placed under Ganga flat land in earlier classification.

Kanagar soil series (B.M. soils of India 1982) a representative of kanagar soil group originally occur in Hooghly district. They have developed on the old flood plain of the river Hooghly on nearly level to very gently sloping lands at an elevation of 5 to 10 m above MSL. Kanagar soils are very deep, imperfectly drained and have dark gray to dark grayish brown mottled, mildly alkaline, silty clay loam A horizons over dark gray to grayish brown mildly alkaline silty clay loam C horizons. The soils are glayed below one metre. The climate is tropical moist sub-humid with mean annual air temperature of 27.5°C and mean annual rainfall of 1,503 mm. The CEC ranges from 10 to 21.6

meq per 100 gm soil. Kanagar soils are fine silty and situated in low lying area. They are heavier in texture and subjected to hydromorphic moistures. As a result they are suited only to rice during kharif. Their productivity potential is medium. At gret group level kanagar soil group has been placed under fluvaquent as per USDA soil taxonomy. The same soil group was classified earlier as Ganga low land.

Paleustalfs-Plinthustalfs-Ochraqualfs (mapping unit-7)

This unit consists of three important soil groups with inclusion of some other soil groups. The major soil groups are Mrigindihi, Sankarpur and Jagadishpur. The principal soil characteristics of Mrigindihi and Jagadishpur soil groups have been described earlier in unit-1.

Sankarpur series (NBSS-1948) which represents Sankarpur soil group have developed on weathered granite gneiss on strongly sloping dissected plateau in Asansol sub-division of Burdwan district at an elevation of 110 to 120 m above MSL. Sankarpur soils are deep well-drained and have reddish yellow, strong acid, sandy loam A horizon yellowish red to dark red medium to light acid, sandy loam to gravelly loam B horizon underlain by massive conglomerate of nodular ferruginous, beads, quartzgravels and small pieces of stones C horizon. The climate is sub-humid tropical with mean annual temperautre 26°C and mean annual rainfall of 1,393 mm. The CEC ranges from 9.0 to 15.5 meq per 100 gm of soil. The available moisture capacity is 8 cm at 60 profile depth. Sankarpur soils have good air-water relationship but they are highly erosive in nature and strong slope causes run off during rains. With proper conservation measures the soils support forest vegetation. The productivity potential of soils is poor. In modern soil classification system Sankarpur group soils have been classified as plinthustalf at great group level. This soil group was placed under laterite in earlier classification.

Paleustalfs-Plinthustalfs-Ustochrepts (mapping unit-8)

This unit consists of three principal soil groups - Mrigindihi, Sankarpur and Hatikheda. The characteristic features of these three soil groups have already been discussed earlier under soil units-1, 7 and 5 respectively.

Paleustalfs-Haplustalfs-Ustochrepts (mapping unit-9)

This unit consists of three principal soil groups Mrigindihi, Hensla and Hatikheda. The characteristics of these soil groups with occurrence have been described in earlier units-1, 2 and 5 respectively. Soils of this unit mostly occur in Midnapur district.

Paleustalfs-Haplustalfs (mapping unit-10)

This unit consists of two important soil groups with inclusion of some minor soil groups. The major soil groups are Mrigindihi and Hensla, which are described under units 1 and 2.

Haplustalfs-Ochraqualfa-Ustochrepts (mapping unit-11)

This unit consists of three principal soil groups with few minor soil groups as inclusion. The three major groups are Hensla, Jagadishpur and Hatikheda - the characterisation feature of which are described earlier under mapping units 1, 2 and 5 respectively. Soils of this unit mostly occur in Birbhum, Bankura, Purulia and Midnapur districts.

Haplustalfs-Paleustalfs-Ustochrepts (mapping unit-12)

This unit consists of three important soil groups - Hensla, Mrigindihi and Hatikheda. The characteristics features of these soil groups are elaborately discussed under mapping units 2, 1 and 5 respectively. Soils of this unit mostly occur in Purulia district.

Heplustalfs-Ustochrepts (mapping unit-13)

This unit consists of two principal soil groups. Hensla and Hatikheda, with one or two minor soil groups as inclusion. The

principal characteristics of soil groups Hensla and hatikheda are presented earlier under units 2 and 5 respectively. The soils of this unit also mostly occur in Purulia district.

Haplustalfs-Ustochrepts-Haplaquepts (mapping unit-14)

This unit consists of three principal soil groups - Hensal, Hatikheda and Banpara soil groups, with inclusion of few other minor soil groups. The principal characteristics of above three major soil groups are discussed earlier in this chapter under mapping unit 2, 5 and 4 respectively. Soils of this unit occur mostly in Murshidabad district.

Haplustalfs-Ustochrepts-Ustorthents (mapping unit-15)

This unit consists of three principal soil groups with some minor soil groups. The important groups are Hensla, Hatikheda and Amra. The soil characteristic of Hensla, Amra and Hatikheda are discussed earlier under units 2 and 5.

Fluvaquents-Ochraqualfs-Haplaquepts (mapping unit-16)

This unit consists of three important soil groups Kanagar, Jagadishpur and Banpara, with few other soil groups as inclusion. The characteristics of these soil groups are vividly discussed under mapping units 6, 1 and 4 respectively. Soils of this unit occur mostly in Purulia district.

Ustifluvents-Fluvaquents-Ochraqualfs (mapping unit-17)

This unit consists of three important soil group Ghoshat, Kanagar and Jagadishpur soil groups. The principal soil characteristics of these soil groups are discussed earlier under mapping units 3.6 and 1 respectively.

Ustifluvents-Haplaquents (mapping unit-18)

This unit consists of two important soil groups with some other groups. The major soil groups are Ghoshat and Charcha. The charac-

teristics feature of Ghoshat soil group is described earlier in this chapter under unit 3.

Charcha series (NBSS and LUS) which represents Charcha soil groups was originally established at Mohammad bazar Police Station in Birbhum district. Charcha soils are developed on local colluvial wash and occur in low laying areas. Charcha soils are deep, imperfectly to poorly drained and have gray medium to slightly acid, sandy loam to sandy clay loam A horizon over grayish brown neutral loamy and C horizon. The climate is tropical subhumid with mean annual air temperature of 26.5°C and mean annual rainfall of 1,422 mm, CEC ranges from 6.0 to 12.0 meq per 100 gm soil. These soils are best suited to rise in kharif season with improvement of drainage condition. Jute can also be grown well under recommended dose of fertilizer application. Productivity protential of these soils is medium. Characha soil group have been placed under Haplaquent at great group level as per soil taxonomy. The same Charcha group soil was classified as Vindhya riverine in earlier classification.

Ustifluvents-Ustorthents-Haplaquepts (mapping unit-19)

This unit consists of three important soil groups with few other soil groups as inclusion. The major soil groups are Ghoshat, Amra and Jotghasi. The characteristic features of Ghoshat and Amra soil groups are presented under mapping units 3 and 5 respectively.

Jatghasi series (DA, WB-1984) which represents Jotghasi soil group originally occur at Gajol police station in Malda district. Jotghasi soils have developed from alluvium brought down by river Tanga. Jotghasi soils are deep, poorly drained and have brown neutral silty clay loam A horizon, light gray to dark gray, neutral to mild alkaline, silty clay loam B horizon. The soils occur on nearly level land at an elevation of about 20 to 30 m above MSL. The climate is tropical moist sub-humid with mean annual air temperature of 25.4°C and mean annual rainfall of 1,814 nm. CEC ranges from 7.0 to 14.0 meq per 100 gm soil. Jotghasi soils are poorly drained and situated in low lying area and subjected to hydromorphic condition under improved

drainage. The soils, have medium potentiality for agricultural production. They are best suited to rice in kharif season. Jotghasi soil group has been placed under Haplaquept at great group level as per USDA soil taxonomy. The same soil group has been clasfified as Tista riverine in older system (1958).

Ustifluvents-Ustochrepts-Haplaquepts (mapping unit-20)

This unit consist of three important soil groups - Ghoshat, Hatikheda and Banpara. The principal soil characteristics of these soil groups are elaborately discussed earlier under units 3, 5 and 4 respectively. Soils of this group generally occur in Hooghly and Howrah district.

Ustifluvents-Haplaquepts-Ochraqualfs (mapping unit-21)

This unit also consists of three important soil groups - Ghoshat, Banpara and Jagadishpur. The characteristic features of soils of these groups are discussed under mapping units 3, 3 and 1 respectively. The soils of this unit occur mostly in Hooghly, Howrah, Burdwan, Murshidabad and Malda districts.

Ustorthents-Haplaquepts-Dystrochrepts (mapping unit-22)

This unit consists of three important soil groups with one or two other soil groups. The major soil groups are Amra, Banpara and Gitaldaha. The characteristic behaviour of Benpara soil group has been discussed under mapping unit-4.

Gitaldaha series (NBSS, 1983) which represents Gitaldaha soil groups was established at Dinhata Police Station of Coochbehar district. Gitaldaha soils have developed on mixed alluvium on flat land at an elevation of 40 to 45 m above MSL. Soils are deep, moderately well drained and have brown very strongly acid fine texture. A horizon gray to pale brown, medium to slightly acid sandy loam B horizon over sandy C horizon. The climate of the area is tropical per humid with mean annual air temperature of 24.4°C and mean annual rainfall of 3,628 mm. Gitaldaha soils are agriculturally important. They have fairly good

air-water relationship. They are productive and crops respond to management. Gitaldaha group soils have been placed under Dystrochrept at great group level as per modern USDA system of soil classification. The same soil group has been classified earlier as Tista riveine soils of Amra series have already been discussed in mapping unit-5.

Ustorthents-Ochraqualfs (mapping unit-23)

This unit consists of two important soil groups Amra and Jagadishpur, with some of the soil groups. This unit occurs mostly in Midnapur district. The soil character of Amra and Jagadishpur soul groups have been discussed under mapping units 5 and 1 respectively.

Haplaquepts-Fluvaquents (mapping unit-24)

This unit consists of two principal soil groups with one or two other soil groups. The major two soil groups are Sagar and Kanagar, the characteristic features of kanagar series was discussed under mapping unit-6.

Sagar series (NBSS, 1984) a representative of Sagar soil group soil group originally occur in Sagar Island of 24 Parganas district. Canning soil series is another important soil of this soil group and is used for rise cultivation. The soils have developed in alluvium on deltaic plain of river Ganga having 1-2 per cent slope.

The soils are deep, imperfectly drained and have light gray, strong acid, silty clay loam A horizon, dark gray mild alkaline silty clay distinctly mottled B horizon. The climate is subtropical moist subhumid with mean annual air temperature of 26.4°C and mean annual rainfall of 1,908 mm. CEC ranges from 21.9 to 26.1 meq per 100 gm soil. Electrical conductivity in 1:2.5 water extract ranges between 1.2 and 2.0 mmhos. In absence of sufficient rainfall, the crop yield suffer due to moisture and salinity. The productive potential of Sagar soils is medium to high according to annual rainfall. Sagar soil group has been placed under Haplaquept (salinephase) at great group level in recent adopted USDA soil classification system. The same soil group has been classified as saline, saline-alkali soils. Soils of this unit generally

occur in Midnapur, Howrah and 24 Parganas districts.

Haplaquepts-Ustochrepts (mapping unit-25)

This unit also consists of two principal groups with few other soil groups as inclusion. The major soil groups are Jotghasi and Hatikheda. The soil characteristics of these soil groups are described earlier in this chapter under mapping units 19 and 5 respectively. Soils of this unit mostly occur in Malda district.

Haplaquepts-Haplaquents-Ustorthents (mapping unit-26)

This unit consists of three important soil groups Banpara, Charcha and Amra. The characteristic features of above soil groups are broadly discussed under mapping units 4, 18 and 5 respectively. Soils of this unit mostly occur in Midnapur district.

Haplaquepts-Ustifluvents-Ochraqualfs (mapping unit-27)

This unit also consists of three principal soil groups with some other soil groups as inclusion. The major soil groups are Banpara, Ghoshat and Jagadishpur. The principal soil characteristics of above soil groups have been discussed earlier in this chapter under mapping units 4,3 and 1 respectively. Soils of this unit occur in Murshidabad Nadia, Purulia and Hooghly and districts.

Haplaquepts-Ochraqualfs (mapping unit-28)

This unit consists of two principal soil groups-Banapara and Jagadishpur. The characteristic features of Banpara and Jagadishpur soil groups have already been discussed in this chapter under mapping units 4 and 1 respectively. Soils of this unit occur in Hooghly, Purulia, Malda, Bankura, and Midnapur districts.

Haplaquepts-Ustorthents (mapping unit-29)

This unit also consists of two important soil groups - Banpara and Amra. The soil characteristics and behaviour of the above soil group have already been discussed earlier under mapping units 5 and 5

respectively. Soils of this unit mostly occur in West Dinajpur district.

Haplaquepts-Ustochrepts-Ustorthents (mapping unit-30)

This unit consists of three principal soil groups with some other soil groups as inclusion. The major soil groups and Banpara, Hatikheda and Amra. The characteristic features of the above soil groups have been discussed earlier under mapping units 4 and 5 respectively. Soils of this unit mostly occur in Birbhum and Burdwan districts.

Ustochrepts-Haplaquepts-Haplustalfs (mapping unit-31)

This unit consists of three principal soil groups with inclusion of some other soil groups. The major soil groups are Hatikheda, Banpara and Sirkabad. The characteristic features of Hatikheda and Banpara soil groups have already been discussed earlier in this chapter under mapping units-5 and 4 respectively.

Sirkabad series (AIS and LUS, 1978) which represents Sirkabad soil group originally established at Area police station in Purulia district. Sirkabad soils have developed on recent erosion deposits on very gently sloping valley plain and river terraces. The soils are deep, well-drained and have grayish brown to dark brown acid loamy sand to sandy loam A horizon, dark yellowish brown to dark brown and reddish brown acid sandy clay loam to clay B horizon. The climate is sub-humid (dry) tropical with mean annual air temperature 26°C and mean annual rainfall of 1,307 mm. CEC ranges between 7.0 and 12.0 meq per 100 gm soil.

Sirkabad soils are agriculturally important. They have good air--water relationship. Measures to check run off and conserve moisture are needed. Under irrigation, soil responds to intensive input use with crops like jute, vegetables, etc. Productivity potential of this soil group is medium under ordinary level of management. Sirkabad soil group has been placed under haplustalfs at great group level as per USDA soil taxonomy. The soil group has been classified earlier (1958) as gneissic colluvial.

Ustochrepts-Haplaquents-Ustifluvents (mapping unit-32)

This unit consists of three principal soil groups - Hatikheda, Charcha and Ghoshat. The principal characteristics of the above soil groups have vividly been discussed under mapping units 5, 18 and 3 respectively. Soils of this unit generally occur in Birbhum, Murshidabad and Purulia districts.

Ustochrepts-Ustorthents-Haplaquents (mapping unit-33)

This unit consists of three principal soil groups - Hatikheda, Amra and Characha. The characteristic features of above soil groups have been discussed earlier in this chapter under mapping units 5 and 18 respectively. Soils of this unit mostly occur in Birbhum, district.

Eutrochrepts-Dystrochrepts-Haplaquepts (mapping unit-34)

This unit consists of three principal soil groups - Madhupur, Gitaldaha and Banpara. The principal soil characteristics and behaviour of these soils have been discussed earlier under mapping units 6, 22 and 4 respectively. Soils of this unit occur in West Dinajpur and Malda districts.

Dystrochepts-Haplaquepts (mapping unit-35)

This unit consists of two important soil groups-Gitaldaha and Banpara. The characteristic features of above soil groups have been discussed earlier under mapping units 22 and 4 respectively. Soils of this unit generally occur in Jalpaiguri, Darjeeling, Coochbehar, Nadia and 24 Parganas districts.

Dystrochrepts-Udifluvents (mapping unit 36)

This unit consists of two important soil groups Gitaldaha and Balarampur. The characteristic features of Gitaldaha soil group have been discussed earlier in this chapter under mapping unit 22.

Balarampur series (NBSS, 1980) which represents Balarampur soil group is originally established at Tufanganj police station of Cooch Behar district. Balarampur soils have developed on recent alluvium and occur on nearly level lands at an elevation of 40 to 45 m above MSL Climate of the area is tropical per humid with mean annual air temperature of 24.4°C and mean annual rainfall of 3,628 mm Balarampur group soils are moderately deep to deep, moderately well-drained and have dark grayish brown to light gray mild to medium alkaline silt loam to loam A horizon over lithological discontinuous coarse loamy C horizon.

Balarampur soils are medium textured. They occur in low-lying situation on nearly level land; and moderately slow in premeability and subjected to water stagnation during rains. The productivity potential of this soil is medium to high. Soils of this unit occur in Darjeeling, Cooch Behar, West Dinajpur, 24 Parganas and Nadia districts.

Sasanga series of Burdwan district also belongs to this soil group and extensively cultivated for rice crop. At great group level, Balarampur soil groups have been placed under Udifluvents as per soil taxonomy 1975. The same soil group has been classified as Tista soils in older classification 1965.

Dystrochrepts-Udorthents (mapping unit-37)

This unit consists of two principal soil groups-Gitaldaha and Darjeeling. The characteristic feature of Gitaldaha soil group has been discussed earlier in this chapter under mapping unit 22.

Darjeeling series (NBSS unpublished) which represents Darjeeling soil group originally occur in Ghum Police Station in Darjeeling district. Darjeeling soils have developed on mica schists and gneisses on moderately steep to steep hill slope at an elevation of about 2,100 m above MSL. The soil are moderately deep to deep and have yellowish brown medium acid loamy sand to sandy loam A horizon over brown to yellowish brown medium to slightly acid sandy loam C horizon. The climate of the area is sub-tropical per humid with mean annual air temperature of 12.3°C and mean annual rainfall of 3,106 mm. Darjeeling soils are coarse loamy soil with low moisture retention capacity. They

occur on very steep hill slope and are highly erodible. Run off loss further aggravates the moisture deficit. Productivity potential is low to medium. Darjeeling group soils have been classified as Udorthent at group level under USDA classification. The same soil group was placed under brown forest soil in order classification 1965.

5.4 INTERPRETATIVE GROUPING OF SOILS

Vide R.R. Biswas, C.J. Thampi, P. Chakraborty and S. Digar. There are eight land capability classes as designed by Roman numericals from 1 to VIII grouped according to the progressively greater limitations and narrower choice for practical use. The classes 1 to IV implay arable lands, whereas classes V to VII are for uncultivable lands and class VIII lands are restricted for use of wild life habitat, recreation and water supply, etc.

The definitions of land capability classes are as follows:

(a) Land suited for cultivation

Class I land: This is very good land that may be cultivated safely with oridinary good farming methods. It is nearly level land (slope less than one per cent) and has deep, productive, easily worked soils and is subject to only slight erosion. It is well-drained and is suited for a wide variety of crops. For continued good production, these lands require the use of fertilisers, green manure crops and crop rotation.

Class II land: This is good land that may be cultivated with easily available practices. Some of the limitations of this class of land are gentle slope, moderate susceptibility to erosion, moderate soil depth, moderate overflow and moderate wetness. Each of these limitations requires special methods for correction, such as contour bunding, strip cropping, contour tillage, crop rotations that include grasses or legumes, drainage improvement and the application of fertilisers and manures.

Class III land: This class of land has restricted use for cultivation. The land is moderately good and may be used for croppin provided intensive management measures are taken. This kind of land is characterised by one or more of the following limitations:

(a) moderate steep slope, (b) high susceptibility to erosion, (c) moderate overflow, (d) slow sub-soil permeability, (e) excessive wetness, (f) shallow soil depth, (g) hard pan or clay pan (h) sandy or gravelly with low moisture capacity, and (i) low inherent fertility.

Class IV land: This class of land has very restricted use for cultivation and needs special care in handling and management. The variety or crops that may be grown is limited. Its croping croppin use is restricted by slope, erosion, unfavourable soil characteristics and adverse climate.

(b) Land unsuited for cultivation

Class V land: This land is not suited for cultivation but is suited for pasture and grassland. Cultivation may not be feasible because of one or more factors, such as, wetness, stoniness of some other limitations. Land is nearly level and not subject to more than slight wind or water erosion. It occurs in many swampy or high water table areas that cannot be drained easily.

Class VI land: This land is subject to moderate limitations under grazing or forestry use. It is too steep subject to erosion shallow, Wet or dry but with careful management may be made suitable either for grazing or forestry. Gullies in such areas should be controlled by diversion of water, provision of contour furrows or ridges.

Class VII land: This land is very steep, eroded, stony, rough shallow, dry or swampy and is recommended particularly in humid regions only for forestry and woodland and not pasture.

Class VIII land: This land includes such areas as marshes, deserts deep gullies, rocky eserpments and very steep, rough stony, barren land. It is suited only for wild life, recreation or watershed protection uses.

A land capability class can be further subdivided into different land capability subclasses. Capability subclasses are soil groups, each of which is recognised by the same kind of dominant limitations. These are designated by adding small letters' to the class numericals. The following limitations are recognised at subclass level.

e : where the erosion susceptibility and erosion hazards are the major limiting factors for their use.

W : where excess water is the dominant factor to limit their use; poor drainage, wetness, high water-table and overflow are the criteria for determining the soils belonging to this subclass.

S : where the major limitations are due to shallow depth, extreme textures such as clay or sand, low moisture holding capacity, low fertility, salinity or alkalinity, stoniness, etc.

C : where the limitations are due to climatic hazards like snowfall, hailstorm, dust storm, fog, prolonged dryness or coldness etc.

Where the soils have two kinds of limitations both can be indicated, if needed for better understanding, but dominant one is shown first.

Land capability subclasses can further be subdivided into land capability units. But since the mapping units of the updated soil map of West Bengal are very broad-based being association of great groups, no attempt has been made to indicate the land capability units. Attempt has also not been made to indicate the land capability class and subclass in each of the mapping units. However since the mapping unit is based on properties of soil series in a particular association of great group, it is found to be more justified to classify these soil series only up to land capability classes and subclasses. Again, it must be remembered that each great group of soil may have other types of land capability classes and subclasses than what has been stated here, on the basis of variation of properties of soil series coming under the soil great group. However, in this chapter, an attempt has been made only to place each of 18 soil series under a

particular land capability class and subclass on the basis of soil properties studied in the field as well as in the laboratory.

Class I: The soils under this category have very few negligible limitations that may restrict their use and this type of land is not normally found to occur in West Bengal.

Class IIs: Soils of this category have moderate soil limitations that refuce their choice of plants or require minimum conservation practices, or both. Only four soil series come under this land capability class and subclass. These soil series are Hatikheda, Madhupur, Balarampur and Gitaldaha. These soils are best suited for paddy cultivation under normal rainfall during kharif season. These have been brought under minimum soil and wather water conservation practices by construction of bunds for growing paddy which is the staple food of the people of the state. The yield of paddy can be increased by susing improved verieties of paddy, improved agronomic practice, recommended doses of fertilizers and supplementary irrigation etc.

Class IIw: Soils of this category have moderate wetness limitation. Only two soil series come under this land capability class and subclass. These soil series are Banpara and Jotghasi. These soils occur in depressional situation and are very suitable for growing paddy during kharif season. These are also suitable for growing a leguminous crop after harvest of kharif paddy and the second crop will grow well as moisture retentively of the soils are good.

Class IIes: Soils of this category have both erosion and soil limitation at moderate level. Only two soil series come under this land capability class and subclass. These soil series are Mrigindihi and Ghoshat. These soils occur on high land with sufficient slope to cause erosion. Though in these types of soils, paddy and vegetables are cultivated, but crop failure occurs due to occasional drought condition during kharif season Irrigation and fertiliser use will improve the crop production of these soils.

Class IIsw: Soils of this category have both soil and wetness problems at moderate level. Only one soil series, viz. Sagar, comes

under this class of land capability class and subclass. These soils occur on deltaic clood plain and are subjected to frequent innundation by brackish water from creeks. These soils are protected from natural calamity like flood by embankments. Suitable salt-tolerent paddy varieties and vegetables can be grown successfully during kharif and rabi season. But crops of rabi season requre irrigation with sweet water.

Class IIw: Soils of this category have serve wetness limitation. Only four soil series comes under this land capability class and subclass. These soil series are Jagadishpur, Hanrgram, Kanagarh, and Charcha. These soils occur on low lying alluvial flood plain or backswamp area of a river and suffer from overground drainage problem for most part of the year. The internal drainage problem of the soil series is also equally bad due to fine texture of the soil. These soils have been found to be suitable for both kharif and boro paddy only.

Class IIIs: Soils of this category have serve soil limitation. Only one soil series, viz. Sirkabad, comes under this land capability class and subclass. The soils are developed on erosional surface of river terraces, which brought down and deposit the alluvial material from nearby hills and mountains. The soils have coarse texture, low organic matter and low natural fertility. The soils are cultivated with paddy during kharif season, which suffers from moisture stress during drought period. In rabi season, a second suitable crop can be grown, with fertiliser, provided irrigation facility is available.

Class IIIce: Soils of this category have severe climatic and erosional problems. Only one soil series, viz. Darjeeling, comes under this land capability class and subclass. The soils of this series have moderate soil depth and steep slopes of sub-Himalayan mountain. Due to altitude factor and presence of clouds, the climate is always cool and the influence of sun-rays becomes less on crop growth. During monsoon period, due to heavy preciptation land slides and land slips often occur. In spite of all these adverse factors, in these soils very good quality tea and orange are grown under suitable management practices.

Class IVe: Soils of these category have very severe erosional problems. Only two soil series, viz. Hensla and Sankarpur, with slope 5 to 10 per cent come under this land capability class and subclass. Due to prevailing erosional character of soil, the natural fertility of the soil becomes so low, that no agricultural crops can be grown successfully on these soils. Hence, wherever these soils occur, they are recommended for pasture, orchard or forestry. But due to pressure of population, these soils of marginal land are sometimes cultivated for dry land crops and it has been found that only the antierosional crops can protect these soils from further deterioration.

Class Vs: The soils of this class are not likely to erode out cultivation is not possible due to severe rockiness. These uncultivable rocky patches are scattered mainly in western parts of this state which could not be shown in such small scale map due to their scattered and less extent of occurance. These lands have thin cover of coarse and medium textured soils, which can never be economically cultivated. As such these areas may be put under permanent vegetative cover of suitable and useful grasses or trees.

Class Vw: These areas cannot be made use of due to their waterlogged ormarshy conditions for agricultural crops, but can be used for fishery or for meadows and pastures after some reclamation like drainage improvement, etc. The patches of these lands are scattered mainly in eastern and southern parts of the state which could not be shown in such small scale maps.

Class VIe: One soil series, viz. Sankarpur, with slope 10 to 15 per cent, come under this land capability class and subclass. The soils under this class of land come under steep slope and occurs in the western undulating tract of this state. This is a shallow depth loamy skeletal soil previously used for grazing purpose, but due to excessive grazing at present soil erosion and land degradation occur very extensively.

However, this type of land under forestry is fafe, wherever illegal felling of trees are not done.

Class VIIes: Only one soil series, viz., Amra, with slope gradient ranging from 15 to 50 per cent having very shallow to shallow soil depth come under this land capability class and subclass. The soils of this series are loamy skeletal and occur on moderately steep hill slopes and escarpment having different degrees of stoniness and rockiness. These lands are neither suitable for agriculture nor for pasture and orchard. Hence, these lands are placed under forest. But due to illegal felling of trees, the density and quality of forest growth is too poor to protect soil from erosion.

Class VIII: Lands of this type are rarely seen in West Bengal excepting in a very few patches, which could not be shown in such small scale map. These have very severe soil erosion or Wetness limitation that preclude their use for plant production and restrict their use to wild life habitat, recreation or water supply.