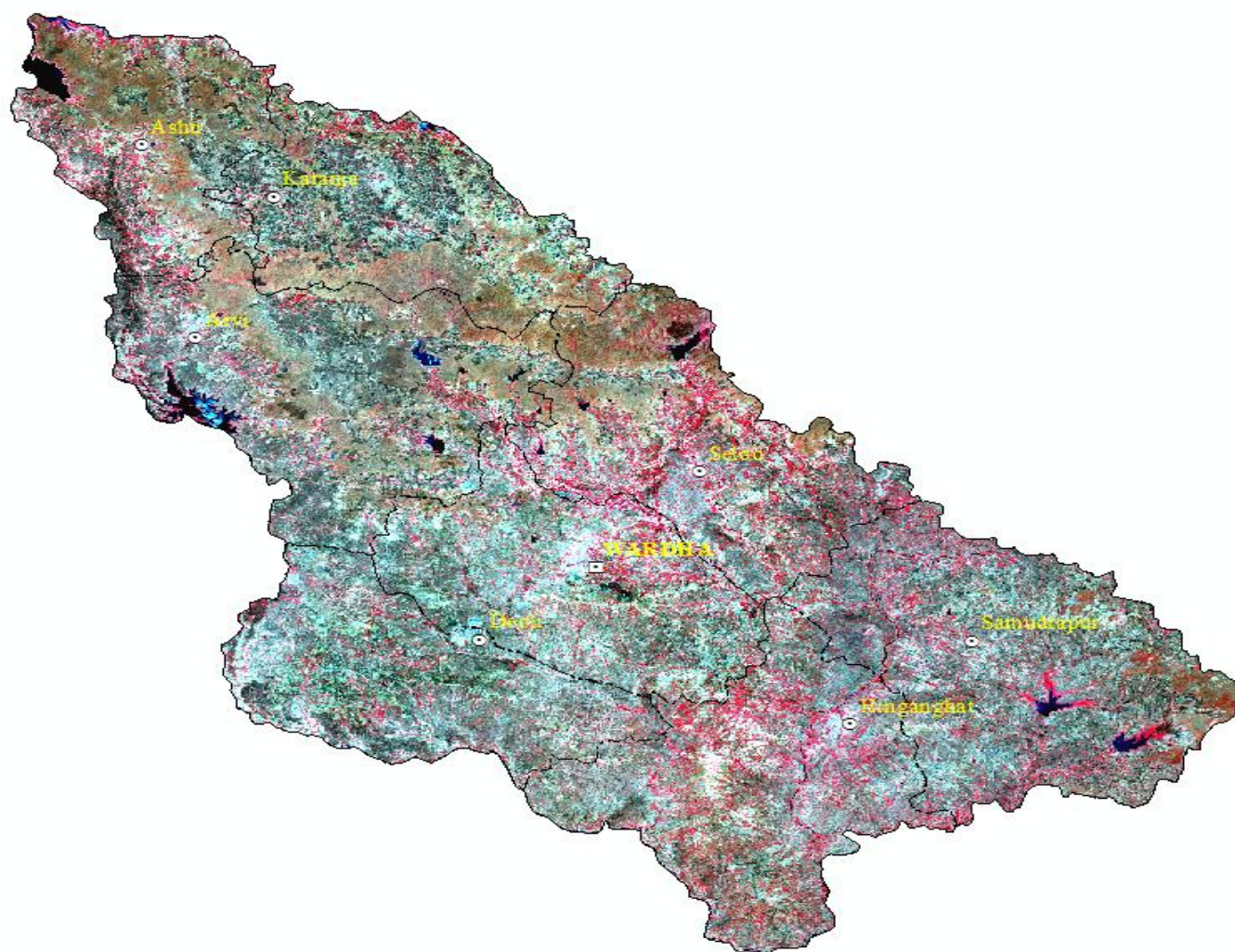


# RECONNAISSANCE SOIL SURVEY MAPPING, CORRELATION & CLASSIFICATION OF WARDHA DISTRICT (MAHARASHTRA)



National Bureau of Soil Survey & Land Use Planning

(Indian Council of Agricultural Research)

Nagpur - 440 033, Maharashtra, India



## FOREWORD

The growing demand for food under the constraint of land resources leads to a situation to grow more and more food per unit area but with a caution of little or no harm to a soil system. To achieve this objective, there is a necessity to study in depth the soils, climate and their characteristics in relation to the use and management. Towards this endeavor, the inventorisation of "Reconnaissance Soil Survey, Mapping, Correlation and Classification of Wardha district, Maharashtra" was attempted. It is an unique exercise in proposing district level scientific land use plan.

The soil resource data base was assessed and evaluated and brought out in a bulletin form. It provides concise information the general information of the district, extent and distribution of soils and their interpretations.

I appreciate the attempt made by Dr. J.P. Sharma, Principal, Scientist and Project leader and a team of scientists and technical officials associated in data generation and preparation of this excellent publication under the able guidance of Dr. Deepak Sarkar, Director, NBSS & LUP, Nagpur, for use at the district level planning. I congratulate them for this significant achievement.

This publication is of immense use to researchers, students, planners, policy makers and farmers of the Wardha district. I assume that it will be helpful for understanding of the soils, their constraints and potentials for formulating land use plan in connection with the future strategies and other developmental and farm related programmes towards the optimizing land use for food security in the Wardha district.

(A.K. Singh)

Deputy Director General (NRM)

Indian Council of Agri. Research

New Delhi

**RECONNAISSANCE SOIL SURVEY,  
MAPPING, CORRELATION AND  
CLASSIFICATION  
OF  
WARDHA DISTRICT (Maharashtra) FOR  
LAND USE PLANNING**

NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING (INDIAN COUNCIL OF  
AGRICULTURAL RESEARCH)

REGIONAL CENTRE: NAGPUR-AMRAVATI ROAD, NAGPUR-440 033

### PREFACE

Soil Resource information at district level is a vital input for developmental planning. The soil inventories conducted at district level (at 1:50,000 scale) provides, the information on soilsclimate and land use in the district. Additionally, the problems and potentials of each parcel of land unit are also discretely described during the course of resource inventory for their use and management.

National Bureau of Soil Survey and Land Use Planning being a nodal institute under Indian Council of Agricultural Research, has been fulfilling its mandate through generation of soil information at village/watershed, district, state and national levels by adopting specific methodologies at each level. It has been a guiding force in implementing the land use based on the soil information at different levels.

As apart of this mandate, the generation of soil information of Wardha district has been taken up at 1:50,000 scale. The resource information generated through this inventory has been compiled and interpreted in this publication entitled “Reconnaissance Soil Survey, Mapping, and Correlation and Classification of Wardha district, Maharashtra”. The publication covers General information, methodology, the soils and their characters, soil interpretations for land use planning, food security scenarios. This publication provides lucid illustrative information on the soil resources, water resources, their characters, problems, potentials, and their suitability for agricultural and non-agricultural purposes. This publication also attempts to assess the food security in the district at present and in future based on the relevant biophysical, socio-economic indicators. Hence, the information provided in this publication will be of immense use for researchers, students, planners, policy makers and overall to the farming community in the district.

I congratulate Dr. J.P. Sharma, Principal Scientist and Project Leader and a team of associated scientists/technical and other officials of the Bureau, for their excellent attempt in bringing out this publication for the benefit of the user agencies and other allied organizations who are involved in district planning concerning to Agriculture.

Director



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## ACKNOWLEDGEMENTS

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- Shri S.M. Pathak, Mrs. Vaishali Arbat and Shri M.M. Khan, Personal Assistant for typing and word processing the manuscript.
- Dr. P. Chandan, Sr. Scientist and Incharge Technical Cell, Dr. A.P. Nagar and Shri S.S. Nimkhedkar for providing technical support.

## CONTENTS

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<b>META DATA.....</b>	<b>5</b>
<b>1. EXECUTIVE SUMMARY .....</b>	<b>6</b>
1.1 ETYMOLOGY .....	7
1.2 ADMINISTRATIVE FORMATION.....	7
1.3 BOUNDARIES.....	7
1.4 GEOGRAPHICAL DELINEATION.....	7
1.5 RELIEF .....	9
1.5.1 Hills.....	9
1.5.2 Talegaon-Karanja plateau .....	11
1.5.3 Geological correlations .....	11
1.5.4 Southern plain lands.....	11
1.5.4 The Arvi Plains .....	11
1.6 RIVERS .....	11
1.6.1 Wardha.....	11
1.6.2 Wunna.....	13
1.6.3 Pothra .....	13
1.6.4 Bor.....	13
1.6.5 Dham.....	13
1.6.6 Asoda .....	13
1.6.7 Bakli .....	13
1.6.8 Kar.....	13
1.7 PHYSIOGRAPHIC REGIONS .....	13
1.7.1 Talegaon-Karanja Plateau .....	14
1.7.2 Arvi Lowlands .....	14
1.7.3 Wardha - Hinganghat Plains .....	15
1.8 GEOLOGY .....	15
1.8.1 Infra-trappeans (Lametas) .....	15
1.8.2 Deccan traps.....	15
1.8.4 Laterite .....	16
1.8.5 Alluvium .....	16
1.8.6 Groundwater .....	16
1.9 CLIMATE.....	16
1.9.1 Seasons.....	16
1.9.2 Rainfall.....	16
1.9.3 Temperature .....	18
1.9.4 Humidity .....	18

1.9.5 Cloudiness.....	18
1.9.6 Winds .....	18
1.10 FOREST.....	22
<b>2. METHODOLOGY .....</b>	<b>24</b>
2.1 Reconnaissance Soil Survey .....	24
2.2. Soil Series .....	24
2.3. Designing Mapping Units .....	25
2.5. Soil Map.....	25
2.6. Laboratory Analysis.....	25
<b>3. BRIEF DESCRIPTION OF SOILS .....</b>	<b>26</b>
<b>4. SOIL SURVEY INTERPRETATION.....</b>	<b>44</b>
4.1 Land Capability Classification:.....	44
4.2 Land irrigability classification: .....	47
4.3 Soil Site Suitability Classification: .....	47
4.4 Conclusions.....	51
<b>REFERENCES .....</b>	<b>51</b>

## LIST OF TABLES

---

Table.1 Number of rainy days and total rainfall in wardha district .....	19
Table.2 Normal & extreme of rainfall in wardha district .....	20
Table.3 Maximum and minimum monthly temperature at selected centres in wardha district .....	21
Table.4 forest area in wardha district.....	23
Table.5 Description, extent and taxonomy of soil mapping units.....	41
Table.6 Land Capability Classification: .....	45
Table.7 Land irrigability classification: .....	47
Table.8 Land Use Units: .....	47

## LIST OF FIGURES

---

Fig. 1: Location Map .....	13
Fig. 2: Relief Map .....	15
Fig. 3: Drainage .....	17
Fig. 4: Rainfall Map .....	22
Fig. 5: Soil Series Association .....	32
Fig. 6: Slope .....	36
Fig. 7: Surface Form .....	37
Fig. 8: Parent Metirials .....	38
Fig. 9: Soil Depth .....	39
Fig. 10: Surface Drainage .....	40
Fig. 11: Surface Texture .....	41
Fig. 12: Erosion .....	42
Fig. 13: Particle Size Class .....	43
Fig. 14: Soil Reaction (pH) .....	44
Fig. 15: Soil Taxonomy .....	45
Fig. 16: Land Capability .....	51
Fig. 17: Land Irrigability .....	53
Fig. 18: Suitabilty for Diffrent Crops .....	54
Fig. 19: Land Use/Land Cover .....	55





### Meta Data for Wardha District, Maharashtra

Sr.No.	Elements	Scheme	Value
1.	Identification Information	Name of the Dataset	RECONNAISSANCE SOIL SURVEY, MAPPING, CORRELATION AND CLASSIFICATION OF WARDHA DISTRICT (Maharashtra) FOR LAND USE PLANNING
		Contents	Soil Survey Reports, Maps and Imagery
		Keywords	Soil Survey Report
		Report/Map Language	English
		Map Scale	1:50000
		Survey Year	-
		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
2.	Contact Information	Use Constraints	Permission Required
		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
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		Contact Fax	+91- 712- 2500534
		Contact Email	director@nbsslup.ernet.in
3.	Spatial Domain	Bound Left	78°30' E
		Bound Right	79°15' E
		Bound Top	21°21' N
		Bound Bottom	20°15' N
		Area/Coverage	
		Projection	UTM
		Datum	WGS 1984
		Unit	Meter
4.	Citation	Administrative Location	State: Maharashtra, District: Wardha
		Data Prepared By	NBSS & LUP, Nagpur (Regional Centre)
		Associated Project	J.P. Sharma
		Associated Value- additions	-
		Associated Publications	-
5.	Storage	Coordinator Value- added Publication	-
		Data Format	PDF/GeoPDF
		Data File Size	
		Data Physical Location	\\GIST6\D:\GeoPDF Mapping Project _2013\Wardha
6.	Quicklook	Download Location	-
		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
		Spatial Resolution	30 m
		Image Downloaded From	<a href="http://earthexplorer.usgs.gov/">http://earthexplorer.usgs.gov/</a>
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## EXECUTIVE SUMMARY

The soil resource inventory in Wardha district involves the assessment of soil morphological features that can be readily interpreted for management requirements. The total geographical area is 628900 hectares covering 16 toposheets on 1:50000 scale. A reconnaissance soil survey in Wardha district (20°15' N and 21°21' N latitudes and 78°30' E and 79°15' E) was conducted on 1:50000 scale with two objectives:

(i) To generate soil map on 1:50000 scale and

(ii) To evaluate soil mapping units for land use plan. The analytical free survey approach was used to separate landscapes into natural soil bodies and then characterize the resulting units by sampling. Six land forms were delineated viz. Plateaus, Eroded hills, Valleys, Gently sloping plains, dissected flood plains and table lands. Thirty eight soil series were identified and used for deriving soil map consisting of thirty three mapping units. These soil mapping units defined in terms of soil series associations.

The arability and irrigability analyses showed that 66 per cent of area is arable and also suitable for irrigation with a limitations of erosion, soil depth, texture and permeability. The non-arable lands covering an area of 34 per cent was evaluated for its suitability to forestry and wildlife conservation. The soil site suitability analyses for arable land consisting of 23 units showed that 24% of land is suitable for cereals in combination with cotton and sugarcane. The land resource inventory in the district had clearly brought out the allocation of land based on soil - site information for different categories of land use to enhance productivity of local crops. This data base is useful for exchanging soil management information among closely related soils for technology transfer by analogy. The thematic maps related to land use is helpful for designing land related schemes for crop oriented programmes and agro-forestry development at local level.

## 1.

**GENERAL DESCRIPTION**

---

**1.1 ETYMOLOGY**

The district 'Wardha' takes its name of the river that encompasses it on three sides. The name 'Wardha' according to local interpretations is a corruption of 'Varaha' or the boar incarnation of Lord Vishnu, as it is believed that the river rises from the mouth of the boar at the invocation of a saint. It is also considered that the name is 'Varda' the giver of boons while according to General Cunningham, it is Wardha or Wartha, the river of the banyan trees, as the entire valley is lined beautifully by rows of banyan (*wad*) trees.

**1.2 ADMINISTRATIVE FORMATION**

The area constituting the Wardha district formed a part of the district till 1862, when it was made a separate district under the plea that Nagpur, as it was then, was too large a district for efficient administration and that the interests of the cotton market and industry of the area demanded direct and special supervision. When the district was formed in 1862, the administrative headquarters was first located at Kaotha village near Pulgaon but, in 1866, it was removed to its present location when the town of 'Wardha' was built on the site occupied by the hamlet Palakwadi. With the re-organization of states in 1956 the district was transferred from Madhya Pradesh to erstwhile Bombay state. The district forms a part of Maharashtra state since 1<sup>st</sup> May, 1960.

The smallest amongst the district of the State of Maharashtra, with 2.06 per cent of the area of the state, the district was divided for purposes of administration into three tehsils, the Arvi tehsil in the north, the Wardha tehsil in the middle and the Hinganghat tehsil in the south.

Later on, the district was reorganized into 8 tehsils or development blocks viz. Ashthi, Karanja, Arvi, Selu, Wardha, Deoli, Hinganghat and Samudrapur. These were further divided into 15 revenue circles which in turn are divided into groups of villages called 'Patwari Halkas'. Thus village formed the lowest unit in the administrative set up. There are 1015 villages in the district.

**1.3 BOUNDARIES**

The district lies between 20°15' N and 21°21' N latitudes and 78°30' E and 79°15' E longitudes (Fig. 1). It is bounded on the west and north by the Amravati district, on the south by Yavatmal district, on the southeast by Chandrapur district and on the east by Nagpur district. The maximum length of the district is 125 km and its breadth at the southern extremities is about 58 km

**1.4 GEOGRAPHICAL DELINEATION**

The river Wardha forms its northern boundary from its point of confluence with one of its left bank tributaries, the Kar river, just a kilometer east of the village Salora in the extreme northeast of the district. The river flows westwards from this confluence forming boundary between Amravati district that lies to its north and Wardha district to its south for about 26 km till its confluence with a right bank tributary, the Maru river. Then, the river turns sharply southwards once again forming a boundary between Amravati and Wardha. Just north of the village Aпти, along the river and about 8 km southwest of Pulgaon Township is the trijunction between the three districts of Amravati, Yavatmal and Wardha. Thereafter, the river continues to flow south forming boundary between Yavatmal and Wardha till its confluence on its right bank with the Bemble *nadi*. Then, the river turns east and flows for about 35 km before turning southeastward near the village Ajni in the Wardha tehsil. The confluence of the Wunna river on its left bank forms the trijunction in the southeast between Yavatmal, Chandrapur and Wardha districts. Thus, the district is enclosed by the Wardha river on its northern, western and southern sides.

# LOCATION MAP

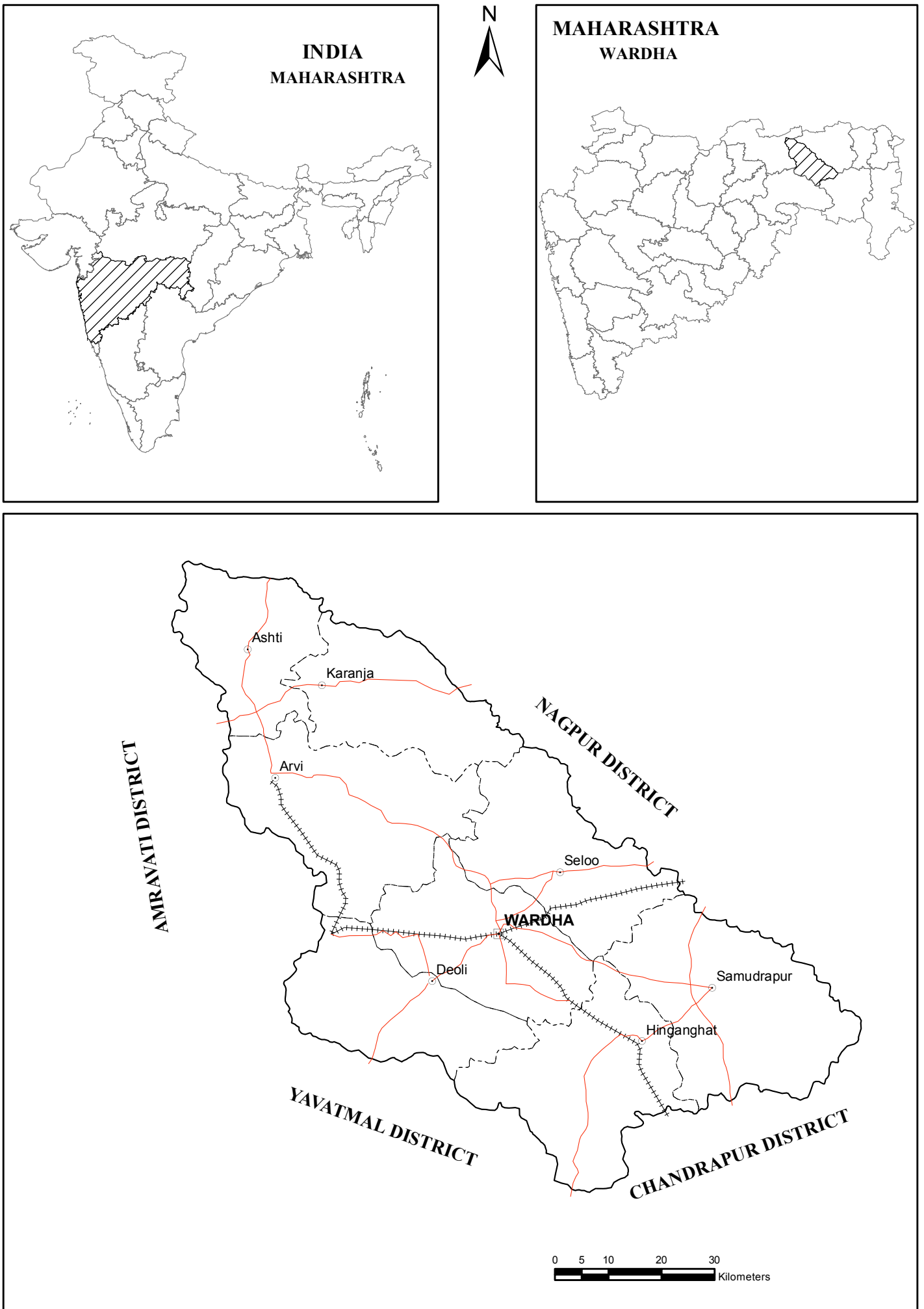


Fig. 1: Location Map

From the southern trijunction, the boundary between the district and Chandrapur runs upstream of the Wunna river till its confluence on its left bank with the Pothra *nadi*. From this confluence, the boundary follows the Pothra *nadi* for about a kilometer, deviates eastward and runs just West of the market centre of Nagri in Chanda and joins once again the Pothra *nadi* to follow its eastward for about 17 km till the Pothra village. Here, the boundary turns east, runs for about 5 kilometer again joins the Pothra *nadi*, follows it northward for about 3 kilometers and then turns east to run through an upland terrain along the crest of a low ridge and a feeble watershed about 270 m to 300 m high. This constant shift of the boundary from and to the Pothra *nadi* every few kilometers is probable due to shifts in the channels position during abnormal floods. After reaching high ground and running for about 20 km, the boundary turns north and then northwest once again following jungle-clad high ground and a watershed that rises in elevation steadily northward. The boundary line cut across the Wunna river and the Hingangthat Nagpur metal road, 2 to 3 km, southeast of Arvi-Wardha tehsil boundary to continue running northwest through forested hill spurs, cut across Amravati-Nagpur road near the 60 km stone (from Nagpur) and thereafter follows the Kar *nadi* till its confluence with the Wardha.

## 1.5 RELIEF

The entire district falls within the Wardha drainage, it naturally divides itself into two parts, the north and northeast forming a hilly spur projecting south and southeastward from the Satpura, while the southern parts form an undulating plain and broad valley floor dissected by streams and dotted with a few residual hillocks rising from the valley floor. The general slope is southwards and gentle towards the Wardha river in the south, but tends to become steeper in the northern uplands. The southern parts have an average elevation ranging between 300 and 500 meters. (Fig. 2)

The whole of the Arvi tehsil except for the areas that line immediately adjoining the Wardha river in the north and the west is hilly terrain while the edge of a trap lava flow at about 300 m contour level runs along the northern edge of the Wardha tehsil except in the northeast, where in the Malegaon and Manoli reserved forest tracts, higher elevations and a more rugged terrain are met with. Almost the entire Wardha tehsil and the complete Hinganghat tehsil are just flat plains.

### 1.5.1 Hills

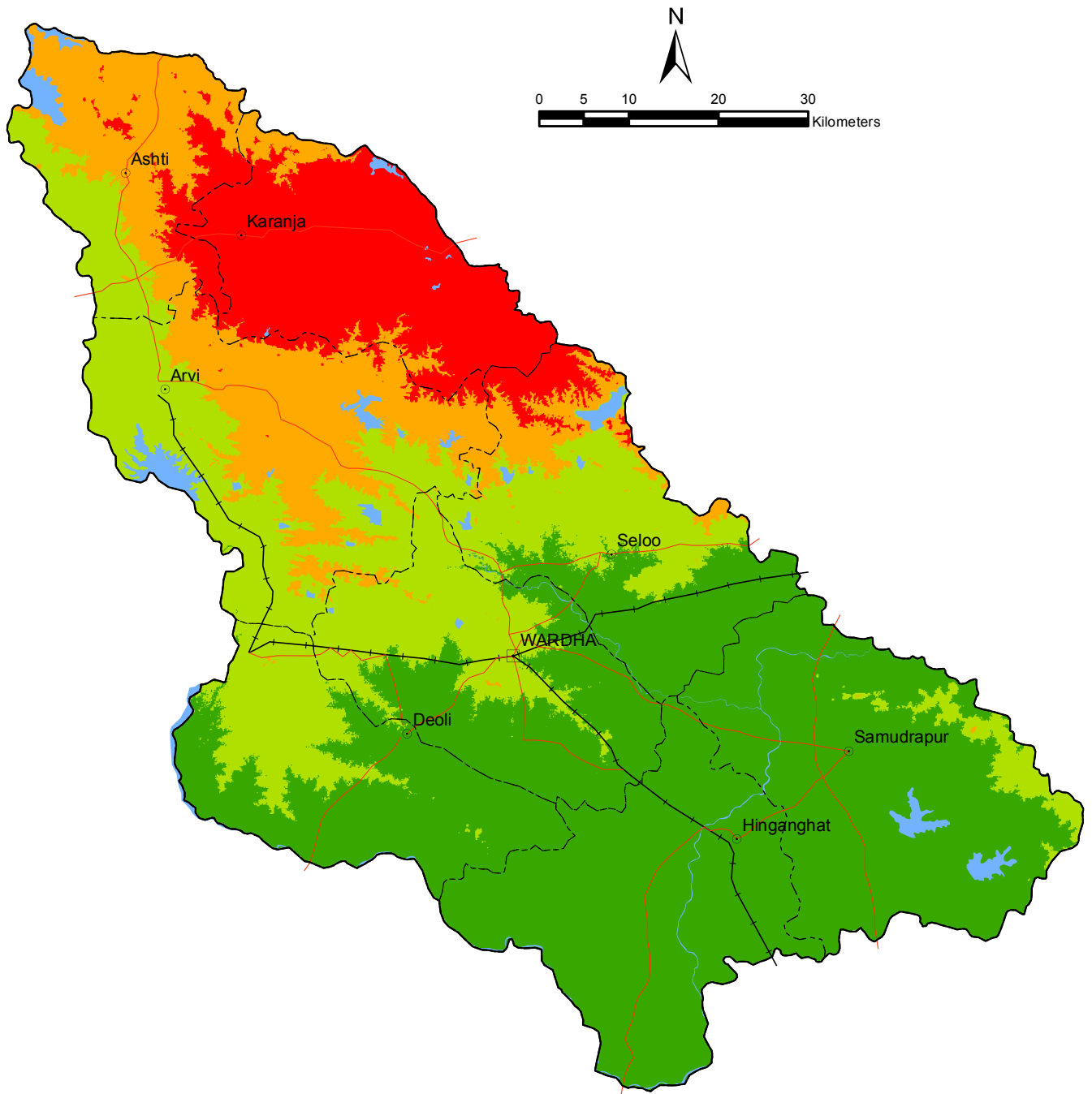
The relief features of the northern uplands are characterized by the residual hill ranges of the Satpuras, enclosing within black soil in-filled valleys. The hill ranges run with a northwest- southwest strike forming an unbroken, rather monotonous landscape that is so typical of the basic trap lava flows that constitute the underlying geology of the region. Flat topped mesas and hills, structural benches with coarse foothill debris slopes, heavily eroded and deeply gullied during the heavy rains of the monsoons repeat all over the area. The entire terrain is rugged and stony, covered by weathered basalt boulders; in the dry hot summers the hills present a desolate appearance with a few shrubs and stunted trees but after the rains, the region is clothed with a beautiful green grazing grounds for large herds of the rural live-stock. In the extreme north on either side of the Amravati- Nagpur road that traverses the area east-west, many of the hill ranges are clothed by fairly dense mixed jungles with valuable teak timber.

The central cluster of hills running southeastward from the 'boat-hook' bend of the Wardha river in a northwest and constituting the main spur from the Satpuras forms a regional watershed carrying over its crest the highest trigonometric points of the district, viz., spot heights of 423 m and 447 m in the Satarpur reserved forest in the northwest, 469 m in Moi reserved forest, 482 m and 536 m in the Dhaga reserved forest in the north-east of Arvi and 533 m and 603 (Garamsur peak) in the Manoli reserved forest in the north of Wardha tehsil. After reaching the highest elevations between 550 and 620 m in the Manoli reserved forest tract, the spur falls in height further southeast to about 370 m in the eastern part of Wardha tehsil.

From the north and east of this watershed, numerous seasonal streams drain into the Wardha while from the southern slopes the valley heads of the Dham, the Bor and the Pothra *nadi* drain, lies all above the district in southerly and south easterly directions. On the southern side, the spur falls in height through a succession of ghat terraces escarpments and flat structural benches of the hard trap and softer intertrappeans. The length of the entire hill tract is 80 km from northwest to southeast and its greatest width is 35 km. The hilly tract covers about a

# WARDHA

## Relief



### Legend

Elevation above MSL (m)



### References

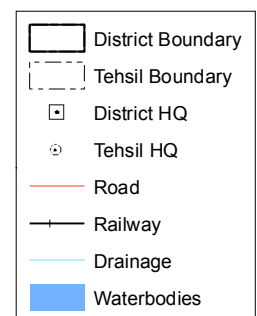


Fig. 2: Relief Map



one fourth of the total area of the district. The only flat land in this upland region is the high level plateau formed north of the crest of the main spur bounded by wooded scarp and cliff slopes.

### 1.5.2 Talegaon-Karanja plateau

The water parting that runs west to east forms the southern rim of a plateau that slopes gently and drains to the north. This plateau, not much dissected, forms part of a larger plateau that extends much farther east in the western parts of the Nagpur district. It is locally recognized as the Talegaon-Karanja plateau after the names of the dominant settlements over it.

### 1.5.3 Geological correlations

The southern rims of the hilly upland region more or less coincide with the limits of the higher level lava flows that essentially comprise the more resistant compact basalt, however, is well jointed. The plains to the south are underlined by softer vesicular basalts, with the vesicles filled in with secondary accretions like zeolite. These formations have been denuded to from lowlands. However, the transition zone from the hilly upland to the riverine plains is dotted with a number of isolated knolls and hills that rise slightly above the valley floor and constitute residual remnants of the more resistant basaltic outliers of the northern area.

### 1.5.4 Southern plain lands

The Mumbai-Nagpur railway track more or less skirts the high ground that lies to its north and divides it from the plains to its south. The rest of the southern parts of the district forms a gently southward sloping fertile plain. It is only along the east, in the eastern parts of Hinganghat tehsil, that the country becomes somewhat undulating and rises to 380 m near Girar. Here, the ground is strewn with zeolites derived from the softer amygdular traps lying underneath. The hillsides are barren and stony while the wide open plains are covered with first and second grade regur varying in thickness between 0.5 to 3 m and intermixed with the fossil ferrous intertrappean limestones.

### 1.5.4 The Arvi Plains

The Arvi plains are narrow and wedged between the Wardha river and hilly Arvi. These plains are flat, gently sloping, slightly eroded and highly productive belt of Cotton. These plains are combined to the elevation below 220 m above MSL.

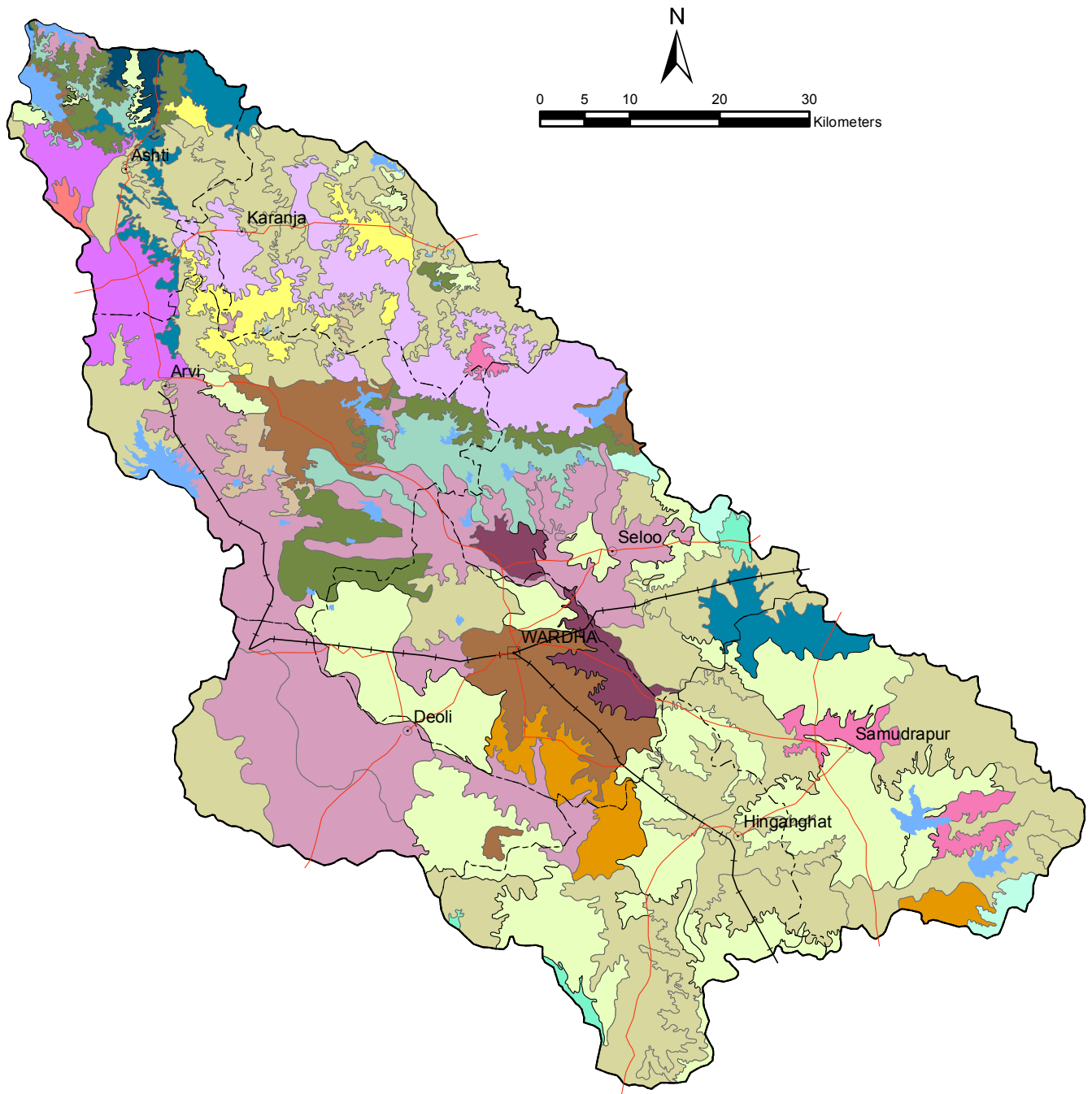
## 1.6 RIVERS

The main rivers of the Wardha the Wunna and other seasonal rivulets as described below.

### 1.6.1 Wardha

The Wardha, rising on the Multai plateau of the Satpuras, flows through the western parts of Nagpur district and enters the district just a kilometer east of the Salora. It runs all along the northern, western and southern boundaries of the district before leaving the district to enter into the district of Chandrapur. The bed of the river is mostly rocky in the Arvi tehsil. The river becomes pools of stagnant water, easily fordable during the dry summer but during the rains turns into a furious torrent. At Pulgaon, the railway crosses it on an iron bridge constructed of 19.5 m (sixty- four feet) girders. The sharp and almost rectangular sweeping bends by which the rivers turn at every bend is strongly suggestive of structural control, delineated by the master-joints of the bedrock which run in north south, east west and northeast-southeast directions. The barbed wire pattern and boathook bends apart from the nature of affluence of streams in the upstream direction by some of the tributaries and the lateral shifting to the west of the aggraded river in the western parts of Arvi tehsil are all indicative of river piracy and a drainage pattern, probably following the Purna valley rift and tilt. (Fig. 3)

# WARDHA Soil Drainage



## Legend

Excessive	Well-Mod well-Imperfect-Poor
Excessive-Mod well	Imperfect-Poor-Mod well
Well-Excessive	Imperfect-Poor-Somewhat excessive-Mod well
Well	Somewhat excessive
Well-Mod well	Somewhat excessive-Mod well
Mod well	Well-Rock out crop
Mod well-Well	Rock out crop-Well-Excessive
Mod well-Well-Excessive	Rock out crop-Mod well-Well
Mod well-Imperfect-Poor	Well-Somewhat excessive-Rock out crop

## References

⊙	Tehsil HQ
⊠	District HQ
---	Tehsil Boundary
---	District Boundary
—	Road
—+—	Railway
—	Drainage
■	Waterbodies

### 1.6.2 Wunna

The Wunna is the main tributary of the Wardha running longitudinally through the eastern parts of the district and forming a boundary between the districts of Wardha and Chanda for a short distance before emptying its waters into the Wardha near the village Savangi at the district trijunction. The Wunna rises near the Mahadgad hills in Nagpur district and enters the Wardha district about 3 km southeast of Sindi railway station to flow south through the western parts of Hinganghat tehsil and passes beside the township of Hinganghat. The Wardha-Chandrapur railway track passes over it by a bridge just west of this town.

### 1.6.3 Pothra

The Pothra *nadi* is the largest of the left bank affluents of the Wunna, rising in the Girar hills and draining the eastern parts of the Hinganghat tehsil. It forms partly the boundary before entering the Wunna about 4 km northeast of the village, Shaikhapur.

### 1.6.4 Bor

The Bor *nadi* rises in the hills near Bazargaon in Nagpur district and rushes down a winding, rocky chann southwards, developing a narrow steep-sided valley in its upper reaches. The river is joined by the Dham on its right bank near the village, Saongi in Hinganghat tehsil and just 3 km downstream of this confluence enters the Wunna on the right bank of the latter near Mandgaon village.

An earthen dam has been constructed across this river near the village Bor in Wardha tehsil, about 5 km upstream of Hingani, at a spot where the river debouches from the upland edge developing a wide alluvial apron. It irrigates 13354.638 hectares (33,000 acres).

### 1.6.5 Dham

The Dham river rises in the southern slopes of the central water parting of the district in the Dhaga reserved forest area and has a southeastward flow before joining the Bor river.

### 1.6.6 Asoda

The Asoda *nadi* rises in the north western slopes of the trap flow in Wardha tehsil and flows southeast and then east turning near the village Alipur in Hinganghat tehsil to finally join the Wardha near the village Nimsada.

### 1.6.7 Bakli

The Bakli *nadi* rises in the hills around Ashti in Arvi tehsil and has a sub parallel drainage to the Wardha along its left bank and enters the Wardha just west of Pargothan railway station on the Pulgaon-Arvi rail link. It has a left bank tributary, the Chhoda *nadi* which also has a similar drainage pattern.

### 1.6.8 Kar

The Kar *nadi* rises in the Kondhali plateau and runs northwest through a steep sided narrow winding rocky channel forming the boundary between Nagpur and Wardha district, before joining the Wardha river on its left bank where the latter river just enters the district. The river valley in many places is bound by high rocky and cliffy banks rising to about 50 m or more and supports an isolated village or two on narrow alluvial flats on the inner at the foot of the intertwining spurs.

## 1.7 PHYSIOGRAPHIC REGIONS

The district has three Physiographic regions viz:

- (i) The Talegaon-Karanja Plateau
- (ii) Arvi low lands; and
- (iii) The Wardha-Hinganghat plains.

### 1.7.1 Talegaon-Karanja Plateau

The Talegaon-Karanja plateau that slopes and drains to the north, descends to the Wardha Valley. The southward slopes have a series of terraces eluviations visibly recognize viz.: (i) at 500 m (ii) at 400 m and (iii) at 300-350 m above m.s.l. These steps are indicative of different lava flows one above the other and the intervening intratrappean ash beds. These terrace levels are much narrower towards west with steep slope gradients. North, the fall in land level towards the Wardha is much less spectacular, sloping gently to the 400 m contour level from the water parting in the south at about 500 to 600 m levels.

The plateau surface is slightly dissected by the Kar *nadi* in severely north dissected rims in the south and the west by seasonal streams.

**Forest:** The main species found in southern and south-western slopes of this plateau are *ber, khair, palas, ain, lendia, saja, devda, moin and karvanda*. A variety of grasses also grow in them, some of which like the 'tikhai' grass are used for extraction of medicinal oils. These forest present a dried up, desolate appearance during the hot weather but beautifully clothed with a greenish carpet of trees soon after the rains.

The northern, northeastern and eastern slopes are, however, covered by mixed teak forests. This difference in vegetation cover with aspect can be partly ascribed to the hot winds that *bijesal, ain, tinsa, bhawada, lendia, mhowa, mowai and black wood*. The flat surfaces are devoid of vegetal cover and rendered barren stpmu wastes.

The valuable forest products are *Tendu* leaves for bidi industry, thatching grasses like *kusal, ghonal, mushan, marvel* and shevel apart from the valuable teak timber. The '*salai*' and '*mowai*' timber provide the necessary softwood for making packing chests for the oranges of the orchards in the plateau, a factor of commercial significance for this economy.

The uneven rugged terrain and the forest lands make these areas ideally suited as pasture grounds for large herds of livestock. Nearly a third of the land of the plateau is used as good pasture land. The 'gaolao' breed of cattle is most common over the area, besides, large stocks of buffaloes. A huge cattle farm has also been established recently at Heti-Heti just south of the Nagpur- Amravati road along the eastern boundary of Arvi tehsil. A number of rural households specialize in the preparation of dairy products, especially butter and ghee that find a wide market in the towns of the district as well as the adjoining districts. Pimpalkhuta on the Arvi-Wardha road is known all over the Vidarbha for its quality butter.

**Crops:** The area under culturable waste is also fairly large over this region. Shifting cultivation in the 'Reserved Forest' areas margins wherever the shallow soils permit tillage is commonly prevalent. More sedentary cultivation is practiced on the plateau top and along stream-sides. *Kharif jowar, tur, mung and sweet potatoes* are raised entirely dependent upon the monsoon showers. However, one area stands out distinctly from the rest of the plateau in the nature of its agrarian economy and crop pattern. The area is the undulating plateau surface around the large market village of Karanja and the economy is market oriented, orange orchard culture. The prosperity of these orange plantations is very well reflected in the larger size of the settlements in the area in comparison to those farther out on the plateau, a fairly large number of market centres and their fairly close spacing about 2 to 2.5 km on an average.

### 1.7.2 Arvi Lowlands

The Arvi lowlands are a narrow, north to south elongated strip, about 70 km long and 6 to 8 km wide on an average, along the western boundary and the adjoining to the Wardha valley. The general elevation is 300 to 350 m, foothills and then more sharply with undulating rolling topography and have by deep, black soils with clay. The entire strip of these lowlands is drained by a series of north to south flowing streams that are the tributaries of the Wardha-Bakli *nadi* and its tributary the Chhodo *nadi*.

**Agriculture:** Cotton covers the largest acreage of the net sown area and is primarily associated with the *morand* soils that lie farther away from the river courses. Adjoining the main river and the tributaries, in the keel of the

valley depressions that are covered by *kali soils*, *kharif jowar* predominates. *Moong*, *turand* *groundnut* are often grown as inter crops with cotton. The varieties of cotton are 170-Co2 and L-l-147. Wheat and gram are grown in *rabi*.

### 1.7.3 Wardha - Hinganghat Plains

The whole of the Hinganghat tehsil and the southern two-thirds of Wardha tehsil together form a fertile riverine plain draining and sloping gently southward the river Wardha. The elevation is about 300 to 350 m level in the north and gradually goes down to 220 m in the south.

In the undulating topography of eastern Hinganghat a number of tanks have been built by erecting embankments at their lower down-slope rims (which is invariably the western or south-western side) to collect and hold the surface run-off in shallow depressions. Some of them are perennial. All of them are used for irrigating *rabi* crops. The most important, among these tanks are those located near Samudrapur, Jamb and Nandori east of Hinganghat.

**Crop pattern:** Over these plains, nearly three-fourth of the land represents the net sown area and about one per cent of the gross cropped area is irrigated, mostly by wells in the west and by tanks in the east.

Cotton is the main in lowlands occupying the first place kharif jowar in case of Wardha lowlands and wheat *rabi*CWP in case of Hinganghat lowlands.

## 1.8 GEOLOGY

The geological formations within the district are arranged in descending order of antiquity as under:

	Formation		Age
•	Infra-trappean (Lametas)	:	Middle Cretaceous
•	Deccan Taps with inter-trappean	:	Upper Cretaceous to Eocene
•	Laterite, Alluvium and Soil	:	Sub-Recent to Recent

### 1.8.1 Infra-trappeans (Lametas)

The Lametas occurring below the traps are called infra-trappeans and laid down under fluvial to estuarine environments to be of Middle Cretaceous age. A prominent horizon of the Infra-trappean is exposed in the Pothra *nala* at Khambad. The red and grey clays, limestones and sandstones, which usually grade into each other. The sandstones are composed of angular to sub-rounded grains of quartz, orthoclase, microcline and plagioclase feldspars cemented together by an aphanitic or crypto crystalline brownish calcareous and ferruginous material. The limestones are composed of crypto crystalline aggregate of carbonates, minor quartz, potash and patches of chert.

Fragmentary fossil remains of mollusca, fishes and dinosaurian reptiles have been reported from other area from rocks of similar age and hence the possibility of coming across similar fossils from this area cannot be ruled out.

### 1.8.2 Deccan traps

This district is covered by Deccan Traps; on the southern boundary of Wardha and Chanda districts almost marks the termination of this extensive rocks and on the east, north and west, it extends beyond the limits of the district. The rocks are basaltic in all seven flows have so far been recognized within a vertical column of about 120 metres from Girar area of Hinganghat Tehsil. The individual flows vary in thickness from 10 to 30 metres. The rocks are well jointed with vertical and inclined joints and sheet joints the traps display spheroidal weathering.

At times, the basalt exhibits a porphyritic texture with the development of large lath shaped crystals of plagioclase feldspar set in a comparatively, fine-grained matrix. The rock is composed of pyroxene (augite), plagioclase feldspar set in a comparatively fine-grained matrix. The rock is composed of pyroxene (augite),

plagioclase feldspar (Labrodorite) and intersitital glass. At places, the glass is devitrified and altered to pale green mineral, palagonite.

### 1.8.4 Laterite

A few small and isolated patches of laterite overlying the traps are seen on plateau tops near Naghari, Dhantoli, Garamsur and Nawargaon in Arvi Tehsil.

### 1.8.5 Alluvium

Four important alluvial tracts covering the following villages are reported from this district.

(1) Pulgaon (20°44': 78°19'), Saongi (20°35': 78°35': 78°16'), Sirpur (20°32': 78°23'), Andori (20°32': 78°29'), Bhidi (20°34': 78°24': 78°24') and Saiod Fakir (20°34': 78°20').

(2) Talegaon (20°31' : 78°30': West of Khamgaon-Pipalgaon and Kolhapur (20°34': 78°28').

(3) Sonegaon (20°41' : 78°26'), Giroli (20°33': 78°35'), Takli(20°26' : 78°40'), Alipur (20°33' : 78°42'), Waigaon (20°38' : 78°36'), Salod (20°42' : 78°33'), Nimgaon (20°43' : 78°29') and Deoli (20°39' : 78°29').

(4) South of Hinganghat near Pipalgaon (20°32': 78°52').

The first two paths occur on the right bank of the Wardha river, the third on the banks of the Asoca nala and the fourth in south of Hinganghat near Pipalgaon. The thickness of alluvium in the Pulgaon area is 18 metres.

### 1.8.6 Groundwater

The joints and fissures present in the massive traps aid movement and percolation of groundwater; but by and large the traps are generally found unsuitable for ground water storage except where there is either a zone of weathered or/and highly vesicular trap or horizon of inter- trappean beds. Generally water is trapped from wells, which yield very limited quantities and most of them are reported to go dry during the summer.

## 1.9 CLIMATE

### 1.9.1 Seasons

The climate is characterized as tropical monsoon season with hot summers and mild winters. The year may be divided into four seasons. The winter is from December to February. The hot season is from March to the middle of June. This is followed by the southwest monsoon season which extends up to the first week of October. The rest of October and November constitute the post monsoon.

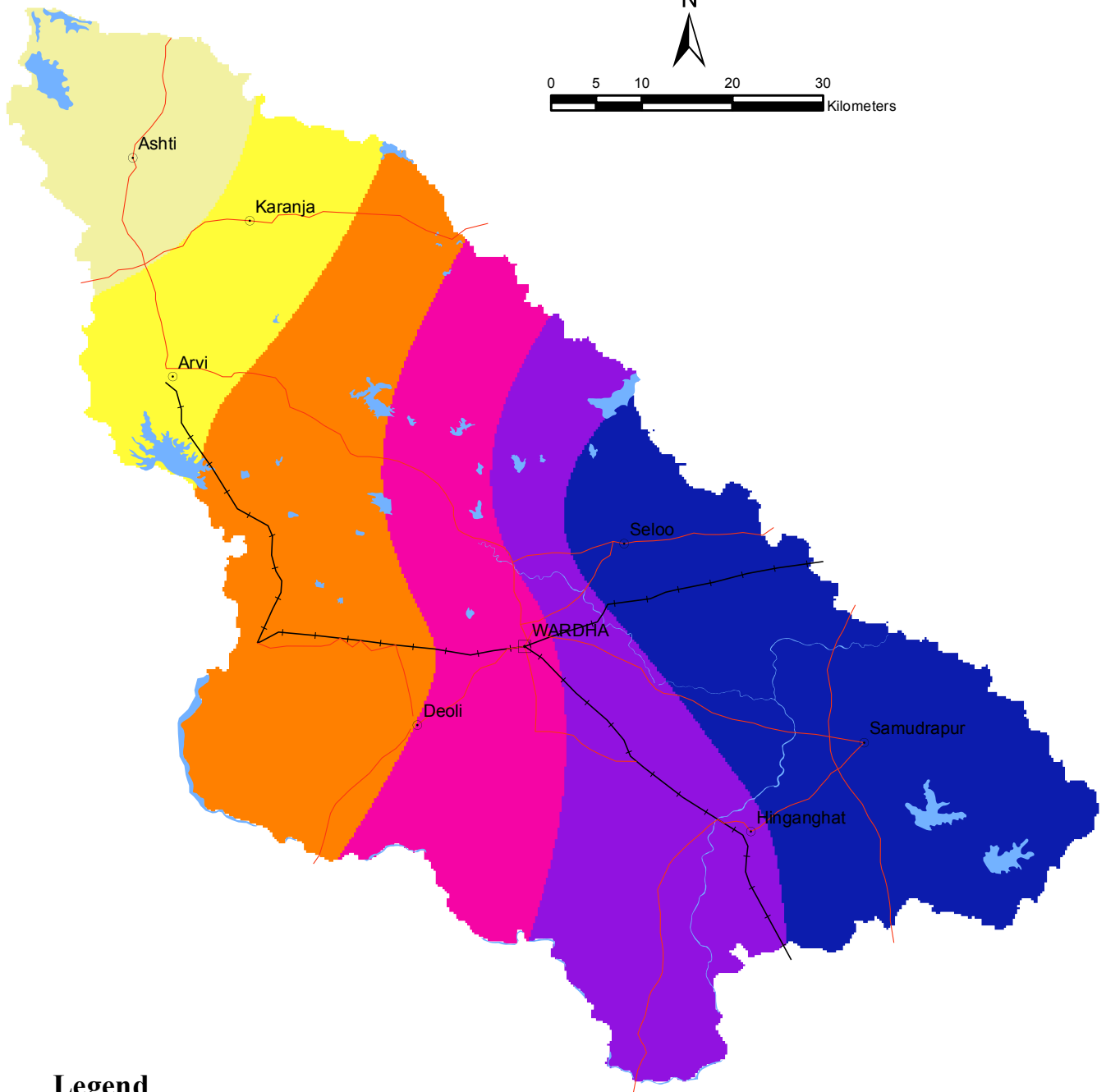
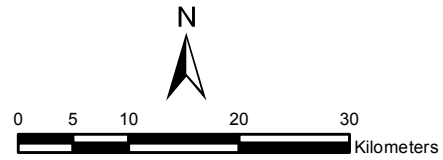
### 1.9.2 Rainfall

The average annual rainfall in the district is 1090.3 mm out of which rainfall during the period from June to September amounts to about 87 per cent (Table 1 & 2, Fig.4). July being the rainiest month. The rainfall generally increases from the west to the east. During the fifty-year period from 1901 to 1950, the highest annual rainfall amounting to 153 per cent of the normal occurred in 1933. The lowest annual rainfall which was only 49 per cent of the normal occurred in 1920 to 1993.



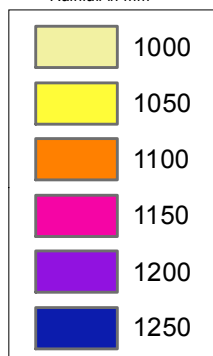
# WARDHA

## Mean Anual Rainfall



### Legend

Rainfall in mm



### References



Fig. 4: Mean Anual Rainfall

### 1.9.3 Temperature

May is the hottest month of the year with the mean daily maximum temperature 42°C (107°F) and the mean daily minimum of 28°C (82.4°F). The night temperatures, however, decrease progressively after September with the mean daily maximum temperature of 28°C (82.4°F) and the mean daily minimum at about 15°C (59°F). In the wake of western disturbances which move across North India in the cold season, the district is sometimes affected by cold waves and the night temperatures of 5°C (41.0°F, Table 3).

### 1.9.4 Humidity

During the southwest monsoon the relative humidity is 70 per cent whereas, in summer it is 20 per cent in day and 20 per cent in the afternoon.

### 1.9.5 Cloudiness

During the southwest monsoon months the skies are heavily clouded to overcast, but in the rest of the year, the skies are clear.

### 1.9.6 Winds

Winds are generally light to moderate with some force hot season in cold seasons, winds blow between north and east.

**TABLE-1. NUMBER OF RAINY DAYS AND TOTAL RAINFALL IN WARDHA DISTRICT**

Sr. No	1980-81	Wardha			Selu			Samudrapur			Hinganghat		
		Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall
1.	January	12.5	1	9.2	-	-	-	-	-	-	12.2	2	20.8
2.	February	18.8	1	7.2	-	-	-	-	-	-	19.6	1	14.0
3.	March	11.4	-	-	-	-	-	-	-	-	12.2	-	-
4.	April	13.2	1	9.8	-	-	-	-	-	-	12.9	-	-
5.	May	15.7	-	-	-	-	-	-	-	-	15.5	-	-
6.	June	192.3	13	292.6	-	-	-	-	-	-	189.2	15	283.0
7.	July	337.8	12	288.2	-	-	-	-	-	-	381.0	15	250.4
8.	August	281.9	14	436.2	-	-	-	-	-	-	239.5	12	378.8
9.	September	213.4	9	109.8	-	-	-	-	-	-	181.4	7	101.1
10.	October	58.7	-	14.0	-	-	-	-	-	-	48.3	-	-
11.	November	19.8	-	-	-	-	-	-	-	-	2.6	-	-
12.	December	8.9	2	32.6	-	-	-	-	-	-	9.1	2	67.8
	Total	1134.4	54	1199.6	-	-	-	-	-	-	994.7	51.0	1206.0
Sr. No	1980-81	Deoli			Arvi			Karanja			Ashti		
		Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall
1.	January	-	-	-	12.9	2	53.8	-	-	-	-	-	-
2.	February	-	-	-	17.0	1	7.0	-	-	-	-	-	-
3.	March	-	-	-	9.4	-	-	-	-	-	-	-	-
4.	April	-	-	-	9.9	1	4.2	-	-	-	-	-	-
5.	May	-	-	-	12.5	-	-	-	-	-	-	-	-
6.	June	-	-	-	181.4	15	271.0	-	-	-	-	-	-
7.	July	-	-	-	304.8	13	237.0	-	-	-	-	-	-
8.	August	-	-	-	212.3	12	553.2	-	-	-	-	-	-
9.	September	-	-	-	165.3	6	63.3	-	-	-	-	-	-
10.	October	-	-	-	41.4	-	-	-	-	-	-	-	-
11.	November	-	-	-	19.2	-	-	-	-	-	-	-	-
12.	December	-	-	-	8.5	1	16.3	-	-	-	-	-	-
	Total	-	-	-	1141.5	54.0	115.9	-	-	-	-	-	-
Sr. No	1997-98	Wardha			Selu			Samudrapur			Hinganghat		
		Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall
1.	January	11.8	2	40.0	11.8	1	9.0	10.8	3	70.3	10.8	2	52.9
2.	February	14.5	-	-	14.5	-	-	15.2	-	-	15.2	-	-
3.	March	13.1	-	-	13.1	-	-	14.2	-	-	14.2	-	-
4.	April	13.2	3	15.4	13.2	-	-	13.3	1	7.0	13.3	1	25.2
5.	May	16.6	1	17.8	16.6	7	-	13.1	1	66.4	13.1	3.0	28.0
6.	June	183.9	10	142.6	183.9	1	28.5	183.5	9	111.6	183.5	11	116.3
7.	July	321.0	19	214.0	321.0	15	236.5	360.0	19	231.0	360.0	16	165.5
8.	August	238.2	16	219.5	238.2	15	254.8	254.1	14	283.0	254.1	13	150.5
9.	September	208.5	15	32.5	208.5	12	165.6	196.0	14	94.8	196.0	12	194.7
10.	October	52.6	7	210.6	52.6	6	193.1	46.5	5	130.4	46.5	4	56.7
11.	November	16.1	4	24.4	16.1	3	45.0	16.2	1	1.4	16.2	1	3.7
12.	December	10.3	11	124.6	10.3	9	116.5	9.4	10	99.8	9.4	8	85.0
	Total												

SrNo	1980-81	Deoli			Arvi			Karanja			Ashti		
		Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall	Normal rainfall	No. of rainy days	Rainfall
1.	January	11.8	2	35.6	10.4	1	13.0	10.1	2	7.0	10.1	-	-
2.	February	14.5	-	-	12.6	-	-	12.6	-	-	12.6	-	-
3.	March	-	9.4	-	9.4	-	-	9.4	-	-	9.4	-	-
4.	April	13.2	1	2.0	10.1	-	-	10.1	1	1.6	10.1	*	-
5.	May	16.0	-	-	13.2	-	-	13.2	2	8.4	13.2	-	•
6.	June	183.9	11	163.2	171.6	13	43.6	171.6	10	71.6	171.6	13	43.6
7.	July	321.0	17	157.2	298.1	18	213.2	298.1	20	237.2	298.1	22	409.2
8.	August	238.2	17	202.2	221.0	13	164.0	221.0	14	109.1	221.0	15	162.2
9.	September	208.5	11	120.8	166.0	9	83.2	166.0	8	61.4	166.0	11	99.3
10.	October	52.6	6	138.4	40.2	5	103.1	40.2	4	65.6	40.2	5	123.5
11.	November	16.1	2	24.0	15.7	3	92.6	15.7	2	196.8	15.7	2	94.0
12.	December	10.3	7	85.2	11.2	7	71.7	11.2	9	121.0	11.2	8	114.4
	Total												

TABLE-2. NORMAL &amp; EXTREME OF RAINFALL IN WARDHA DISTRICT

Station	No. of Years of Data	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.	Annual	Highest Annual rainfall As % of normal & year**	Lowest Annual rainfall As % of normal & year**		
Wardha	50 a	12.5	18.8	11.4	13.2	15.7	19.2	33.7	23.9	21.3	58.7	19.8	8.9	1,134.4	142 (1933)	45 (1920)	241.3	1905 Sept., 7
	b	0.9	1.3	1.1	1.2	1.4	9.3	15.1	12.0	10.3	2.8	1.1	0.7	57.2	-	-	-	-
Hingan-ghat	50 a	12.2	19.6	12.2	12.9	15.5	189.2	381.0	239.5	181.4	48.3	20.6	9.1	1,141.5	159 (1933)	45 (1920)	312.9	1913 July, 18
	b	0.8	1.5	3.3	1.1	1.5	9.2	16.0	12.2	9.5	2.7	1.1	0.6	57.5	-	-	-	-
Arvi	50 a	12.9	17.0	9.4	9.9	12.5	181.4	304.8	212.3	165.3	43.4	19.3	8.6	994.8	158 (1931)	53 (1950)	290.8	1927 June, 19
	b	1.0	1.1	0.8	0.7	1.3	8.5	14.3	10.8	9.3	2.4	1.1	0.7	52.0	-	-	-	-
Wardha (Distt.)		12.5	18.5	11.0	12.0	14.6	187.6	341.2	227.9	186.7	49.5	19.9	8.9	1,090.3	153 (1933)	49 (1920)	-	-
		0.9	1.3	1.1	1.0	1.4	9.0	15.1	11.7	9.7	2.6	1.1	0.7	55.6	-	-	-	-

(a) Normal rainfall in mm. (b) Average number of rainy days (days with rain of 2.5 mm or more). \*Based on all available data upto 1959. \*\*Years given in brackets.

**TABLE-3. MAXIMUM AND MINIMUM MONTHLY TEMPERATURE AT SELECTED CENTRES IN WARDHA DISTRICT**

(Temperature in Degree Centigrade)

Sr. No.	1980	Maximum	Minimum
1.	January	32.2	12.2
2.	February	36.4	13.2
3.	March	40.0	15.6
4.	April	43.8	21.0
5.	May	45.0	25.6
6.	June	48.8	21.0
7.	July	33.2	21.4
8.	August	31.6	21.4
9.	September	34.4	21.0
10	October	35.8	21.4
11.	November	31.6	13.8
12.	December	29.6	10.0
	<b>Average</b>	<b>48.8</b>	<b>10.0</b>
	<b>1997</b>		
1.	January	30.5	6.7
2.	February	36.3	8.7
3.	March	39.8	11.7
4.	April	42.0	16.8
5.	May	45.2	20.4
6.	June	42.8	19.0
7.	July	34.0	20.2
8.	August	34.9	20.9
9.	September	34.8 •	18.2
10	October	33.8	17.4
11.	November	31.5	15.2
12.	December	29.6	12.2
	<b>Average</b>	<b>45.2</b>	<b>6.7</b>

## 1.10 FOREST

The district has an area of 342.93 square miles under forest, of which 333.73 square miles are in charge of Forest department and remaining 9.20 square miles in charge of Revenue department. The forest area 14.13 per cent of the total geographical area as against 17.56 per cent for the whole of the state of Maharashtra (Table 4).

Of the forest area in charge of Forest department, 199-78 square miles are occupied by reserved forest. These forest are very valuable, well preserved and well managed. The remaining area comprising protected forest represents the ex-proprietary forest vested in the State.

Most of the forest in the district lie in the northern half of the district in a more or less compact block in the Arvi and Wadha tehsils while the rest is in Hinganghat tehsil. The forest met within the tract are of one main type, namely, the southern tropical dry deciduous forest of the Champion's classification of forest in India. Within this main type considerable local variation occurs depending mainly on rock and soil, topography and past treatment. In Wardha division the forest are mainly borne by the trap zone (so called as the rock is mainly Deccan trap basalt).

These teak forest are of three types.

**(1) Good quality teak Forest** - These are found in parts of Arvi and Hingni range. The common associates of teak in these areas are Dhaora (*Anogeissus latifolia*), Salai (*Boswellia serrata*), Tendu (*Diospyros melanoxylori*) and Ain (*Terminalia tomentosa*). The average quality of crop is Iva/Ivb. The top height usually varies from 35' to 45'. The average density of crop is about 0.7. These forest are capable of producing sound teak trees of about 3' in girth at breast height. Bamboos are practically absent. The under wood and under growth is sparse. Khair (*Acacia catechu*), bor (*Zizyphus jujuba*), Palas (*Butea monosperma*), Jilhili (*Woodfordia fruticosa*) are the main species occurring as underwood and under growth. Tarota (*Cassia forta*), Ban tulsi (*Eranthemum pulchellum*) and Diwali are the main weeds.

**(2) Poor quality teak forest** - These occurs on the major part of the trap zone in Arvi, Karanja and Hingni ranges. The forest are IVth quality, the average top height being 35'. These are capable of producing sound teak trees of T girth at breast height. Teak occurs in high percentage over most of the area and at places it forms pure crop. The common associates are Dhavda (*Anogeissus latifolia*), Lendia (*Lagerstroemia parviflora*), Salai (*Boswellia serrata*), Mawai (*Lannea grandia*), Ain (*Terminalia tomentosa*) etc. The average density of crop is 0.7 in this type of forest there are many under stocke area in which either grass or ban tulasi grows very thick.

**(3) Mixed Forest** - This type is confined only to small area with poorly drained clayey soils. The over wood consists of Ain (*Terminalia tomentosa*), Bel (*Aegle marmelos*), Karam (*Mitragyna parcifolia*), Palas (*Buteafrondosa*), Moha (*Madhuca latifolia*), Beheda (*Terminalia belerica*), etc.

The other commercially important associates found in the forest are:

- (1) Tendu leaves, useful in Bidi industry,
- (2) Kadai or Kulha and Dhavda for gum and
- (3) Small quality of fodder and thatching grasses.

The principal grasses found are Jusal, Ghonal, Mushan, Marwel and Sheda. There are also a number of species which are useful as firewood. Generally, manufacture of charcoal is not undertaken. Falai and Mowai are the soft-wood species which are used for the manufacture of packing cases of orange.



TABLE -4 FOREST AREA IN WARDHA DISTRICT

Sr. No.	District	Total Revenue Forest	Reserved	Protected	Unclassed	Total	Year
1.	Wardha	Total	527.88	330.21	27.80	885.89	1980-81
		Revenue	-	-	27.80	27.80	
		Forest	527.88	330.21	-	858.09	
		Total	527	330	181	1038	1997-98
		Revenue	-	-	28	28	
		Forest	527	330	153	1010	

## 2.

## METHODOLOGY

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### 2.1 Reconnaissance Soil Survey

The Reconnaissance survey procedure includes delineation of land forms using toposheets of Survey of India; geology map and soil survey reports in Madhya Pradesh. The land forms include the elements of local sequences of graded erosional land surfaces with respect to local base level contours. The features of physiographic units are usually due to joint product of deep seated forces and complex set of surface processes acted upon a long period of time. The geopedological approach was applied in legend construction and larger areas rapidly by establishing relation between geomorphology and soils. The geoforms are identified at first and defined at landscape level with further subdivision by identifying relief types. The land form map for reconnaissance soil survey on 1:50000 scale covering twenty one toposheets was generated with the delineation of fourteen land forms in basaltic and granitic landscapes of the district. This land form map was used as base map for ground truth, compilation of soil data for generating soil map and other thematic maps. The boundaries of land units were verified and possibly modified by field investigation. In this approach, the soil surveyor is free to choose sample points to confirm mental model of soil- landscape relationships, draw boundaries and determine mapping unit composition. The soils were identified by traversing representative areas and applying information to like areas. Some additional observations and transects were made for verification. The profiles at intervals of 3 to 6 km or shorter intervals depending upon the soil heterogeneity were studied. The morphological properties of soil profiles were recorded and classified as per USDA soil taxonomy (Soil Survey Staff, 1998).

### 2.2. Soil Series

The lowest category of soil taxonomy and the most basic unit for most of soil mapping projects. This is also regarded as the largest landscape unit about which all features and characteristics relevant to soil formation are distinguished. Soil series is defined as “a group of soils having soil horizons similar in differentiating characteristics and arrangements within the series control section, except for features of the surface soils and have developed on similar parent material under comparable climate and geomorphic environment”. The differentiae for soil series are mainly the same properties used to define classes in higher categories, but have much narrower ranges. Soil series are used mainly for practical purposes. These series were described accurately for comparison of series delineations and interpretations. The methodology for correlation of soil series in the field is done as per memorandum on soil correlation (Shankarnarayana et al. 1984). The grouping of soils to identify soil series is done as per outlines given by Reddy et al. (2006). The modal profiles were selected with the help of profile data by comparing the mean/mode of each morphological properties against the values of each profile. The variation in every property may have a maximum deviation of + or - of five per cent of the value of a given property.

Profiles showing similar horizon characters with in narrowly defined limits are grouped together into “series”. This is important part of correlating the character of the different profiles studied and fixing the classificational units at series level. The series normally the classification units in which the mapping units in reconnaissance soil surveys were named. The mapping units used generally is the soil associations occurring together in a regularly repeating geographic pattern and delineated by a common boundary. The delineation of soil association boundaries in such surveys was made partly by extrapolation.

### 2.3. Designing Mapping Units

The taxonomic classes provide the basic sets of properties to which the soil map units are defined. They provide the three defined sets of soil properties that have been tested for genetic relationship for interpretative value. Taxa provides a firm base for recognizing the components of potential mapped units in an unfamiliar areas. The names of soil taxa along with one or more modifying terms are used to identical soil series in the map units.

The kind of mapping units are complex and associations consisting of two or more dissimilar components occurring in the regular repeating pattern. The full, total amount of inclusion in the mapping unit that of dissimilarity of any of the major components does not exceed above 15%, if limiting and 25%, if not limiting. A number of inclusions reflect purity of map units (Soil Survey Division Staff, 1995).

### 2.5. Soil Map

The soil maps have implicit knowledge of how soil types are related with each other and why certain soils are mapped at certain landscape positions. The knowledge embedded in soil maps is useful to facilitate traditional soil survey updates and for automated soil mapping and certification when soil polypedon boundaries were drawn and implicitly applied multilayer data such as geology, topographic and land use information. The thematic maps were generated through GIS-ArcInfo environment. The cartographic generalizations were made at 1:250,000 scale.

### 2.6. Laboratory Analysis

Air dried soil samples passing through 2 mm size sieve was used for laboratory analysis. The particle size analysis was done as per international pipette method. The chemical analysis where in pH, electrical conductivity, organic carbon, calcium carbonate, exchangeable bases and cation exchange capacity were determined as per standard procedures.

### 3.

## BRIEF DESCRIPTION OF SOILS

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### BRIEF DESCRIPTION OF SOILS

Thirty eight soil series were identified in Wardha district and are correlated with some of the series identified earlier. Brief description is given below but details of series description is given in Appendix 1. Soil series association map of the district is shown in Fig.5

**1. Pardi (Pa) series** is a member of fine, mixed, family of hyperthermic Typic Ustorthents. This soil has brown (10YR4/4), clayey A horizon followed by weathered basaltic Cr horizon. They occur on gently sloping plateaus at an elevation of 450 m above mean sea level. They are under cultivation of soybean.

**2. Yakamba (Yk) series** is a member of fine mixed family of hyperthermic Typic Haplustepts. This soil has dark greyish brown (10YR 4/4), clayey A horizon and very dark greyish brown (10YR 3/2), clayey, cambic B horizon, followed by the weathered basaltic Cr horizon. They occur on very gently sloping plateaus at an elevation of 430 m above mean sea level. They are under cultivation for cotton and pigeon pea.

**3. Pachod (Pc) series** is a member of fine montmorillonitic family of hyperthermic Typic Haplusterts. This soil has very dark greyish brown (10YR 3/2), clayey A horizon and very dark grey (10YR 3/1), clayey, cambic B horizons followed by very dark grey (10YR 3/1), clayey slickensided B horizons. They occur on very gently sloping plateaus at an elevation of 400 m above mean sea level. They are under cultivation of cotton, pigeon pea and gram.

**4. Kinala (ki)series** is a member of loamy, mixed, family of hyperthermic Lithic Ustorthents. This soil has brown (7.5YR4/4), loamy A horizon followed by weathered basaltic horizon of Cr and hard Basalt. They occur on very steeply sloping hills at an elevation of 360 m above mean sea level. They are under mixed forest.

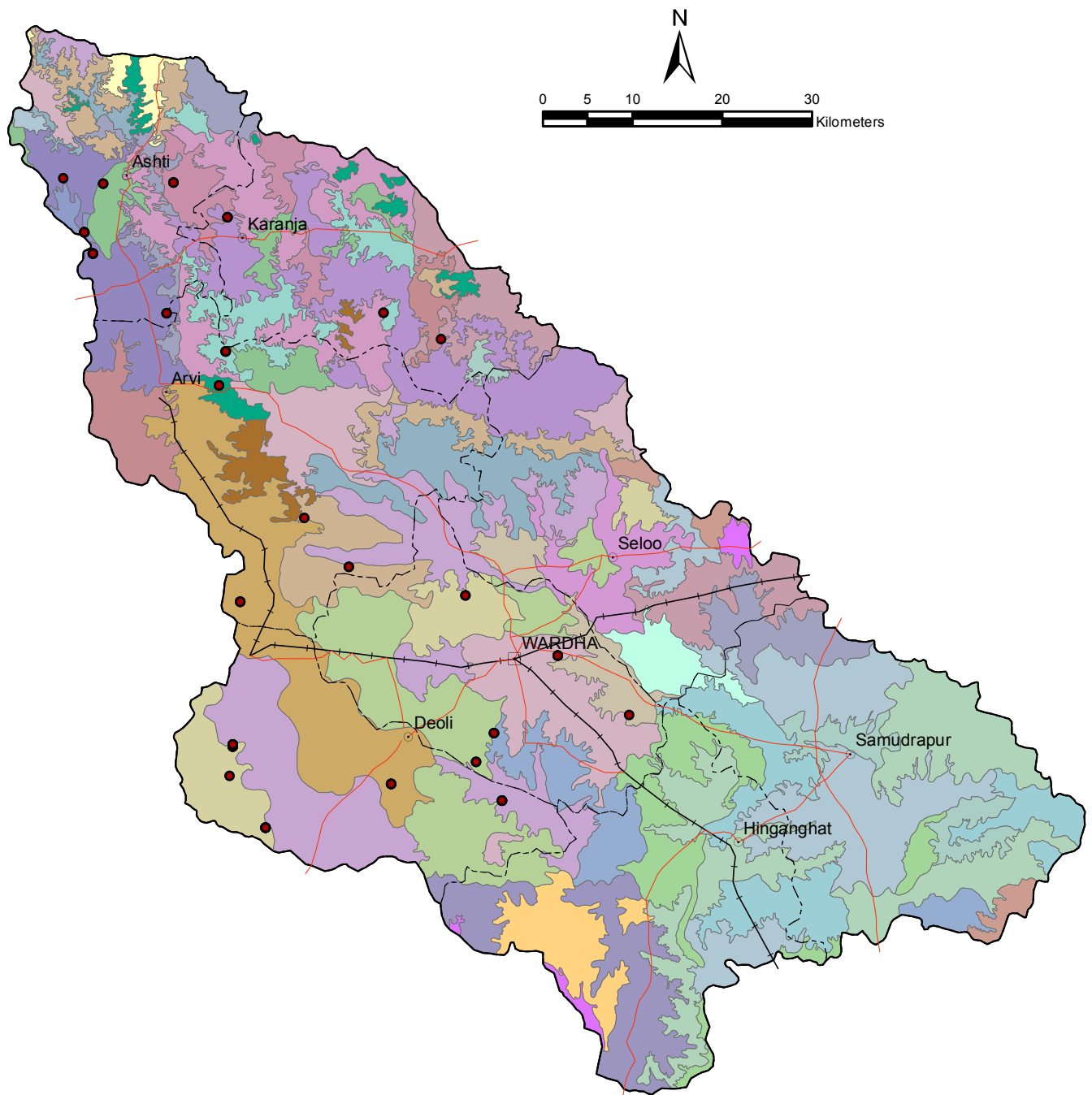
**5. Ashti (As) series** is a member of clayey, skeletal mixed family of hyperthermic Typic Haplustepts. This soil has reddish brown (5YR4/3), clayey A horizon and very dark reddish brown (5YR3/3), gravelly clay, cambic B horizons below which weathered basaltic Cr horizon. They occur on hilly slopes at an elevation of 360 m above mean sea level. They are under bushy forest.

**6. Arvi (Ar) series** is a member of fine mixed calcareous family of hyperthermic Typic Haplustepts. This soil has very dark greyish brown (10YR3/2), clayey A horizon and very dark greyish brown (10YR3/2), clay mixed with fine lime nodules in cambic B horizons below which weathered basaltic Cr horizon. They occur on very gently sloping Padi plains at an elevation of 440 m above mean sea level. They are under cultivation of cotton, pigeon pea, groundnut and wheat.

**7. Chamtla (Cm) series** is a member of fine, mixed, family of hyperthermic Vertic Haplustepts. This soil has dark greyish brown (10YR3/2), clayey A horizon and very dark grey (10YR3/1), clayey, cambic B horizons followed by the weathered basaltic Cr horizon. They occur on very gently sloping plateaus tops of 400 m above mean sea level. They are under cultivation of cotton, pigeon pea and wheat.

**8 Thar (Th) series** is a member of fine, montmorillonitic family of hyperthermic Typic Haplusterts. This soil has very dark greyish brown (10YR3/2), clayey A horizon, very dark grey (10YR3/1), clayey, cambic B horizons and very dark grey (10YR3/1), clay, slicken sided B horizon, they occur on very gently sloping plains at 400 m above mean sea level. They are under cultivation of cotton and pigeon pea.

# WARDHA Soil Series Association



## Legend

Anjangaon-Nijampur-Panthargovda	Mahakali-Sirpur-Karanja
Arvi-Talegaon-Lasanpur	Nagjhari-Pardi-Yakamba
Asti-Wardha-Sewagram	Nijampur-Malatpur-Lasanpur
Bothali-Waigaon-Chanakpur	Panthargovda-Nijampur-Parsodi
Chamla-Thar	Pardi-Pachod-Asti
Hewan-Karla	Parsodi-Madani-Rock outcrop
Hewan-Wadner-Waigaon	Parsodi-Mahakali-Rock outcrop
Hewan-Waigaon-Kinala	Rock outcrop-Nijampur-Parsodi
Hridi-Wadner	Rock outcrop-Parsodi-Lakandevi
Karanja-Wardha-Sewagram	Sewagram-Chamla-Talegaon
Karanji-Kolona-Anjangaon	Sirasaon-Talani-Lasanpur
Karla-Malkapur-Kondhali	Sirpur-Karanja-Sewagram
Karla-Wadner-Hewan	Talegaon-Mahakali-Vagholi
Kinala-Malatpur	Talegaon-Malkapur-Arvi
Kolona-Anjangaon-Nagjhari	Waigaon-Hewan
Kondhali-Hewan-Wadner	Wardha-Sewagram-Vagholi
Mahakali-Malatpur	

## References

	Tehsil Boundary
	District Boundary
	District HQ
	Tehsil HQ
	Profile Site
	Road
	Railway
	Contour
	Drainage
	Watershed



**9. Talegaon (Ta) series** is a member of fine montmorillonitic family of hyperthermic Typic Haplusterts. This soil has dark grey (10YR4/1), clayey A horizon and very dark grey (10YR3/1), clayey, cambic B horizons and very dark grey (10YR3/1) clay slicken sided B horizon. They occur on nearly level to very gently sloping plains at 300-320 m above mean sea level. They are under cultivation of cotton, sorghum, pigeon pea gram and wheat.

**10. Vagholi (Va) series** is a member of fine montmorillonitic family of hyperthermic Chromic Haplusterts. This soil has brown (10YR5/3), clayey A horizon and brown (10YR4/3), clay loamy to dark reddish brown (10YR3/3), sandy clay loamy or clay cambic B horizon. They occur on very gently sloping piedmont plains at 300 to 320 m above mean sea level. They are under cultivation of cotton and pigeon pea and wheat.

**11. Malkapur (Ma) series** is a member of fine montmorillonitic family of hyperthermic Typic Haplusterts. This soil has very dark greyish brown (10YR3/2), clayey A horizon, very dark greyish brown (10YR3/2), clayey, cambic B horizon and very dark greyish brown (10YR3/2), clayey, slickensided B horizon. They occur on very gently sloping piedmont plains at 320 m. They are under cultivation of cotton, pigeon pea and wheat.

**12. Bothali (Bo) series** is a member of fine montmorillonitic family of hyperthermic Typic Haplusterts. This soil has very dark greyish brown (10YR3/2), silty clay, A horizons, very dark greyish brown (10YR3/2) to very dark grey (10YR3/1), clayey cambic B horizon and very dark grey (10YR4/1), clayey, slickensided B horizons. They occur on north Deccan Maharashtra lower plateau at 320 m. and are used for cultivation of cotton and pigeon and pea.

**13. Chanakpur (Cp) series** is a member of loamy, mixed family of hyperthermic Lithic Ustorthents. This soil has very dark greyish brown (10YR3/2), clay loamy, A horizon and very dark greyish brown (10YR3/2), clay loam AC horizon and light grey (10YR 7/2) C horizon. They occur on lower plateaus at 320 m and are used as under pasture land.

**14. Waigaon (Wg) series** is a member of fine, mixed, family of hyperthermic Typic Haplustepts. This soil has very dark greyish brown (10YR3/2), clayey A horizon, very dark greyish brown (10YR3/2), clayey, cambic B horizons very dark greyish brown (10YR3/2), clayey, BC horizon and weathered basaltic Cr horizon. They occur on lower plateau at 320 m and are for Linseed cultivated mostly.

**15. Hewan (Hw) series** is a member of fine montmorillonitic family of hyperthermic Typic Haplusterts. This soil has very dark greyish brown (10YR3/2), clay A horizons very dark greyish brown (10YR3/2), clayey, cambic B horizon and very dark greyish brown (10YR3/2), clayey, slicken sided B horizons. They occur on lower plateau at 320 m and cultivated for cotton and Pigeon Pea.

**16. Karla (Ka) series** is a member of fine, mixed, family of hyperthermic Typic Haplustepts. This soil has very dark greyish brown (10YR3/2), clayey A horizon very dark greyish brown (10YR3/2) to dark brown (10YR3/3), clayey, cambic B horizon and very dark greyish brown (10YR3/2), clayey BC horizon and weathered basaltic Cr horizon. They occur on lower plateau at 320 m and are under cultivated for cotton and Pigeon Pea.

**17. Wadner (Wd) series** is a member of loamy, mixed, family of hyperthermic Lithic Ustorthents. This soil has very dark greyish brown (10YR3/2), clay loam A horizon and very dark greyish brown (10YR3/2), clay loam AC horizons. They occur on upper plateau tops at 720 m and are used for Pigeon Pea cultivation.

**18. Hridi (Hi) series** is a member of clayey skeletal family of hyperthermic Typic Haplustepts. This soil has dark brown (10YR3/3), clayey A horizon, dark brown (10YR4/2), clayey, cambic B horizons and the weathered basaltic Cr horizon. They occur on upper plateau tops at 780 m and are under cultivation of cotton and Pigeon Pea.

**19. Kondhali (Kd) series** is a member of fine, montmorillonitic family of hyperthermic Typic Haplusterts. This soil has very dark greyish brown (10YR3/2), clay A horizons and very dark greyish brown (10YR3/2), clayey,

cambic B horizons, very dark greyish brown (10YR3/2), clayey, slicken sided B horizons very dark greyish brown (10YR3/2), clayey BC horizon. They occur on upper plateaus at 778 m and are used for Cotton and sorghum cultivation.

**20. Lasanpur (La) series** is a member of fine montmorillonitic family of hyperthermic Vertic Haplusterts. The soil has very dark greyish brown (10YR3/2), clay A horizon and very dark greyish brown (10YR3/2), clayey, cambic B horizon with weathered basaltic Cr horizon. They occur on flat valleys at 705 m and are under cultivation of cotton and Pigeon Pea.

**21. Lakhandevi (Ld) series** is a member of fine mixed family of hyperthermic Lithic Haplustepts. This soil has dark brown (7.5YR4/4) clay A horizon, dark greyish brown (10YR4/4), clayey, cambic B horizon with Lithic contact. They occur on moderately sloping land at 390 m. They are mostly under mixed Forest.

**22. Mahakali (Mk) series** is a member of fine, mixed, family of hyperthermic Typic Haplustepts. This soil has dark brown (7.5YR4/4) clay loam A horizon and dark reddish brown (5YR3/2) clayey cambic B horizon with Cr horizon. They occur on moderately sloping land at 390 m and are under mixed Forest.

**23. Parsodi (Pd) series** is a member of fine loamy family of hyperthermic Typic Haplustepts. This soil has dark brown (10YR4/3), sandy clay loam A horizon and dark red (7.5YR3/4), sandy loam cambic B horizon. They occur on flat valleys at 280m above mean sea level. They are mostly under mixed forest but in patches Cotton is cultivated.

**24. Karanji (Ki) series** is a member of fine, mixed, calcareous family of hyperthermic Typic Haplusterts. This soil has dark brown (10YR4/3), clay A horizon, dark brown (10YR3/3), clayey cambic B horizon and dark brown (10YR3/2), clayey, polished slicken sided B horizon. They occur on gently sloping to moderately sloping land at 300 m above mean sea level. They are under cultivation for cotton.

**25. Malatpur (Mp) series** is a member of fine, montmorillonitic, family of hyperthermic Typic Haplusterts. This soil has dark greyish brown (10YR4/2), clay A horizon, very dark greyish brown (10YR3/3), clayey cambic B horizon and very dark greyish brown (10YR3/2), clayey, slickensided B horizon. They occur in valleys at 250 m and are mostly used for cotton.

**26. Sirasgaon (Sg) series** is a member of loamy mixed family of hyperthermic Typic Ustorthents. This soil has dark brown (10YR4/3), clay loam A horizon with weathered basaltic Cr horizon. They occur on gently sloping plateaus at 300 m they are under pasture but in patches of land is used for cotton.

**27. Talani (Tn) series** is a member of loamy mixed family of hyperthermic Typic Ustorthents. This soil has dark brown (10YR5/3), sandy loam A horizons with soft this partially weathered basaltic Cr horizon. They occur on undulating plateau at 300 m and are used mostly as pastures but in patches, cotton and Pigeon Pea is cultivated.

**28. Anjangaon (An) series** is a member of fine, mixed, family of hyperthermic Typic Haplusterts. This soil has brown (10YR4/3), clay A horizon, dark brown (10YR3/3), clayey, cambic, B horizon dark brown (10YR3/3), clayey, slickensided B horizon. They occur on valleys at 240 m. They are mostly under cultivation of cotton and wheat.

**29. Takli (Ti) series** is a member of fine, mixed, family of hyperthermic Typic Haplustepts. This soil has brown (10YR4/3), sandy clay loam A horizons dark brown (10YR3/3), clay, cambic B horizon and dark yellowish brown (10YR3/4), gravely clay BC horizon followed by weathered basaltic Cr horizon. They occur on gently sloping plains at 260m. They are cultivated for cotton and red gram.



**30. Kolona (Kn) series** is a member of fine, mixed, family of hyperthermic Typic Haplustepts. This soil has brown (10YR4/3), sandy clay A horizons, dark brown (10YR3/3), clay, cambic B horizons and weathered basaltic Cr horizon. They occur on gently sloping plains mostly used for cotton.

**31. Nagjhari (Nh) series** is a member of fine, mixed, family of hyperthermic Typic Haplustepts. This soil has brown (10YR4/3), clay A horizon, dark brown (10YR3/3), clay, cambic B horizon weathered basaltic Cr horizon. They occur on gently sloping plains used monthly for wheat and soybean.

**32. Nijampur (Nj) series** is a member of fine, mixed, family of hyperthermic Typic Haplustepts. This soil has brown (10YR4/3), sandy clay A horizon and dark brown (10YR3/3), clay cambic B horizon. They occur on gently sloping plains under the cultivation for wheat and soybean.

**33. Madni (Md) series** is a member of fine, mixed, family of hyperthermic Lithic Ustorthents. This soil has brown (10YR4/3), sandy clay A horizon weathered basaltic Cr horizon. They occur on plateau at 320 m mostly used pasture.

**34. Panthargavda (Pg) series** is a member of fine loamy, mixed, family of hyperthermic Typic Haplustepts. This soil has yellowish brown (10YR5/4), clay loam A horizon and brown (10YR4/3), clay, cambic, B horizons. They occur on undulating plateaus at used for cotton and wheat cultivation.

**35. Wardha (Wa) series** is a member of fine montmorillonitic family of hyperthermic Typic Haplusterts. This soil has dark greyish brown (10YR4/2), clay A horizon, very dark greyish brown (10YR3/2), clay, cambic B horizons and dark greyish brown (10YR3/2), clayey, slickensided B horizons. They occur on lower plateaus mostly used for cotton cultivation.

**36. Sirpur (Si) series** is a member of fine, montmorillonitic, calcareous family of hyperthermic Vertic Haplustepts. This soil has dark greyish brown (10YR3/3), clay A horizon dark brown (10YR3/3), clay, cambic B horizon brown (10YR4/3), B horizon. They occur on lower plateaus, under the cultivation of cotton and pigeon pea.

**37. Sewagram (Sw) series** is a member of fine, mixed, family of hyperthermic Lithic Ustorthents. This soil has yellowish brown (10YR5/3), clay A horizon with weathered basaltic Cr horizon They occur on plateaus under pastures.

**38. Karanja (Kj) series** is a member of fine mixed family of hyperthermic Lithic Ustorthents. This soil has very dark greyish brown (10YR3/2), gravelly loam A horizon and soft weathered basaltic Cr horizon They occur on plateaus covered with mixed teak forest.

### Soil Mapping Units

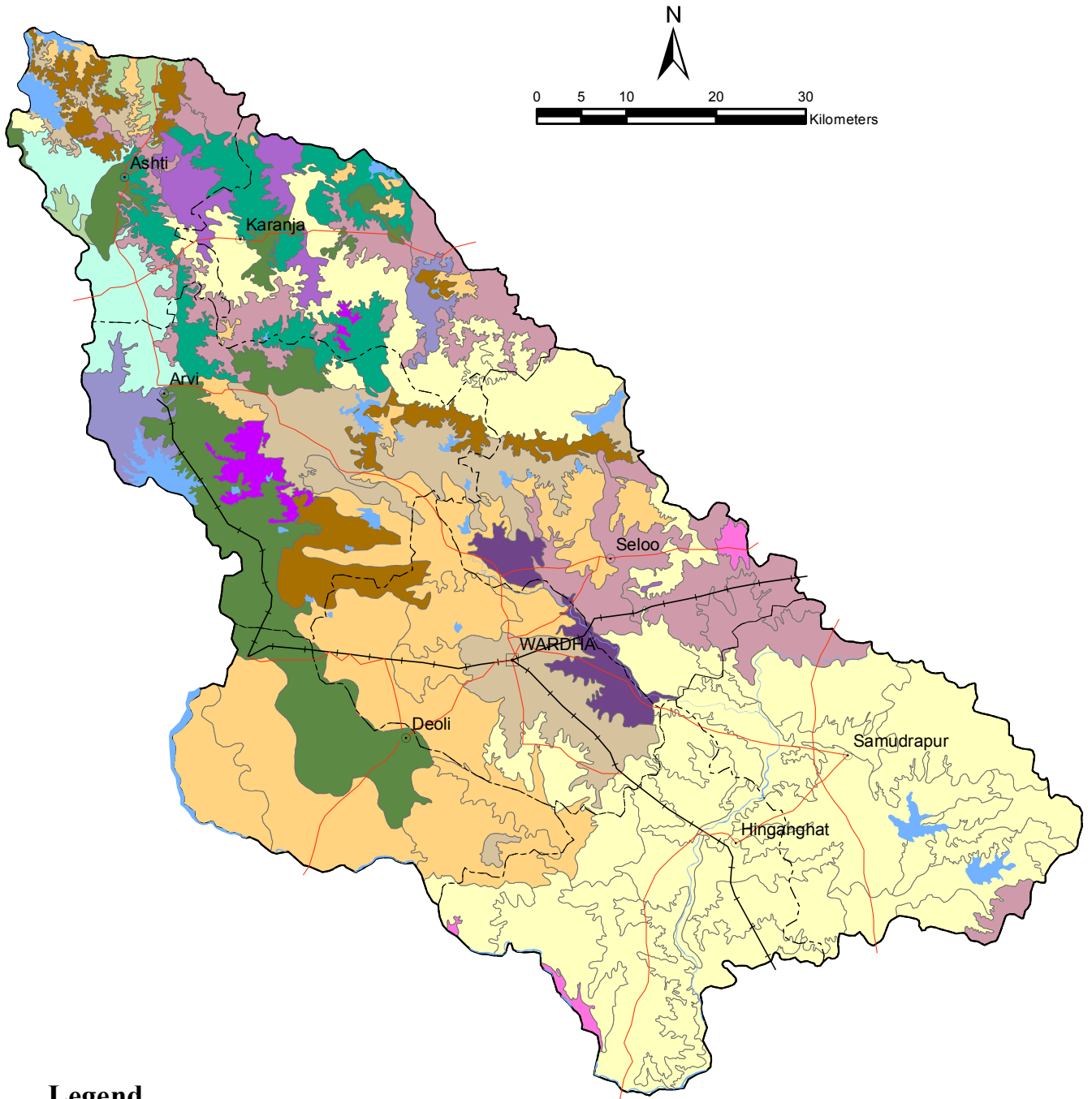
A mapping unit is collection of areas defined and named the same in terms of their soil components or miscellaneous areas or both. Each map unit differs in some respect from all others in the survey area and is uniquely identified on a soil map. Each individual area on the map is delineation. In Reconnaissance soil survey of Wardha district, thirty three mapping units, with its delineations and brief descriptions are given below and presented in table 5.

The thematic maps on Slope, Surface Form, Parent Materials, Soil Depth, Surface Drainage, Texture, Erosion, Particle Size, Soil Reaction (pH) and Soil Taxonomy are shown in Fig. 6 to 15, respectively



# WARDHA

## Slope



### Legend

- Very gently sloping
- Very gently sloping-Gently sloping
- Very gently sloping-Gently sloping-Very steeply sloping
- Very gently sloping-Very steeply sloping
- Gently sloping
- Gently sloping-Very gently sloping
- Gently sloping-Moderately sloping
- Very gently sloping-Moderately sloping
- Moderately sloping-Gently sloping
- Moderately sloping-Very gently sloping-Gently sloping
- Moderately sloping-Rock out crop
- Very steeply-sloping-Gently sloping
- Rock out crop-Gently sloping-Moderately sloping
- Rock out crop-Moderately sloping

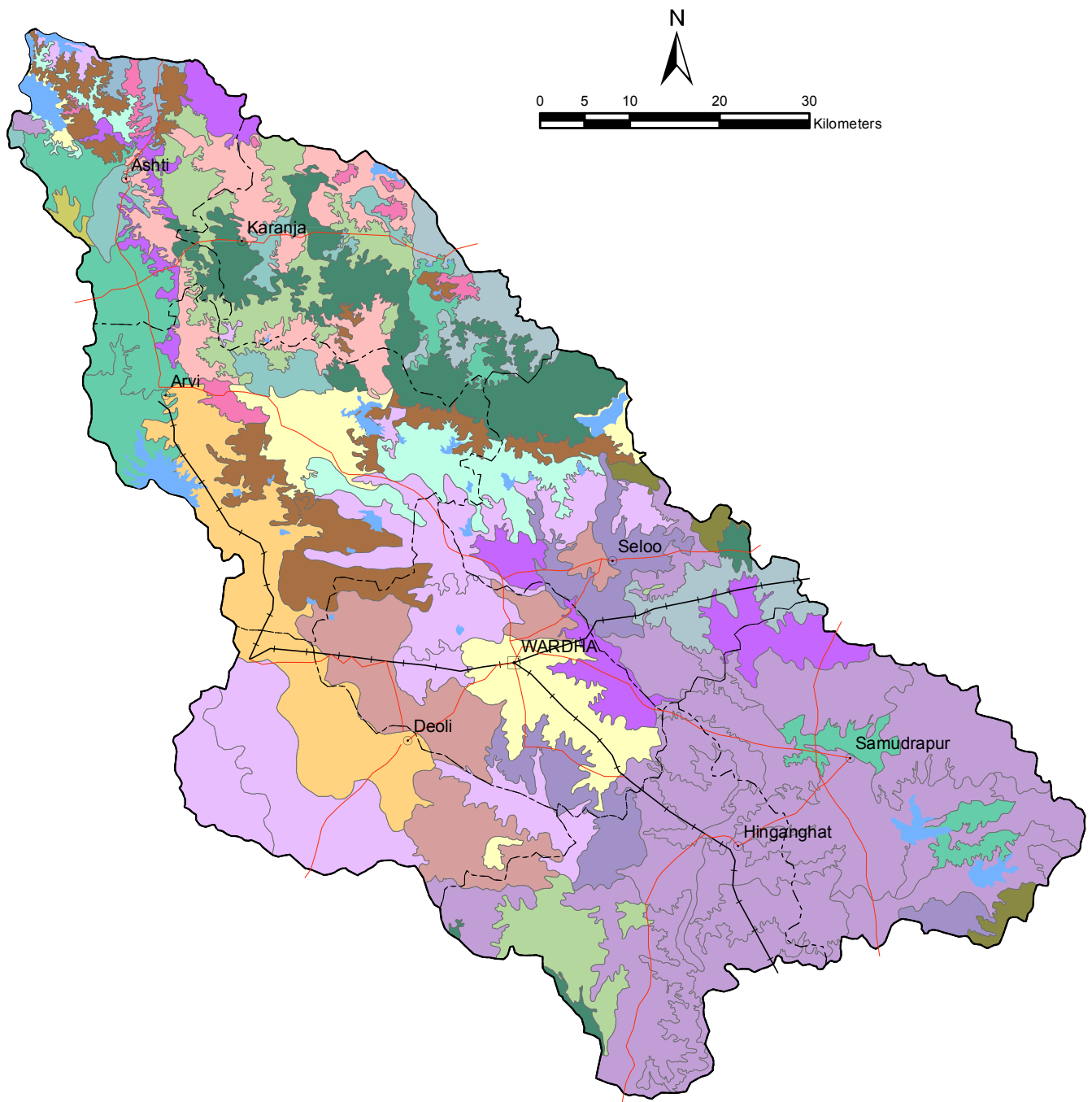
### References

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



Fig. 6: Slope

# WARDHA Surface Form



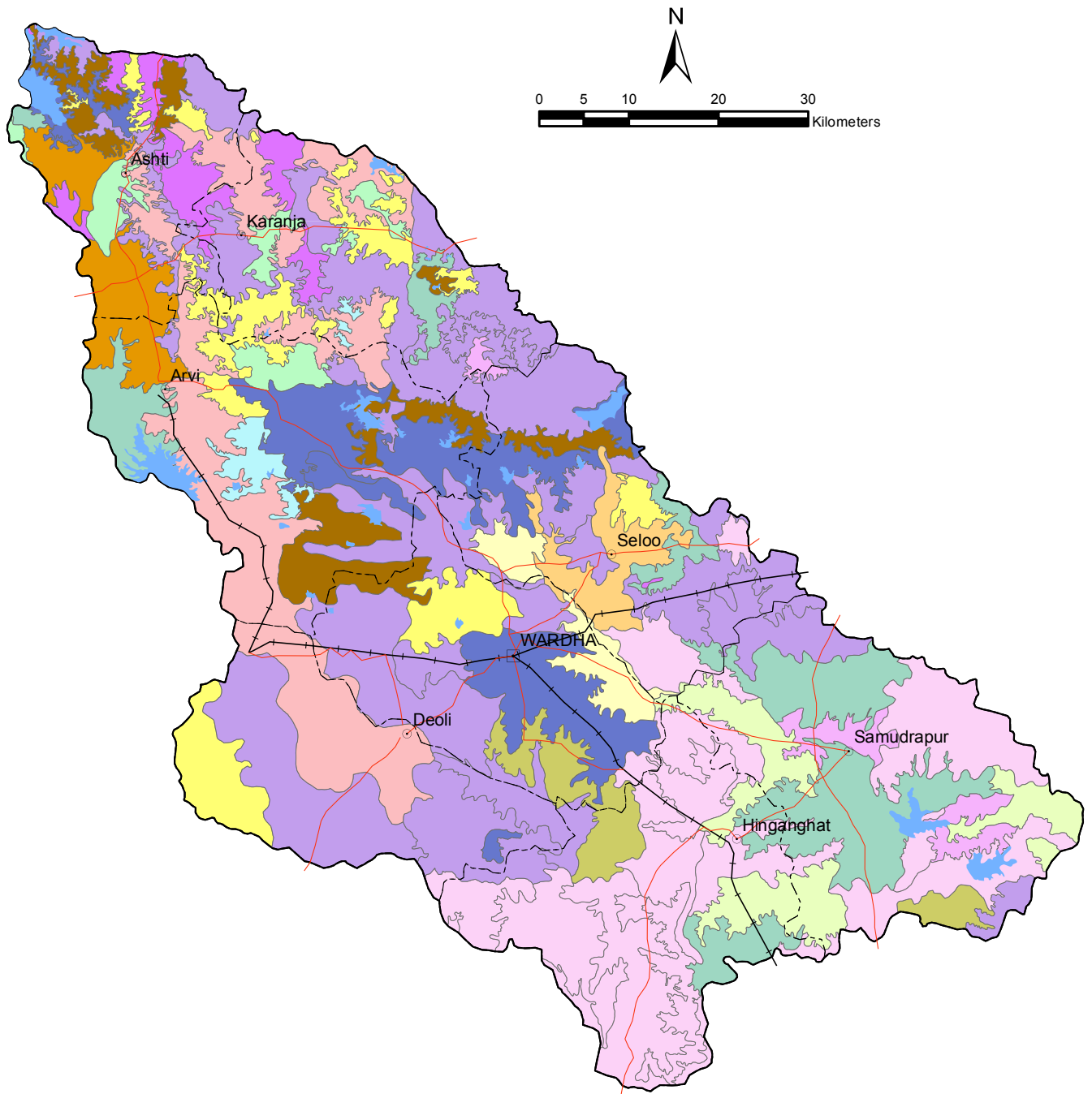
## Legend

Level	Plateau-Level
Level-Valley	Plateau-Undulating-Level
Level-Valleys	Plateau-Hill
Level-Rock outcrop	Undulating-Plateau
Level-Undulating	Hill-Plateau
Level-Plateau-Rock outcrop	Rock outcrop-Level
Level-Valleys-Gently sloping	Valleys-Plateau
Gently sloping-Level	Undulating-Level
Gently sloping-Plateau	Valleys-Gently sloping-Plateau
Plateau	

## References

⊙	Tehsil HQ
□	District HQ
▭	District Boundary
▭	Tehsil Boundary
—	Road
—+—	Railway
—	Drainage
■	Waterbodies

# WARDHA Parent Material



## Legend

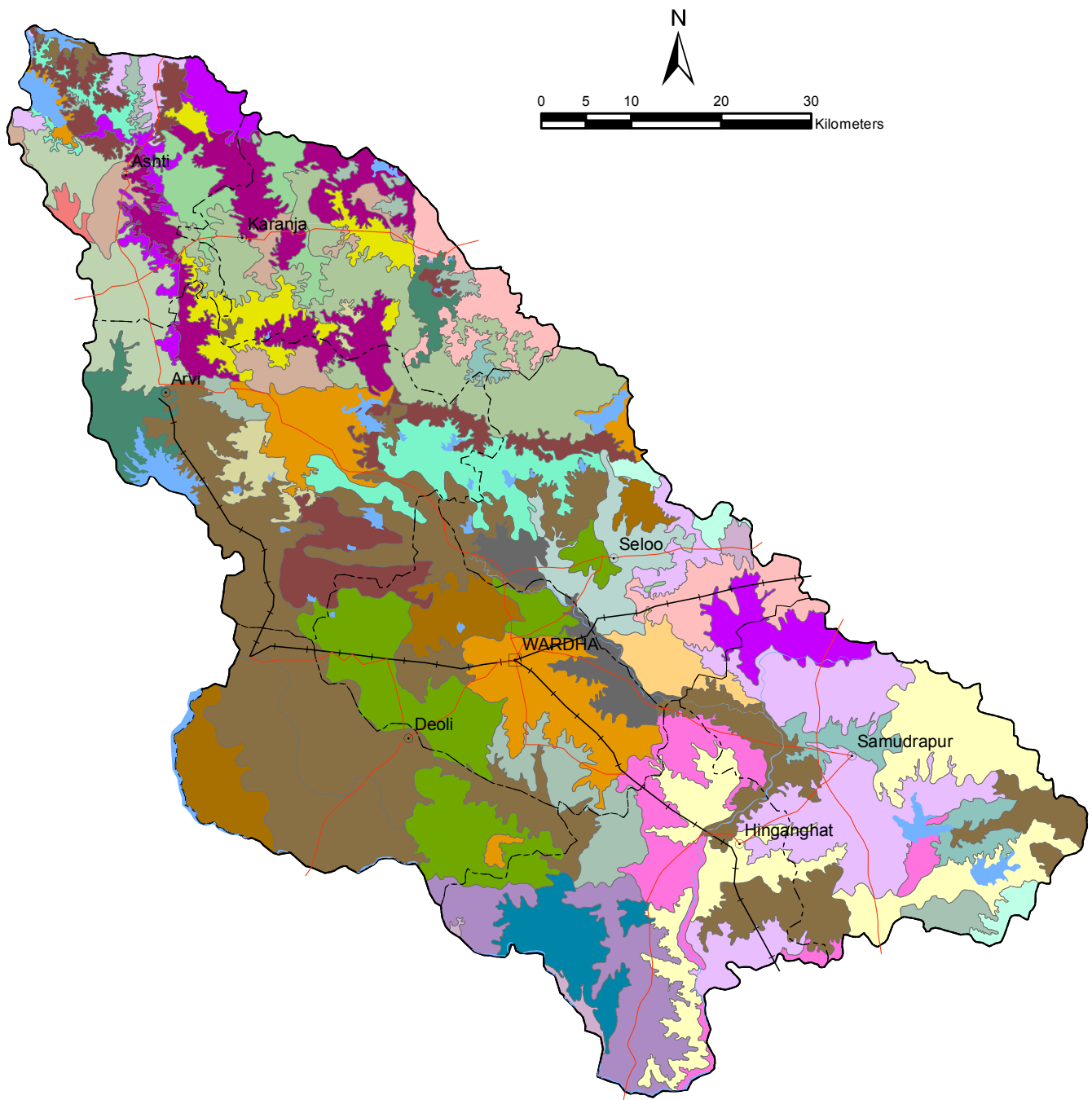
Alluvium-Basalt	Rock outcrop-Alluvium-Weathered Basalt
Alluvium-Basalt-Weathered Basalt	Rock outcrop-Weathered Basalt
Alluvium-Weathered Basalt-Basalt	Weathered Basalt-Alluvium-Basalt
Alluvium-Weathered Basalt	Weathered Basalt-Basalt
Basalt-Alluvium-Weathered Basalt	Weathered Basalt-Basalt-Alluvium
Basalt	Weathered Basalt-Alluvium
Basalt-Alluvium	Weathered Basalt-Rock outcrop
Basalt-Weathered Basalt	Weathered Basalt

## References

⊙	Tehsil HQ
⊠	District HQ
- - -	Tehsil Boundary
▭	District Boundary
—	Road
—+—	Railway
—	Drainage
■	Waterbodies



# WARDHA Soil Depth



## Legend

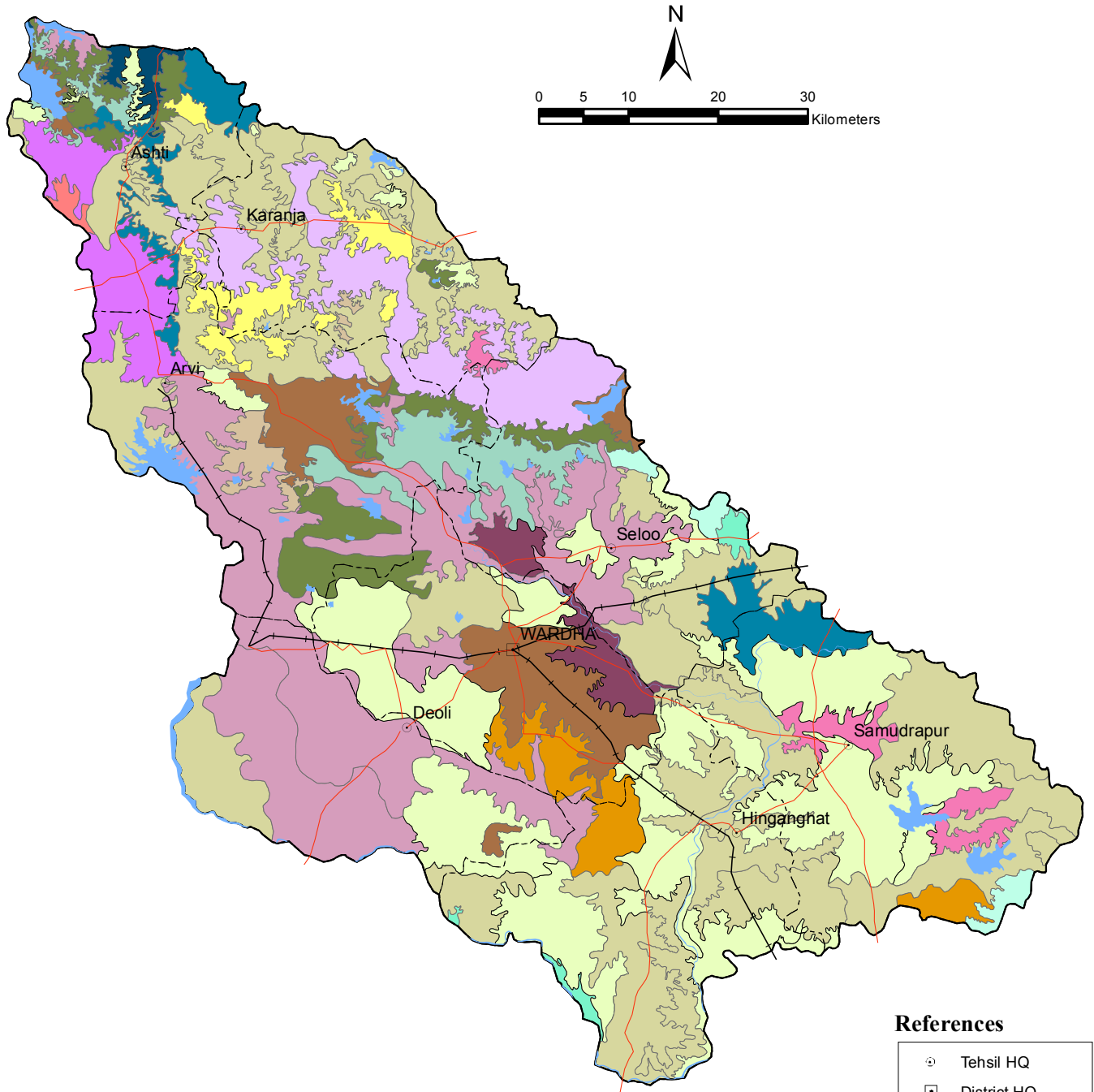
Extremely shallow-Deep	Mod. shallow-Very deep-Deep
Very shallow-Mod. shallow-Deep	Deep-Extremely shallow
Very shallow-Mod. deep	Deep-Shallow-Very deep
Very shallow-Deep-Shallow	Deep-Very shallow-Very deep
Very shallow-Deep	Deep-Very shallow
Shallow-Mod. shallow-Rock outcrop	Deep-Mod. shallow-Extremely shallow
Shallow-Deep	Deep-Mod. shallow-Very shallow
Shallow-Deep-Very shallow	Deep-Mod. shallow-Shallow
Shallow-Extremely shallow-Rock outcrop	Deep-Extremely shallow-Mod. shallow
Mod. shallow-Extremely shallow	Deep-Very deep-Shallow
Mod. shallow-Extremely shallow-Deep	Deep
Mod. shallow-Deep-Very shallow	Deep-Mod. shallow
Mod. shallow-Deep-Shallow	Rock out crop-Deep-Shallow
Mod. shallow-Deep	Rock out crop-Shallow
Mod. shallow-Mod. deep	

## References

□	District HQ
○	Tehsil HQ
▭	District Boundary
- - -	Tehsil Boundary
—	Road
—+—	Railway
—	Drainage
■	Waterbodies



# WARDHA Soil Drainage



## Legend

Imperfect-Poor-Mod. well	Well-Mod. well-Imperfect-Poor
Imperfect-Poor-Somewhat excessive-Mod well	Well-Rock out crop
Mod. well	Well-Somewhat excessive-Rock out crop
Mod. well-Well	Somewhat excessive
Mod. well-Well-Excessive	Somewhat excessive-Mod. well
Mod. well-Imperfect-Poor	Excessive
Well	Excessive-Mod. well
Well-Mod. well	Rock out crop-Mod. well-Well
Well-Excessive	Rock out crop-Well-Excessive

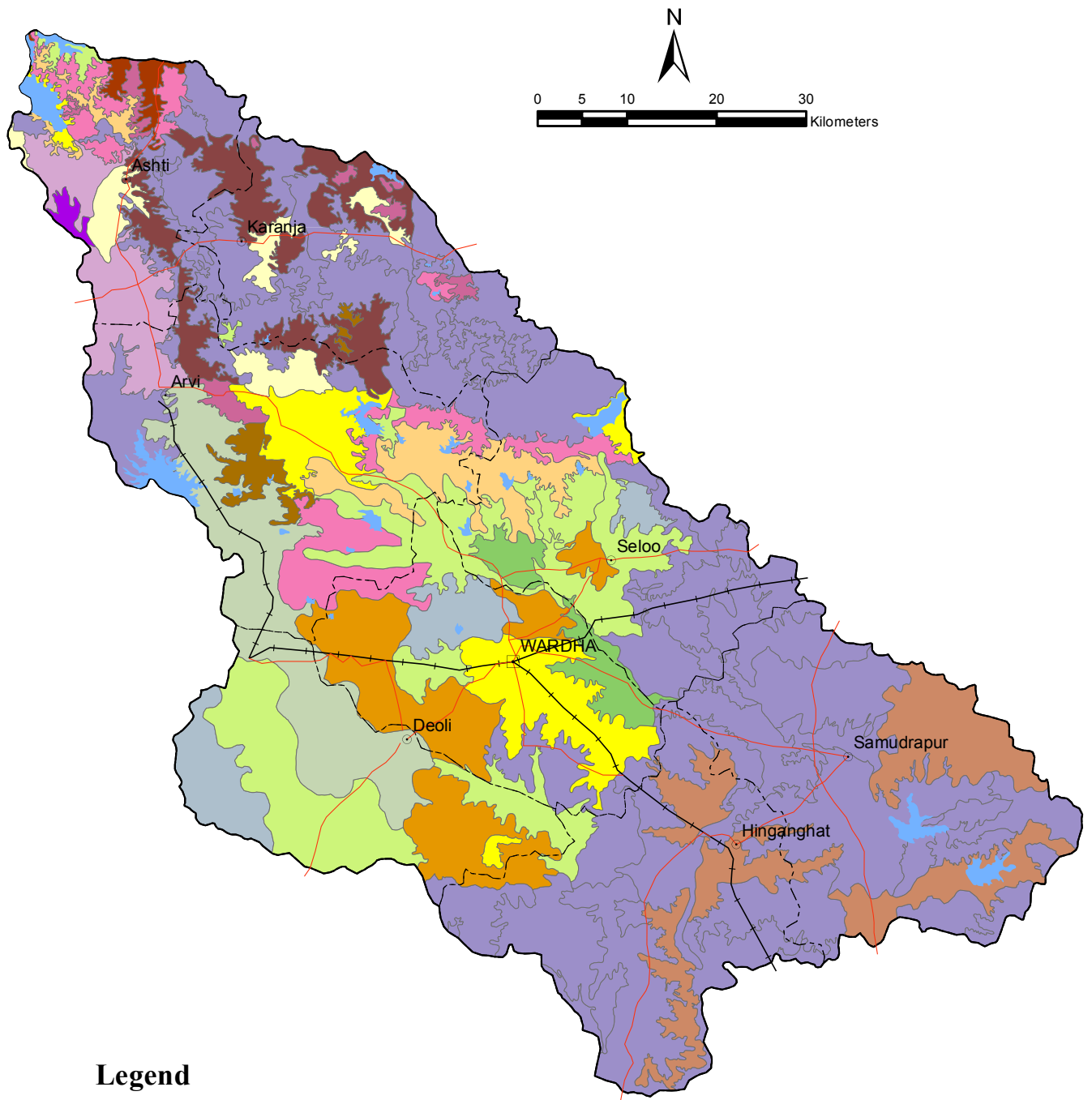
## References

●	Tehsil HQ
■	District HQ
---	Tehsil Boundary
---	District Boundary
—	Road
—	Railway
—	Drainage
—	Waterbodies





# WARDHA Surface Texture



## Legend

- Clayey
- Clayey-Clay loam
- Clayey-Sandy loam
- Clayey-Gravelly loam
- Clayey loam-Clayey
- Clayey-Sandy clay-Clayey loam
- Clayey loam-Clayey-Gravelly loam
- Loamey-Clayey
- Clayey loam-Sandy clay-Sandy clay loam
- Clayey loam-Sandy loam-Clayey
- Sandy clay loam-Clay loam
- Sandy clay loam
- Sandy clay-Clayey
- Silty clay-Clayey- Clay loam
- Gravelly loam-Clayey
- Rock out crop-Sandy clay loam-clayey
- Rock out crop-Sandy clay-Sandy clay loam

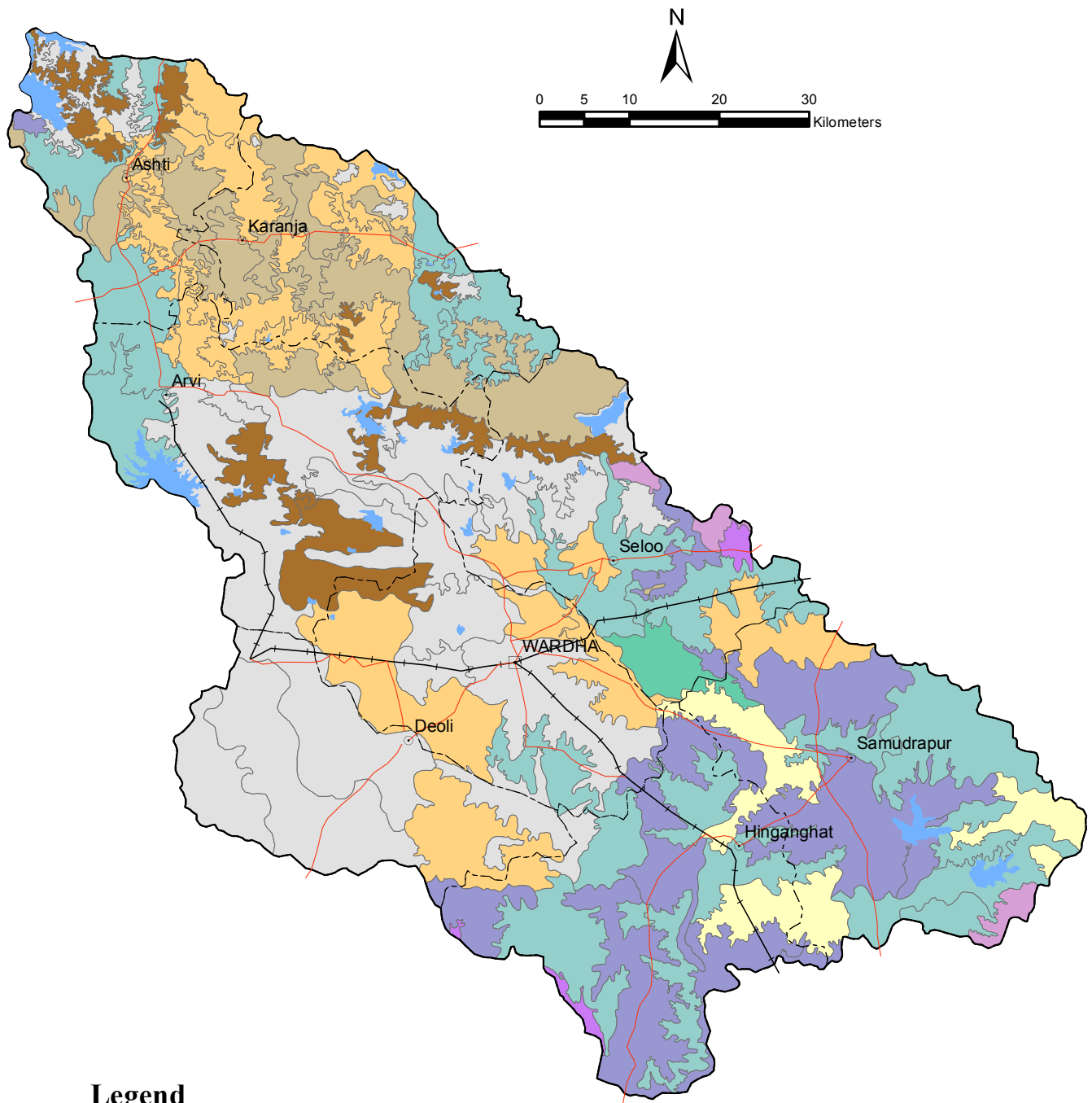
## References

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



# WARDHA

## Erosion



### Legend

- Slight
- Slight-Moderate
- Moderate-Slight
- Moderate
- Moderate-Severe
- Severe-Moderate
- Very severe-Moderate
- Slight-Moderate-Severe
- Rock out crop
- NA

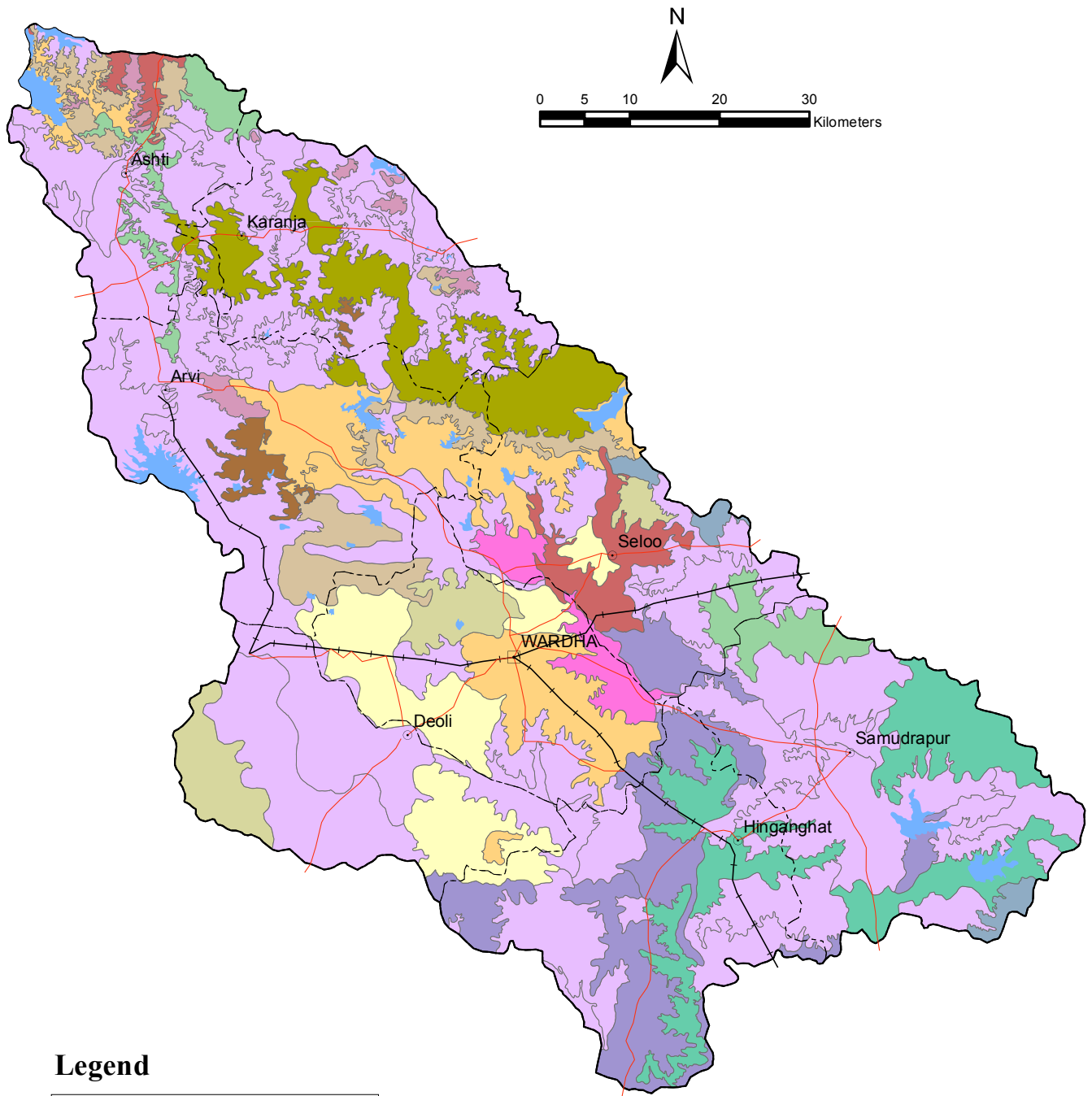
### References

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



# WARDHA

## Particle Size Class



### Legend

- Fine
- Fine-Very fine
- Fine-Fine Loamy
- Fine-Loamy
- Fine-Clayey
- Fine loamy-Fine
- Fine-Very fine-Clayey skeletal
- Clayey skeletal-Clayey
- Clayey skeletal-Fine
- Fine loamy-Fine-Rock out crop
- Loamy-Fine
- Loamy-Very fine
- Rock out crop-Fine loamy-Fine
- Rock out crop-Fine-Fine loamy

### References

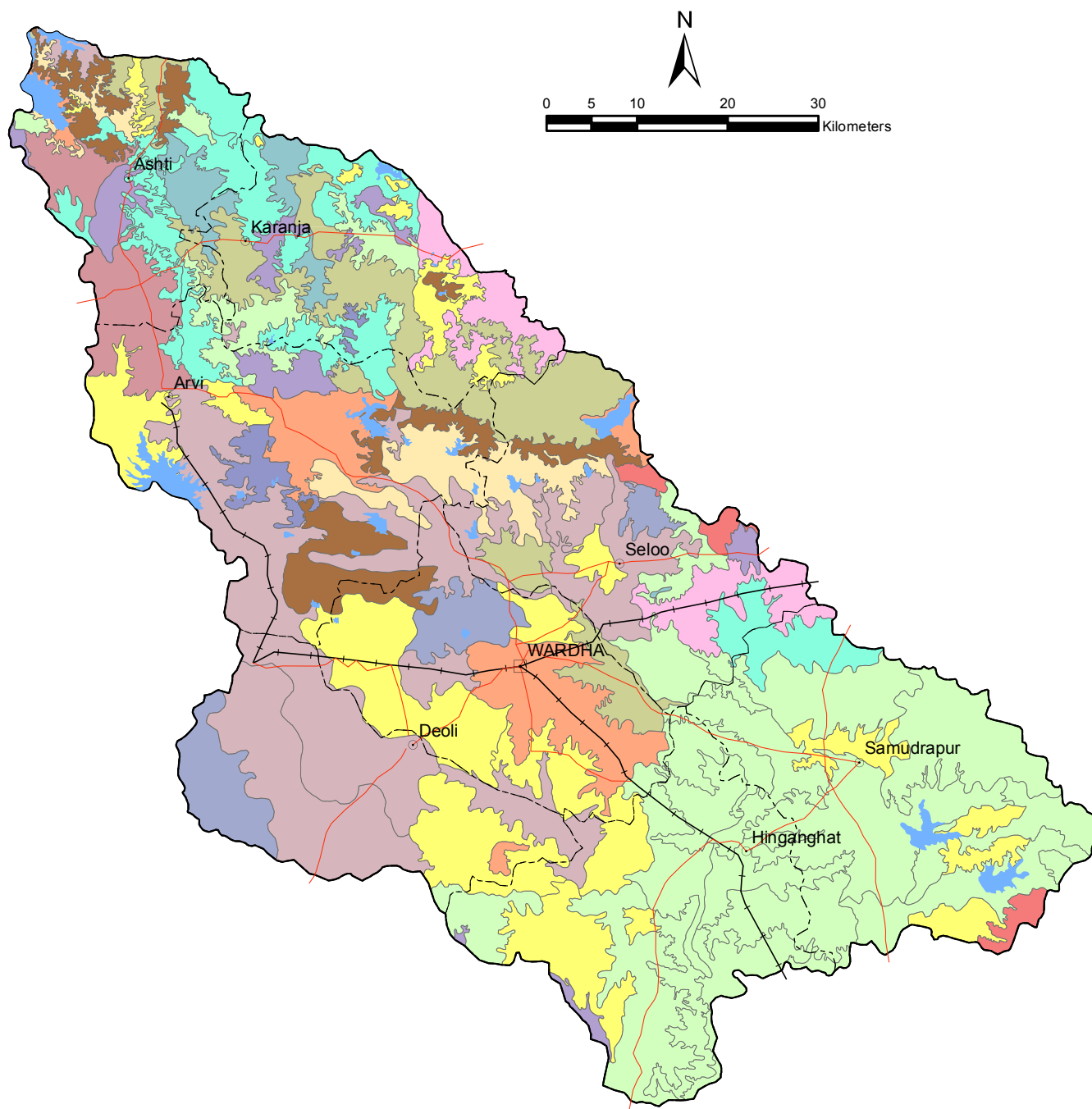
- Tehsil HQ
- District HQ
- District Boundary
- Tehsil Boundary
- Road
- Railway
- Drainage
- Waterbodies





# WARDHA

## Soil Reaction (pH)



### Legend

Neutral	Slightly alkaline-Mod alkaline
Neutral-Slightly alkaline	Slightly aklaline-Strongly alkaline
Mod acidic-Slightly alkaline	Slightly alkaline-Neutral-Rock out crop
Mod alkaline-Slightly alkaline	Slightly alkaline-Slightly acidic
Mod alkaline	Slightly aklaline-Rock out crop
Mod alkaline-Neutral	Rock out crop-Mod alkaline-Slightly alkaline
Slightly aklaline	Rock out crop-Slightly alkaline
Slightly aklaline-Neutral	

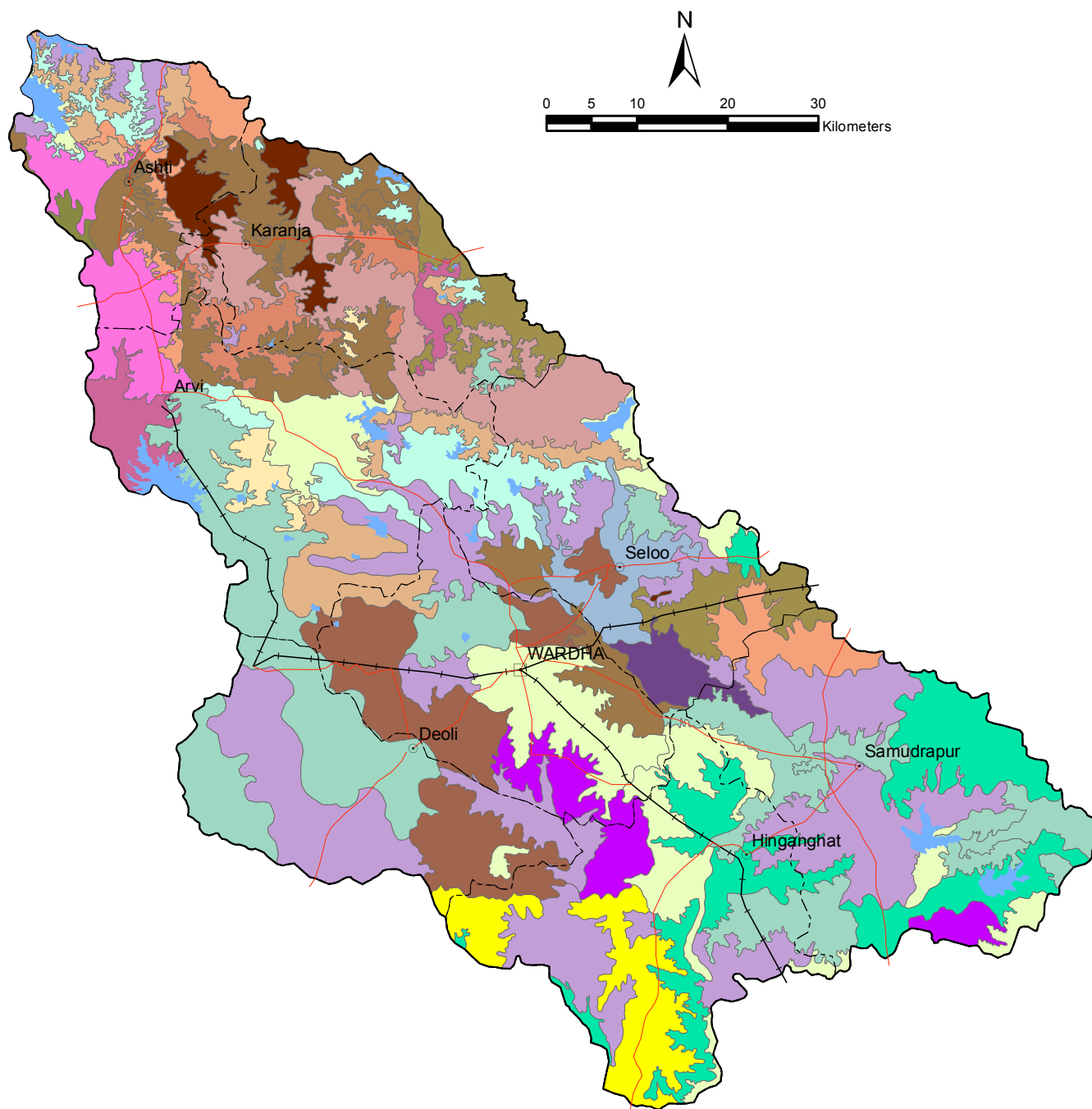
### References

⊙	Tehsil HQ
◻	District HQ
▭	District Boundary
- - -	Tehsil Boundary
—	Road
—+—	Railway
—	Drainage
■	Waterbodies



Fig. 14: Soil Reaction (pH)

# WARDHA Soil Taxonomy



## Legend

Lithic Ustorthents-Typic Haplusterts	Typic Haplustepts-Vertic Haplustepts-Lithic Ustorthents
Lithic Ustorthents-Vertic Haplustepts-Typic Haplusterts	Typic Haplusterts-Lithic Ustorthents-Chromic Haplusterts
Rock outcrops-Typic Haplustepts-Lithic Haplustepts	Typic Haplusterts-Lithic Ustorthents-Typic Haplustepts
Rock outcrops-Typic Haplustepts	Typic Haplusterts-Typic Haplustepts-Chromic Haplusterts
Typic Haplustepts-Lithic Ustorthents	Typic Haplusterts-Typic Haplustepts-Lithic Ustorthents
Typic Haplustepts-Vertic Haplustepts	Typic Haplusterts-Typic Haplustepts
Typic Haplustepts	Typic Haplusterts-Lithic Ustorthents
Typic Haplustepts-Typic Haplusterts-Lithic Ustorthents	Typic Ustorthents-Typic Haplusterts-Typic Haplustepts
Typic Haplustepts-Typic Haplusterts	Typic Ustorthents-Lithic Haplustepts
Typic Haplustepts-Typic Haplusterts-Vertic Haplustepts	Vertic Haplustepts-Leptic Haplusterts
Typic Haplustepts-Typic Ustorthents	

## References

⊙	Tehsil HQ
⊠	District HQ
▭	District Boundary
- - -	Tehsil Boundary
—	Road
—+—	Railway
—	Drainage
■	Waterbodies



Table.5 Description, extent and taxonomy of soil mapping units

Sl. No	Soil mapping Unit	Brief description of soils	Soil Taxonomy of Dominant Soil	Area (ha)	
				ha	%
1	Pd-Mk-Rock outcrops	Very shallow soils of Parsodi associated with shallow soils of Mahakali and rock outcrops.	Fine loamy, hyperthermic family of Typic Haplustepts	31445	5
2	Rock outcrops- Pd-Ld	Rock outcrops associated with very shallow soils of parsodi on gently sloping plateaus and also associated with shallow soils of Lakandevi.	Fine loamy, hyperthermic family of Typic Haplustepts	31445	5
3	Mk-Mp	Shallow soils of Mahakali associated with deep soils of Malatpur in valleys.	Fine, hyperthermic family of Typic Haplustepts	12578	2
4	Pd-Md-Rock outcrops	Very shallow soils of Parsodi is associated with very shallow soils of Madani over plateau and associated with rock outcrops	Fine loamy, hyperthermic family of Typic Haplustepts	25156	4
5	Rock outcrops- Nj-Pd	Rock outcrops is associated with deep Nijampur soils on gently sloping plateaus and with very shallow parsodi soils.	Fine, mixed, hyperthermic, (cal) family of Typic Haplustepts	18867	3
6	Pg-Nj-Pd	Shallow Panthargovda soil is associated with deep Nijampur soils and very shallow Parsodi soils on undulating plateaus.	Fine, loamy mixed, hyperthermic, (cal) family of Typic Haplustepts	37734	6
7	Kr-Kn-An	Deep Karanji soil is associated with deep Kolona soils and also with moderately shallow Anjangaon soils on plateau, tops.	Fine, mixed, hyperthermic, calcareous family of Chromic Haplusterts	6289	1
8	Ki-Mp	Extremely shallow Kinala soils over steeply sloping hills is associated with deep Malatpur soils in valleys.	Loamy, mixed, hyperthermic, Lithic Ustorthents	6289	1
9	Sg-Tn-Ti	Very shallow Sirasgaon soil is associated with very shallow Talani soils and deep Takli soils in gently sloping to undulating plateaus.	Very fine, loamy, mixed, hyperthermic, family of Typic Ustorthents.	25156	4
10	Kn-An-Nh	Deep Kolona soil is associated with moderately shallow Anjangaon soils over gently sloping plateau and also with deep Nagjhari soils.	Fine, mixed, hyperthermic, family of Typic Haplustepts	37734	6
11	Ar-Ta- La	Shallow Arvi soil is associated with deep Talegaon soils and with deep Lasanpur soils on gently sloping plains.	Fine, mixed, Calcareous, hyperthermic, Typic Haplustepts	6289	1
12	Nj-Mp-La	Deep Nijampur soil is associated with deep Malatpur and deep Lasanpur soils on gently sloping plains and valleys.	Fine, mixed, hyperthermic, (cal) family of Typic Haplustepts	12578	2
13	An-Nj-Pg	Moderately shallow Anjangaon soils on plateau is associated with deep Nijampur soils and shallow Panthargovda soils	Fine, mixed, hyperthermic, family of Leptic Haplusterts	18867	3

SI. No	Soli mapping Unit	Brief description of soils	Soil Taxonomy of Dominant Soil	Area (ha) ha %	
14	Pa-Pc-As	Very shallow soils of Pardi is associated with deep soils of Pachod, on gently sloping plateau and shallow soils of Asti.	Fine mixed hyperthermic, Typic Ustorthents	25156	4
15	Cm-Th	Moderately shallow soils of Chamla is associated with moderately deep soils of Thar on gently sloping plains.	Fine, mixed, hyperthermic, Vertic Haplustepts	12578	2
16	Ta-Ma-Ar	Deep soils of Talegaon is associated with deep soils of Malkapur on gently sloping piedmont plains and with shallow Arvi soils.	Fine montmorillonitic hyperthermic, Typic Haplusterts	12578	2
17	Bo-Wg-Cp	Deep Bothali soil is associated with moderately shallow Waigaon and very shallow Chanakpur soils lower Plateau.	Fine, montmorillonitic, Hyperthermic Calcareous, Typic Haplusterts	25156	4
18	Wg-Hw	Moderately shallow soils of Waigaon soils are associated with deep Hewan soils,	Fine, mixed, hyperthermic, typic Haplustepts	25156	4
19	Ka-Wd-Hw	Shallow Karla soil is associated with moderately shallow Wadner soils and deep soils of Hewan.	Fine, mixed, hyperthermic Typic Haplustepts	25156	4
20	Hw-Ka	Deep Hewan soil is associated with shallow Karla soils on lower Plateau.	Fine, montmorillonitic, hyperthermic, Calcareous, Vertic Haplustepts	25156	4
21	Hw-Wd-Wg	Deep Hewan soil is associated with moderately shallow Wadner and moderately shallow Waigaon soils on lower Plateau.	Fine, montmorillonitic, hyperthermic, Calcareous, Haplustepts	6289	1
22	Hi-Wd	Moderately shallow Hridi soil is associated with moderately shallow Wadner soils on lower Plateau.	Clayey skeletal, mixed, hyperthermic, Typic Haplustepts	12578	2
23	Kd-Hw-Wd	Deep Kondhali soil is associated with deep Hewan soil and moderately shallow Wadner soils lower Plateau.	Very fine, montmorillonitic, hyperthermic, Typic Haplusterts	6289	1
24	Hw-Wg-Ki	Deep Hewan soil is associated with moderately shallow Waigaon soils on lower Plateau, and with extremely shallow Kinla soils on hill slopes.	Fine, montmorillonitic, hyperthermic, Calcareous, Typic Haplusterts	12578	2
25	Ka-Ma-Kd	Shallow Karla is associated with deep Malkapur soils and Kondhali soils on lower Plateau.	Fine, mixed, hyperthermic, Typic Haplustepts	6289	1
26	Nh-Pa-Yk	Deep Naghjari on gently sloping plain is associated with very shallow Pardi soils on flat plateau and with moderately shallow Yakamba soils.	Fine, mixed, hyperthermic, family of Typic Haplustepts	25156	4

Sl. No	Soil mapping Unit	Brief description of soils	Soil Taxonomy of Dominant Soil	Area (ha)	
				ha	%
27	Kj-Wa-Sw	Very shallow Karanja series is associated with deep Wardha and very shallow soils of Sewagram soil series lower Plateau	Loamy-skeletal, mixed hyperthermic, Lithic Ustorthents	31445	5
28	Sw-Cm-Ta	Very shallow Sewagram series is associated with moderately shallow Chamla soils and deep Talegaon series on gently sloping plain.	Loamy, mixed hyperthermic, Lithic Ustorthents	25156	4
29	Si-Kj-Sw	Deep soils from Sirpur over North Deccan Lower Plateau is associated with very shallow soils of Karanja and associated with very soils of Sewagram.	Fine, montmorillonitic (Calcareous), hyperthermic, Vertic Haplustepts	25156	4
30	Wa-Sw-Va	Deep soils of Wardha is associated with very shallow soils of Sewagram on North Deccan lower plateau and deep soils of Vagholi.	Fine, montmorillonitic (calcare-ous), hyperthermic, Typic Haplusterts	18867	3
31	Ta-Mk-Va	Deep Talegaon series is associated with very shallow Mahakali series and deep Vagholi series on lower piedmont plains.	Fine, montmorillonitic, hyperthermic, Typic Haplusterts	6289	1
32	Mk-Si-Kj	Very shallow soils from Mahakali series is associated with deep soils of Sirpur and shallow Karanja series on North Deccan Lower Plateau	Fine, mixed, hyperthermic, Typic Haplustepts	6289	1
33	As-Wa-Sw	Shallow Asti series is associated with deep Wardha series and very shallow soils of Sewagram series occurring on over North Deccan Lower Plateau	Clayey skeletal, mixed, hyperthermic, Typic, Haplustepts	25156	4

## 4.

### SOIL SURVEY INTERPRETATION

---

The application of soil resource data base to agricultural use is assessed with the existing land capability classification, land irrigability classification (USBR 1953) and soil site suitability for crops (Sys, 1985).

#### 4.1 Land Capability Classification:

The land capability is mainly based on inherent soil characteristics, soil depth, CEC, BS, OC, EC, external land features such as stoniness, flooding, drainage and the environmental factors like climate that limits the use of land (Klingebiel and Montgomery, 1961). The classification of soil unit into the capability groupings enable one to get a picture of hazards of soil to various factors which causes deterioration and declination in fertility and it's potentiality for productions. This classification system has a class, subclass and capability units as defined below.

Capability classes or groups of capability sub classes or capability unit that have same relative degree of limitation. The type of soil damage or limitation in use become comparatively greater from class I to VIII.

#### Sub-classes:

Subclasses are groups of capability unit which have a same conservation problems such as

e - erosion and run off

w - excessively wet

s - root zone limitation

c - climatic limitations

Capability unit is a grouping of one or more individual soil mapping unit having a similar potential and continuing limitation on hazards. The soil capability units are sufficiently uniform to produce similar kind of cultivated crops and pasture land in the similar management practices, require similar conservation treatment and management under the same kind and vegetative cover and have a comparable potential productivity.

The soil mapping units provide a detailed information for all interpretative groupings. The soil mapping unit is a portion of landscape having similar characteristics and qualities and whose limits are fixed by prescribed definition. These limits were evaluated and its detailed description is given in the table 6, Fig.16.

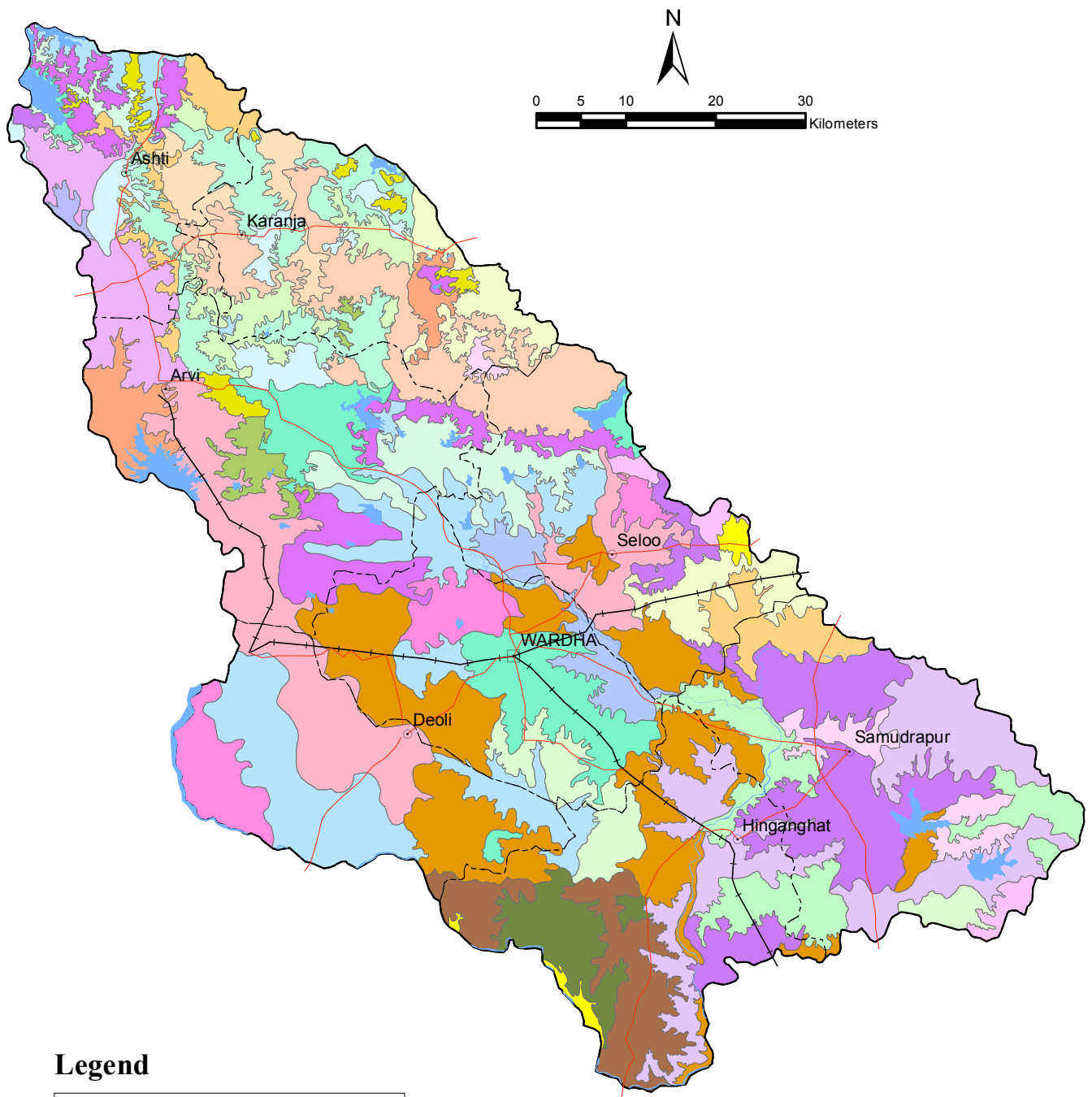
The twelve soil mapping units were classified under land capability class II covering an area of 27 per cent with limitations of wetness and erosion. The eight mapping units classified under capability class III covers 22% of area with erosion and soil limitations. These areas need careful selection of varieties of local crops and proper care for soil management. The three under class IV cover 7% of area mostly confined to the plateaus and escarpments of the district. The dominant crops are mostly sorghum and millets. The non-arable lands covers 34% of area out of which 16 percent is suitable for forestry and grazing and 18 % for wildlife conservation.

Table 6- Land Capability Classification:

Sr. No	Soil Mapping Units	Land Capability sub class	Area		Management	Limitations
			ha	%		
1	5,12,17,19	IIsw	81757	13	These soils occur on gently sloping lands with slight erosion and wetness problems in lower topographic basaltic terrain. These soils have tillage problem when it is too wet and dry.	These soils are mostly having high shrink-swell potentials and needs careful water management.
2	7,10,13,14, 15,16,27,31	IIes	150936	24	Gently to moderately sloping land having heavy textured soil of expanding type of clay mineral with gentle slope in black or mixed red and black soil region, erosion and root zone limitation are common but drainage is difficult with intensive rains	The careful selection of crops in rotation with pastures
3	9,11,19,20, 21,23,26,30	IIIes	138358	22	Strongly sloping to steep land, deep to shallow soils with intensive erosion and limitation of gravel, stone and strongly alkali soils	
4	18,22,25	IVes	44023	7	All steep land subject to erosion if cover is depleted. Suitable for grazing or forestry	Manage grazing and logging to maintain sufficient residue and litter for soil and moisture conservation
5	3,8,24,32, 33,6	Vies	100624	16	Very steep land, very shallow, stony limited to grazing only	
6	1,2,4,28	VIIes	113202	18		



# WARDHA Land Capability



## Legend

Iles-Iles	Ilist-Iles
Iles-Vles	Ives-Iles
Ils-Ives-Vlls	Ives-Ils-Vlls
Ils-Vlls-Illst	Ives
Ils-Vles-Vlls	Vlds-Iles-RO
Ilt-Iles	Vlds-Vlls-RO
Iles	Vles-Iles
Iles-Illst	Vles-Iles-Vlds
Iles-Ives	Vles-Ils-Vlls
Iles-Iles	Vlls-Iles
Iles-Iles-Ills	Vlls-Iles
Iles-Iles-Ills-Illst	Vlls-Ilt-Iles
Iles-Ils-Ives	RO-Iles-Vlds
Iles-Ives	RO-Vlds-Vles
Iles-Ives-Vles	

## References

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



#### 4.2 Land irrigability classification:

It is primarily concerned with predicting the behaviour of soils under greatly altered water regime brought about by introduction of irrigation. The mapping units delineated were interpreted land irrigability classes 1 to 6 with the sub classes defined with limiting factor viz., soil (s), drainage (d), topography (t), climate (c). The details are given in the table .7 and depicted in the fig.17

**Table 7.Land irrigability classification:**

Sr.no	Soil Mapping Units	Land irrigability sub class	Area		Limitations
			ha	%	
1	7,10,12,13,14,15,29	2st	138358	22	Texture and permeability
2	3,5,6,11,16,17,18,19,20,21,23,25,27,30,31	3st	264138	42	Texture and permeability
3	9,22,26,33	4st	88046	14	Severe for sustained use under irrigation
4	1,2,4,8,24,28,32	6st	138358	22	Topography and stoniness of soils.

The seven soil mapping units were classified under land irrigability sub class 2st covers 22% of area followed by 3st comprising fifteen soil units covering an area of 42 per cent of the district, The eleven units classified as 4st and 6st covering 36 per cent of area is not suitable for irrigation with the severe limitations of terrain attributes and surface stoniness.

#### 4.3 Soil Site Suitability Classification:

The land suitability classes include suitable (SI), moderately suitable (S2), marginally suitable (S3), actually unsuitable but potentially suitable (NI), actually and potentially unsuitable (N2).The land suitability sub classes are reflecting the limitations in the classes indicated by using lower case letters as climate (c) , topography (t), wetness (w), salinity and alkalinity (n), soil fertility (f), physical soil limitations. The soil site suitability for six major crops viz. sorghum, wheat, millets, cotton, sugar cane and banana (Sys *et al.*, 1991) for each mapping units is determined up to subclass level and presented in table 8, Fig.18.

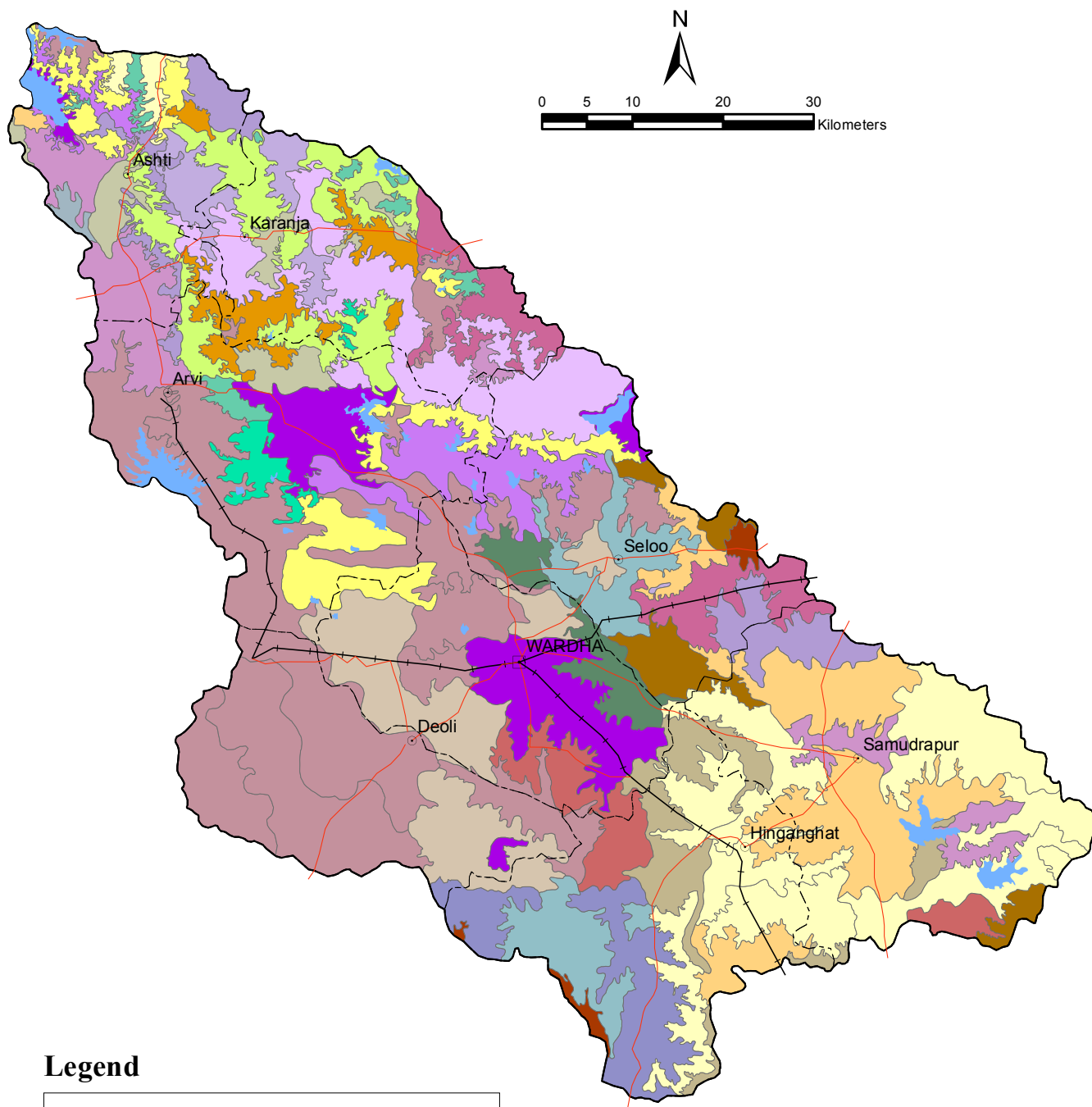
**Table 8.Land Use Units:**

Sr.No	Soil Mapping Units	Land Use units	Area	
1	7, 10, 12, 15, 17,18, 20, 21	Sorghum/Millets/wheat/cotton/sugarcane/banana	150936	24
2	5, 9, 11, 14, 13, 30, 31	Sorghum/Millets/wheat	119491	19
3	16, 19, 23, 25, 26	cotton/sugarcane/banana	75468	12
4	22,27,29	Sorghum/Millets/cotton	69179	11
5	3, 6, 8, 24, 32, 33	Forestry and grazing	100624	16
6	1,2,4,28	Wildlife conservation	113202	18

Land Use Land Cover map of the district generated from ETM+ data in Fig. 19

# WARDHA

## Land Irrigability



### Legend

2st	6st-2st
2st-3st-4st	6st-2st-5st
2st-4st-3st	6st-3st
2st-3s	N1-2st-S
3st	N1-S2-N2
3st-2st	N2-2st-3s
3s-3st	RO-2st-S
3st-4st	RO-S-6st
3st-6st	S2-N1-N2
3st--3s-2st	S2-N2-3st
3st-S2-N1	Suitable-3st-RO
4st-2st	Suitable-Not Suitable-RO
5st-S2-N2	

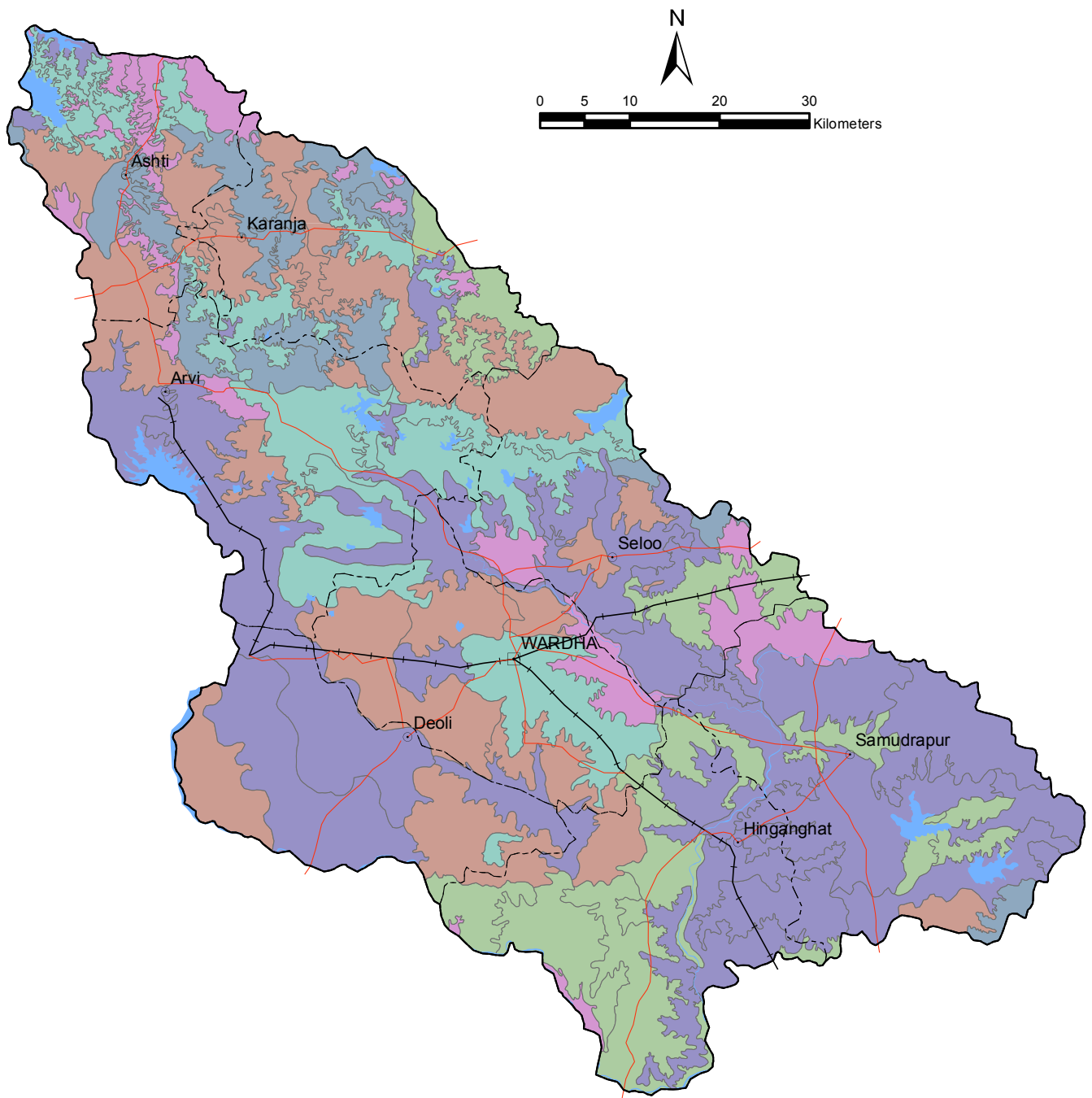
### References

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



# WARDHA

## Soil Suitability for Crops



### Legend

- cotton/sugarcane/banana
- Forestry and grazing
- Sorghum/Millet/cotton
- cotton/sugarcane/banana
- Sorghum/Millet/wheat/cotton/sugarcane/banana
- Wildlife conservation

### References

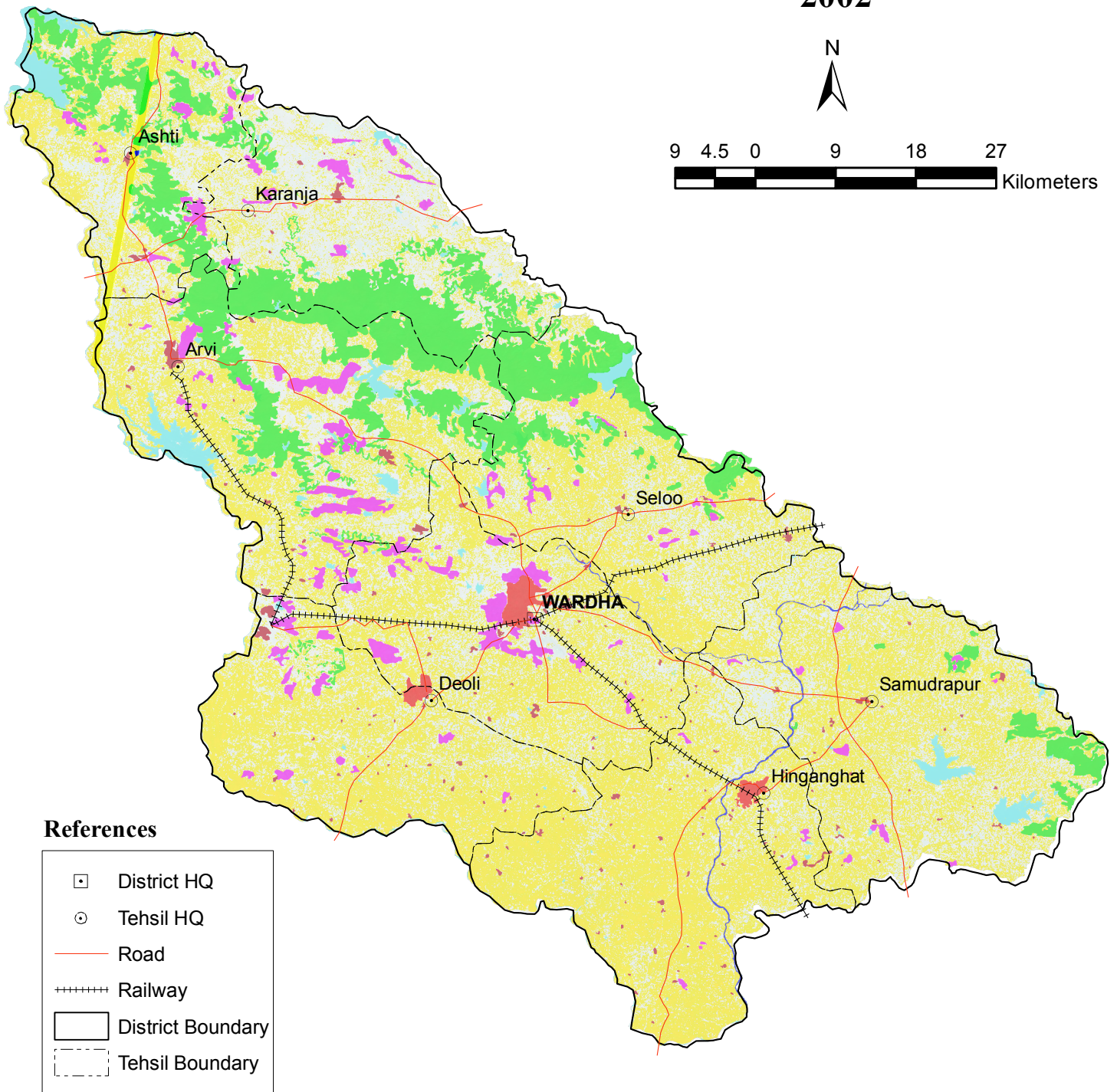
- District Boundary
- Tehsil Boundary
- District HQ
- Tehsil HQ
- Road
- Railway
- Drainage
- Waterbodies



# WARDHA

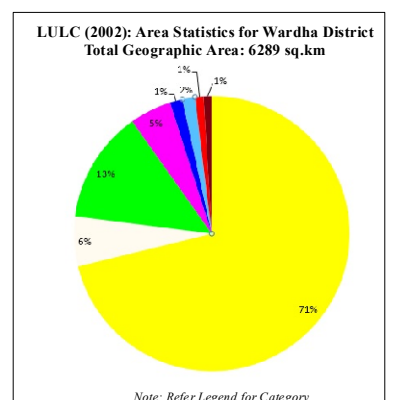
## Land Use/Land Cover

### 2002



### Legend

Classes	Area [sq.km]	Classes	Area [sq.km]
Agriculture		Uncultivable	
— Agriculture, Cropland	4476	— Barren/Uncultivable/Wastelands, Scrub Land	308
— Agriculture, Single Crop, Fallow	368	Water	
Builtup		— Wetlands/Water Bodies, Reservoir/Lakes/Ponds	94
— Built-up, Rural	60	— Wetlands/Water Bodies, River/Stream/Canals	92
— Built-up, Urban	62		
Forest			
— Forest, Deciduous	829		



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

The 23 soil mapping units are considered in evaluation of crop suitability and derived six land use units. The 66 per cent of area under arable is evaluated and found that 24 per cent of area is suitable for six crops and only 12 per cent of area is suitable for cotton sugarcane and banana. Non arable portion (34 %) is evaluated for forestry and wild life conservation as already mentioned in land capability section.

### 4.4 Conclusions

The following conclusions were drawn from the soil survey of Wardha district on 1:50,000 Scale.

- The district was divided into 6 major land forms viz. plateaus, eroded hills, valley, gently sloping plains, dissected flood plains and table land.
- Thirty eight were identified and used for deriving the soil map consisting of 33 soil mapping units.
- The *arability* analyses showed that out of 33 soil mapping units 23 units come under arable and remaining 13 units under non arable. The arable land covers 66 per cent of the district while 34 per cent as non-arable.
- The *irrigability* analyses showed that 36 per cent of area is not sustained under irrigation due to topographic limitations whereas the 66 per cent of area is suitable with the severe soil and drainage limitations.
- The soil site suitability analyses of the arable units showed that 22 per cent of

## REFERENCES

Klingebiel, A.A. and Montgomery, P.H. (1961) Land capability classification. Agri. Handb. 210. USDA. Soil conserve. Serv. Washington, DC.

Reddy R.S.(2006) Methodology for Correlation of Soil Series in Soil Survey and Mapping. Agropedology, 16, 1-11.

Shankaranarayana,H.S., Sarma,V.A.K., Deshpande,S.B. and Pandey, S. (1984). Memorandum on Soil Correlation. Bull no 10. NBSS& LUP, Nagpur.

Soil Survey Staff (1975) Soil Taxonomy. Agril.Hb.436,754pp.

Soil Survey Staff (1995) Soil Survey Manual, USDA, HB.18, Washington DC, USA

Soil Survey Staff (1998).Keys to Soil Taxonomy, 9th Edition.United State Department of Agriculture, Natural Resource Conservation Service, Washington DC,USA.

Sys, Ir.C., Van Ranst, E. and Debaveye, Ir.J. (1991) Land Evaluation (Part-I to III), Agricultural Publications No.7, Central Administration of Development Cooperation, Brussels, Belgium.

USBR (1951).Bureau of Reclamation Manual.Vol.V.P2.Land Classification. U.S.Dept, of interior.Devner.Col.80225.U.S. A.



## 1. PARDI SERIES (Pa)

<b>Classification</b>	:	Fine, mixed hyperthermic, family of Typic Ustorthents
<b>Type Location</b>	:	Village-Bangdapur, Tehsil-Karanja, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	244/55K/12
<b>Physiographic position</b>	:	Very gently sloping plateaus
<b>Elevation (m)</b>	:	450m
<b>Ground water table</b>	:	>10m
<b>Rainfall</b>	:	933.9mm
<b>Slope &amp; erosion</b>	:	Very gently sloping, Moderate
<b>Geology &amp; parent material</b>	:	Basalt, weathered Basalt.
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Yakamba, Nijampur, Pachod, Ashti
<b>Typifying pedon</b>	:	

Horizon	Depth(cm)	Description
Ap	0-12	Brown (10YR4/3 D), dark brown (10YR3/3 M), clay, moderate, medium, sub angular blocky structure, hard friable, sticky and plastic, few fine roots, 8 to 10% fine gravels, few, fine pores abrupt smooth boundary, pH 7.4.
C	12-50	Weathered basalt.

**Range in Characteristics:** The thickness of the solum ranges from 8 to 20 cm. The estimated MAST is 28.0°C, MSST is 32.6°C and MWST is 25°C. The moisture regime is ustic. A horizon has 10YRhue with value of 3 to 4 and chroma 2 to 3 for dry and moist soils. The texture is gravelly clay. The structure is weak sub angular blocky to coarse moderate subangular blocky.

**Drainage and Permeability:** Well drained soils with medium to rapid permeability.

**Use and Vegetation:** These soils are under soybean at places, cotton is also observed. Neem, teak, palas are the natural vegetation.

**Distribution and extent:** Mostly occur on plateaus and hill ranges of Karanja Tehsil, Ashti and Arvi Tehsil.

**Type location:** Profile No. 244 Village-Bangdapur, Tehsil-Karanja, District-Wardha, Maharashtra 21° 3' 0" N 78° 31' 45" E.

**Series proposed:** National Bureau of Soil Survey and LUP, Soil Survey Unit, Nagpur.

**Interpretation:** Pardi soils are very shallow clay textured and low nutrient status. They are susceptible to erosion hazard. They are suitable for pastures.

### Interpretative groupings:

- Land capability and sub-class - Vlls
- Land irrigability sub-class - 6st
- Productivity potential - low.

## ANALYTICAL DATA

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	Na	K	CEC	Water Retention (%)	
					.....cmol (+) kg <sup>-1</sup> ....					33 kPa	1500 kPa
0-12	7.41	0.06	0.94	4.0	32.0	13.8	-	-	-	28.18	15.45

## 2. YAKAMBA SERIES (Yk)

<b>Classification</b>	:	Fine, mixed hyperthermic, family of Typic Haplusteps
<b>Profile No.</b>	:	118/55K/8
<b>Physiographic position</b>	:	Very gently sloping Plateau
<b>Elevation (m)</b>	:	430 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	933.9mm
<b>Slope &amp; erosion</b>	:	Very gently sloping, moderate
<b>Geology &amp; parent material</b>	:	Basalt, weathered Basalt.
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Pardi, Nijampur
<b>Typifying Pedon</b>	:	Yakamba, clay, cultivated.

Horizon	Depth(cm)	Description
Ap	0-20	Dark greyish brown (10YR4/2 D), very dark greyish brown (10YR3/2 M), clay, moderate, medium, subangular blocky structure, hard, friable, sticky and plastic, fine to medium, many roots, fine few pores, clear smooth boundary, pH 8.0.
Bw1	20-42	Very dark greyish brown (10YR3/2 M) clay, moderate, medium, subangular blocky structure, friable, sticky and plastic, fine to medium, common roots, very fine pores,, gradual smooth boundary, pH 8.4.
Bw2	42-60	Very dark greyish brown, (10YR3/2 M) clay, moderate, medium, subangular to angular blocky structure, friable sticky and plastic, fine few roots, abrupt smooth boundary, pH 8.4.
C	60-75	Weathered basalt.

**Range in Characteristics:** The thickness of the solum ranges from 40 to 70 cm. These soils have 10YRhue with value of 3 or 4 and chroma 2 or 3. The texture is clay with subangular blocky to angular blocky structures.

**Competing series and their differentia:** Arvi series. This series is moderately alkaline with organic carbon of 0.9%.

**Drainage and permeability:** CaCO<sub>3</sub> of 5 to 16% and exchangeable Ca of 39 to 47 cmol (+) kg<sup>-1</sup> but at few places, well drained, moderate permeability.

**Use and Vegetation:** These soils are mostly under cotton and pigeonpea at places fairly dense forest exist.

### Distribution and Extent:

**Type location:** Profile No. 118 Village-Yekamba, Tehsil-Ashti, District-Wardha, Maharashtra 21° 10' 08" N 78° 17' 45" E.

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

**Interpretation:** This soil is moderately shallow, moderately eroded, well drained, slightly to moderately alkaline, clay type with good water holding capacity and moderate permeability.

### Interpretation groupings:

- Land capability sub-class - IIes
- Irrigability sub-class - 3st
- Productivity potential: Moderate



## ANALYTICAL DATA

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	Na	K	Water Retention (%)	
									.....cmol (+) kg <sup>-1</sup> ....	
									33 kPa	1500 kPa
0-20	8.0	.0.1	0.76	5.26	37.5	13.7	0.4	0.7	34.58	18.81
20-42	8.4	0.06	0.45	5.84	40.0	13.7	0.4	0.40	33.64	17.62
42-60	8.4	0.07	0.44	5.55	39.4	14.8	0.5	0.40	35.73	17.37

## 2. PACHOD SERIES (Pc)

<b>Classification</b>	:	Very fine, montmorillonitic, hyperthermic, family of Typic, Haplusterts
<b>Profile No.</b>	:	168/55K/8
<b>Physiographic position</b>	:	Flat plateau tops
<b>Elevation (m)</b>	:	400 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	933.9 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping, moderate
<b>Geology &amp; parent material</b>	:	Basalt, weathered Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Pardi, Ashti
<b>Typifying Pedon</b>	:	Pachod, clay, cultivated.

Horizon	Depth(cm)	Description
Ap	0-16	Very dark greyish brown (10YR3/2 D M), clay, medium, moderate, subangular blocky structure, hard friable sticky and plastic, many fine lime nodules with strong effervescent, 2-3 cm, wide surface cracks, medium to fine, common roots, clear smooth boundary, pH 8.5.
Bw	16-42	Very dark grey (10YR3/1 M), clay medium, moderate sub-angular blocky structure, with shining pressure faces, on ped surfaces friable, sticky and plastic, 1-2 cm wide cracks, many fine lime nodules, strong effervescent, few, fine roots, gradual wavy boundary, pH 8.7.
Bss1	42-74	Very dark grey (10YR3/1 M) clay, coarse, intersecting slickensides, breaking into medium strong angular blocky to wedge surfaces peds with shining pressure faces, friable very sticky, very plastic, many fine lime nodules strong effervescent; very fine few roots, gradual smooth boundary, pH 8.7.
Bss2	74-110	Very dark grey (10YR3/1 M), clay, coarse intersecting slickensides, breaking into medium, strong angular blocky to wedge shaped peds with shiny pressure faces, firm very sticky and very plastic, many fine lime nodules, strong effervescent, abrupt smooth boundary, pH 8.7.
R	110-115+	Hard basaltic boulder.

### Range in Characteristics:

The solum is generally deep to very deep and the thickness ranges from 75 to 120 cm. The moisture regime is A horizon has ustic dark greyish brown to dark brown 10YR hue with value 3 or 4 and chroma 2 or 4. The B horizon has 10YR hue with value 3 to 4 and chroma of 1 to 3. The texture is mostly clay or silty clay moderate to weak, medium subangular blocky structure is the distinct polished, shiny intersecting slickenside appear between 40 to 100 cm depth. The lime nodules increase with depth.

Kondhali series-deep, moderately well drained, very dark grayish brown, lay textured, slightly alkaline with organic carbon of 0.83%,  $\text{CaCO}_3$  of 4 to 9% and exchangeable Ca of 42 to 50  $\text{cmol}(+)\text{kg}^{-1}$

**Drainage and permeability:** Pachod soils are moderately well to well drained with moderately slow permeability.

**Use and Vegetation:** These soil are mostly used for cotton and pigeonpea during rainy seasons Mung grain and Vegetables are grown under irrigation.

**Distribution and extent:**

**Type location:** Profile No, 168 Village-Pachod, Tehsil.-Arvi, District-Wardha, Maharashtra 21° 1' 55" N 78° 17' 48" E.

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

**Interpretation:** This soil is deep, moderately well to well drained moderately slow permeability, moderately eroded and swell-shrink soils. The tillage is too difficult when dry or wet.

**Interpretation groupings:**

- i) Land capability sub-class - IIes
- ii) Irrigability sub-class - 2st
- iii) Productivity potential - High.

**ANALYTICAL DATA**

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	K	NA	CEC	Water Retention (%)	
					.....cmol (+) kg <sup>-1</sup> ....					33 kPa	1500 kPa
0-16	8.5	0.33	0.41	8.0	43.0	8.4	-	-	-	38.52	18.68
16-42	8.7	0.19	0.93	8.45	43.1	11.2	-	-	-	36.36	17.12
42-74	8.7	0.16	0.63	12.1	34.6	15.9	-	-	--	33.75	15364
74-110	8.7	0.21	0.50	10.56	31.8	19.2	-	-	-	38.21	17.57

#### 4. KINALA SERIES (Ki)

<b>Classification</b>	:	Loamy, mixed, hyperthermic, family of Lithic Ustorthents
<b>Profile No.</b>	:	26/55K/4
<b>Physiographic position</b>	:	Very sleepy sloping hills
<b>Elevation (m)</b>	:	360 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	933.9 mm
<b>Slope &amp; erosion</b>	:	Very steeply sloping, severely eroded
<b>Geology &amp; parent material</b>	:	Basalt, Basalt.
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Hewan, Waigaon
<b>Typifying pedon</b>	:	Kinala clay loam, forest

Horizon	Depth(cm)	Description
Ap	0-9	Brown (7.5YR4/4 D), dark brown (7.5YR3/4 M); clay loam, weak, medium, subangular blocky breaking into granular structure slightly hard, friable slightly sticky and slightly plastic, fine many roots, few fine pores, clear smooth boundary, pH 7.3.
C	9-28	Weathered basalt.
R	28+	Hard basalt.

**Range in Characteristics:** The thickness of 9-15 cm A horizon is 7.5YR hue and 4YR with value of 3 to 4 and chroma of 2 to 4. This horizon has clay texture with weak sub-angular block structure.

**Competing series and differentiae:** Chanakpuri series on gently sloping table lands, has clay loam (clay of 8 to 41%) and exchangeable Ca of 38 to 40% cmol (+) kg<sup>-1</sup>. The Karanja series is extremely shallow with organic carbon of 2.4%, clay of 28% and CEC of 27 cmol (+) kg<sup>-1</sup>.

**Drainage and permeability:** These soils are mostly excessively drained with rapid permeability.

**Use and Vegetation:** These soils are mostly under busily forest.

**Distribution and extent:** Mostly in Ashti Karanja and Arvi Tehsil and may extent in the adjoining areas.

**Type Location:** Profile No. 26 in Village-Kinala, Tehsil-Ashti, District-Wardha, Maharashtra, 21° 12' 15"N 78° 07' 15" E.

**Series Proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** Kinala series have very shallow to shallow depth, light textured and low in nutrient status. They are susceptible to severe erosion due to steep slopes. They have stony and rocky surfaces at places. They are suitable for forestry and grasses.

#### Interpretation groupings:

- i) Land capability sub-class - Vies
- ii) Land irrigability sub-class - 6st
- iii) Productivity potential - low

## ANALYTICAL DATA

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	K	NA	CEC	Water Retention (%)	
										33 kPa	1500 kPa
0-9	7.3	0.06	0.76	2.8	17.6	8.5	0.3	0.2	-	18.6	10.1

### 5. ASHTI SERIES (As)

<b>Classification</b>	:	Clayey skeletal, mixed, hyperthermic, family of Typic Haplustopte
<b>Profile No.</b>	:	60/55K4/1
<b>Physiographic position</b>	:	Hill slope,
<b>Elevation (m)</b>	:	360 m
<b>Ground water table</b>	:	>10m
<b>Rainfall</b>	:	933.9 mm
<b>Slope &amp; erosion</b>	:	Hill slope, severely eroded
<b>Geology &amp; parent material</b>	:	Basalt, Weathered Basalt.
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Pacho, Pardi, Wardha, Sewagram.
<b>Typifying pedon</b>	:	Dongargaon, gravelly clay, forest

Horizon	Depth(cm)	Description
Ap	0-16	Reddish brown (5YR4/3 D) gravelly clay, dark reddish brown (5YR3/3 M), moderate medium, subangular blocky structure, hard, friable, sticky and plastic, fine medium many roots, fine common pores, 40- 45 % coarse gravels, clear smooth boundary, pH 7.3.
Bw	16-45	Dark reddish brown (5YR3/2D) gravelly clay, dark reddish brown (5YR3/3 M), medium moderate subangular blocky, structure, hard, friable very sticky and very plastic, medium coarse many roots, fine few pores and 40% coarse garvels, abrupt smooth boundary, pH 7.5.
Cr	45-72	Weathered basalt.

**Range in Characteristics:** The thickness of the solum varies from 25 to 50 cm. The surface texture is gravelly clay loam to clay in sub soil texture is dominantly clay loam to clay; sub soil texture in dominantly clay loam. The A and B horizons have in hue 5 YR, value 3 to 4 and chroma of 2 to 3. The texture is gravelly clay. The structure is weak to moderate medium subangular blocky.

#### Competing series and differentiae:

Hirdi series- This soil has 30% clay, 0.4% organic carbon, slightly, alkaline with exchangeable Ca of 44 cmol (+) kg<sup>-1</sup> this soil is dark brown.

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

**Use and Vegetation:** They are mostly under bushy forest. Hi war, Bhasali, Neem, Palas is mostly observed.

**Type Location:** Profile No. 60 Village - Dongargaon, Tehsil-Ashti, District-Wardha, Maharashtra, 21°12' 00" N 78° 09' 40" E.

**Series Proposed:** Nationl Bureau of Soil Survey and land use Planning, Regional Center Nagpur

**Interpretation:** This Soil is shallow, skeletal, reddish brown to dark reddish Borwn gravelly Clay texture with rapid Permeability. These soils are severely eroded on hill slope and excessively drained.

**Interpretation groupings:**

- i) Land capability and sub-class-VIes
- ii) Land irrigability class -5st
- iii) Productivity potential-low

**ANALYTICAL DATA**

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	K	Na	CEC	Water Retention (%)	
										33 kPa	1500 kPa
0-16	7.3	0.08	0.95	4.01	21.5	14.5	0.15	0.21		24.0	11.60
16-45	7.5	0.11	0.83	3.76	24.4	16.7	0.30	0.35		31.69	16.20

## 6. ARVI SERIES (Ar)

<b>Classification</b>	:	Fine, mixed, Calcareous, hyperthermic family of Typic Haplustepts
<b>Profile No.</b>	:	92/55K/4
<b>Physiographic position</b>	:	Very gently sloping piedmont plain,
<b>Elevation (m)</b>	:	340 m
<b>Rainfall</b>	:	933.9mm
<b>Slope &amp; erosion</b>	:	Moderate, Normal
<b>Geology &amp; parent material</b>	:	Basalt, Weathered Basalt.
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Talegaon, Malakpur.
<b>Typifying pedon</b>	:	

Horizon	Depth(cm)	Description
Ap	0-16	Dark greyish brown (10YR4/2 D), gravelly clay, very dark greyish brown (10YR3/2 M) moderate, medium subangular blocky structure, hard, friable, sticky and plastic, common fine lime nodules, 25-30% fine to coarse gravels, fine to medium, many roots, slight effervescent, fine common pores, clear smooth boundary, pH 8.6.
Bw1	16-32	Very dark greyish brown (10YR3/2 M), clay moderate, medium, subangular blocky structure, friable sticky and plastic. Common fine lime nodules, 10-15% gravels, common fine roots, few fine pores, strongly effervescent, gradual wavy boundary, pH 8.4.
Bw2	32-47	Very dark greyish brown (10YR3/2 M), clay, moderate, medium, subangular blocky structure, friable, sticky and plastic, with 10-20% fine gravels, few fine roots, fine many lime nodules, violent effervescent, abrupt wavy boundary, pH 8.5.
Cr	47-58+	Weathered basalt.

**Range in Characteristics:** The solum depth ranging from 30 to 50 cm The A horizon has 10YRhue 3 to 5 and chroma of 2 to 3. The sub cambic B horizons have 10YRhue and chroma of loam to clay at places gravelly clay. The sub-soil textures are mostly clay and at places. The texture is clay with moderate, medium sub-angular blocky structures.

**Competing series and differentiae:** Yakamba series-This soil is moderately alkaline with organic carbon of 0.76% and exchangeable Mg of 13 to 14 cmol (+) kg<sup>-1</sup>.

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

**Use and Vegetation:** These soils are used mostly for cotton, Pigeonpea, groundnut, wheat. The main natural vegetation is Teak, Dhawda, Bharati, Neem, Palas.

**Distribution and extent:** These soils are found in Patches in Arvi and Karanja Tehsil of Wardha district.

**Type location:** Profile No. 92 Village-Maneri, Tehsil-Arvi, District-Wardha, Maharashtra. 21° 04' 20" N and 78° 13' 58" E.

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** This soil is shallow, moderately well drained and moderately eroded. This soil is strongly alkaline and have good water holding capacity.



**Interpretation groupings:**

- i) Land capability and sub-class - IIIst
- ii) Land irrigability sub-class - 3st
- iii) Productivity potential - Moderate

**ANALYTICAL DATA**

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	NA	K	Water Retention (%)	
									.....cmol (+) kg <sup>-1</sup> ....	
									33 kPa	1500 kPa
0-16	8.6	0.13	0.88	5.21	39.5	3.3	0.35	0.43	30.88	14.05
16-32	8.4	0.13	0.67	11.18	47.3	2.6	0.46	0.39	35.23	18.35
32-47	8.5	0.26	0.66	16.19	46.2	2.9	0.38	0.38	36.73	18.66

## 7. CHAMLA SERIES (Cm)

<b>Classification</b>	:	Fine, mixed, hyperthermic family of Vertic, Haplustepts
<b>Type Location</b>	:	Village-Chamla, Tehsil-Ashti, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	76/55K/4
<b>Physiographic position</b>	:	Very gently sloping plains
<b>Elevation (m)</b>	:	400 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	933.9mm
<b>Slope &amp; erosion</b>	:	Very gently sloping plain
<b>Geology &amp; parent material</b>	:	Basalt, Weathered Basalt.
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Thaw, Sewagram, Talegaon
<b>Typifying pedon</b>	:	Chamla, clay, cultivated

Horizon	Depth(cm)	Description
Ap	0-17	Very dark greyish brown (10YR3/2 DM) clay moderate, medium subangular blocky structure, hard, friable, sticky and plastic fine to medium many roots, fine common pores about 8 to 10% fine to coarse gravels, clear smooth boundary, pH 8.0.
Bw1	17-32	Very dark, grey (10YR3/1 M) clay, moderate, medium subangular blocky structure, friable sticky and plastic, fine many roots, fine few pores, fine gravels 5 to 8% gradual smooth boundary, pH 7.9.
Bw2	32-56	Very dark grey (10YR3/1 M) clay moderate medium subangular blocky structure, friable, sticky and plastic fine common roots, slight pressure faces, fine gravels 5%, abrupt smooth boundary, pH 8.2.
Cr	56-68	Weathered basalt with boulders.

**Range in Characteristics:** The solum ranges from 50 to 70 cm underlined by weathered basalt. The surface AP horizon has 10YRhue value 3 to 4 and chroma 2 to 1. The surface texture varies from clay loam to clay. The cambic B horizon colour have of hue 10YRhue, value 3 and chroma 1 to 2. The texture is generally clay with moderate, medium, sub-angular blocky or angular blocky aggregates. The sub-soil horizons have pressure faces and fine to coarse gravels of 5 to 10% throughout the profile.

**Competing series and diffeentiae:** Lasanpur series is moderately alkaline with 8 to 22% of CaCO<sub>3</sub> at 80 to 130 cm and have very dark grayish brown matrix throughout depth. Nagjhari series an undulating plateaus are deep, brown to dark brown matrix with moderately alkaline soils and clay content 750 per cent.

**Drainage and permeability:** These soils are, moderately well to well drained with moderately slow permeability.

**Use and Vegetation:** These soils are mostly used for cotton and Pigeonpea at places wheat and oranges is also grown. Babul, Neem, Ber, vegetation is observed.

**Distribution and extent:** Chamla soils are distributed in Ashti Tehsil and extended in Arvi and Kariya Tehsil of Wardha district and adjoining areas.

**Type location:** Profile No. 76 Village-Chamla, Tehsil-Ashti, District-Wardha, Maharashtra.

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** Chamla soils have good depth favourable textures and drainage. The soils respond to agricultural crops under proper management practices for both rainfed and irrigated condition.

**Interpretation groupings:**

- i) Land capability sub-class - II<sub>t</sub>
- ii) Land irrigability class - 2<sub>st</sub>
- iii) Productivity potential - High.

**ANALYTICAL DATA**

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	NA	K	Water Retention (%)	
									33 kPa	1500 kPa
0-17	8.0	0.1	1.33	3.98	42.2	8.3	0.47	1.1	36.83	18.27
17-32	7.9	0.1	1.10	3.82	41.1	7.3	0.50	0.8	36.54	17.44
32-56	8.2	0.1	1.02	4.78	43.8	7.6	0.38	0.6	36.33	17.03

## 8. THAR SERIES (Th)

<b>Classification</b>	:	Fine, montmorillonitic, hyperthermic, Leptic Haplusterts
<b>Type Location</b>	:	Village-Thar, Tehsil-Ashti, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	72/55K/4
<b>Physiographic position</b>	:	Gently sloping plains
<b>Elevation (m)</b>	:	400 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	933.9 mm
<b>Slope &amp; erosion</b>	:	Gently sloping plain, Moderate erosion Normal
<b>Geology &amp; parent material</b>	:	Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Chamla
<b>Typifying pedon</b>	:	Thar, clay, cultivated

Horizon	Depth(cm)	Description
Ap	0-16	Very dark greyish brown (10YR3/2 D+M), clay moderate, medium sub-angular blocky structure hard, friable, sticky and plastic, many fine roots, common fine pores, 5 to 6% fine gravels, very fine few lime nodules pH 7.5 clear smooth boundary.
Bw	16-40	Very dark grey (10YR3/1 M) clay, moderate, medium, subangular blocky structure, moist friable, sticky and plastic, slight pressure faces, many fine roots, few fine nodules, 5 to 8% fine gravels. pH 8.1 gradual smooth boundary.
Bss	40-82	Very dark grey, (10YR3/1 M) clay, moderate medium subangular blocky structure, friable very sticky and very plastic, many, very fine roots, common fine lime nodules with slickensides, 5 to 8% fine gravels. pH 8.3 abrupt smooth boundary.
Cr	82-85	Hard Basaltic boulders.

**Range in Characteristics:** The solum depth ranging from 60 to 90 cm. The surface AP horizon colors are in hue of 10YRhue, value of 3 of 4 and chroma 2 to 3. The B horizons have 10YRhue value 3 or 4 and chroma of 1 or 2, the texture is clay at few places clay loam. Thought depth with distinct sub-angular to angular, wedge shaped aggregates.

**Competing and differentiae:** Hewan series is occurring on very gently sloping plain, slightly alkaline with depth. Anjangaon series is moderately deep in valleys with brown to dark brown matrix with moderate alkalinity with depth.

**Drainage and permeability:** These soils are moderately well drained with moderately slow to slow permeability.

**Use and Vegetation:** These soils are mostly used for growing cotton and pigeonpea. The natural vegetation is Babul, Neem and Teak.

**Distribution and extent:** These soils are mostly found in Ashti Tehsil, of Wardha district, Maharashtra.

**Type location:** Profile No. 72 Village-Thar, Tehsil - Ashti, District - Wardha, 21° 12' 12" N and 78° 14' 10" E.

**Series proposed:** National Bureau of Soil Survey and land use planning Regional Centre, Nagpur.

**Interpretation:** This soil is moderately deep, moderately, eroded and moderately slow to slow permeability, slightly to moderately alkaline in reaction.

**Interpretation groupings:**

- i) Land capability and class - IIes
- ii) Land irrigability class - 2st
- iii) Productivity potential - High.

**ANALYTICAL DATA**

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	NA	K	Water Retention (%)	
									33 kPa	1500 kPa
0-16	7.5	0.1	1.1	4.11	40.7	9.9	0.31	0.81	35.43	18.11
16-40	8.1	0.1	0.84	4.52	41.5	8.2	0.29	0.73	33.12	15.56
40-82	8.3	0.2	0.85	6.48	42.6	7.0	0.31	0.66	37.93	18.46

### 9. TALEGAON SERIES (Ta)

<b>Classification</b>	:	Fine, montmorillonitic hyperthermic, family of Typic Haplusterts
<b>Type Location</b>	:	Village-Bharaswada, Tehsil-Ashti, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	8/55K/4
<b>Physiographic position</b>	:	Level to very gently sloping plain
<b>Elevation (m)</b>	:	300 to 320 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	933.9 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping, moderate
<b>Geology &amp; parent material</b>	:	Basalt, Alluvium.
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Malakpur, Arvi, Chamla, Sewagram, Vagholi.
<b>Typifying pedon</b>	:	Talegaon Clay Cultivated.

Horizon	Depth(cm)	Description
Ap	0-14	Dark grey, (10YR4/1 D), very greyish brown (10YR3/2 M), clay moderate, medium, subangular blocky structure, hard, friable, sticky and plastic, fine to medium, common roots, fine common pores, fine and medium, common lime nodules, slight effervescent coarse fragments 5 to 6%, smooth boundary clear, pH 8.3.
Bw1	14-36	Very dark grey (10YR3/1 M) clay, moderate medium subangular blocky structure, friable, sticky and plastic fine common roots, fine pores, fine to medium, common lime nodules, slight effervescent, fine gravels 4 to 5%, diffused smooth boundary, pH 8.3.
Bw2	36-71	Very dark grey (10YR3/1 M), clay, moderate medium, subangular blocky to angular blocky structure, friable, very sticky and very plastic, pressure faces, fine common roots, fine, common lime nodules, 4 to 5% fine gravels, gradual wavy boundary, pH 8.4.
Bssl	71-126	Very dark grey (10YR3/1 M), clay, moderate coarse, angular blocky structure, friable, very sticky and very plastic, intersecting slickensides cracks 0.5 to 1.5 cm wide, fine common lime nodules, 3 to 4% fine gravels, slight effervescent, diffused wavy boundary, pH 8.5.
Bss2	126-145+	Very dark grey (10YR3/1 M) clay, moderate coarse angular blocky structure, friable very sticky and very plastic, 3 to 4% fine gravels, intersecting slicknsides, few, fine lime nodules, slight effervescent, pH 8.5.

**Range in Characteristics:** The average depth of the solum ranges from 120 to 150 cm The AP horizon has 10YRhue, value of 3 to 4 and chroma of 1 to 2. The B horizons have 10YRhue value 2 to 3 and chroma 1 or 2. The texture is clay throughout and medium subangular blocky with pressure face and intersecting slickenside. The lime content is common throughout the profile and increases with depth. Cracks 1-3 cm wide extend upto 100 to 120 cm

**Competing series and differentiae:**Competing series is Malkapur (Mk) series occurring on Piedmont plains. This soil has 0.7% organic carbon and 4% of  $\text{CaCO}_3$  with depth and have exchangeable  $\text{Ca} < 30 \text{ cmol (+) kg}^{-1}$  and K of more than  $1 \text{ cmol (+) kg}^{-1}$ .

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

**Use and Vegetation:** Cultivated to rainfed, cotton, sorghum, Pigeonpea and gram at places wheat and vegetables are also grown under irrigation, Neem, Palas, Babul is generally found under vegetation.

**Distribution and extent:** Extensive in Ashti Tehsil and the adjoining of Wardha district of Maharashtra.

**Type location:** Profile No. 8 Village-Bharaswada, Tehsil-Ashti, District-Wardha, Maharashtra at 21° 07'45" N and 78° 09'10" E.

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** Talegaon soils are fine textured with high shrink swell potential. During monsoon, crops may be adversely affected due to stagnation of water. These soils are susceptible to erosion even on gently sloping lands. They are productive with proper management and drainage under both rainfed and irrigated agriculture.

**Interpretation groupings:**

- i) Land capability sub-class IIes - IIIs
- ii) Land irrigability sub-class - 3s
- iii) Productivity potential - medium to high.

**ANALYTICAL DATA**

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	K	Na	Water Retention (%)	
									33 kPa	1500 kPa
0-14	8.3	0.16	0.73	20.73	44.8	4.6	1.3	0.36	39.3	18.0
14-36	8.3	0.12	0.67	19.58	46.7	4.9	1.15	0.40	38.4	19.7
36-71	8.4	0.18	0.67	19.90	47.7	6.6	1.06	0.42	42.1	24.8
71-126	8.5	0.14	0.62	16.28	37.0	7.7	1.03	0.49	45.3	25.8
126-145	8.5	0.16	0.62	17.31	33.3	10.1	1.04	0.59	40.0	21.1

### 10. VAGHOLI SERIES (Va)

<b>Classification</b>	:	Fine, mixed, hyperthermic, Calcareous family of Chromic Haplusterts
<b>Type Location</b>	:	Village-Vagholi, Tehsil-Ashti, Dist-Wardha (Maharashtra)
<b>Profile No</b>	:	17/55K/4
<b>Physiographic position</b>	:	Very gently sloping piedmont plains
<b>Elevation (m)</b>	:	300 to 320 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	933.9 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping, Moderate
<b>Geology &amp; parent material</b>	:	Basalt, Alluvium.
<b>Distribution and extent</b>	:	
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Talegaon, Malakpur, Wardha, Sewagram.
<b>Typifying pedon</b>	:	Vagholi, Clay, Cultivated.

Horizon	Depth(cm)	Description
Ap	0-18	Brown (10YR5/3 D) Brown (10YR4/3 M) clay moderate medium subangular blocky structure, slightly hard friable, sticky and plastic, fine to medium, many lime nodules, fine many roots, fine few pores, violent effervescent, clear smooth boundary, pH 8.6.
Bwl	18-54	Brown (10YR4/3 M), clay loam to clay moderate medium subangular blocky structure, hard friable, sticky and plastic fine to medium, common lime nodules fine few roots, fine very few pores, violent effervescent, gradual smooth boundary, pH 8.9.
Bssl	54-73	Brown (10YR4/3 M) clay loam, moderate medium subangular blocky structure, friable slightly sticky and slightly plastic, fine to medium, common lime nodules, 3 to 4% fine gravels, very fine, very few roots and violent effervescent, diffused smooth boundary, pH 8.9.
Bss2	73-115	Brown (10YR4/3 M) clay loam, moderate medium, subangular blocky structure, friable, slightly sticky, slightly plastic fine to medium common lime nodules 3-4% fine gravels, violent effervescent, diffused smooth boundary, pH 8.9.
Bss3	115-130	Dark reddish brown (10YR3/3 M) sandy clay loam, moderate medium subangular blocky structure, firm slightly sticky and slightly plastic, fine to medium, few lime nodules 3-4% fine gravels violent effervescent, pH 8.9.

**Range in Characteristics:** The average thickness of the solum ranges from 120 to 150 cm. The AP horizon is brown with 10YR hue while the moist colour of the AP horizon with value 4 to 5 and for dry soils is mostly 5 and having chroma 2 to 3 for dry and moist soils. The subsoil colour ranges in hue of 10YR with value 3 to 4 in moist soils, having chroma 2 to 3 of both dry and moist soils. The common soils types are clay loam, while at places gravelly clay loam are also met with. The structure of the surface soil is medium weak subangular blocky to medium moderate subangular blocky through the depth, lime nodules and fine gravels decrease in size and volume through depth.

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

**Use and Vegetation:** These soils are mostly cultivated for cotton and pigeonpea and at places wheat and vegetables are also grown. Babul, Neem, Ber, Khair and Hiwar are the natural vegetation.

**Distribution and extent:** These soils are distributed in Ashti, Karanja and Arvi Tehsil of Wardha district and in the adjoining areas.



**Type location;** Profile No. 17 Village Vagholi about 1 km from towards north side of the village. Tehsil Ashti, District Wardha, Maharashtra 21° 10' 12" N and 79° 07' 25" E.

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** Vagholi is a very deep and fine textured. They are susceptible to erosion moderate. This soil is strongly alkaline with lime nodules in deeper layers.

**Interpretation groupings:**

- i) Land capability sub-class - IIIest
- ii) Land irrigability sub-class - 3st
- iii) Productivity potential - Medium.

**ANALYTICAL DATA**

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	K	Na	Water Retention (%)	
									33 kPa	1500 kPa
0-18	8.6	0.13	0.83	13.32	21.1	4.4	0.03	0.32	27.1	14.0
18-54	8.9	0.13	0.21	10.35	19.2	12.0	0.76	0.34	29.8	16.1
54-73	8.9	0.16	0.13	10.00	11.6	17.0	0.58	0.30	28.6	15.6
73-115	8.9	0.18	0.10	7.72	9.3	20.1	0.46	0.19	27.2	15.4
115-130	8.9	0.15	0.10	6.48	10.3	20.8	0.54	0.34	26.4	15.2

## 11. MALAKPUR SERIES

<b>Classification</b>	:	Fine, montmorillonitic hyperthermic family of Typic Haplusterts
<b>Type Location</b>	:	Village-Tekoda, Tehsil-Ashti, Dist-Wardha (Maharashtra)
<b>Profile No</b>	:	15/55K/4
<b>Physiographic position</b>	:	Very gently sloping piedmont plain
<b>Elevation (m)</b>	:	320 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	933.9 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping, piedmont plains, Moderate
<b>Geology &amp; parent material</b>	:	Basalt, Weathered Basalt.
<b>Distribution and extent</b>	:	
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Talegaon, Vagholi, Arvi, Kala, Kandhal
<b>Typifying pedon</b>	:	Malakpur, clay, cultivated

Horizon	Depth(cm)	Description
Ap	0-15	Very dark greyish brown (10YR3/2 DM) clay, moderate medium subangular blocky structure, hard friable, sticky and plastic, fine common roots, fine few lime nodules with fine gravels 5-6% fine common pores, clear smooth boundary, pH 7.7.
Bw1	15-37	Very dark greyish brown (10YR3/2 M) clay, moderate, medium sub-angular blocky structure, hard friable, very sticky, very plastic, fine few roots, fine few lime nodules with 3 to 4% fine gravels, fine few pores, gradual smooth boundary, pH 7.8.
Bw2	37-64	Very dark greyish brown (10YR3/2 M) clay, moderate, medium, subangular blocky to angular blocky peds with shiny pressure faces friable very sticky and very plastic, few fine lime nodules, 3 to 4% fine gravels, gradual smooth boundary, pH 7.8.
Bss	64-86	Very dark greyish brown (10YR3/2 M), clay moderate medium angular blocky structure with intersecting slickensides, friable very sticky and very plastic, fine few lime nodules fine gravels 2-3%, diffused smooth boundary, pH 8.0.
Ck	86-135	Brown (10YR4/3), sandy clay loam, medium weak sub-angular blocky structure, friable, slightly sticky and slightly plastic, fine gravels 8-10% lime mixed with soil, violent effervescent pH 8.6
Cr	135+	Weathered basalt.

**Range in Characteristics:** The thickness of the solum ranges from 120 to 140 cm. The stimulated MAST is 28°C, MSST is 32.6°C and MWST is 25°C. The moisture regime is ustic. The colour is in hue of 10YR with value 3 to 4 and chroma 2 to 3. The sub-soil colour also ranges in hue of 10YR with value 3 to 4 and chroma 2 to 3. The common soil type is clay. The subsoil texture is dominantly clay while at places gravelly clay loam or sandy clay loam are also met with. The structure of the surface soil is medium moderate sub angular blocky to coarse strong angular blocky through depth, followed by medium weak sub- angular blocky slickensides are prominent from third layer downwards. The sub-soil horizons have coarse intersecting slickensides that break into medium moderate angular blocky peds with shiny pressure faces, fine gravels and lime nodules throughout the depth.

**Competing series and differentiae:** Talegaon is the competing soils, moderately well drained, Typic Haplusterts with exchangeable Ca more than 40 cmol (+) kg<sup>-1</sup> and moderately alkaline throughout depth.

**Drainage and permeability:** Moderately well drained soils with moderately slow to slow permeability.

**Use and Vegetation:** These soils are mostly cultivated for cotton and Pigeonpea, wheat and chilly and vegetables are grown in patches. Babul, ber, palas, Hiwar and Mango constitute the natural vegetation.

**Distribution and extent:** These soils are distributed in Ashti, Karanja and Arvi Tehsil of Wardha district and adjoining areas. Their extent in root so large.

**Type location:** Profile No. 15 Village-Tekoda, Tehsil-Ashti, District-Wardha, Maharashtra 21° 09' 02" N 78° 08' 32" E.

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** Malakpur series is very deep, heavy textured with high shrink-swell potential. They are susceptible to erosion hazards.

#### Interpretation groupings:

- i) Land capability sub-class - IIes - IIIs
- ii) Land irrigability sub-class - 3s
- iii) Productivity potential - High.

#### ANALYTICAL DATA

Depth (cm)	pH	EC dSm <sup>-1</sup>	OC (%)	CaCO <sub>3</sub> (%)	Ca	Mg	Na	K	Water Retention (%)	
									33 kPa	1500 kPa
0-15	7.7	0.21	0.77	4.59	31.5	7.9	0.40	1.30	421.1	23.4
15-37	7.8	0.08	0.71	4.2	33.3	8.4	0.38	1.08	43.7	23.4
37-64	7.8	0.09	0.70	4.14	30.6	8.7	0.42	1.03	44.6	26.3
64-86	8.0	0.21	0.64	4.65	32.4	9.6	0.44	1.00	47.2	28.0
86-135	8.6	0.17	0.28	7.92	24.1	6.6	0.40	0.52	27.5	15.6

## 12. BOTHALI SERIES (Bo)

<b>Classification</b>	:	Veryfine, montmorillonitic, hyperthermic Calcareous family of Typic Haplusterts
<b>Type Location</b>	:	Village-Dhumantehera, Tehsil-Samudrapur, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	55P/2-P-31
<b>Physiographic position</b>	:	North Deccan Maharashtra lower Plateau: Table land
<b>Elevation (m)</b>	:	
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	
<b>Slope &amp; erosion</b>	:	Very gently sloping (1-2%), moderate
<b>Geology &amp; parent material</b>	:	Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Waigaon, Chanakpur
<b>Typifying pedon</b>	:	Bothali clay-cultivated

Horizon	Depth(cm)	Description
Ap	0-11	Very dark greyish brown, (10YR3/2 M) silty clay; medium moderate subangular blocky structure; hard, friable, sticky, plastic, fine, medium, common roots; clear smooth boundary, pH 7.80.
Bw1	11-26	Very dark greyish brown, (10YR3/2 M) clay; medium moderate subangular blocky structure, hard, friable, fine, medium, Common roots; diffuse; smooth boundary, pH 7.87.
Bw2	26-47	Very dark grey, (10YR3/1 M) clay; medium, moderate subangular blocky structure; very hard, medium friable, very sticky, very plastic; fine, fine roots; diffuse smooth boundary, pH 7.98.
Bssl	47-79	Dark grey, (10YR4/1 M) clay; coarse, strong, angular blocky structure; very hard, very friable, very sticky, very plastic, very fine roots; diffuse smooth boundary, pH 7.82.
Bss2	79-128	Very dark grey, (10YR3/1 M) clay; coarse strong angular block structure; very hard, friable, very sticky, very plastic; very fine fine roots; clear wavy boundary, pH 7.85.
C	128-135	Weathered basalt.

**Range in Characteristics:** Thickness of solum and depth to bed rock range from about 120 to 150 with Ap-Bw-Bss horizon sequence. The A horizon is very dark greyish brown, 11 to 15 cm thick, moderately alkaline and lay texture. The Cambic and sticken sided B horizons have same colour value as That of A horizon and Chroma of 10. It is clay and averages more than 30 percent with strong angular blocky structures.

**Competing and differentiae:** Malkapur series have very dark grayish brown with clay of 72 to 85% and exchangeable Mg of 4 to 8 cmol (+) kg<sup>-1</sup>.

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

**Use and Vegetation:** These soils are cultivated for cotton and red gram.

**Distribution and extent:** Widely distributed in Samudrapur & Ashti Tehsil of Wardha district.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** This soil is deep, moderately well drained, high shrink-swell potential making it difficult to tillage when too dry and too wet.

#### Interpretation groupings:

- i) Land capability sub-class - IIs
- ii) Land irrigability class - 3st
- iii) Productivity potential - Medium.

#### ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
AP	0-11	9.1	29.9	61	-
Bwl	11-26	10.1	29.9	60	-
Bw2	26-47	9.4	29.6	61	-
Bssl	47-79	8.7	25.3	66	-
Bss2	79-128	8.1	26.4	65.5	-
C	128-135	45.6	36.4	18	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil:water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-11	1.23	4.45	0.46	7.8	-	-	32.33	16.72
11-26	0.76	0.37	0.27	7.87	-	-	31.34	16.62
26-47	0.75	4.45	0.2	7.98	-	-	34.49	15.93
47-79	0.7	3.77	0.38	7.82	-	-	37.8	19.19
79-128	0.68	2.46	0.21	7.85	-	-	39.21	20.67
128-135	0.68	3.51	0.12	8.17	-	-	-	-

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-11	51.98	21.63	0.81	0.92	75.34	62.08	121.3
11-26	48.5	22.62	0.75	0.68	72.55	61.3	118.3
26-47	50.12	22.62	0.84	0.6	78.18	62.86	184.4
47-79	46.35	28	1.01	0.6	75.96	58.98	128.8
79-128	43.79	30.01	1.25	0.56	75.61	57.42	131.7
128-135	-	-	-	-	-	-	-

### 13. CHANAKPUR SERIES (Cp)

<b>Classification</b>	:	Loamy mixed, hyperthermic family of Lithic Ustorthents
<b>Type Location</b>	:	Village-Dhandgaon, Tehsil-Samudrapur, Dist- Wardha (Maharashtra)
<b>Profile No.</b>	:	55P/2-P-3
<b>Physiographic position</b>	:	Northern Deccan Maharashtra lower Plateau: Table land
<b>Elevation (m)</b>	:	
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	
<b>Slope &amp; erosion</b>	:	Very gently sloping (1-3%) on table tops, Moderate
<b>Geology &amp; parent material</b>	:	Weathered Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Chanakpur, Waigaon, Bothali.
<b>Typifying pedon</b>	:	clay loam, pasture land

Horizon	Depth(cm)	Description
A	0-13	Very dark greyish brown, (10YR3/2 M) clay loam; weak medium, subangular blocky structure; dry hard, medium friable, sticky, very fine, medium roots; clear smooth boundary with slightly effervescence, pH 7.76.
Ac	13-25	Very dark greyish brown, (10YR3/2 M) gravelly clay loam; weak medium subangular blocky structure; slight, hard, friable, WP, very fine common roots, strong effervescence, pH 8.04.
C	25-40	Light grey, (10YR7/2 M) Weathered basalt with strong effervescence.

**Range in Characteristics:** This is shallow lithic contact within 25 cm. Thickness of solum and depth to bed rock range from about 25 to 35. The A horizon 10YRhue, value 3 and chroma of 2 or 3. It is slightly alkaline and have light grey C horizon.

**Competing and differentiae:** Karanja series is extremely shallow, neutral in reaction and have organic carbon of 2.4% and occurs on moderately sloping and severely eroded will slopes. This soil has CEC of 27 cmol (+) kg<sup>-1</sup> neutral, with exchangeable Ca of 17.6% and Mg of 8.5 cmol (+) kg<sup>-1</sup>.

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

**Use and Vegetation:** Pasture and grazing land.

**Distribution and extent:** Extensive in Chanakpur, Waigaon and Bothali Villages of Wardha district.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** It is shallow, loamy textured, well drained, rapid infiltration, mostly occurring on gently sloping table tops, moderately eroded and suitable for grazing.

**Interpretation groupings:**

- i) Land capability sub-class - VIIs
- ii) Land irrigability class - 2st
- iii) Productivity potential - Low.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
A	0-13	15.9	42.6	41.5	-
Ac	13-25	41.5	30.5	28	-
C	25-40	64.8	27.7	7.5	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil:water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-13	0.83	9.63	0.52	7.76	-	-	26.26	11.68
13-25	0.63	2.18	0.31	8.04	-	-	18.35	8.1
25-40	0.48	-	0.19	8.3	-	-	-	-

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-13	40.77	4.61	0.43	0.46	46.27	48.11	96.2
13-25	38.39	4.99	0.49	0.26	44.13	45.78	96.4
25-40	-	-	-	-	-	-	-



#### 14. WAIGAON SERIES (Wg)

<b>Classification</b>	:	Very fine, mixed, hyperthermic, family of Typic Haplustepts
<b>Type Location</b>	:	Village-Waigaon, Tehsil-Samudrapur, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	55P/2-P-33
<b>Physiographic position</b>	:	North plains Deccan Maharashtra lower Plateau-Piedmont.
<b>Elevation (m)</b>	:	
<b>Ground water table</b>	:	> 10 m
<b>Rainfall</b>	:	934 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping (1-5%), moderate
<b>Geology &amp; parent material</b>	:	Weathered Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Bothali, Chanakpur, Wadne, Hewan, Waigaon
<b>Typifying pedon</b>	:	Clay - cultivated

Horizon	Depth(cm)	Description
Ap	0-11	Very dark grayish brown, (10YR3/2 M) clay coarse moderate; medium, subangular blocky structure; dry, slightly, hard, medium friable, very sticky, very plastic; fine, common roots; clear smooth boundary, pH 8.70.
Bw1	11-38	Very dark grayish brown, (10YR3/2 M) clay; moderate, medium subangular blocky structure; hard, medium friable, very sticky, very plastic; fine common roots, gradual smooth boundary, pH 7.54.
Bw2	38-54	Very dark grayish brown, (10YR3/2 M) clay coarse moderate medium angular block structure; hard, massive friable, very sticky, very plastic; very fine very fine roots, clear smooth boundary, pH 7.46.
Be	54-64	Very dark grayish brown, (10YR3/2 M) gravelly clay massive; clear wavy boundary with strong effervescence, pH 8.03.
C	64-78	Weathered basalt.

**Range in Characteristics:** Moderately deep, clay soils with horizon sequence of Ap, Bw and Cr. The A horizon and B horizons have same colours of value 3 or 4 and chroma of 2. The thickness ranges about 11-20 cm. It is moderately alkaline to slightly alkaline with depth.

**Competing and differentiae:** Karla series- This soil has 0.5% to 0.4% organic carbon, 4 to 8%, CaCO<sub>3</sub> and exchangeable Na of 0.52 to 0.58 cmol (+) kg<sup>-1</sup>.

**Drainage and permeability:** Well drained and slow.

**Use and Vegetation:** Most of the soil is used for linseed

**Distribution and extent:** Waigaon area of Samudrapur Tehsil, Wardha district. This series is extensive.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** This soil is moderately deep, clay with medium shrink-swell potential.

**Interpretation groupings:**

- i) Land capability class - IVes
- ii) Land irrigability class - 3st
- iii) Productivity potential - Medium.

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
Ap	0-11	2.9	30.6	66.5	-
Bwl	11-38	3	32.5	64.5	-
Bw2	38-54	2.5	30.5	67	-
Be	54-64	13.2	28.3	58.5	-
C	64-78	61.9	25.1	13	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil:water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-11	0.85	2.26	0.49	8.7	-	-	26.18	15.48
11-38	0.58	1.41	0.28	7.54	-	-	28.38	14.14
38-54	0.58	0.4	0.27	7.46	-	-	29.83	15.95
54-64	0.5	11.91	0.225	8.03	-	-	29.78	15.85
64-78	0.07	10.96	0.19	8.15	-	-	1238	6.64

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-11	43.23	7.6	0.46	0.77	52.06	52.77	98.6
11-38	45.45	7.93	0.46	0.7	54.54	55.1	99
38-54	47.46	7.77	0.38	0.62	56.23	55.87	100.6
54-64	47.15	6.3	0.41	0.6	54.46	55.09	98.8
64-78	35.56	4.81	0.2	0.16	40.73	41.13	99

### 15. HEWAN SERIES (Hw)

<b>Classification</b>	:	Fine, montmorillonitic, hyperthermic Calcic Family of Leptic Haplusterts
<b>Type Location</b>	:	Village-Kinhal, Tehsil-Samudrapur, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	55L/14-P-72
<b>Physiographic position</b>	:	North Deccan Maharashtra lower Plateau: Table tops
<b>Elevation (m)</b>	:	
<b>Ground water table</b>	:	>10 m
<b>Rainfall</b>	:	934 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping (1-3%) slight
<b>Geology &amp; parent material</b>	:	Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Waigon, Karla, Wadne, Kandhali, Hewan
<b>Typifying pedon</b>	:	Mangrulpir clay-cultivated

Horizon	Depth(cm)	Description
Ap	0-10	Very dark grayish brown, (10YR3/2 M) clay; weak medium, subangular blocky structure; slightly hard, friable, very sticky, very plastic; fine, fine roots; pH 7.98; diffuse smooth boundary with slight effervescence.
Bw1	10-30	Very dark grayish brown, (10YR3/2 M) clay; moderate medium subangular blocky structure; hard very friable, very sticky; very plastic; very fine, fine roots; pH 8.00 diffuse smooth boundary with slight effervescence.
Bss1	30-52	Very dark grayish brown, (10YR3/2 M) clay; coarse, common angular blocky structure; very hard, very friable and very sticky; very fine, very fine roots; pH 8.01; gradual smooth boundary; slight effervescence.
Bss2	52-105	Very dark grayish brown, (10YR3/2 M) clay; coarse strong angular blocky structure; very hard; friable, very sticky and plastic; pH 8.08 with strong effervescence.
Cr	105-145	Weathered basalt.

**Range in Characteristics:** This soil has Ap-Bss horizon sequence with 10YR hue value 3 and chroma of 2. The thickness of A horizon is 11 to 18 cm with clay content 7.35% and slightly alkaline. This soil has weak, medium subangular blocky structures. The B horizon is 15 to 30 cm thick with strong angular blocky structure and have average clay more than 35%.

**Competing and differentiae:** Thar series with strong alkalinity and exchangeable Ca more than 40 cmol(+)kg<sup>-1</sup>. Anjangaon series in valley have brown/dark brown with moderate alkalinity.

**Drainage and permeability:** Moderately drained and slow permeability.

**Use and Vegetation:** Mostly cultivated for cotton and redgram.

**Distribution and extent:** Kinhal and Hewan areas of Samurapur tehsil, Wardha district. This series is extensive.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** This soil is deep, moderately well drained, high shrink-swell potential and usually deficient in Fe, Zn and Phosphorus.

**Interpretation groupings:**

- i) Land capability sub-class - IIIes
- ii) Land irrigability class - 3st
- iii) Productivity potential - Medium.

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
Ap	0-10	4.8	30.7	64.5	
Bwl	10-30	5	30	65	
Bssl	30-52	4.1	23.9	72	
Bss2	52-105	3.5	20	76.5	
Cr	105-145	56.9	16.6	26.5	

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil:water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-10	1.16	-	0.18	7.98	-	-	-	-
10-30	1.01	4.99	0.2	8	-	-	29.08	14.48
30-52	1	4.33	0.19	8.01	-	-	32.57	15.67
52-105	0.88	4.56	0.17	8.08	-	-	32.55	16.92
105-145	0.75	5.91	0.18	8.13	-	-	19.84	9.29

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-10	55.69	4.41	0.49	1.08	61.67	62.09	99.3
10-30	50.71	4.08	0.43	0.86	56.08	58.98	95.1
30-52	49.91	5.22	0.49	0.92	56.54	57.42	98.5
52-105	49.36	6.86	0.52	0.98	57.72	56.64	101.9
105-145	43.54	7.32	0.32	0.3	51.48	50.44	102.1

### 16. KARLA SERIES (Ka)

<b>Classification</b>	:	Fine, mixed, hyperthermic typic family of Haplustepts
<b>Type Location</b>	:	Village-Ralegaon, Tehsil-Samanapur, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	55L/14-P-15.
<b>Physiographic position</b>	:	North Deccan Maharashtra lowers Plateau: Piedmont land
<b>Elevation (m)</b>	:	
<b>Ground water table</b>	:	>10 m
<b>Rainfall</b>	:	934 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping (1-2%) & moderate relief
<b>Geology &amp; parent material</b>	:	Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Hewan, Malakpur, Kandhali, Wadner Karla.
<b>Typifying pedon</b>	:	Clay-cultivated

Horizon	Depth(cm)	Description
Ap	0-15	Very dark grayish brown, (10YR3/2 M) clay; moderate medium, subangular blocky structure; slightly hard medium friable, sticky, plastic, fine, medium common roots; pH 7.87; clear smooth boundary; with slightly effervescence.
Bw1	15-31	Very dark grayish brown, (10YR3/2 M) clay; strong medium subangular blocky structure; hard, friable, sticky and plastic; fine medium, fine roots; pH 7.78; gradual smooth boundary with slightly effervescence.
Bw2	31-56	Very dark grayish brown, (10YR3/2 M) clay; massive structure; pH 8.00; with strong effervescence.
Bw3	56-64	Dark brown, (10YR3/3 M) gravelly clay; massive structure; pH 8.20 with violent effervescence.
C	64-74	Weathered basalt material.

**Range in Characteristics:** This soil is very dark grayish brown matrix. Throughout depth. It has 10YRhue, value 3 and chroma 2 in A and B horizons. The A horizon is 11 to 16 cm thick, clay textured, medium subangular blocky structures. The B horizon is 15 to 60 cm thick, clay textured, strong, subangular blocky structures.

**Competing and differentiae:** Waigaon series- This soil is slightly alkaline with clay of >60%, organic carbon of 0.9 to 0.5% increase of CaCO<sub>3</sub> of 1.4 to 11.9% and exchangeable Na of 0.2 to 0.4 cmol(+) kg<sup>-1</sup>

**Drainage and permeability:** Well drained and slow permeability.

**Use and Vegetation:** Mostly used for cotton and Redgram.

**Distribution and extent:** Mostly extensive in Ralegaon area of Samudrapur tehsil, Wardha district. This series is extensive.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** This soil is moderately deep, moderately eroded, well drained with slight alkalinity throughout depth.

**Interpretation groupings:**

- i) Land capability class - IIIes
- ii) Land irrigability class - 2st
- iii) Productivity potential - Medium.

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
Ap	0-15	5.5	32	62.5	
Bwl	15-31	5.6	32.4	62	
Bw2	31-56	5.7	31.3	63	
Bw3	56-64	27.1	25.9	47	
C	64-74	68.4	18.1	13.5	

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil:water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-15	0.57	4.09	0.309	7.87	-	-	27.59	15.1
15-31	0.43	4.16	0.89	7.78	-	-	30.34	14
31-56	0.43	3.57	0.26	8	-	-	33.75	16.66
56-64	0.29	8.94	0.22	8.2	-	-	28.66	13.4
64-74	0.29	-	0.19	8.16	-	-	-	-

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-15	49.14	6.72	0.58	0.9	57.34	55.42	99.9
15-31	47.07	6.76	0.55	1.02	55.4	55.87	99.2
31-56	48.23	8.48	0.52	0.7	57.93	54.32	106.6
56-64	35.55	6.67	0.55	0.5	43.27	41.9	103.3
64-74	-	-	-	-	-	-	-

### 17. WADNER SERIES (Wd)

<b>Classification</b>	:	Clay, mixed, hyperthermic, family of Lithic Ustrothent
<b>Type Location</b>	:	Village-Nandgaon, Tehsil-Hinganghat, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	55L/14-P-62
<b>Physiographic position</b>	:	North Deccan Maharashtra lower Plateau: Pidmenta
<b>Elevation (m)</b>	:	720 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	934 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping (2.5%) & moderate relief
<b>Geology &amp; parent material</b>	:	Weathered Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Karla, Hewan, Hirdi, Kandhali, Wadner.
<b>Typifying pedon</b>	:	Gravelly clay - Cultivated.

Horizon	Depth(cm)	Description
Ap	0-10	Very dark grayish brown, (10YR3/2 M) gravelly clay; fine weak, subangular blocky structure; slightly firm, slightly sticky, plastic, fine, few, common roots; pH 7.96.
Ac	10-30	

**Range in Characteristics:** This soil has mostly very dark grayish brown A horizons with gravelly clay loam texture and weak subangular blocky structure. It is slightly alkaline and have thickness of 8-12 cm.

**Competing and differentiae:** Sewagram series-Extremely shallow, yellowish brown to brown, clay loam (35%), organic carbon of 0.48% and CEC of 35 cmol(+) kg<sup>-1</sup>.

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

**Use and Vegetation:** Mostly used for cotton and Redgram.

**Distribution and extent:** Extensive in Nandegaon and Hinganghat area of Wardha district. This series is extensive.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** It is extremely shallow, gravelly, clay soils with ground water holding capacity and moderately eroded.

**Interpretation groupings:**

- i) Land capability sub-class - IVes
- ii) Land irrigability sub-class - 4st
- iii) Productivity potential - Low.



## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments ( $<2\text{mm}$ )% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay( $<0.002$ )	
		.....(%).....			
Ap	0-10	29	33	38	-
Ac	10-30	21.4	27.6	51	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil:water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-10	0.63	7.64	0.25	7.96	-	-	19.07	10.7
10-30	0.56		0.27	7.98	-	-		

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-10	45.4	3.21	0.38	0.76	49.85	48.89	102
10-30	-	-	-	-	-	-	-

### 18. HRIDI SERIES (Hi)

<b>Classification</b>	:	Clayey skeletal, mixed, hyperthermic, family of Typic Haplustepts
<b>Type Location</b>	:	Village-Bambrud, Tehsil-Hinganghat, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	55L/15-P-45
<b>Physiographic position</b>	:	North Deccan Maharashtra lower Plateau: Vally
<b>Elevation (m)</b>	:	780 m above MSL
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	
<b>Slope &amp; erosion</b>	:	Gently sloping (3.5%), very severe
<b>Geology &amp; parent material</b>	:	Basalt weathered basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Wadner
<b>Typifying pedon</b>	:	Hirdi clay cultivated.

Horizon	Depth(cm)	Description
Ap	0-20	Dark brown (10YR3/3 M), gravelly clay; coarse, medium, weak, subangular blocky, slightly hard, sticky, plastic, fine, common roots; strong effervescence clear smooth boundary, pH
Bw	20-55	Dark brown (10YR4/2 M) gravelly clay; coarse medium, weak subangular blocky, slightly hard, friable, sticky, plastic few common roots, strong effervescence, clear smooth boundary with.
C	55-60	Weathered basaltic material.

**Range in Characteristics:** The thickness of solum ranges from 35 to 60 cm. The A horizon is 20 cm thick, dark brown, gravelly clay and strongly effervescence. The cambic B horizon is dark grayish brown, gravelly clay subangular blocky structures.

**Competing and differentiae:** Ashti series- This soil has reddish brown, gravelly clay, organic carbon of 0.95% and exchangeable Ca of 21 to 24 cmol (+) kg<sup>-1</sup>.

**Drainage and permeability:** Mostly used for cotton and red gram cultivation.

**Use and Vegetation:** Mostly used for cotton and Redgram.

**Distribution and extent:** Bambrud Village, Hinganghat. This series is extensive.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** Severely eroded, moderately deep, gravelly clay soils.

**Interpretation groupings:**

- i) Land capability sub-class - IVes
- ii) Land irrigability sub-class - 3st
- iii) Productivity potential - Low.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
Ap	0-20	-	-	-	
Bw	20-55	37.6	31.4	31	-
C	55-60	50.1	26.9	23	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil:water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-20	-	-	-	-	-	-	-	-
20-55	0.35	15.19	0.19	8.16			20.44	8.55
55-60	0.06	-	0.15	8.24	-	-	-	-

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-20	-	-	-	-	-	-	-
20-55	43.98	2.42	0.49	0.52	47.41	48.11	98.54
55-60	-	-	-	-	-	-	-

### 19. KONDHALI SERIES (Kd)

<b>Classification</b>	:	Very fine, montmorillonitic, hyperthermic, family of Typic Haplusterts
<b>Type Location</b>	:	Village-Sirsagaon, Tehsil-Hinganghat, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	55L/11-P-108
<b>Physiographic position</b>	:	North Deccan Maharashtra lower Plateau: Table land
<b>Elevation (m)</b>	:	778 m above MSL
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	
<b>Slope &amp; erosion</b>	:	Very gently sloping (1-2%) and moderate
<b>Geology &amp; parent material</b>	:	Alluvium Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Hewan, Wadner, Karla, Wengaoon
<b>Typifying pedon</b>	:	Kandhali clay - cultivated

Horizon	Depth(cm)	Description
Ap	0-13	Very dark grayish brown, (10YR3/2 M) clay; moderate, medium, subangular blocky structure; friable slightly sticky, slightly plastic, medium, few roots; strong effervescence, clear smooth boundary, pH 8.0.
Bw1	13-37	Very dark grayish brown, (10YR3/2 M) clay; moderate, medium subangular blocky structure; friable, sticky, slightly plastic; fine common roots; strong effervescence gradual smooth boundary, pH 8.01.
Bss1	37-60	Very dark grayish brown, (10YR3/2 M) clay moderate, medium subangular blocky; fine common; strong effervescence diffuse smooth boundary, pH 8.01.
Bss2	60-114	Very dark grayish brown, (10YR3/2 M) clay; coarse medium, angular blocky, very hard friable sticky, slightly plastic, very fine, few roots; strong effervescence diffuse smooth boundary, pH 7.98.
Bss3	114-141	Very dark grayish brown, (10YR3/2 M) clay; coarse medium, angular blocky, very hard, friable, sticky, slightly plastic; very fine few roots; pH 8.12 with slight effervescence.
Be	141-160	(10YR3/2 M) clay; coarse medium angular blocky; very hard, friable, sticky, slightly plastic pH 8.12 with slight effervescence.

**Range in Characteristics:** This soil is very deep with thickness of 100 to 200 cm and have matrix of very dark grayish brown with hue 10 YR, value 3 or 4 and chroma of 2. The Ap horizon is 13 to 17 cm thick, slightly alkaline and clay textured with medium subangular blocky structure. The cambic B horizon is 20 to 25 cm thick with distinct pressure on Ped surfaces. The slickensided B horizons have 120 to 140 cm thick with distinct shiny polished surfaces. It is slightly to moderately alkaline.

**Competing and differentiae:** Pachod series is gently sloping on moderately alkaline with exchangeable Ca more than 40 cmol (+) kg<sup>-1</sup> and downward increase of organic carbon (0.4 to 0.93%). Talegaon series on level to very gently sloping plain is moderately alkaline with downward movement of organic carbon and calcium carbonate. Malkapur series is slightly alkaline with exchangeable Ca of 24 to 31 cmol (+) kg<sup>-1</sup> and calcium carbonate 45%.

**Drainage and permeability:** Moderately well drained and slow.

**Use and Vegetation:** Mostly used for cotton and sorghum.

**Distribution and extent:** Mostly extensive in Sirasgaon and Hinganghat areas of Wardha. This series is extensive.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** This soil is very deep, clay textured with distinct pressure faces and prominent slickensides in sub soil horizons and high shrink-swell potentials. It is slightly to moderately alkaline and mostly suitable for sorghum and cotton.

**Interpretation groupings:**

- i) Land capability sub-class - IIes
- ii) Land irrigability sub-class - 2st
- iii) Productivity potential - High.

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
Ap	0-13	6.2	23.3	70.5	-
Bwl	13-37	3.6	29.9	66.5	-
Bssl	37-60	5	30.5	64.5	-
Bss2	60-114	3.8	29.2	67	-
Bss3	114-141	5.1	29.9	65	-
Be	141-160	7.1	29.9	63	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-13	0.831	4.6	0.21	8	-	-	30.92	14.21
13-37	0.694	7.12	0.22	8.01	-	-	32.33	17.25
37-60	0.637	7.12	0.26	8	-	-	31.91	16.74
60-114	0.625	7.25	0.19	7.98	-	-	38.25	19.85
114-141	0.416	7.38	0.23	8.12	-	-	36.58	19.34
141-160	0.354	9.63	0.22	8.12	-	-	36.12	17.29

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-13	50.24	4.51	0.46	1.02	58.23	58.93	98.7
13-37	48.81	4.87	0.46	0.94	55.08	55.87	98.6
37-60	46.63	5.74	0.49	0.96	53.62	54.32	98.7
60-114	48.96	7.37	0.49	0.98	57.8	58.2	99.31
114-141	46.01	8.16	0.52	1	55.69	55.87	99.68
141-160	42.77	8.39	0.55	0.98	52.69	52.77	99.8

## 20. LASANPUR SERIES (La)

<b>Classification</b>	:	Fine, montmorillonitic, hyperthermic family of Vertic Haplustepts
<b>Type Location</b>	:	Village-Khairgaon, Tehsil-Samudrapur, Dist-Wardha (Maharashtra)
<b>Profile No.</b>	:	55P/2-P-8
<b>Physiographic position</b>	:	
<b>Elevation (m)</b>	:	705 m
<b>Ground water table</b>	:	
<b>Rainfall</b>	:	
<b>Slope &amp; erosion</b>	:	Very gently sloping (1-2%) & moderate relief
<b>Geology &amp; parent material</b>	:	Basalt
<b>Soil series correlated</b>	:	
<b>Soil series associated</b>	:	Arvi, Malakpur, Nijhari, Talegaon,
<b>Typifying pedon</b>	:	Lasanpur - clay- Cultivated

Horizon	Depth(cm)	Description
Ap	0-17	Very dark grayish brown, (10YR3/2 M) clay; coarse, moderate subangular blocky structure; slightly hard, strong effervescence, very sticky and very plastic; fine, medium, common roots; clear smooth boundary, pH 8.10.
Bw1	17-46	Very dark grayish brown, (10YR3/2 M) clay, coarse, moderate subangular block structure, hard, friable, very sticky and very plastic, fine medium common roots; strong effervescence, gradual smooth boundary, pH 8.10.
Bw2	46-86	Very dark grayish brown, (10YR3/2 M) clay; coarse, moderate subangular blocky structure; hard, very sticky and very plastic; few common roots, strong effervescence, gradual smooth boundary, pH 8.27.
Bw3	86-113	Very dark grayish brown, (10YR3/2 M) clay; coarse, medium subangular blocky structure; hard friable, very sticky and very plastic; fine, fine roots; strong effervescence clear smooth boundary, pH 8.35.
C	113-128	Gravelly clay-7.5% mixed up with 95% of weathered basaltic fragments.

**Range in Characteristics:** The thickness of solum ranges from 80 to 120 cm with Ap and Bw horizon sequence. The A horizon is mostly very dark grayish brown with 10YR hue, value 3 and chroma 2. It is 13 to 17 cm thick, clay textured and moderately alkaline. The cambic B horizon has same colours as of A horizon but has a thickness of 80 to 100 cm and strong subangular to wedge shape aggregates.

**Competing and differentiae:** Chamla series is moderately alkaline, dark grey B horizons and have thickness of 30 to 60 cm. This soil has 1 per cent organic carbon, 3 to 4.5% of  $\text{CaCO}_3$  and exchangeable Mg of 7.3 to 8.3  $\text{cmol (+) kg}^{-1}$ .

**Drainage and permeability:** Moderately well drained and slow.

**Use and Vegetation:** Mostly used for cotton and Redgram.

**Distribution and extent:** Extensive in Khairgaon and Samudrapur Tehsil of Wardha district. This series is extensive.

**Type location:**

**Series proposed:** National Bureau of Soil Survey and land use planning, Regional Centre, Nagpur.

**Interpretation:** It is deep on valley floors, moderately alkaline with vertic properties. It is mostly used for cotton and Redgram.

**Interpretation groupings:**

- i) Land capability sub-class - IIIes
- ii) Land irrigability sub-class - 2st
- iii) Productivity potential - Medium.

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
Ap	0-17	10.3	32.7	57	-
Bw1	17-46	12	30	58	-
Bw2	46-86	-	-	-	-
Bw3	86-113	17.9	27.6	54.5	-
Bss3	113-128	50.1	14.4	35.5	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-17	1	4.85	0.2	8.1	-	-	25.23	12.48
17-46	-	-	-	-	-	-	-	-
46-86	1	8.32	0.22	8.27	-	-	29.5	14.96
86-113	0.39	13.34	0.22	8.35	-	-	27.32	12.08
113-128	0.23	22.11	0.19	8.5	-	-	16.54	7.99

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-17	44.29	8.46	0.58	0.58	53.91	55.87	96.5
17-46	-	-	-	-	-	-	-
46-86	36.42	12.76	1.22	0.54	50.94	53.54	95.1
86-113	36.34	14.25	1.36	0.52	52.47	53.93	97.3
113-128	24.18	9.74	0.96	0.34	35.22	48.89	72



## 21. LAKANDEVI SERIES(Ld)

<b>Soil Series/ Status</b>	:	Lakandevi - Identified series
<b>Classification</b>	:	Fine, mixed hyperthermic family of Lithic Haplustepts
<b>Location</b>	:	Located in Chicholi RF (78° 17' 30" E & 20° 59' 55" N)
<b>Mapping Symbol</b>	:	
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	8-15 % Slope, moderately sloping land
<b>Sampled by</b>	:	Dr. P. Raja
<b>Profile Characteristics</b>	:	Typifying pedon- PI06

Horizon	Depth(cm)	Description
Al	0-11	Dark brown (7.5YR4/4)sandy loam fine, weak, massive structure, slightly hard, friable non-sticky and non-plastic under wet conditions, fine pores are many, few fine roots fine fragments 3-5 per cent, clear smooth boundary, pH 7.5.
Bw1	11-25	Dark grayish brown (10YR 4/4), clay, medium, moderate, sub-angular blocky, hard, friable dry sticky and plastic moist fine pores common, thin patchy cutans fine roots common 5-8% fine fragments, pH 7.5.
Bw2	25-36	Dark brown (7.5YR3/2), clay, medium, moderate, sub-angular blocky, ard, firm dry and sticky and plastic moist under dry and wet conditions respectively fine pores common. Moderately thick cutans, few medium roots. 5-8 per cent fine fragments Clear and abrupt boundary. pH 7.8
R	36+	Hard Basalt

**Range in Characteristics:** The thickness of A horizon ranges from 8 to 11 cm. Its dry colour ranges from dark grayish brown (10YR 4/2) to dark brown (7.5YR 4/4). Its moist colour ranges from very dark grayish brown (10YR3/2) to dark brown (7.5YR 3/4). The B horizon is 12-15 cms thickness. Its moist colour ranges from very dark grayish brown (10YR3/2) to dark brown (7.5YR3/4). The Bw2 horizon ranges from 12 to 13 cm thickness. Its moist colour ranges from very dark grayish brown (10YR3/2) to dark brown 7.5YR3/2.

**Competing series and their differentiae:** No Competing series identified.

**Distribution and extent:** Extensive in Chicholi, reserve forest and its adjoining areas of Wardha.

**Vegetation and Land use:** It is mostly thin forest with sparse vegetation Palas and mohua is also observed.

**Drainage and Permeability:** It is somewhat excessively drained with rapid Permeability

**Geographically associated Series:** These soils are geographically associated with Typic Haplustepts Series which are shallow in depth.

**Series Identified:** NBSS & LUP, R.C, Nagpur.

**Interpretation:** These soils are shallow, excessively drained, mostly found an moderately sloping land, severely eroded and clay textured. It is slightly alkaline in reaction with 2% of organic carbon and high amount of exchangeable Ca and potassium.

**Interpretation groupings:**

- i) Land capability sub-class - VIes
- ii) Land irrigability sub-class - 6st
- iii) Productivity potential - Medium.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
A1	0-11	6.9	44.7	48.4	-
Bwl	11-25	13	34.5	52.5	-
Bw2	25-36	8.1	34.9	57	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention(%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-11	2.1	6.27	0.3	7.5	-	-	32.39	15.89
11-25	1.7	2.34	0.1	7.5	-	-	23.79	11.38
25-36	1.4	3.64	0.2	7.8	-	-	34.31	15.93

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-11	31.46	5.1	0.35	0.41	-	38.11	-
11-25	35.94	5.07	0.3	0.35	-	44.1	-
25-36	50.48	4.46	0.36	0.42	-	56.7	-

## 22. MAHAKALI SERIES(Mk)

<b>Soil Series/Status</b>	:	Mahakali
<b>Classification</b>	:	Fine, mixed, hyperthermic family of Typic Haplustepts
<b>Location</b>	:	Located in Chicholi RF (78° 17' 30"E& 20° 59' 55" N)
<b>Mapping Symbol</b>	:	
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	8-15 % slope, moderately sloping land
<b>Sampled by</b>	:	Dr.P.Raja
<b>Profile Characteristics</b>	:	Typifying pedon- P112

Horizon	Depth(cm)	Description
A1	0-10	Dark brown (7.5YR3/4) clay loam, fine, weak, massive structure, slightly hard, many slightly sticky and non-plastic under wet conditions, fine many pores, few fine, medium common roots, fine gravels are 5-8 per cent, clear smooth boundary, pH 6.9.
Bw1	10-22	Dark reddish brown (5YR 3/2), clay, medium, moderate, sub-angular blocky, sticky and slightly plastic, medium common roots, 15-18 % fine gravels, medium, common roots, clear, smooth boundary, pH 6.9.
Bw2	22-32	Dark reddish brown (5YR 3/2), clay, medium, moderate, sub-angular blocky, friable sticky and slightly plastic, medium fine roots, 15-18 % fine gravels, clear, smooth boundary, pH 6.8.
Cr	32-50+	Weathered Basalt.

**Range in Characteristics:** The thickness of A horizon ranges from 8-11 cm. Its dry colour ranges from dark grayish brown (10YR 4/2) to dark brown (7.5YR 4/4). Its moist colour ranges from very dark grayish brown (10YR3/2) to dark brown (7.5YR 3/4). The Bw1 horizon is 12-15 cm thickness. Its moist colour ranges from very dark grayish brown (10YR3/2) to dark brown (7.5YR3/4). The Bw2 horizon ranges from 12 to 13 cm thickness. Its moist colour ranges from very dark grayish brown (10YR3/2) to dark brown 7.5YR3/2), fine pores are common.

**Vegetation and Land use:** It is mostly thin forest with sparse vegetation Palas and mohua is also observed.

**Drainage and Permeability:** It is somewhat excessively drained with rapid Permeability.

**Completing series and their differentiae:** Takli, Nijampur and Kolona series.

**Distribution and extent:** Extensive in Chicholi reserved forest and its adjoining areas of Wardha district.

**Geographically associated Series:** These soils are geographically associated with Lithic Haplustepts series which are shallow in depth.

**Series Identified:** NBSS & LUP, R.C, Nagpur.

**Interpretation:** Shallow soils on moderately sloping land slightly acidic with surface organic carbon of 3.8%,

**Interpretation groupings:**

- i) Land capability sub-class - IIes
- ii) Land irrigability sub-class - IIIst
- iii) Productivity potential - Low

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
Al	0-10	20.2	27.8	52	-
Bwl	10-22	17.7	21.3	61	
Bw2	22-32	21.9	46.1	32	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-10	3.8	2.71	0.1	6.9	-	-	26.9	12.04
10-22	0.6	2.52	0.06	6.9	-	-	30.14	13.66
22-32	0.6	2.43	0.06	6.8	-	-	31.56	13.17

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-10	22	3.55	0.3	0.35	-	38.4	-
10-22	19.45	3.31	0.28	0.33	-	36.48	-
22-32	20.75	3.14	0.29	0.34	-	35.2	-

### 23. PARSODI SERIES (Pd)

<b>Soil Series/Status</b>	:	Parsodi (Pd) - Identified series
<b>Classification</b>	:	Fine loamy, hyperthermic family of Typic Haplustepts
<b>Location</b>	:	Located between 78° 25' 57" E & 20° 49' 11" N
<b>Mapping Symbol</b>	:	
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	8-15 % Slope, moderately sloping land
<b>Vegetation and Land use</b>	:	It is mostly thin forest with sparse vegetation Palas, Hiwar, Ber are mainly present. Some portion of land is cultivated for cotton
<b>Drainage and Permeability</b>	:	It is well drained with medium permeability
<b>Sampled by</b>	:	Dr.P.Raja
<b>Profile Characteristics</b>	:	
<b>Typifying pedon</b>	:	P-61

Horizon	Depth(cm)	Description
A1	0-11	Dark brown (10YR4/3 d) and dark yellowish brown (7.5YR3/4) in moist conditions. Sandy clay loam with sandy clay loam texture, fine, weak, massive structure, slightly hard, friable, slightly sticky, slightly plastic in consistency. Fine roots are common. Fine pores are many. 5-8 per cent fine gravels are seen.
Bw	11-22	Dark red (7.5YR 3/4m), sandy loam, fine, weak, massive, structure, slightly hard, friable, non-sticky, non-plastic consistency, many fine pores, common fine roots and fine gravels are 10-12 %.
Cr	22- 50+	Weathered Basalt.

**Range in Characteristics:** The thickness of Ap horizon ranges from 7-12 cm. Its dry colour ranges from reddish brown to (SYR 4/4) to dark brown (10YR 4/3). The A12 horizon thickness ranges from 8 to 12 cm. Its colour (moist) ranges from dark brown (7.5YR3/4) to dark brown (10YR3/3).The texture ranges from sandy loam to clay loam.

**Competing series and their differentiae:** Panthargavda series- It is moderately deep, yellowish brown A horizons, moderately alkaline, organic carbon of 1.2%, CaCO<sub>3</sub> of 12-21% and exchangeable K of 0.78 cmol (+) kg<sup>-1</sup>.

**Geographically associated Series:** These soils are geographically associated with Mandva (Mv) and Karanji (Kj) of Lithic Ustorthent (NC) and Typic Haplustepts (NC) which are very shallow to mod. Shallow in depth.

**Series Identified:** NBSS & LUP, R.C, Nagpur.

**Interpretation:** It is shallow on moderately sloping land, slightly alkaline. It is mostly under forest and some part cultivated for cotton.

#### Interpretation groupings:

- Land capability sub-class – VI es
- Land irrigability sub-class - Suitable
- Productivity potential - Very low

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
A1	0-11	15.1	50.9	34	-
Bw	11-22	37.6	33.9	28.5	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-11	0.5	3.17	0.09	7.7	-	-	25.47	11.56
11-22	0.4	4.16	0.08	8	-	-	18.28	9.8

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-11	26.94	6.4	0.37	0.28	-	34.02	-
11-22	27.77	6.25	0.38	0.11	-	35.91	-

## 24. KARANJI SERIES (Ki)

<b>Soil Series/ Status</b>	:	Karanji-Identified series
<b>Classification</b>	:	Fine, mixed, hyperthermic, calcareous family of Chromic Haplusterts
<b>Location</b>	:	Located between 78° 36' 05" E& 20° 35' 05"N
<b>Mapping Symbol</b>	:	
<b>Parent material</b>	:	Basaltic Alluvium
<b>Slope and Land form</b>	:	Gently sloping to moderately sloping land with a slope length of 50 to 150 m length
<b>Vegetation and Land use</b>	:	It is mostly cultivated. Babool, Hiwar, Imli are present as natural vegetation
<b>Drainage and Permeability</b>	:	It is moderately well drained with medium permeability
<b>Sampled by</b>	:	Dr.P.Raja

Moderately deep to deep soils on gently sloping to moderately sloping land with a slope length of 50 to 150 mtrs length

**Profile Characteristics** : Typifying pedon- P144

Horizon	Depth(cm)	Description
Ap	0-19	Brown (10YR 4/3 d) to dark brown (10YR 3/3 m), clay, medium, moderate, sub angular blocky structures. Slightly hard, friable, Sticky and plastic. Fine many pores, Nodules are many fine, medium common roots, fine many roots. It shows strong effervescence with dil. HC1 acid. Fine gravels ranges from 5- 8 %.
Bw1	19-43	Dark brown (10YR3/3),clay, medium, moderate, sub-angular blocky structure, hard and firm, very sticky and plastic in consistency, fine common pores, fine common nodules, fine, few medium roots, fine common roots. Effervescent with dil. HC1 acid. Fine gravels 3-5 %.
Bss1	43-68	Dark brown (10YR3/3), coarse, moderate, subangular blocky structure, very hard and firm, very sticky and plastic in consistency, fine common pores, fine common nodules, fine few roots. Prominent effervescent with dil. HC1. Fine gravels 3-5 %. Pressure faces are prominent.
Bss2	68-106	Dark brown (10YR3/3), clay, coarse, moderate, sub-angular blocky structure, very hard and very firm, very sticky and plastic in consistency, fine common pores, fine few nodules. Effervescent with dil. HC1. Fine gravels 3 -5%. Prominent pressure faces. Effervescent with dil. HC1.
BC	106-146	Dark brown (10YR3/3), clay, coarse, moderate, sub-angular blocky structure, very hard and firm very sticky and plastic in consistency, fine few nodules. Effervescent with dil. HC1 acid. Fine gravels are 3-5%. Well developed pressure faces are observed. It is effervescent with dil. HC1.

**Range in Characteristics:** The thickness of Ap horizon ranges from 14-20 cm. Its dry colour ranges from dark grayish brown to (10YR 4/2) to grayish brown (2.5Y 5/2) and moist colour ranges from very dark grayish brown (10YR3/2) to dark brown (10YR4/3). The thickness of the Bss horizon ranges from 49- 150 cmIt has wedge shaped slickensides beginning at the depth of 55 cm and extend up to 120 cm. They are generally calcareous Topography ranges from gently sloping plain to valleys. Erosion is generally moderate.

**Competing series and their differentiae:** Vagholi series is competing series with strong alkalinity with decreasing exchangeable Ca 4 to 9 cmol (+) kg<sup>-1</sup> and increasing Mg 4.4 to 21 cmol (+) kg<sup>-1</sup>.

**Geographically associated Series:** These soils are geographically associated with Typic Haplusterts (Cal) belong to Malatpur.

**Series Identified:** NBSS & LUP, R.C, Nagpur.

**Interpretation:** It is deep soil on gently sloping to moderately sloping land. It is moderately alkaline with vertic properties. It is mostly cultivated for cotton.

**Interpretation groupings:**

- i) Land capability sub-class - II es
- ii) Land irrigability class - 2 st
- iii) Productivity potential – Medium

#### ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (<2mm)% of whole Soil
		Sand(2.0-0.05)	Silt(0.05-0.002)	Clay(<0.002)	
		.....(%).....			
Ap	0-19	7.8	44.2	48	-
Bw1	19-43	12	37.5	50.5	-
Bw2	43-68	8.1	40.4	1.5	-
Bssl	68-106	11	41	48	-
BC	106-146	6.6	44.4	49	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (<%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-19	0.75	11.88	0.2	8.5	-	-	32.79	15.05
19-43	0.5	11.54	0.2	8.6	-	-	32.91	15.38
43-68	0.6	14.02	0.3	8.8	-	-	34.48	16
68-106	0.5	13.09	0.3	8.9	-	-	33.29	15.83
106-146	0.5	11.14	0.3	9.1	-	-	34.8	16.9

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> ....						
0-19	44.26	4.77	0.44	0.54	-	50.56	-
19-43	43.38	6.42	0.48	0.43	-	52.93	-
43-68	35.55	7.14	0.69	0.39	-	52.14	-
68-106	33.29	8.67	1.26	0.4	-	53.72	-
106-146	31.51	14.15	3.26	0.43	-	55.3	-



## 25. MALATPUR SERIES (Mp)

<b>Soil Series/ Status</b>	:	Malatpur series- Identified series
<b>Classification</b>	:	Very fine, montmorillonitic, hyperthermic, family of Typic Haplusterts
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	Located between 78° 20' 57" E & 20° 33' 13" N
<b>Parent material</b>	:	Basaltic Alluvium
<b>Slope and Land form</b>	:	3-8 % Slope, Valley
<b>Sampled by</b>	:	Dr .P.Raja
<b>Typifying pedon</b>	:	P 42
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
Ap	0-18	Dark grayish brown (10YR4/2) to very dark grayish brown (10YR 3/2) in moist, clay, medium, moderate, sub angular blocky structure, hard, friable, sticky and plastic, fine common pores, fine and common lime nodules medium, many roots, fine gravels 5- 8 %.
Bw	18-38	Very dark grayish brown (10YR3/3), clay, coarse, moderate, sub angular blocky structure, firm, sticky and plastic, fine common pores, fine, few nodules, medium common roots, fine gravels are 5-8 %.
Bssl	38-64	Very dark grayish brown (10YR3/2), clay, coarse, strong, angular blocky structure, very firm, very sticky and very plastic, fine, many pores, fine, few nodules, medium few roots, fine gravels 8-10%, prominent intersecting slickensides.
Bss2	64-100	Very dark grayish brown (10YR3/2), clay, coarse, strong, angular blocky structure, very firm, very sticky and very plastic, fine, few pores fine, common nodules, medium, few roots, fine gravels 10-12%, prominent intersecting slickensides.
Bss3	100-140	Very dark grayish brown (10YR3/2), clay, coarse strong angular blocky structure, very hard and very firm, very sticky and very plastic in consistency, fine common pores, fine many nodules, medium few roots, Effervescent with dil. HCl, fine gravels 10-12%, prominent intersecting slickensides.
BC	140-150	Brown (10YR4/3), clay, coarse, strong angular blocky structure, very hard and very firm, sticky and plastic in consistency, fine pores are common, fine many nodules, powdery lime is present. Violently effervescent with dil. HCl acid. Fine gravels are 10 -12%. Prominent intersecting slicken sides.

**Range in Characteristics:** The thickness of Ap horizon ranges from 18-19 cm. Its dry colour ranges from dark grayish brown to (10YR 4/2) to dark brown (10YR4/3) and moist colour is dark brown (10YR3/3). The thickness of the B1 horizon ranges from 20 to 32 cm It has wedge shaped slickensides beginning at the depth of 30 cm and extend up to 110. The slickensides are observed in Bss horizon 50 cm to 110 cm. They are generally calcareous. The moist colour in Bss horizon ranges from very dark grayish brown (10YR3/2) to dark brown (10YR3/3). Topography is of valley. Erosion ranges from very slow to moderate.

**Competing series with differentiae:** Bothali series have dark grey to very dark grey matrix with clay of 60 to 66% and exchangeable Mg of 20 to 30 cmol (+) kg<sup>-1</sup>.

**Geographically associated Series:** These soils are geographically associated with Typic Haplustepts (Cal) belong to Karanji Series.

**Series Identified:** NBSS & LUP, Nagpur.

**Interpretation:** It is deep soil on valleys. It is slickensided with deep cracks, mostly cultivated for cotton. It has high amount of exchangeable Calcium.

**Interpretation groupings:**

- i) Land capability sub-class - IIes
- ii) Land irrigability class - 2st
- iii) Productivity potential - Medium

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-18	1.2	19.8	79	-
B1	18-38	1	14.5	84.5	-
Bssl	38-64	1.4	18.1	80.5	-
Bss2	64-100	1.6	23.9	74.5	-
Bss3	100-140	2	26	72	-
BC	140-150	9.3	30.5	60.2	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-18	0.9	4.6	0.08	7.6	-	-	38.41	15.85
18-38	0.8	4.2	0.05	7.4	-	-	39.71	19.3
38-64	0.7	4.26	0.05	7.9	-	-	43.69	20.02
64-100	0.7	4.1	0.1	8	.	-	40.11	17.67
100-140	0.6	4.85	0.1	8.3	-	-	33.31	15.32
140-150	0.2	5.53	0.2	8.6	-	-	34.25	15.93

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	..... cmol (+) kg <sup>-1</sup> .....						
0-18	47.12	7.92	0.59	1.12	-	56.88	-
18-38	49.19	8.21	0.56	0.84	-	58.32	-
38-64	52.62	7.8	0.55	0.73	-	61.2	-
64-100	47.11	7.01	0.56	0.67	-	56.16	-
100-140	52.7	6.29	0.6	0.64	-	59.04	-
140-150	42.67	4.03	0.52	0.45	-	48.25	-

## 26. SIRASGAON SERIES (Sg)

<b>Soil Series/ Status</b>	:	Sirasgaon series - Identified series
<b>Classification</b>	:	Very fine, loamy, mixed, hyperthermic, family of Typic Ustorthent
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	Located between 78° 34' 19" E & 20° 37' 35" N
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	3-8 % slope, gently sloping Plateau
<b>Sampled by</b>	:	Dr .P.Raja
<b>Typifying pedon</b>	:	P 126
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
A1	0-11	Dark brown (10YR 4/3) in dry and 10YR3/3 in moist sandy clay loam, fine, weak, massive blocks, slightly hard breaking with little pressure. Slightly hard, friable, slightly sticky plastic, fine common pores, fine many roots, no effervescence. 8-10% fine gravels, clear smooth boundary, pH 8.2.
A12	11-25	Dark brown (10YR3/3) in Moist, sandy clay loam, fine, weak, massive blocks, slightly hard, breaking with little pressure. Slightly hard, friable, slightly sticky and non-plastic, fine common pores, fine many roots, no effervescence. 8-10 % fine gravels, clear smooth boundary, pH 8.3.
Cr	25-50+	Weathered Basalt

**Range in Characteristics:** The thickness of the A horizon ranges from dark reddish brown (5YR 4/4) to yellowish brown (10YR5/4) and its moist colour ranges from dark reddish brown 5YR 3/3 to 10YR4/3 dark brown. The thickness of the A12 ranges from 9-15 cm Topography varies from gently sloping to undulating upland. It has gently sloping to moderately sloping plain. Erosion is moderate to severe.

**Vegetation and Land use:** Hiwar, Mohua, neem, ber are present as natural vegetation.

**Drainage and Permeability:** It is well drained with medium permeability

**Competing series and their differentiae:** Sirasgaon series soils are competing with Parsodi. They are generally reddish brown (5YR 4/4) to yellowish brown soils, non-calcareous and very shallow soils.

**Geographically associated soils:** These soils are also geographically associated with Lithic Ustorthent (NC), Typic Ustorthent (Cal), Typic Haplustepts (NC), Typic Haplustepts (Cal), which are shallow to deep.

**Series identified:** NBSS & LUP, Nagpur.

**Interpretation:** It is shallow located on gently sloping plateau. It is moderately alkaline with high exchange Ca.

### Interpretation groupings:

- Land capability class - IIIes
- Land irrigability class - 4st
- Productivity potential - Low.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-18	1.2	19.8	79	-
B1	18-38	1	14.5	84.5	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-11	0.9	8.75	0.2	8.2	-	-	21.31	9.62
11-25	0.5	10.33	0.2	8.3	-	-	21.66	8.93

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	..... cmol (+) kg <sup>-1</sup> .....						
0-11	40.53	1.48	0.36	0.42	-	48	-
11-25	42.25	1.41	0.36	0.37	-	46.7	-

## 27. TALANI SERIES(Tn)

<b>Soil Series/ Status</b>	:	Sirasgaon series - Identified series
<b>Classification</b>	:	Very fine, loamy, mixed, hyperthermic, (cal) family of Typic Ustorthent
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	Located between 78° 18' 26" E& 20° 36' 25" N
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	3-8 per cent slope, Undulating Plateau
<b>Sampled by</b>	:	Dr .P.Raja
<b>Typifying pedon</b>	:	P 157
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
A1	0-10	Brown (10YR 5/3) in dry and dark brown (10YR4/3) in moist sandy loam, fine, weak, massive blocks, slightly hard, breaking with little pressure. Slightly hard, friable, non-sticky non-plastic, many fine pores, common fine roots, few fine nodules, strongly effervescent with dil HCl. 5-8% fine gravels, gradual smooth boundary, pH 8.4.
A12	10-20	Yellowish brown (10YR5/4) in dry and brown (10YR 4/3) in Moist, sandy loam, fine, weak, massive blocks, slightly hard, breaking with little pressure. Slightly hard, friable, non-sticky and non-plastic, many fine pores, common fine roots, strongly effervescent with dil HCl. 5-8% fine gravels, clear abrupt boundary, pH-8.5.
Cr	20-50+	Weathered Basalt

**Range Characteristics:** The thickness of the A1 horizon is 10 cm. Its dry colour ranges from dark brown (10YR3/3) to brown (10YR5/3). Its moist colour ranges from 10YR3/3 to 10YR4/3. A12 horizon thickness varies from 8 to 10 cm both horizons are calcareous in reaction. The dry colour of the horizon is reddish brown (10YR5/4 (d) to brown (10YR4/3 moist). Topography varies from gently sloping plain to undulating upland.

**Vegetation and Land use:** Hiwar, Mohua, neem, ber are present as natural vegetation.

**Drainage and Permeability:** It is well drained with medium permeability.

**Competing series and their differentiae:** Talani series soils are competing with Panthargavda series. They are generally dark brown to brown/ reddish brown soils, calcareous, shallow to very shallow.

**Geographically associated soils:** These soil are geographically associated with Lithic Ustorthents (NC) and Typic Haplustepts (NC).

**Interpretation:** It is very shallow located on undulating plateau. Moderately alkaline on mostly under natural vegetation.

### Interpretation groupings:

- Land capability class - IVes
- Land irrigability class - 4st
- Productivity potential - Low.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Al	0-10	23.5	45.4	31.1	-
A12	10-20	27	47.9	25.1	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-10	0.5	8.78	0.2	8.4	-	-	17.5	8.82
10-20	0.25	9.56	0.1	8.5	-	-	18.86	8.05

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-10	36.87	1.66	0.43	0.32	-	35.55	-
10-20	37.56	1.41	0.38	0.14	-	36.34	-

## 28. ANJANGAON SERIES (An)

<b>Soil Series/ Status</b>	:	Anjangaon series - Identified series
<b>Classification</b>	:	Fine, mixed, hyperthermic, family of Leptic Haplusterts
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	Located between 78° 35' 20" E & 20° 39' 10" N
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	3-8 % slope, gently sloping plain
<b>Sampled by</b>	:	Dr .P.Raja
<b>Typifying pedon</b>	:	P 2
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
A1	0-25	Brown (10YR4/3) in dry and dark brown (10YR3/3) in moist, clay with medium, Moderately strong sub angular blocky structure, slightly hard, friable sticky and plastic under wet conditions. Fine pores are common, fine roots and fine calcareous nodules are also commonly observed. Fine gravels are 5-8 per cent, clear smooth boundary.
BW1	25-50	Dark brown (10YR 3/3), clay, coarse moderate, sub-angular blocky, hard, friable, sticky and plastic under dry, moist and wet conditions respectively. Fine pores are many, Fine nodules are also commonly observed. Fine roots are few. pH 8.7, clear, gradual smooth boundary. 5-8 % fine gravels are observed.
BW2	50-75	Dark brown (10YR 3/3), clay, coarse moderate, sub-angular blocky, hard, firm, very sticky and very plastic under dry, moist and wet conditions respectively. Fine pores are many fine nodules are few. Fine roots are few. pH 8.5, clear, gradual smooth boundary. 8-10 % fine gravels are observed.
Cr	75+	Weathered Basalt

**Range in Characteristics:** The thickness of the Ap horizon is from 10 cms to 25 cm. Its dry colour 10YR4/3 and its moist colour is 10YR3/3. The thickness of the B horizon ranges from 38 to 78 cm. Its moist colour ranges from dark brown (10YR 3/3) to 10YR3/6 dark yellowish brown. Texture is mostly of clay. The fine gravel ranges from 5 to 10%. Topography ranges from gently sloping plain to undulating upland. Moderate erosion

**Vegetation and Land use:** Babool, Hiwar, Mohua, palas and Ber are present as natural vegetation.

**Drainage and Permeability:** It is moderately well drained with medium permeability

**Competing series and their differentiae:** Hewan and Thar series occurring on very gently sloping with very dark grayish brown and slightly alkaline in reaction.

**Geographically associated soils:** These soils are geographically associated with Vertic Haplustepts (NC) and Typic Haplustepts (Cal).

**Interpretation:** It is moderately shallow soils on gently sloping valleys. It is high slickensided horizon with deep cracks. It is moderately alkaline and cultivated for cotton, soybean.

Interpretation groupings:

- Land capability class - Iles
- Land irrigability class - 2st
- Productivity potential - Medium.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
A1	0-25	4.4	34.1	61.5	-
Bw1	25-50	4.6	34.9	60.5	-
Bw2	50-75	4	40.9	55.1	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil: water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-25	0.6	5.37	0.1	8.5	-	-	37.43	19.79
25-50	0.5	6.17	0.1	8.7	-	-	38.54	18.96
50-75	0.3	6.39	0.1	8.5	-	-	30.81	16.1

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-25	49.87	2.85	0.5	0.59	-	57.6	-
25-50	48.52	3.08	0.55	0.81	-	61.1	-
50-75	48.7	3.6	0.56	0.7	-	60.2	-



## 29. TAKLI SERIES (TI)

<b>Soil Series/ Status</b>	:	Takli series - Identified series
<b>Classification</b>	:	Fine, mixed, hyperthermic, (Cal) family of Typic Haplustepts
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	Located between 78° 28' 50" E & 20° 36' 04" N
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	3-8 % slope, gently sloping plain
<b>Sampled by</b>	:	Dr .P.Raja
<b>Typifying pedon</b>	:	P 2
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
Al	0-12	Brown (10YR4/3) in dry and dark brown (10YR3/3) in moist, clay with medium, Moderately strong sub angular blocky structure, slightly hard, friable, sticky and plastic under wet conditions. Fine many pores, medium few roots, Calcareous commonly nodules, Fine gravels 5-8%, clear smooth boundary, pH 8.7.
Bw1	12-40	Dark brown (10YR 3/3), clay, coarse Moderate sub angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine common pores, fine few roots, clear, gradual smooth boundary, 5-8% fine gravels observed, pH 8.7.
Bw2	40-61	Dark brown (10YR 3/3), clay, coarse strong, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine many pores, medium few roots, clear, gradual smooth boundary, 5-8 % fine gravels, pH 8.6.
Bw3	61-84	Dark brown (10YR 3/3), clay, coarse, strong, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine many pores, medium few roots, clear, gradual smooth boundary, 5-8 % fine gravels, pH 8.6.
BC	84-99	Dark yellowish brown (10YR 3/4), gravelly clay, medium, moderate, sub angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine few pores, clear, gradual smooth boundary. 18-20 % fine gravels, pH 8.6.
Cr		.....Weathered Basalt.....

**Range in Characteristics:** The thickness of the Ap horizon is from 12 cms to 13 cm. Its dry colour 10YR4/3 and its moist colour is 10YR3/3. The thickness of the B horizon ranges from 48 to 62 cm. Its moist colour ranges from dark brown (10YR 3/3) to 10YR3/4 dark yellowish brown. Texture is mostly of clay. The fine gravel ranges from 5 to 20%. Topography ranges from gently sloping plain to undulating upland. Moderate erosion.

**Vegetation and Land use:** Babool, Hiwar, Mohua, Palas and Ber are present as natural vegetation.

**Drainage and Permeability:** It is moderately well drained with medium permeability

**Competing series and their differentiae:** Mahakali, Nijampur and Kolona series they are moderately shallow to deep.

**Geographically associated soils:** These soils are geographically associated with Vertic Haplustepts (NC) and Typic Haplustepts (Non-Cal).

**Interpretation:** Moderately deep soil located on gently sloping plain cultivated for Soybean. It is moderately alkaline.

**Interpretation groupings:**

- Land capability class - IIes
- Land irrigability class - 2st
- Productivity potential - Medium.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
A1	0-12	9.9	31.2	58.9	-
Bw1	12-40	4.6	28	67.4	-
Bw2	40-61	8.1	35.5	56.4	-
Bw3	61-84	5.2	46.1	48.7	-
BC	84-99	34.6	33.1	32.3	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-12	1.2	14.55	0.2	8.7	-	-	37.31	16.77
12-40	0.8	9.28	0.1	8.7	-	-	37.51	17.37
40-61	0.8	10.15	0.1	8.6	-	-	39.98	17.85
61-84	0.6	7.57	0.2	8.6	-	-	33.85	16.02
84-99	0.4	8.33	0.2	8.6	-	-	33.33	17.72

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-12	52.42	3.27	0.52	0.77	-	56.88	-
12-40	47.83	4.11	0.52	0.72	-	54	-
40-61	48.78	5.3	0.49	0.67	-	56.16	-
61-84	47.09	5.58	0.58	0.72	-	54.72	-
84-99	53.8	6.65	0.5	0.38	-	61.2	-

### 30. KOLONA SERIES (Kn)

<b>Soil Series/ Status</b>	:	Kolona series- Identified series
<b>Classification</b>	:	Fine, mixed, hyperthermic, family of Typic Haplustepts
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	Located between 78° 18' 36"E & 20° 38'17" N
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	3-8 % slope, gently sloping plain
<b>Sampled by</b>	:	Dr .P.Raja
<b>Typifying pedon</b>	:	P 84
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
Ap	0-17	Brown (10YR4/3) in dry and dark brown (10YR3/3) in moist, clay with medium, Moderately strong subangular blocky structure, slightly hard, friable sticky and plastic under wet conditions. Fine many pores, fine commonly roots, calcareous common nodules, Fine gravels are 3-5 per cent, clear smooth boundary, pH 8.5
A12	17-41	Dark brown (10YR 3/3), clay, coarse moderate, sub-angular blocky, hard, friable, sticky and plastic under dry, moist and wet conditions respectively. Fine many pores, fine commonly nodules. Fine few roots, Pressure faces commonly, clear, smooth boundary. 5-8 % fine gravels, pH 8.6
BW1	41-77	Dark brown (10YR 3/3), clay, coarse Strong, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine many pores, very fine common nodules, Pressure common faces. Fine few roots, clear, gradual smooth boundary. 5-8 % fine gravels are observed, pH 8.6
BW2	77-107	Dark brown (10YR 3/3), clay, coarse Strong, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine pores are many, very fine nodules are common. Pressure faces are commonly seen. Fine few roots, clear, gradual smooth boundary. 3-5 % fine gravels are observed.
Cr	107+	Weathered Basalt

**Range in Characteristics:** The thickness of the Ap horizon ranges from 14 to 19 cm and its dry colour ranges from 10YR5/3 brown to very dark grayish brown (10YR3/2). Its moist colour varies from 10YR4/3 brown to dark brown (10YR3/3). The fine gravels ranges from 3-8%. The thickness of BW horizon ranges from 90 to 130 cm Topography ranges from 1-8 per cent. The erosion is slow to moderate.

**Vegetation and Land use:** Babool, Hiwar and Ber are present as natural vegetation

**Drainage and Permeability:** It is moderately well drained with medium permeability

**Competing series and their differentiae:** Takli, Nijampur, Mhakali series they are mod. deep to deep lying on very gently sloping to moderately sloping soils.

**Geographically associated soils:** These soils are geographically associated with Vertic Haplustepts which are deep to very deep clayey cracking soils.

**Interpretation:** It is deep soil located on gently sloping plain. Moderately alkaline and cultivated for sorghum and pantry under natural vegetation.

#### Interpretation groupings:

- Land capability class - IIIes
- Land irrigability class - 2st
- Productivity potential - Medium.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-17	8.7	33.8	57.5	
A12	17-41	6.6	30.9	62.5	-
Bwl	41-77	8.3	32.2	59.5	-
Bw2	77-107	7.7	44.5	47.8	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-17	0.6	10.74	0.2	8.5	-	-	38.82	16.59
17-41	0.6	10.77	0.1	8.6	-	-	31.36	15.03
41-77	0.7	8.91	0.2	8.6	-	-	33.73	16.28
77-107	0.5	8.91	0.2	8.5	-	-	35.03	17.31

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-17	44.75	2.93	0.43	0.64	-	51.03	-
17-41	45.47	4.18	0.36	0.47	-	52.92	-
41-77	41.68	6.12	0.46	0.55	-	51.66	-
77-107	42.05	7.21	0.48	0.57	-	53.55	-

### 31. NAGJHARI SERIES (Nh)

<b>Soil Series/ Status</b>	:	Nagjhari series - Identified series
<b>Classification</b>	:	Fine, mixed, hyperthermic, family of Typic Haplustepts
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	Located between 78° 18'36"E & 20° 38'17" N
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	3-8 % slope, gently sloping plain
<b>Vegetation and Land use</b>	:	Babool, Hiwar, Palas and Ber are present as natural vegetation
<b>Drainage and Permeability</b>	:	It is well drained with medium permeability
<b>Sampled by</b>	:	Dr .P.Raja
<b>Typifying pedon</b>	:	P 78
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
Ap	0-20	Brown (10YR4/3) in dry and dark brown (10YR3/3) in moist, lay with medium, Moderately strong subangular blocky structure, lightly hard, friable sticky and plastic under wet conditions. Fine common pores, fine common roots, and coarse few roots, Fine gravels are 5-8 per cent, clear smooth boundary.
Bw1	20-42	Dark brown (10YR 3/3), clay, coarse moderate, sub-angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine pores are common, Fine few roots. Pressure faces, clear, gradual smooth boundary. 5- 8 % fine gravels.
Bw2	42-72	Dark brown (10YR 3/3), clay, coarse moderate, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Pressure commonly seen, clear, gradual smooth boundary. 5-8 % fine gravels.
Bw2	72-94	Dark brown (10YR 3/3), clay, coarse moderate, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine pores are many. Pressure commonly seen, clear, gradual smooth boundary. 3-5 % fine gravels observed.
Bw22	94-110	Brown (10YR 4/3), clay, coarse moderate, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine many pores, clear, gradual smooth boundary. 18-20% fine gravels.
Cr	107+	Weathered Basalt.

**Range in Characteristics:** The thickness of the Aphorizon ranges from 15 to 22 cm and the dry colour ranges from 10YR 4/3. The thickness of the Bw horizon ranges from 90 to 130 cm Its moist colour ranges from 10YR3/3 to 10YR4/3. Vertical cracks are observed upto 50 cm. Wedge shaped blocks are also seen. Fine gravels varies from 3-8 per cent. Topography is mostly of gently sloping plain. Gently sloping to moderately sloping (1-3%) to (3-8%). Slight to moderate erosion.

**Competing series and their differentiae:** Nagjhari series soils are competing with Chamala and Lasanpur series identified. Chamla series is moderately deep, very dark grayish brown slightly alkaline soils where as Lasanpur series is deep, moderately alkaline and decreasing exchangeable (44 to 24 cmol (+) kg<sup>-1</sup>) with depth.

**Geographically associated soils:** These soils are geographically associated with Typic Haplustepts belong to Kolona series which are deep clayey soils.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-20	6.4	40.1	53.5	-
BW1	20-42	5.9	36.1	58	-
BW12	42-72	6.2	40.8	53	-
BW2	72-94	3.8	48.2	48	-
BW22	94-110	7.5	33.5	59	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-20	1.3	9.87	0.2	8.5	-	-	38.72	19.9
20-42	0.8	10.98	0.2	8.6	-	-	40.77	17.87
42-72	0.6	9.68	0.2	8.5	-	-	37.73	18.85
72-94	0.6	10.71	0.2	8.6	-	-	37.3	16.56
94-110	0.5	10.36	0.2	8.7	-	-	43.93	20.04

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-20	49.01	2.5	0.43	0.65	-	52.08	-
20-42	46.32	2.76	0.44	0.52	-	50.4	-
42-72	46.96	3.23	0.42	0.54	-	51.03	-
72-94	44.74	3.88	0.41	0.52	-	50.4	-
94-110	44.67	3.92	0.46	0.55	-	49.14	-

### 32. NIJAMPUR (Nj) SERIES (P 73)

Soil Series/ Status	:	Nijampur series - Identified series
Classification	:	Fine, mixed, hyperthermic, (cal) family of Typic Haplustepts
Mapping Symbol	:	
Location	:	Located between 78° 19' 5" E & 20° 47' 01" N
Parent material	:	Basaltic alluvium
Slope and Land form	:	31-3 % slope, gently sloping plain
Sampled by	:	Dr .P.Raja
Typifying pedon	:	P 73
Profile Characteristics	:	

Horizon	Depth (cm)	Description
Ap	0-20	Brown (10YR4/3) in dry and dark brown (10YR3/3) in moist, clay with medium, Moderately strong sub-angular blocky structure, slightly hard, friable sticky and plastic under wet conditions. Fine common pores, fine common roots, coarse few roots, fine calcareous nodules few. Fine gravels 3-5 per cent, Effervescent with dil.HCl, pH 8.6.
A12	20-57	Dark brown (10YR 3/3), clay, coarse moderate, sub-angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine common pores, fine few roots, Pressure commonly faces, clear, smooth boundary. 5-8% fine gravels are observed. Effervescent with dil. HCl, pH 8.6.
BC1	57-87	Dark brown (10YR 3/3), clay, medium, weak single grain, slightly hard, friable, slightly sticky and slightly plastic under dry, moist and wet conditions respectively. Pressure faces commonly, clear, abrupt boundary. 20-25% fine gravels, fine common pores, fine few roots and very fine common calcareous nodules, clear, abrupt boundary. Effervescent with dil.HCl, pH 8.8.
Bb1	87-115	Dark brown (10YR 3/3), clay, coarse strong, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine common pores. Pressure commonly faces seen, clear, gradual smooth boundary. 5-8% fine gravels observed. Effervescent with dil.HCl, pH9.2.
Bb2	115-150	Brown (10YR 3/3), clay, coarse, strong, angular blocky, hard, firm, sticky and plastic under dry, moist and wet conditions respectively. Fine common pores, gradual smooth boundary. 5-8% fine gravels, pH 9.4.

**Range in Characteristics:** The thickness of the Ap horizon ranges from 14 cm to 20 cm. Its dry colour ranges from dark grayish brown (2.5 Y 4/4) to dark yellowish brown (10YR4/2). The moist colour ranges from 2.5 Y4/4 to 10YR3/3 dark brown. The thickness of the B horizon ranges from 93 cm to 132 cm. It is calcareous. The fine gravels ranges from 3-8%. The slope range from 1-3% and 3-8%. Topography varies from very gently sloping plain to gently sloping plain. Erosion is slight to moderate.

**Vegetation and Land use:** Babool, Hiwar, Palas and Ber are present as natural vegetation. Drainage and Permeability: It is moderately well drained with medium permeability.

**Competing series and their differentiae:** Nijampur series soils is competing with Mahakali, Kolona and Takli soils. They are deep clayey soils, calcareous in reaction.

**Geographically associated soils:**

**Interpretation:** It is deep located on gently sloping plain. Moderately alkaline and cultivated for sorghum, soybean.

**Interpretation groupings:**

- i) Land capability class - IIes
- ii) Land irrigability class - 2st
- iii) Productivity potential - Medium.

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-20	5	44	51	-
AI2	20-57	5.8	41.2	53	-
BC1	57-87	5.2	12.8	36	-
Bbl	87-115	4.2	42	54	-
Bb2	115-150	6.3	43.7	50	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-20	0.8	9.34	0.2	8.6	-	-	38.54	18.82
20-57	0.5	8.63	0.1	8.6	-	~	35.82	16.81
57-87	-	23.34	0.2	8.8	-	-	22.72	10.56
87-115	0.4	9.65	0.3	9.2	-	-	40.12	18.82
115-150	0.4	11.39	0.3	9.4	-	-	41.27	18.02

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-20	37.55	3.88	0.6	0.88	-	42.84	-
20-57	36.11	4.92	0.62	0.53	-	43.47	-
57-87	29.54	5.28	0.51	0.23	-	34.65	-
87-115	31.2	6.81	3.18	0.33	-	38.98	-
115-150	29.68	7.19	4.19	0.3	-	37.8	-



**33. MADNI SERIES (Md)**

<b>Soil Series/ Status</b>	:	Madni series (Md) - Identified series
<b>Classification</b>	:	Fine, mixed, hyperthermic family of Lithic Ustorthents
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	2 km NE of Borkhed (78° 44' 07" E & 20° 40' 29" N)
<b>Slope and Landform</b>	:	Moderately sloping plateau.
<b>Parent material</b>	:	Weathered Basalt
<b>Sampled by</b>	:	Dr.P.Raja
<b>Typifying pedon</b>	:	P10
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
A1	0-12	Brown (10YR4/3) to dark brown (10YR 3/3), massive, medium, moderately strong sub-angular blocky, sandy clay hard and firm, sticky and plastic in consistency, fine pores are many, fine roots are also many Fine gravels are 5-8 %.
Cr	12-25	Weathered Basalt
R	25-50	.....Hard Basalt.....

**Range in Characteristics:** The thickness of the A1 horizon ranges from 7-12 cm. Its dry colour is 10YR4/3. Texture ranges from sandy clay loam to sandy clay. The thickness of the A12 horizon is 10 cm. Its dry colour is of 10YR 4/3 and its moist colour ranges from 10YR3/3. Texture of the A12 horizon is sandy loam. Fine gravels ranges from 3-%. Topography varies from gently sloping plain to undulating table land.

**Vegetation and Land use:** It is mostly pasture land.

**Drainage and Permeability:** It is well drained with fast Permeability.

**Competing series and their differentiae:** Madni series are competing with Sewagram series and these soils are extremely shallow to shallow.

**Geographically associated soils:** These soils are geographically associated with Typic Ustorthents (Non-Calcareous) and Typic Ustorthents (Cal) of shallow soils.

**Interpretation:** It is extremely shallow soil located on moderately sloping plateau, mostly under forest.

**Interpretation groupings:**

- i) Land capability class - VIIIs
- ii) Land irrigability class - Not suitable
- iii) Productivity potential - Very poor.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
A1	0-12	5.1	39.9	55	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-12	0.6	3.55	0.07	7.8	-	-	40.93	21.45

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-12	30.32	11.88	0.42	0.18	-	54.2	-

### 34. PANTHARGAVDA (Pg) SERIES P49

<b>Soil Series/ Status</b>	:	Panthargavda series - Identified series
<b>Classification</b>	:	Fine loamy mixed, hyperthermic, (cal) family of Typic Haplustepts
<b>Mapping Symbol</b>	:	
<b>Location</b>	:	Located 78° 33' 29" E & 20° 47' 33" N
<b>Parent material</b>	:	Weathered Basalt
<b>Slope and Land form</b>	:	3-8 per cent slope, Undulating Plateau
<b>Vegetation and Land use</b>	:	Hiwar, Mohua, neem, ber and babool are present as natural vegetation.
<b>Drainage and Permeability</b>	:	Well drained with medium permeability
<b>Sampled by</b>	:	Dr .P.Raja
<b>Typifying pedon</b>	:	P 49
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
Al	0-7	Yellowish brown (10YR 5/4 D) in dry and dark yellowish brown (10YR4/4 M) in moist colour, clay loam, medium, moderate, sub-angular blocky, slightly hard, slightly sticky and slightly plastic, fine many pores and fine common roots, fine many nodules, violently effervescent. 8-10 % fine gravels, gradual smooth boundary, pH 8.2.
Bw	7-26	Brown (10YR 4/3) in dry and dark brown in moist colour, sandy clay loam, medium, moderate, sub-angular blocky, slightly hard, slightly sticky and non-plastic, fine many pores and fine few roots, fine many nodules, violently effervescent, 10-12 % fine gravels, gradual smooth boundary, pH 8.6.
Cr	26-53	Weathered Basalt
R	53+	Hard Basalt

**Range in Characteristics:** The thickness of the Ap horizon ranges from 7-16 cm. Its dry colour ranges from 10YR3/3 to 10YR5/4 and its moist colour varies from 10YR3/3 to 10YR4/4. The texture varies from sandy clay loam to clay. The thickness of the B horizon ranges from 10 cm to 25 cm and its colour is 10YR3/3. Fine gravels varies from 5-12 %. These soils are generally calcareous. Topography varies from gently sloping plain to undulating upland. Erosion is slight to moderate.

**Competing series and their differentiae:** Parsodi series- It is shallow dark, dark brown A horizon. It is natural with 0.5% organic carbon, 3 to 4% of CaCO<sub>3</sub> and 0.28 cmol (+) kg<sup>-1</sup>exchangeable K.

**Geographically associated soils:** Nil.

**Interpretation:** Those soil are shallow on undulating plateau, mostly under natural vegetation.

#### Interpretation groupings:

- Land capability class - VIes
- Land irrigability class - Not suitable
- Productivity potential - Very poor.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
A1	0-7	38.8	47.7	25.5	-
Bw	7-26	42.8	35.7	21.5	-

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-7	1.2	12.64	0.3	8.2	-	-	22.73	11.87
7-26	0.6	21.52	0.1	8.6	-	-	25.5	12.9

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-7	34.93	3.09	0.5	0.78	-	39.6	-
7-26	36.8	2.34	0.37	0.15	-	40.19	-

### 35. WARDHA (Wa) SERIES

<b>Classification</b>	:	Fine, montmorillonitic (calcareous), hyperthermic, Typic Haplusterts
<b>Type Location</b>	:	Village: Sewagram; Tehsil: Wardha; Distt: Wardha 20° 44' 00" N & 78° 39' 30" E
<b>Physiographic position</b>	:	North-Deccan lower Maharashtra plateau: undulating lands
<b>Elevation (m)</b>	:	Weathered Basalt
<b>Ground water table</b>	:	5-10 m
<b>Rainfall</b>	:	1090 mm
<b>Slope &amp; erosion</b>	:	Very gently sloping (1-3%), Moderate & Normal
<b>Drainage &amp; permeability</b>	:	Mod well drained & slow permeability
<b>Land use and Vegetation</b>	:	Cotton, Neem, Palas
<b>Geology &amp; parent material</b>	:	Basalt & Weathered Basalt.
<b>Distribution and extent</b>	:	Extensive in Wardha (85,320 ha.), Chandrapur (31,380 ha) and Akola (10,800 ha) districts. (Mapping units 222, 223, 225).
<b>Soil series correlated</b>	:	Pandharponi
<b>Soil series associated</b>	:	Mangrulpir series
<b>Typifying pedon</b>	:	Wardha clay - cultivated.
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
Ap	0-19	Dark grayish brown (10YR 4/2 D) and dark brown (10YR3/3 M) clay; medium moderate sub angular blocky; hard, friable sticky and plastic; fine common lime concretions; violent effervescence; fine common roots; clear smooth boundary, pH 8.2.
Bw	19-47	Very dark grayish brown (10YR 3/2 M) clay, medium moderate sub angular blocky with pressure faces; friable sticky and plastic; fine common lime concretion; violent effervescence fine common roots; clear smooth boundary, pH 8.1.
Bssl	47-86	Very dark grayish brown (10YR 3/2 M) clay; medium strong angular blocky with intersecting slickensides; firm very sticky and very plastic, fine common lime concretions; violent effervescence; fine few roots; clear smooth boundary, pH 8.2;.
Bss2	86-116	Very dark grayish brown (10YR 3/2 M) clay; medium moderate angular blocky with intersecting slickensides; very firm very plastic; fine common lime concretion; violent effervescence fine few roots; clear smooth boundary, pH 8.1.
Bss3	119-150	Very dark grayish brown (10YR 3/3 M) clay; medium moderate angular blocky with intersecting slickensides; very firm very sticky and very plastic; fine many lime concretions, violent effervescence; pH 8.1

**Range in Characteristics:** The thickness of solum is 140 to 150 cm. The estimated MAST is 28.9°C, MSST is 30.9°C and MWST is 24.1°C. The moisture regime is ustic. The Ap horizon is 16 to 20 cm thick. Its colour is in hue 10YRvalue 3 and chroma 2 to 3. The texture is clayey. The structure is subangular blocky, fine common lime concretions; violent effervescence. The B horizon is 140 to 150 cm thick. Its colour is in hue 10YRvalue 3 and chroma 2 to 3. The texture is clayey. The structure is subangular blocky to angular blocky with pressure faces and intersecting slicknsides; fine common lime concretions; violent effervescence.

**Competing series and their differentiae:** Kopra series: Fine, montmorillonitic, hyperthermic Udic Haplusterts.

**Interpretation:** These soils are very deep and could be used for annual crops under rainfed and irrigated conditions.

**Interpretation groupings:**

- i) Land capability and sub-class - IIs
- ii) Land irrigability - Moderately suitable (S2)
- iii) Productivity potential - Good.

**Yield:** Based on data from farmer's field.

Crops	Farmer's practices	Improved practices
	..... (Yields q/ha).....	
Cotton	3.0-5.0	6-10

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-19	17.2	31.2	51.6	8-10
Bw	19-47	15.4	39.4	55.2	5-8
Bssl	47-86	13.4	28.6	58.0	3-5
Bss2	86-116	10.8	28.0	61.2	3-5
Bss3	116-150+	8.8	26.0	65.2	15-20

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-19	0.55	11.0	0.17	8.2	6.6	-	33.9	24.3
19-47	0.43	11.20	0.19	8.1	6.5	-	34.2	25.5
47-86	0.43	11.40	0.18	8.2	6.6	-	35.7	25.9
86-116	0.34	11.44	0.16	8.1	6.5	-	36.0	26.7
116-150+	0.24	11.63	0.21	8.1	6.6	-	36.6	27.3

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-19	38.7	4.95	0.25	0.98	44.88	48.0	93.5
19-47	42.7	6.76	0.22	0.77	50.45	52.0	97.0
47-86	38.7	8.00	0.24	0.71	47.65	48.0	99.3
86-116	34.9	11.55	0.28	0.78	47.51	50.0	95.0
116-150+	35.6	14.35	0.35	0.90	51.2	52.0	98.5

### 36. SIRPUR (Si) SERIES

<b>Classification</b>	:	Fine, montmorillonitic (cal.), hyperthermic, Vertic Calciustepts
<b>Type Location</b>	:	Village: Sirpur; Tehsil: Deoli; Distt: Wardha. 20° 52' 00" N & 78° 23' 00" E
<b>Physiographic position</b>	:	North-Deccan Maharashtra lower plateau: plains & Valleys
<b>Elevation (m)</b>	:	242 m above MSL
<b>Ground water table</b>	:	5-10 m
<b>Rainfall</b>	:	1090 mm.
<b>Slope &amp; erosion</b>	:	Gently sloping (3-8%), Moderate & Normal
<b>Drainage &amp; permeability</b>	:	Mod well drained & slow permeability
<b>Land use and Vegetation</b>	:	Cotton, Pigeonepea, Neem, Acacia, Palm.
<b>Geology &amp; parent material</b>	:	Basalt & Basaltic Alluvium
<b>Distribution and extent</b>	:	Extensive in Wardha (13,240 ha.), Chandrapur (14,300 ha) and Amravati (3690 ha) districts. (Mapping units 264).
<b>Soil series correlated</b>	:	Nil
<b>Soil series associated</b>	:	Nil
<b>Typifying pedon</b>	:	Sirpur clay - cultivated
<b>Profile Characteristics</b>	:	

Horizon	Depth (cm)	Description
Ap	0-24	Dark grayish brown (10YR 3/3 M) clay; medium, moderate sub angular blocky; friable sticky and plastic; fine common lime concretions; violent effervescence; fine many roots; clear smooth boundary, pH 8.5.
Bkwl	24-51	Dark brown (10YR 3/3 M) clay; medium moderate angular blocky structure with pressure faces; firm sticky and plastic; fine common lime concretion; violent effervescence fine common roots; gradual smooth boundary, pH 8.5.
Bkw2	51-71	Dark brown (10YR 3/3 M) clay; medium moderate angular blocky with pressure faces; firm, sticky and plastic; fine common lime concretions; violent effervescence; fine common roots; gradual smooth boundary, pH 8.5.
Bkl	71-100	Brown (10YR 4/3 M) gravelly clay; medium weak sub angular blocky; firm sticky and plastic; fine lime concretion; violent effervescence; fine few roots; clear smooth boundary, pH 8.3.
Bk2	100-125	Dark yellowish brown (10YR 4/4 M) gravelly clay; medium weak, sub angular blocky; friable sticky and plastic; fine many lime violent effervescence; fine few roots; pH 8.5.

**Range in Characteristics:** The thickness of solum is 90 to 150 cm. The estimated MAST is 28.9°C, MSST is 30.9°C and MWST is 24.1°C. The moisture regime is Ustic. The Ap horizon is 18 to 25 cm thick. Its colour is in hue 10YRvalue 3 and chroma 2 to 3. The texture is clayey. The structure is subangular blocky, fine common lime concretions; violent effervescence. The B horizon is 75 to 125 cm thick. Its colour is in hue 10YRvalue 3 and chroma 1 to 4. The texture is clayey. The structure is subangular blocky to angular blocky with pressure faces few many lime concretions; slight to violent effervescence.

**Competing series and their differentiae:** Nil.

**Interpretation:** These soils are very deep and could be cultivated for crops both under rainfed and irrigation condition.

**Interpretation groupings:**

- i) Land capability and sub-class - IIs
- ii) Land irrigability - Moderately suitable (S2)
- iii) Productivity potential - Good.

**Yield:** Based on data from farmer's field.

Crops	Farmer's practices	Improved practices
	..... (Yields q/ha).....	
Cotton	3.0-5.0	6-10
Pigeonpea	6.0-7.0	20.0-22.0

**ANALYTICAL DATA**

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-24	14.4	33.2	52.4	5-10
Bkw1	24-51	13.2	31.2	55.6	5-8
Bkw2	51-71	11.2	30.8	58.0	10-15
Bk1	71-100	9.8	30.5	59.7	15-20
Bk2	100-125	7.9	29.0	63.1	15-20

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-24	0.43	10.56	0.30	8.5	-	-	35.9	26.7
24-51	0.42	10.64	0.25	8.5	-	-	37.8	27.1
51-71	0.30	20.64	0.25	8.5	-	-	38.2	27.9
71-100	0.18	20.86	0.30	8.3	-	-	38.9	28.8
100-125	0.15	21.60	12.3	8.5	-	-	40.6	29.4

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-24	31.3	5.77	0.38	2.25	39.7	48.9	81.1
24-51	34.4	11.38	0.50	3.25	49.53	54.0	91.1
51-71	28.3	14.35	0.55	3.74	49.64	51.7	90.7
71-100	24.4	12.37	0.57	4.00	41.34	46.5	88.9
100-125	19.6	12.37	0.61	4.26	36.84	43.2	85.2



### 37. SEWAGRAM SERIES (Sw)

<b>Classification</b>	:	Clayey, mixed hyperthermic, Lithic Ustorthents
<b>Type Location</b>	:	Village: Sewagram; Tehsil: Wardha; Distt: Wardha 19° 44' 30" N 78° 40' 00" E
<b>Physiographic position</b>	:	North-Deccan Maharashtra lower plateau: Undulating to rolling lands with mesa and butte.
<b>Elevation (m)</b>	:	270 m above MSL
<b>Ground water table</b>	:	>10 m
<b>Rainfall</b>	:	1080 mm
<b>Slope &amp; erosion</b>	:	Gently sloping (3-8%), severe erosion & Normal
<b>Drainage &amp; permeability</b>	:	Well drained & moderately slow permeability
<b>Land use and vegetation</b>	:	Degraded unculturable, Bharati, Babul.
<b>Geology &amp; parent material</b>	:	Basalt & Weathered basaltic.
<b>Distribution and extent</b>	:	Extensive in Wardha
<b>Soil series correlated</b>	:	Pardi series.
<b>Soil series associated</b>	:	Nil.
<b>Typifying pedon</b>	:	Sewagram clay loam - degraded lands.

Horizon	Depth (cm)	Description
Ap	0-8	Yellowish brown (10YR 5/3 D) and brown (10YR4/3 M) clay loam; hard, firm, slightly sticky and slightly plastic; fine many roots; gradual smooth boundary, pH 7.7.
Cr	8-20	.....Weathered Basalt.....

**Range in Characteristics:** The thickness of solum is 8 to 20 cm The A horizon is 8 to 20 cm thick. Its colour is 7.5YR to 10YR value 3 to 4 and chroma 2 to 4. The texture is sandy loam to gravelly clay loam. The structure is subangular blocky. The C horizon is 10 to 30 cm thick with weathered basalt.

**Competing soil and their taxonomy:** Wadner series-Extremely shallow very dark grayish brown, gravelly clay (38 to 51%), organic carbon (0.56 - 0.63%) and CEC of 49 cmol (+) kg<sup>-1</sup>.

**Interpretation:** These soils are extremely shallow and to be kept under grasses or forest vegetation. This prevents further degradation of the lands.

#### Interpretation groupings:

- Land capability sub-class - VIIs
- Land irrigability - Not suitable (N2)
- Productivity potential-Very poor.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-8	44.6	33.2	52.4	5-10
Cr	8-20	.....Weathered Basalt.....			

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-8	0.48	10.56	0.30	8.5	-	-	35.9	26.7
8-20	.....Weathered Basalt.....							

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-8	23.80	5.77	0.38	2.25	39.7	48.9	81.1
8-20	.....Weathered Basalt.....						

### 38. KARANJA (Kj) SERIES

<b>Classification</b>	:	Loamy-skeletal, mixed hyperthermic family of Lithic Ustorthents
<b>Type Location</b>	:	Village: Garpit RF; Tehsil: Karanja; Distt: Wardha 21° 4' 30" N, 78° 28' 00" E
<b>Physiographic position</b>	:	North-Deccan Maharashtra lower plateau: Dissected table lands.
<b>Elevation (m)</b>	:	440 m above MSL
<b>Ground water table</b>	:	>10 m
<b>Rainfall</b>	:	1090 mm
<b>Slope &amp; erosion</b>	:	Moderately sloping (8-15%), severe erosion & Normal
<b>Geology &amp; parent material</b>	:	Basalt & Weathered basaltic.
<b>Soil series correlated</b>	:	Nil.
<b>Soil series associated</b>	:	Talegaon series.
<b>Typifying pedon</b>	:	Karanja loam - Forest.

Horizon	Depth (cm)	Description
Ap	0-18	Very dark grayish brown (10YR 3/2 M) gravelly loam; medium, weak, granular, friable, non-sticky and non-plastic; fine, coarse many roots; gradual smooth boundary, pH 7.5.
Cr	18-30	.....Weathered Basalt.....

**Range in Characteristics:** The thickness of solum is 18 cm The A horizon is 18 cm thick. Its colour is 10YR hue value 3 and chroma 2. The texture is gravelly loam. The structure is granular. The C horizon is 12 cm thick with >40% rock fragments.

**Competing soil and their taxonomy:** Chanakpur series- This soil is very dark grayish brown, gravelly clay loam (8 to 41% clay) and CEC of >45 cmol (+) kg<sup>-1</sup>.

**Interpretation:** These soils are very shallow marginal soils for the cultivation of crops. These soils could be kept under forest vegetation.

#### Interpretation groupings:

- Land capability sub-class - IVes
- Land irrigability - Not suitable (N1)
- Productivity potential - Very poor.

## ANALYTICAL DATA

Horizon	Depth(cm)	Particle size diameter (mm)			Coarse fragments (>2mm) % of whole soil
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	
		.....(%).....			
Ap	0-18	40.9	31.6	27.5	30-40
Cr	18-30	.....Weathered Basalt.....			

Depth (cm)	Organic carbon (%)	CaCO <sub>3</sub> (%)	EC (1:2.5, soil: water dSm <sup>-1</sup> )	pH (1:2.5) Soil water ratio		Bulk density (Mgm <sup>-3</sup> )	Water retention (%)	
				H <sub>2</sub> O	KCl		33 kPa	1500 kPa
0-18	2.44	Nil	<0.30	7.5	6.1	-	31.3	20.2
18-30	.....Weathered Basalt.....							

Depth (cm)	Exchangeable cations					CEC	Base saturation (%)
	Ca	Mg	Na	K	Sum		
	.....cmol (+) kg <sup>-1</sup> .....						
0-18	17.10 ,	4.95	0.25	0.34	22.64	27.0	83.9
18-30	.....Weathered Basalt.....						