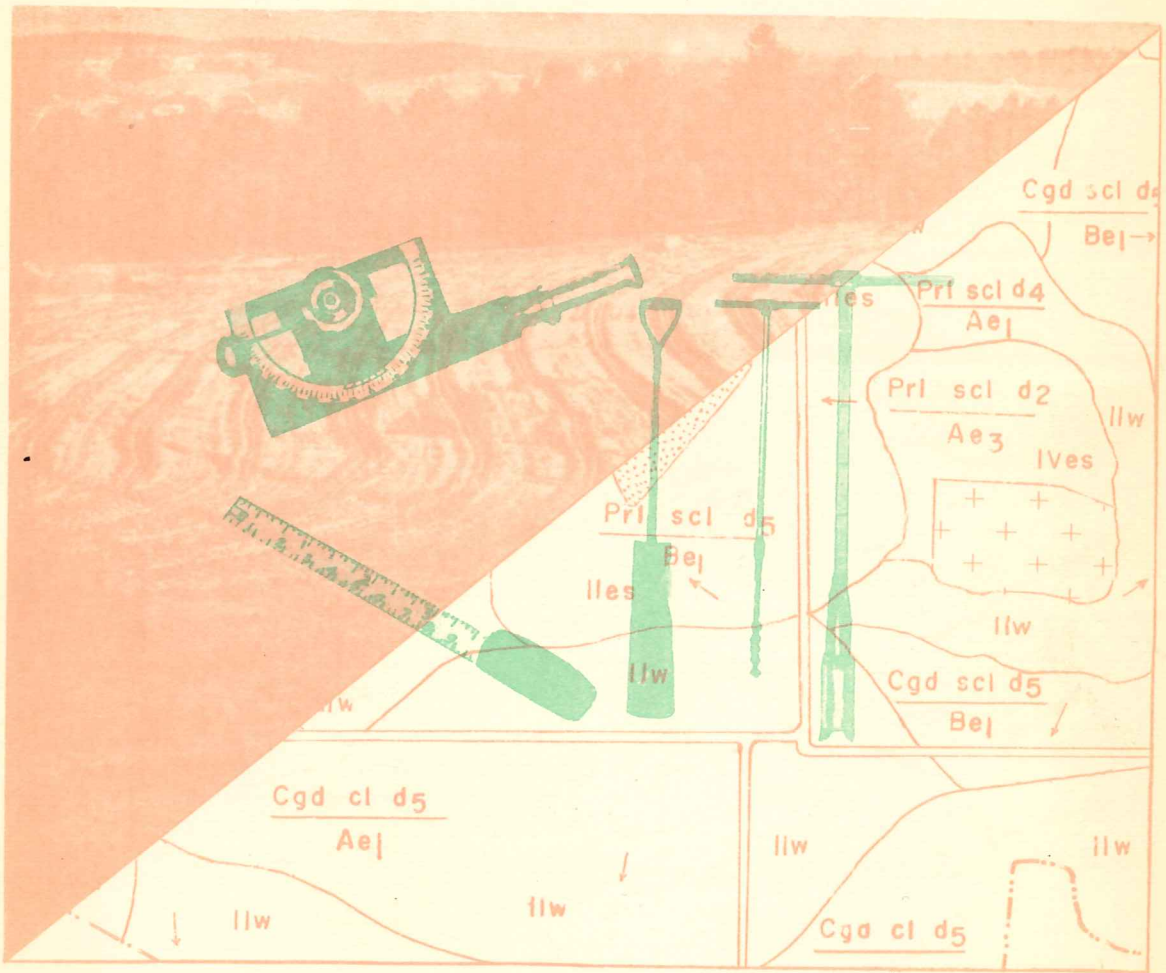
SOIL SURVEY AND LAND USE

of

Settler's villages in Raighar region of Koraput District (Orissa) and Kondagaon zone of Bastar District (Madhya Pradesh)

(DANDAKARANYA REHABILITATION PROJECT AREA)



ALL INDIA SOIL AND LAND USE SURVEY

(CENTRAL SOIL CONSERVATION BOARD),

INDIAN AGRICULTURAL RESEARCH INSTITUTE

NEW DELHI

JUNE, 1965

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(DANDAKARANYA REHABILITATION PROJECT AREA)

SURVEY BY

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OUTLINE

1. Area surveyed:

24 Settlers' villages in Raighar region of Koraput district (Orissa) comprising 4937.51 hectares and 3 settlers' villages in Kondagaon zone of Bastar district (Madhya Pradesh) comprising 612.38 hectares, totalling to 5549.89 hectares.

2. Type of survey carried out

Standard detailed soil survey.

3. Base maps used and their scale:

Village maps of 25.2 cms - 1 Km. scale supplied by the Land Survey Office of the Dandakaranya Project.

4 Purpose of survey:

To assessthe suitability of the land allotted to the Settlers for production of paddy and other crops and recommend suitable cropping patternsbased on the soil survey data.

5. Number and names of soil series recognised and mapped, their extent of occurrence:

		(hectares)	Percentages.
6 Soil series namely	Chattiguda.	2278.60	41.1
	Purla.	2185.00	39.4
	Hatibena	423.59	7.6
	Boregaon	404.40	7.3
	Gobri	234.00	4.2
	Mahuli	24.30	0.4
		5549.89	

6. Number of units mapped under each series:

Chattiguda	13
Purla	17
Hatibena	13
Gobri	6
Mahuli	2
Boregaon	4
Total:	55

7. Land capability classes and sub-classes - their areas and percent of total:

Capability class and sub-class	Area (hectares)	Percentage of the total
IIs	251.54	4.5
IIw	1910.34	34.0
IIes	2043.60	37.0
IIew	693.20	10.5
IIIes	268.36	4.0
IIIew	189.40	4.0
IVes	195.62	6.0

8. Land area suitable for paddy cultivation: About 51 percent of the total area.

Interpretation of soil survey data of settlers' villages Raighar region of Koraput district (Orissa) and Kondagaon zone of Bastar district, (Madhya Pradesh) under Dandakarnya Project (Report 199, June '65).

The Report embodies the results of soil survey work conducted in 27 villages selected for settlement purposes. The total area surveyed is 5549.89 hectares, of which 4937.51 hectares fall under Koraput district, Orissa and the rest in Bastar district Madhya Pradesh. The details regarding village-wise distribution of soil survey coverage is given in Table I of the Report. The soils of the area could be classified into six soil series. viz Chattiguda, Purla, Hatibena, Boregaon, Gobri, and Maholi. Descriptions in relation to differentiating morphological characteristics of the soils are given in pages 16 - 29 of the Report. Analytical data of the soils together with compendious discussion thereon, is provided in Appendix I of the Report.

Of the six soils series recognized, Chattiguda and Purla are most extensive, each constituting around 40.0 percent whereas, Boregaon, Hatibena and Gobri together occupy only 19.50 percent of the surveyed area.

Mapping units corresponding to each of the soil series are given following the description of soil series in pages 16 - 29. On the basis of these units, capability classification is worked out to indicate relative suitability of soils for crops, grazing, forestry or wild life. The distribution of area under each of the capability classes together with limitations for use and general recommendations are indicated in the following tabular Statement.

Capability Class	Capability Sub-class	Area falling under each series		General Recommendations.
			(hectares)	
	IIw	Chattiguda -	1492.88	This comprises lands characterized by poor soil drainage, though satisfactory for paddy cultivation, field bunding, levelling and judicious use of organic manures, as also practice of green manuring and proper fertilization is recommended. For clayey soils open drainage is suggested.
		Hatibena -	247.39	
		Gobri -	145.78	
		Mahuli -	24.29	
			1910.34	

IIs	Purla	- 251.54	This is susceptible to slight erosion. Related to their texture, water holding capacity of the soils is low, and they are highly drained. Deep ploughing, field bunding, levelling and use of organic manures and green manuring practice is recommended.
IIew	Chattiguda	- 693.20	This includes lands with soils susceptible to moderate hazards of erosion and are poorly drained. Field bunding, leveling, and application of organic manures and practice of green manuring is recommended.
IIes	Purla	- 1639.20	These are subject to moderate erosion hazards. Limitations for use are susceptibility to moderate sheet erosion and low water-holding capacity. Arhar. maize, jowar and groundnut are recommended with suitable management practices.
	Boregaon	- 404.40	
		2043.60	
IIIew	Chattiguda	- 86.38	This consists of lands susceptible to erosion and characterized by poor drainage. Paddy cultivation with good management practices and proper manuring is recommended to be continued.
	Hatibena	- 14.70	
	Gobri	- 88.32	
		189.40	
IIIes	Purla	- 154.15	These are susceptible to erosion hazards and are excessively drained and are not recommended for paddy cultivation. Other crops like groundnut, arhar, jowar, til etc. may be tried with proper management practices.
	Hatibena	- 112.21	
		266.36	
IVes	Chattiguda	- 6.07	The lands are nearly level to gently sloping with shallow soils with severe susceptibility to erosion. Intensive soil management is recommended. Crops like Green gram, Black gram, Bengal gram and oil seeds are suggested.
	Purla	- 140.06	
	Hatibena	- 49.49	
		195.62	

Detailed soil survey of Settlers' villages in Raighar Region of Koraput District (Orissa) and Kondagaon zone of Bastar district (Madhya Pradesh) under Dandakaranya Project.

I INTRODUCTION

Detailed soil surveys were conducted in the Dandakaranya Project area in order to assess the suitability of the land allotted to the refugees from East Bengal for raising agricultural crops and recommend a suitable cropping pattern based on the soil survey data. The land, once covered with dense forest has now been converted into settlement colonies and agricultural lands. Before releasing the land for settlement, advance soil surveys had been conducted by the Dandakaranya Project officials to demarcate the land fit for forest clearence Soils having a minimum depth of 44 cms.and slope gradients less than 5 percent were taken as guiding factors for the purpose. When the land was cleared of the natural vegetation, field plots were laid and contour bunds constructed.

On a further request from the Chief Administrator, Dandakaranya Project, Koraput, detailed soil surveys were taken up by the Bangalore Centre of the All India Soil & Land Use Survey in Raighar region of Koraput district and Kondagaon zone of Bastar District. The field party consisted of S/Shri P.S. Anjaneya Reddy, (Soil Survey Asstt.), B.T. Shivahiah (Field Asstt.) and Krishnappa (Khalasi) started the field work in April, 1964 and completed in June, 1964. This report describes the soil survey and land use of 24 Settlers' villages in Raighar region and 3 settlers' villages in Kondagaon zone of Orissa and Madhya Pradesh States respectively. (Figure 1)

II. GENERAL DESCRIPTION OF THE AREA.

1. Location and extent: For administrative convenience, the project area of operation has been divided into four zones viz. Umarkote - Raighar and Malkangiri zones in Koraput district of Orissa and Pharasgaon and Paralkote zones in the Bastar district of Madhya Pradesh, each zone having its own headquarters (Figure 2). Raighar region in Koraput district, Orissa, is situated about 160 Km. north - west of Koraput and the area surveyed, consists of 24 villages falling within a radius of 32 Km. of Raighar village. The headquarters of the region is located at Umarkote. Kondagaon zone in Bastar district, Madhya Pradesh, is situated about 88 kms West of Kondagaon. The headquarters of the Zone and the area surveyed covering 3 villages namely Boregaon east, Boregaon west and Jugani fall within a radius of 4.8 kms from Boregaon village. The total area surveyed in Raighar region and kondagaon zone is 5590.90 hectares. The list of villages surveyed with the areas is given in Table I.

2. Physiography, relief and drainage: The Raighar region in Dandakaranya Project constitutes a plateau with an altitude ranging from 609.60 to 670.56 metres above M.S.L. The physiography is marked by an undulating topography dotted by small elevations and depressions. The slope gradient ranges from 1 to 5 percent. There are a few isolated hills but no hill ranges. Mohand hill at a height of 748.28 metres is the only prominent peak in the region.

There are no important rivers but a number of nalas contribute to the natural drainage. Erosion is not very severe.

Kondagaon zone also forms a plateau with an altitude of approximately 670.56 metres above M.S.L. The topography is undulating with slope gradients ranging from 1 to 5 percent. There are no such important rivers in this area too, but many streams are found flowing.

3. Climate: The climate of Raighar region and Kondagaon zone is of a sub-tropical type. It is mild and salubrious with absence of extremes of heat and cold. The Raighar region receives on an everage 152.40 to 165.10 cms of rainfall during the year. The rainfall is fairly heavy, but is confined to the south-west monsoon. Most of the precipitation occurs during the months of July to September and is not evenly spread. Scattered showers are however received during the months of April - June and October - November. The intensity of rainfall is high during the wettest months of July and August. The highest temperature recorded is 41 C in the month of May.

TABLE II(a)

Monthly rainfall data (1961-1963) recorded at Umarkote dam site (rainfall in cms. unless otherwise stated) :

Months.	April.	May	June	July	August	Sept.	October	November.
Year								
1961	-	5.70	23.25	28.50	40.00	25.00	12.20	2.31
1962	14.00	5.22	21.25	99.90	30.00	13.80	-	-
1963	5.2	3.61	20.18	27.82	45.31	43.04	10.68	-

TABLE I.

List of villages surveyed with areas in Raighar region and Kondagaon zone, Dandakaranya Project.

(AREA IN HECTARES)

Sl. No.	Name of the village	Village site	Tank site	Link road	Total	Land allotted to the settlers	Land reserved for further adjustment.	Land allotted to settlers but still not in possession.	Land though once alloted was subsequently un-utilised.	Total	Total of columns 6 & 11
1	2	3	4	5	6	7	8	9	10	11	12
					Raighar region						
1.	Bharsundi	35.40	7.30	9.30	52.00	276.70	33.75	9.55	41.25	361.25	413.25
2.	Chhotabeda	34.00	4.30	10.50	48.80	265.75	2.70	5.40	20.25	294.10	342.90
3.	Kumuli	34.75	4.80	11.60	51.15	263.91	14.15	8.20	11.30	297.56	348.71
4.	Sarguli	28.55	4.95	3.30	34.80	203.50	26.50	-	11.35	241.35	276.15
5.	Kachrapara I	14.50	10.20	9.70	34.40	108.50	1.26	-	19.75	129.51	163.91
6.	Kachrapara II	24.00	2.95	4.95	31.90	135.60	5.40	-	9.00	150.00	181.00
7.	Dumrimunda	32.50	2.25	9.30	44.75	284.65	10.80	5.40	38.75	339.60	384.35
8.	Gurusingha	32.50	17.60	9.80	55.90	264.00	4.10	8.20	9.50	285.80	341.70
9.	Mohand	29.00	4.05	12.05	45.30	265.75	16.40	1.46	18.76	302.37	347.67
10.	Udaypur	19.40	.16	4.05	23.61	176.31	5.40	13.56	19.70	212.77	236.38
11.	Biripur	12.15	3.20	1.20	16.55	86.05	6.80	-	18.80	110.55	127.10
12.	Hatibena	12.20	3.60	2.40	18.20	87.15	2.20	-	9.25	99.10	117.30

1	2	3	4	5	6	7	8	9	10	11	12
13.	Sonepur	22.75	3.75	5.00	32.00	171.30	10.90	18.50	13.50	208.90	240.50
14.	Kusumpur	21.50	2.90	2.95	27.35	111.00	12.75	-	0.52	124.27	151.00
15.	Naktisimara	9.80	4.17	0.44	14.41	67.81	8.45	13.45	19.20	108.51	128.14
16.	Hirapura	25.52	5.35	34.20	94.22	20.34	20.34	-	32.51	183.05	220.60
17.	Paurbella I.	20.69	2.90	3.90	27.49	135.70	4.50	-	14.60	154.80	181.54
18.	Paurbella II.	19.98	4.70	5.90	30.53	130.00	5.40	-	12.10	177.50	208.25
19.	Turudihi	31.60	7.00	8.20	46.26	235.00	20.50	8.10	14.70	278.30	328.40
20.	Kachrapara III.	24.25	2.85	5.54	32.64	206.10	24.45	13.58	5.40	249.53	278.90
21.	Kibikonga	19.85	4.80	4.45	29.10	127.40	4.06	8.12	8.22	147.80	176.80
22.	Jorjenga	14.60	2.80	3.20	20.60	119.95	5.42	6.76	13.00	139.13	159.81
23.	Jalangapara I	12.62	6.45	4.02	23.09	108.50	-	-	14.77	123.27	148.43
24.	Patchipara	24.70	2.55	6.18	33.43	178.75	8.14	15.60	10.80	224.32	256.06
										4943.34	

Kondagaon zone.

1.	Boregaon east		311.56
2.	Boregaon west		55.87
3.	Jugani		244.94
		Total:	5555.71

The Kondagaon zone receives on an average 140 to 165 cms of rainfall during the year. Most of the precipitation occurs during the south-west monsoon period. It is not evenly spread. Both the temperature and humidity are more or less similar to that of Raighar region.

TABLE II(b)

Monthly rainfall data in cms (1959 - 63) recorded at Kondagaon station.

Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Year												
1959	3.97	-	-	1.27	1.35	34.45	29.00	68.00	36.75	8.50	-	
1960	-	-	4.60	.58	7.90	30.05	41.50	19.30	14.20	14.80	-	-
1961	-	3.46	-	-	-	21.50	49.20	53.00	33.75	8.20	-	-
1962	.91	1.02	-	3.70	-	18.40	38.75	25.20	-	3.95	-	4.15
1963	-	-	-	5.70	5.60	24.75	17.60	55.14	32.75	-	-	-

4. Geology: In Raighar region, geology is made up of the rocks of the Archaean complex and Dharwars. The various rock types encountered in the course of field traverse include, hornblende granite, pegmatite, laterite, quartz, diorite, ferruginous quartzite, hornablende schist, amphibolite and epidiorite. Basic rocks like hornblende schist, amphibolite and epidiorite from the parent rocks for gray brown soils i.e. Gobri and Mahuli soil series occurring in the valleys. Ferruginous quartzite and pegmatite form the parent materials of Purla soil series occurring on the uplands. Granite gneiss rock is seen occasionally in isolated patches which probably does not play much role in soil formation. Hornblende schist is highly foliated. The intensity of metamorphism is high as a result of which precipitation of calcium carbonate in the nodular from is observed. Banded ferruginous quartzite forms a capping on the ridges in most of the villages.

In Kondagaon zone hornblende granite, quartz diorite, ferruginous quartzite, hornblende schist and epidiorite are the chief types of rocks noticed. Quartz diorite forms the parent rock material for the Boregaon soil series.

5. Natural vegetation: Koraput and Basta, Districts of Orissa and Madhya Pradesh respectively are famous for the sal forests which form important sources for railway sleepers, furniture and fuel. The forest wealth of the area is considerably rich. The deciduous forest vegetation having a few species of evergreens commonly occur in the area. Important among the flora are Acacia catechu, Aegle marmelos, Albizzia labbek, Bambusa arundinacea, Boswellia serrata, Bursera serrata, Cassia fistula, Cleistanthus collinus, Dendro calamus strictus, Eugenia jambolana, Grmelina arboria, Mangifera indica, Odina woodier, Pterocarpus, marsupium, Schleichera trijuga, Tamarindus indica, Terminalia arjuna, Terminalia chebula, Adina cordifolia, Ailanthus excelsa, Anogeisus latifolia, Bassia latifolia, Buchnania latifolia, Butea frondsa, Gedrela tonna, Dalbergia latifolia, Diospyros melanoxylon, Gardenia species, Grewia tilliaefolia, Michelia champaka, Phyllanthus emblica, Salmelia malabarica, Sterculia species, Tectona grandis, Terminalia belerica, Terminalia tomentosa. Among the grasses, mention may be made of cenchrus ciliaris and saccharum ciliaris and saccharum spontaneum.

Apart from sal, the forests yield many varieties of valuable soft and hard wood. Minor but nevertheless important forest products include Myrobalan, Sabai and broom grasses, lac, cane, catechu, gum arecanut and arrow-root.

6. Water supply: Water for domestic purposes is available from masonry wells and tube wells. Each village is supplied with one or two deep mesonry wells, two to four tube wells depending upon the size and population of the village. Water for live-stock is made available from head-water tanks, irrigation tanks and also wells during summer when there is no water in the tanks. The soil Conservation wing of the Agricultural Department has plans to construct head-water tanks in each village. In a majority of the villages, the construction of head-water tanks has been completed. It is rather surprising to see that water does not stand in these tanks even during the rainy season. Since large amount of money is involved in the construction of head-water tanks, suitable sites should be located for the purpose. Attention should be paid to this aspect by the Engineering department of the project. The purpose with which the head-water tanks are constructed will otherwise be defeated.

Even in the Kondagaon zone, water supply for domestic and live stock is similar to that of Raighar region, except tanks. Here also the construction of tanks in every village may be taken up.

7. Public facilities: In general, the primary education facilities are good. Education is free for settlers' childern. Every village is provided with an elementary school by the Dandakaranya Development Authority. Bengali language is taught along with Hindi or Oriya in these schools. At Umarkote there is a high school, and hostel acco-

modation has been made for boys and girls separately. For Kondagaon zone students, High School education is provided at Kondagaon and at Umarkote. Substantial grants have also been given to the colleges at Jeypore and Jagadalpur which will admit settlers' students studying for the college courses.

The Umarkote temple attracts large number of pilgrims during the annual car festival. Even in Raighar, festivals are conducted every year on a grand scale. Recently, the Y.M.C.A. is organising sport events in Raighar region. Popular among the games are Football, Volleyball and Badminton (Shuttle cock). Festivals like Tagore Jayanthi, Banjo Jayanthi and Durga Puja are observed at Raighar and Kondagaon. During the festival time, the local Orissa Adivasi dances and Madhya Pradesh Adivasi dances are held. They are very famous & liked by many people in the country.

The Directorate of Public Health Services of the D.D.A. runs hospitals at Raighar and Kondagaon. In addition, there are health centres, dispensaries and fully equipped mobile medical units. Each village is provided with a compounder. The mobile medical units visit the villages regularly. The antimalaria wing of the Directorate has been quite successful in eradicating the malarial. A 50 bed hospital with facilities for most modern treatment is under construction at Umarkote. Tuberculosis and other major diseases are being treated at Kondagaon and Nowrangapur.

The new railway line Dandakaranya - Bolangir - Kiribura (D.B.K.) due to be completed by 1965 will link Bailadilla with Vishakhapatnam and the main towns of Dandakaranya and also with the Trunk Madras - Calcutta line. The rail-road will considerably increase the industrial and other potentialities of Dandakaranya.

8. Communications: In regard to the road communications, most of the roads are negotiable only in fair weather. Now the DDA has improved the National Highway No. 43 and also the road system in Dandakaranya Project. There is now a road from Raighar to Kondagaon Kankair, and a fair weather road to Nowrangapur. The National Highway No. 43 runs through Kondagaon zone. Buses run from Raighar to Kondagaon and Kankair. In Kondagaon zone the transport system is better as compared to the Umarkote zone. The project maintains a net-work of wireless stations in between the existing resettlement zones and other places like Mana, Jagadalpur and Koraput. There is a branch Post Office at Raighar and a Post and Telegraph office at Kondagaon. The project runs its own courier system for the regular carriage of mail all over the area of operation.

9. Industries: There are no major industries in the area. Although the Dandakaranya Development itself, because of its limited resources, cannot undertake any major industry, it has taken up a programme of cottage and small scale industries, using the labour potential created by the influx of displaced persons. There is great future in Dandakaranya for ceramic industry, tanneries, paper mills and medium industries for the production of hard board, straw board etc. The project is setting up a semi-urban centre at Jagadalpur to train settlers, to start with, in black-smithy, tin-smithy, weaving and carpentry, on the earning while learning basis. Rehabilitation benefits to new agriculturist settlers include on the job training in different trades in the project industrial centres. The project has also helped the formation of Mahila Samathies in many settlers' villages where Gram Sevikas train the settler women in tailoring, embroidery etc. At Umarkote, the DDA has established a wool-working centre which has provided employment for about fifty people. The wood-working centre is manufacturing windows, doors, tables, chairs and other items of furniture. In the black-smithy section of wood-working centre, steel tables and chairs are also being manufactured. In Kondagaon zone there is a big wood-working centre at Jugani which has given employment to many people. Picking of beedi leaves has engaged many Adivasi people in their off time, in the Raighar region and Kondagaon zone.

10. Transportation and Marketing: Raighar, the headquarters of the Region, is connected by bus service to Jeypore, Kondagaon and Kankair. Majority of the Settlers' villages are not connected by bus service. Raighar, is the place where bus service is available. The major roads and also village roads are not well-maintained and need considerable attention.

Raighar is the marketing centre for all the commodities and goods produced in the area. Paddy is the most important commodity sold at Raighar on the weekly shandy day. It is sent to other places by trucks. The weekly shandies meet in many important villages in the area where purchase and sale of commodities are made on a small scale, just sufficient to meet the daily needs of the people.

Kondagaon zone is well connected by bus service to Jagadalpur, Raipur and other places. Kondagaon town is the marketing centre for all the commodities and goods produced in the area. The weekly shandies meet in many villages where purchase and sale of commodities are made on a small scale to meet the daily needs of the people.

The nearest railway stations for the above places are Raipur in Madhya Pradesh and Vizianagaram in Andhra Pradesh.

III. AGRICULTURE AND PRESENT LAND USE

The majority of the settlers and the local people being agriculturists, agriculture will naturally be the bed-rock of the future pattern of economy in the Dandakaranya. The Agricultural Directorate of the Project runs a 400.50 hectares mixed-farm at Umarkote and a Horticultural Station at Dumriput near Koraput. Experiments are conducted in the mixed farm to select suitable manures and fertilisers, and to evolve the most suitable cropping pattern for different types of soil occurring in the zone.

Apart from the irrigation projects which are under construction, the head-water tanks are being constructed in most of the villages as soil conservation measures, and to provide facilities for retting jute and mestha. Seepage water from these tanks benefit the fields below them for raising rabi crops.

About 60 to 75 percent of the total cultivated area is under paddy. Pulses like mung, urid, arhar and pea; fibre crops like jute and mestha; and oil seeds like til, niger and groundnut; and crops like jowar, maize and ragi, occupy the rest of the area. Village forests and lands found unsuitable for cultivation are the only grazing lands. There are no separate pasture lands. The acreages of different crops in the villages surveyed are given in Table III.

For some of the crops like paddy, pulses and oil seeds, the Extension wing of the Agricultural Department should popularise methods of cultivation which are new to the settlers, who had been accustomed to a different type of farming. They should keep information also of improved seeds, implements etc.

The areas cultivated for paddy and the varieties grown are given in Table IV.

It is seen from the table that among the improved varieties, PTB10 gives the highest average yield per hectare and occupies about 40 to 45 percent of the total area under paddy, 25 to 30 percent of paddy area is occupied by local variety of which Dular paddy gives the lowest yield.

1. Crops:

Paddy. Paddy is largely grown under rain-fed condition. Immediately after the harvest of paddy crop, one summer ploughing is given. This is followed by 3 to 4 ploughings by a country plough in a preparatory process, of clod crushing, levelling and application of farm-yard manure. Seed rate is 75 kg per hectare and the seeds are sown during the last week of May or early in June. Afterwards 'Bida' operation is given which thins out the excess plants, removes weeds, stirs up the soil and serves as root pruning. This is followed by 2 to 3 hand weedings at intervals of 15 to 20 days. The average yield of paddy per hectare is about 3.5 to 4.5 quintals.

TABLE III.

Area (hectares) occupied by different crops in Raighar region (1963-64)

Sl. No.	Name of the village.	Paddy	Maize	Ragi	Urid	Mung	Pea	Niger	Til	Groundnut	Mestha	Jute	Ginger	Jowar	Arhar
1.	Bharsundi	204.22	-	0.81	3.64	12.14	-	4.86	8.09	-	7.23	4.86	-	-	-
2.	Chotabeda	203.14	-	-	18.24	-	-	4.05	16.60	-	4.05	-	-	-	-
3.	Kumuli	214.70	-	-	15.80	3.24	-	11.74	4.05	-	0.89	-	-	-	-
4.	Sargull	146.05	-	-	-	-	-	-	-	-	-	-	-	-	-
5.	Kachrapara I	77.19	-	2.02	5.83	-	-	0.20	0.96	0.41	2.63	0.21	-	-	-
6.	Kachrapara II	92.17	-	1.44	1.14	-	-	1.28	1.65	0.50	3.94	-	-	-	-
7.	Dumrimunda	215.13	-	0.20	16.19	2.02	-	10.12	2.43	-	5.07	2.02	-	-	-
8.	Gurusingha	176.10	-	-	8.09	-	-	1.22	6.07	1.62	8.10	1.62	-	-	1.62
9.	Mohand	187.11	-	0.40	6.07	0.34	-	4.03	6.12	0.05	2.28	0.15	-	-	0.56
10.	Udaypur	130.77	2.02	-	3.44	1.42	0.40	12.76	6.33	1.37	1.34	-	0.23	-	-
11.	Biripur	72.33	-	-	4.72	2.93	-	0.76	2.06	-	0.21	0.50	-	-	-
12.	Matibena	73.68	-	0.81	4.05	2.28	-	0.41	2.17	-	0.55	0.55	-	-	-
13.	Sonepur	135.11	-	-	11.33	7.73	-	3.24	7.29	-	-	-	-	-	-
14.	Kusumpur	102.66	-	-	3.64	2.43	-	2.02	0.81	-	1.22	-	-	-	-
15.	Naktisimara	53.00	-	1.43	5.44	-	-	-	6.07	0.01	1.77	-	-	-	0.62
16.	Hirapara	98.38	-	0.40	9.71	5.26	-	5.67	2.43	-	1.22	-	-	-	-
17.	Paurbella I	104.43	3.24	-	16.19	-	-	0.81	3.24	-	4.05	-	-	2.03	0.41
18.	Paurbella II	126.31	-	-	6.81	4.05	-	2.83	2.57	-	1.77	-	-	-	-
19.	Turudihi	174.09	2.02	-	25.90	-	-	17.41	2.02	-	8.10	2.02	-	-	-
20.	Kachrapara III	149.00	0.81	-	20.64	0.81	-	14.17	1.62	-	8.10	1.66	-	4.06	1.62
21.	Kibikonga	83.80	1.62	-	25.92	-	-	1.22	2.43	-	-	8.30	-	1.43	2.32
22.	Jorjenga	77.73	4.45	-	22.26	-	-	1.22	-	-	1.62	1.22	-	0.81	0.81
23.	Jalangapara	80.97	-	-	8.90	6.47	-	4.86	1.62	-	2.02	-	-	-	2.84
24.	Parchipara	90.28	2.75	1.62	36.76	-	-	1.49	-	2.00	8.10	-	-	2.03	-

TABLE IV

Area under paddy of different varieties in 12 villages of Raighar Region

Sl.No.	Name of the Village.	Area under paddy (hectares)	PTB 10 paddy Area in hectares	HR 19 paddy Area in hectares	Dular paddy Area in hectares	Local paddy Area in hectares
1.	Kumuli	214.77	139.61	24.39	4.10	46.66
2.	Sonepur	135.16	81.40	4.79	-	48.96
3.	Kusumpur	102.70	72.74	18.17	-	11.79
4.	Naktisimara	53.02	28.54	0.14	4.61	19.72
5.	Chhotabeda	206.86	161.91	19.47	-	25.47
6.	Bharsundi	204.29	124.60	24.50	-	55.18
7.	Sirguli	146.10	-	21.83	63.69	60.57
8.	Kachrapara I	77.22	29.75	10.21	5.32	31.93
9.	Kachrapara II	92.21	27.63	19.51	16.92	28.14
10.	Mohand	187.18	44.98	52.14	27.60	62.45
11.	Dumrimunda	215.21	76.45	74.91	15.27	48.56
12.	Gurusingha	176.17	33.82	34.48	15.60	92.27
	Total:-	1810.89	821.43	304.54	153.11	531.70
	Average yield quintal/hectare.		28.5	9.2	13.3	16.2

TABLE V

Seed rate, growing season and yield of different crops
Raigher Region

Crop	Seed rate (kg)	Growing season	Yield (quintal/ hectare)
Maize	10	July to Sept.	18.0
Ragi	5	June to Sept.	9.1 - 10.9
Urid	8	- do -	4.5
Mung	6	- do -	4.5
Til	6	July to October	5.4
Groundnut	30-35	- do -	7.3
Mestha	6	- do -	7.3
Jute	5	- do -	5.4
Ginger	40	- do -	18.0
Jowar	10	- do -	9.1
Arhar	12	June to Jan.	7.3 - 9.1

The above crops are cultivated to a limited extent under rainfed conditions.

2. Agricultural practices and crop production:

The settlers are not aware of the proper agricultural practices that are required to be adopted for different crops introduced by the Agricultural Department. Improved methods of cultivation like line sowing, Japanese method of paddy cultivation which have got the benefits like saving of cultivator's money on seeds, easy way of intercultural operations like removing weeds, application of fertilisers, use of insecticides and fungicides should be demonstrated to the cultivators.

The following improved agricultural practices may be tried for different crops in the existing mixed farm and popularised by demonstration.

TABLE VI

Crop	Spacings	Brief improved agricultural practices
1. Arhar	.9 x .9 meteres	Sow 2 to 3 seeds per hole. After germination thin cut the plants leaving one. Hoeing operations should be done 2 to 3 times at regular intervals and at proper time.
2. Jowar	.45 meteres	Thin out the plants to have a spacing of about one foot in line from plant to plant. Intercultivation operations should be carried out at regular intervals and at proper time.
3. Mestha	.23 meteres	Only one plant should be raised from every hole and the others should be thinned out. Earthing operations should be carried out after one month of sowing. Application of suitable nitrogenous and phosphatic fertilizers should be done at the time of sowing and earthing up.
4. Maize	.6 x .3 meteres	-- do --
5. Mandia	.15 meteres	Transplanting of one month old seedlings should be done.
6. Sweet potato.	.6 x .15 meteres	Vines should be planted having atleast 3 nodes. Intercultivation and earthing up operation should be done.
7. Lady's finger trinjal, tomato, chillies.	.6 x .6 meteres	Seedlings of 15 cms height should be transplanted. Application of suitable fertilizer mixtures and spraying of insecticides should be made at the time of attack.

3. Fertilizer use:

Table VI shows the response of paddy crop to Ammonium sulphate at 113 kg. per hectare on 7 settlers' agricultural plots in Naktisimara village of Raighar region.

TABLE VII

Response of paddy to ammoniam sulphate at 113 Kg/ hectare on seven settlers' agricultural plots in Naktisimara village of Raighar Region.

Name of the village.	Name of the settler	Yield in dry weight (Kg/ hectare) in the fertilized plot.	Yield in dry weight (Kg/ hectare) in the control plot.
Naktisimara	Lulman murian	14.1	9.3
	Satish murian	13.3	10.2
	Rabi murian	14.4	8.5
	Lassumenda	11.5	8.2
	Sukrumurian	10.5	8.3
	Tuplianimurian	11.7	8.7
	Budumurian	11.9	9.3
	Average	12.5	8.93

It is seen from the table that the soils respond well to the application of nitrogenous fertilizers. There is a net increase in yield by about 25 to 30 percent. Most of the settlers are not using artificial fertilizers like ammonium sulphate, urea, calcium nitrate, ammonium sulphate nitrate, calcium ammonium nitrate, superphosphate and muriate of potash. The settlers should be made fertiliser-minded by supplying the fertilizers at subsidised rates. The above fertilizers should be tried for their response in different types of soils occurring in the mixed farm. Proper dosage and correct type of fertilizer should be recommended to the settlers for different types of soils by the Agricultural Department of the project.

4. Live stock: The Directorate of Animal Husbandry and Veterinary services of the project has undertaken dairy farming, poultry farming and pisiculture on a large scale. The Directorate maintains a poultry farm at Umarkote. Eggs and birds are supplied at subsidised rates to the settlers and the Adivasis for food as well as for encouraging poultry farming as a gainful subsidiary occupation. Milch cattle and bullocks are made available to the settlers through this Directorate. Under the "Key Village scheme" some improved cows and heifers from Punjab, have been supplied to them to improve the livestock of the project.

5. Pests and diseases: The common pests, diseases, period of attack and extent of damage (percent) are given in table VIII.

TABLE VIII.

Name of the crop.	Pests	Diseases	Period of attack	Extent of damage (Percent)
Paddy	White ants, grass-hopper, swarming-case-worm, gallfly, stemborer and mealy bug.	Blast Brown spot	Aug.-Oct.	15 to 25
Maize	Army worm.		Aug.-Sept.	10 to 15
Brinjal	Fruit and shoot borer		Aug.-Jan.	10 to 20
Pumpkin beetle gourd	Beetle		- do -	5 to 10

The following control measures for the attack of different crop pests and diseases are recommended and these may be tried on the crops at the time of attack in the mixed farm. Regarding their suitability, the benefits may be demonstrated to the settlers. Insecticides and fungicides may be supplied at subsidised rates to the settlers.

Crop	Pests and iseases	Control measures
Paddy	Grass hopper hispa	Dust gammexane at the rate of 22.00 kgs per hectare twice.
	Swarming caterpillar	Spray 0.2% D.D.T. or Gammexane or dust 5% D.D.T. or B.H.C.
	Case worm	Spray endrin at 250 gms in 165 litres of water per hectare.
	Gallfly	Spray endrin at 110 gms in 55 to 65 litres of water per hectare.
	Blast Brown spot	Dust or spray with Agrosan B.N. of Fytolaw.

Maize	Army worm	Spray endrin at 250 gms in 165 litres of water per hectare.
Pumpkin Beetle	Beetle gourd	Spray endrin at the time of attack.

For white ants attack, the settlers should clear away the harbours of the ants like wood pieces, twigs, etc. and destroy the ant hills if there are any.

IV. SOIL SURVEY METHOD

The detailed soil survey of Raighar region and Kondagaon zone has been carried out, following the standard techniques prescribed in the Soil Survey Manual and mapping has been done on the scale of 25.2 cms to 1 Km village maps supplied by the Land Survey Office of the Dandakaranya Project. These maps lack in control and reference points, but they indicate the boundaries of individual fields, roads, homestead area, buildings, tanks, rejected areas, adivasi lands etc. Soil profiles to a depth of 1.52 metres or more were examined at required intervals depending upon the field observations. Surface samples were examined by post-hole auger at a number of places to fix the soil boundaries in respect of texture, depth of soil, and erosion classes. The profile observations were recorded in the profile description note book provided. Soil samples were collected from representative profiles identified and mapped under different series for laboratory characterisation. The delineation of the soil boundaries was made by actual traversing, following the available roads, link roads, tractor roads and carttracts. The soil survey report is appended with soil and land capability maps of all the villages surveyed on 25.2 cms - 1 Km scale, showing all the mapping units with land capability classes and sub-classes.

V. DESCRIPTIONS OF THE SOILS IDENTIFIED IN RAIGHAR REGION AND KONDAGAON ZONE

During the coarse of the detailed soil survey of Raighar region and Kondagaon zone, 6 soil series have been identified, described and mapped, of which 4 soil series have been correlated with the soils of Umarkote region established during the course of the detailed soil survey of Umarkote region. Each series differs from the other in certain morphological and other characteristics that ultimately affects its suitability for agriculture and soil management. The various soil series along with type, depth of soil, slope and erosion classes have been delineated on the soil and land capability maps appended with the report. The areas of the mapping units and the capability classes and sub-classes under which they are classified are given under the respective soil series. The descrip-

tions of the soil series are given below. The analytical data is given in appendix I and soil map legend in appendix II.

Chattiguda series: (Cgd)

The Chattiguda series consists of dark brown to dark gray brown soils derived from granite gneisses and diorite in the wet subtropical parts of Koraput and Bastar districts of Orissa and Madhya Pradesh respectively. Deep to very deep, moderately well drained, sandy clay loam to clay loam soils occurring on level to gently sloping lands; they have 15.24 to 22.86 cms thick A horizon, undertain by a thick B horizon, 50.80 to 88.90 cms thick. The ferruginous gravel occurs below 102 cms. The yellowish brown to brown subsoil contains mottlings of variegated colours. Geographically associated soils are the Purla series.

Chattiguda sandy clay loam - A typical profile in plot No.95 of the village Kachrapara on Sarguli - Kachrapara road is described below.

Honizon.	Depth (cms)	Description
Ap	0-15	Very dark gray brown (10YR 3/2 dry and moist) sandy clay loam; medium, strong, crumb structure; slightly hard when dry, firm when moist, slightly sticky and plastic when wet; pH 6.2; clear smooth boundary; many roots.
A3	15-35	Dark brown (7.5YR 4/4 dry, 7.5YR 5/4 moist) clay loam; medium, strong, crumb structure; hard when dry, firm when moist and slightly sticky and plastic when wet; pH 5.3; gradual to diffuse wavy boundary; few thick roots.
B1	35-68	Brown to dark brown (7.5YR 5/4 dry, 7.5 YR 4/4 moist); clay loam with a few iron concretions and quartz gravel and a few fine faint mottlings of yellowish red colour (5YR 4/6); medium strong sub-angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; pH 5.2; gradual to diffuse wavy boundary.
B2	68-86	Gray brown to light brown (10YR 5/2 dry and 7.5YR 6/4 moist) gravelly clay loam with many iron concretions of 2 to 10 m.m. size and common faint mottlings of yellowish red colour (5YR 4/6); medium strong blocky structure; very hard when dry,

firm when moist, sticky and plastic when wet; pH 5.2; gradual to diffuse wavy boundary.

B3 over 86 cms. Dark gray brown to pinkish gray (10YR 4/2 dry and 7.5YR 6/2 moist) gravelly clay with abundant iron concretions of 5 to 10 m.m. size and common fine, faint mottlings of yellowish red colour (5YR 4/6); medium strong subangular blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; pH 5.8.

Range in characteristics: Sandy clay loam, silt loam, clay loam and silty clay loam are the important types mapped. Wherever erosion is severe, specially on 'C' slopes, gravelly clay loam is also noticed. In some places the percentage of mottlings decreases, thus ranging from abundant to few, and also mottlings are observed below 76.20 cms on nearly level lands.

Topography: Very gently sloping to gently sloping land with slope gradients below 5 percent but a few on nearly level lands also.

Drainage and permeability: Moderately well drained to poorly drained with moderate permeability.

Vegetation: Deciduous forest vegetation as listed in Purla series.

Use: Mostly cultivated to paddy.

Distribution: In almost all the settlers' villages of Umarkote and Kondagaon zones in the valleys just above the Adivasi valley lands.

The following units are mapped under Chattiguda series.

Mapping unit.	Area (hectares)	Land capability class and sub-class.
Cgd scl d5 / Ael	113.70	IIw
Cgd cl d5 / Ael	98.57	IIw
Cgd scl d5 / Bel	819.50	IIw
Cgd sicl d5 / Bel	18.17	IIw

Cgd cl d5 / Be1	390.96	IIw
Cgd sicl d5 / Ce1	42.93	IIIew
Cgd scl d4 / Ae1	48.14	IIw
Cgd scl d4 / Be1	581.29	IIew
Cgd cl d4 / Be1	112.03	IIew
Cgd gscl d3 / Be2	4.05	IIIew
Cgd gcl d3 / Be2	1.84	IIIew
Cgd scl d3 / Be2	37.55	IIIew
Cgd gcl d2 / Be3	6.07	IVes

Purla series: (Prl)

The Purla series consists of brown to dark brown soils derived from granite gneiss rock associated with ferruginous quartzite in the sub-tropical parts of Koraput and Bastar districts of Orissa and Madhya Pradesh respectively. Moderately deep to very deep, excessive to moderately well drained, sandy loam to sandy clay loam soils occurring on level to gently sloping lands; they have a fairly thick A horizon undertain by B which gets heavier with depth. The ferruginous gravel occurs generally below 75 to 100 cms. The subsoil is also characterised by mottlings of yellowish red and strong brown colour. Geographically associated soils are the Chattiguda series.

A typical profile of Purla sandy loam, about ½ km West of the village site Kachrapara III in plot No. 24 is described below:

Horizon	Depth	Description
Ap	0-12 cms	Pale brown to dark brown (10YR 6/3 dry, dark brown 10YR 3/3 moist) sandy loam; medium, moderate, crumb structure; slightly hard when dry, firm when moist and slightly sticky and plastic when wet; pH 6.2; clear,

		smooth boundary; abundant roots.
A3	12 - 33 cms.	Dark brown (7.5 YR 4/4) sandy clay loam with a few iron concretions and quartz gravel; medium strong crumb structure; hard when dry, firm when moist and sticky and plastic when wet; pH 6.0; gradual smooth boundary; many roots.
B1	33 - 71 cms.	Yellowish red to reddish brown (5YR 5/6 dry, 5YR 4/4 moist) clay loam with many iron concretions & many fine faint mottlings of very dark gray brown colour (10 YR 3/2); medium moderate subangular blocky structure;hard when dry, firm when moist, sticky and plastic when wet; pH 6.1; gradual to diffuse wavy boundary; few roots.
B2	71 - 111 cms.	Yellowish red (5YR 4/6 dry and moist) gravelly clay loam with abundant iron concretions and common, fine distinct mottlings of very dark gray brown (10 YR 3/2) colour; strong coarse subangular blocky structure; very hard when dry, very firm when moist, sticky and plastic when wet; pH 6.2.

Range in characteristics: Sandy loam, sandy clay loam and gravelly clay loam are the important types mapped. In some places massive structure is also noticed in association with abundant mottling in the subsoil. Occasionally iron gravel and quartz gravel are spread on the surface specially on the ridges. At some places the iron mottlings range from abundant to few. The colour of Ap horizon remains almost uniform.

Topography: Nearly level to gently sloping with slope gradients below 3 percent but a few up to 4 percent.

Drainage and permeability: Excessively to well-drained externally and well-drained internally with a rapid permeability.

Vegetation: Deciduous forest vegetation having a few species of evergreen; important among the trees are Sal (Shorea robusta), Assan (Terminalia tomantosa), Bija sal (Rerocarpus marsupium), Bandan (Eugenia delbergidious), Sisoo (Dalbergia sisoo), Dalbergia latifolia, Jamoon (Eugenia Jambolona), Mahua (Madhuka indica), Daura (Anogeissus latifolia), Siali (Bohemea ualty), Bahada (Terminalia balarica) and Ongla (Eagle -

marmelos). Grasses include cenchrus ciliaris and Saccharum spontaneum.

Use: Mostly cultivated to paddy, urid, niger, til and mestha.

Distribution: In almost all the settlers' villages and mixed farm of Umarkote zone.

The following units are mapped under Purla series.

Mapping unit.	Area (hectares)	Land capability class and sub-class.
Prl sl d5 Ae1	109.61	IIes
Prl scl d5 Ae1	234.36	IIs
Prl sl d5 Be1	18.58	IIes
Prl scl d5 Be1	700.09	IIes
Prl sl d4 Ae1	63.47	IIes
Prl scl d4 Ae1	17.20	IIs
Prl sl d4 Be1	146.50	IIes
Prl scl d4 Be1	574.24	IIes
Prl cl d4 Be2	26.31	IIes
Prl sl d4 Ce1	10.52	IIIes
Prl scl d3 Ae2	14.52	IIIes
Prl scl d3 Be2	129.09	IIIes
Prl gscl d2 Ae3	12.30	IVes

Prl scl d2 / Ae3	4.88	IVes
Prl gsol d2 / Be3	88.82	IVes
Prl gcl d2 / Be3	26.48	IVes
Prl cl d2 / Be3	7.59	IVes

Hatibena series (Hatb)

Hatibena series consists of dark reddish brown to reddish brown colluvial soils in the narrow valleys deposited from the nearby hills. They are derived from gneissic rocks associated with the ferruginous quartzites and pegmatites occurring in the wet sub-tropical parts of koraput and Bastar districts of Orissa and Madhya Pradesh respectively. Deep to very deep, moderately well drained, heavy textured clay loam to clayey soils occurring on level to gently sloping lands. These soils are characterised by heavy sub-soils of medium strong sub-angular blocky structure and of dark red to red colour. The soils do not reveal much horizonal differentiation and the ferruginous gravel occurs generally below 100 cms except in the eroded profiles where they occur nearer to the surface. Geographically associated soils are Purla and Chattiguda series.

Hatibena clay loam - A typical profile about 180 metres South east of the village Hirapara in plot No. 176 is described below.

Horizon	Depth (cms.)	Description
1	0 - 12	Dark reddish brown (5YR 3/3 dry and 5YR 3/4 moist) clay loam; medium moderate sub-angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; pH 6.4; clear smooth boundary; abundant roots.
2	12 - 25	Dark reddish brown to reddish brown (5YR 3/4 dry and 5YR 4/3 moist) clay loam medium Strong sub-angular blocky structure; very hard when dry, very firm when moist, sticky and plastic when wet; pH 6.5; gradual smooth boundary; few roots.
3	25 - 53	Reddish brown to dark red (2.5YR 4/4 dry and 2.5YR 3/6 moist) clay; medium strong sub-angular blockly structure;

		very hard when dry, very firm when moist, very sticky and plastic when wet; pH 6.5 gradual smooth boundary, few roots.
4	53 - 111	Dark red to red (2.5YR 3/6 dry and 2.5YR 4/6 moist) clay; medium strong sub-angular blocky structure; very hard when dry, very firm when moist, very sticky and plastic when wet; pH 6.2.

Range in characteristics: Clay loam, silty clay loam and gravelly clay loam are the major types. The colour of the top soil ranges from dark reddish brown to reddish brown. In some places massive structure is also noticed in association with abundant mottlings in the sub-soil. Iron gravel and quartz gravel are spread on the surface specially at the foot of the ridges.

Topography: Level to gently sloping lands with slope gradients ranging from 1 to 3 percent but a few up to 5 percent.

Drainage and permeability: Moderately well drained to poorly drained from the surface with slow permeability.

Vegetation: Deciduous forest vegetation having a few species of evergreen; important among the trees are Sal (Shorea robusta), Assan (Terminalia tomantosa) Bija sal (Pterocarpus marsupium), Bandan (Eugenia delbergidious), Sisoo (Dalbergia sisoo), Dalbergia latifolia, Jamoon (Eugenia jambolona), Mahua (Madhuka indica), Daura (Anogeissus latifolia), Siali (Bohemea ualty), Bahada (Terminalia balarica) and Ongla (Eagle marmelos). Grasses include Cenchrus ciliaris and Saccharum spontaneum.

Distribution: In the villages Hatibena, Hirapara, Biripur etc. in Raighar region.

The following units are mapped under Hatibena series.

Mapping unit	Area (hectares)	Land capability class and sub-class
Htb cl d5 Ael	18.76	IIw
Htb cl d5 Bel	32.49	IIw
Htb sicl d5 Cel	14.29	IIIew
Htb cl d4 Ael	8.70	IIw

Htb sicl d4 / Be1	30.07	IIw
Htb cl d4 / Be1	157.36	IIw
Htb gol d3 / Be2	13.55	IIIes
Htb sicl d3 / Be2	3.84	IIIes
Htb cl d3 / Be2	94.73	IIIes
Htb gsicl d2 / Be3	5.28	IVes
Htb cl d2 / Be3	25.44	IVes
Htb gcl d2 / Be3	17.95	IVes
Htb cl d2 / Ce3	1.02	IVes

Boregaon series: (Bgn)

Boregaon series consists of brown to dark brown soils derived from quartz diorites occurring in the wet subtropical parts of Bastar District of Madhya Pradesh. Deep to very deep, excessively drained externally, well drained internally, light textured loamy sand to sandy loam soils occurring on level to very gently sloping lands; the sub-soil becomes heavier with depth with medium strong sub-angular blocky structure of reddish yellow colour. Geographically associated soils are the Chattiguda Series. Related but not associated soils are the Purla series which consist of deep to very deep, excessively to moderately welldrained sandy loam to sandy clay loam soils having yellowish brown coloured mottlings in the sub-soil.

Boregaon loamy sand - A typical profile in plot No. 5 in Boregaon west village is described below.

Horizon	Depth (cms.)	Description
Ap	0 - 15	Brown to dark brown (10YR 5/3 dry, 10YR 4/3 moist) loamy sand; fine weak granular structure; loose and friable; pH 5.6; clear smooth boundary; many roots.

Topography: Level to gently sloping lands with slope gradients ranging from 1 to 3 percent but a few up to 4 percent.

Drainage and permeability: Moderately well drained to poorly drained from the surface with slow permeability.

Vegetation: Deciduous forest vegetation having a few species of evergreen; important among the trees are Sal (Shorea robusta) Assan (Terminalia tomantosa) Bija sal (Pterocarpus marsupium), Bandan, (Eugenia delbergidious) Sisoo (Dalbergia sisoo), Dalbergia latifolia, Jamoon (Eugenia jambolona), Mahua (Madhuka indica), Daura (Anogeissus latifolia), Sialia (Bohemea ualty), Bahada (Terminalia balarica) and ongia (Eagle marmelos). Grasses include cenchrus ciliaris and Saccharum spontaneum.

Use: Mostly cultivated to paddy, arhar, mestha etc.

Distribution: In the villages Gobri, Mahuli, Umarkote mixed farm, Mohand in the Umarkote zone and in the villages of Kondagaon zone.

The following units are mapped under Gobri series.

Mapping unit	Area (hectares)	Land capability class & sub-class
Gbr c d5 Ae1	16.55	IIw
Gbr cl d5 Be1	82.90	IIw
Gbr c d5 Be1	36.31	IIw
Gbr cl d4 Ae1	10.02	IIw
Gbr cl d4 Be2	42.62	IIIew
Gbr c d4 Be2	45.69	IIIew

The Mahuli series consists of pale olive to light olive brown soils derived from Talcchlorite schists and confined to certain parts of Koraput district in Orissa. Very deep sandy clay loam to clay loam soils occur on very gently sloping to gently sloping lands. The subsoil is heavy with a strong coarse sub-angular blocky structure. Occasionally a few lime concretions are also present. Geographically associated soils are the Purla and Chattiguda series.

Mahuli clay loam - A typical profile in village Udaypur is described below.

Horizon	Depth(cms.)	Description
Ap	0 - 15	Pale olive (5YR 6/4 dry and moist) clay loam; medium, moderate, sub-angular blocky structure; hard when dry, firm when moist,sticky and plastic when wet; pH 6.3; clear smooth boundary; many roots.
AB	15 - 35	Light olive brown (2.5Y 5/4 dry and 2.5Y 5/6 moist) clay loam; medium strong, sub-angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; pH 5.2; gradual smooth boundary; few roots.
B1	35 - 60	Light yellowish brown (2.5Y 6/4 dry and moist) silty clay loam; medium, strong, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; pH 5.9 diffused wavy boundary.
B2	60 - 152	Light brownish gray (2.5Y 6/2 dry and moist) silty clay loam with a few lime concretions; coarse strong subangular blocky structure; very hard when dry, very firm when moist, very sticky and plastic when wet; pH 6.5.

Range in characteristics: Sandy clay loam and clay loam are the major types. The colour of the Ap horizon ranges from pale olive to gray brown and of the sub-soil from light olive brown to light brownish gray. In some profiles a few lime concretions are noticed in the sub-soil. The content of lime concretions varies. A few yellowish red mottlings of iron and quartz gravel are also noticed.

Topography: Nearly level to very gently sloping with slope gradients below 3 percent.

Drainage and permeability: Moderately well drained from the surface with slow permeability.

Vegetation: Deciduous forest vegetation having a few species of evergreen; important among the trees are Sal (Shorea robusta), Assan (Terminalia tomantosa) Bija sal (Pterocarpus marsupium), Banda. (Eugeniadelbergidious) Sisoo (Dalbergia sisoo), Dalbergia latifolia. Jamoon (Eugenia jambolona), Mahua (Mahuka indica), Daura (Anogeissus latifolia), Sialia (Bohemea ualty), Bahada (Terminalia balarica) and Ongla (Eagle marmelos). Grasses include Cenchrus ciliaris and Saccharum spontaneum.

A3	15 - 33	Reddish yellow (5 YR 7/6 dry and moist) sandy loam; medium strong crumb structure; slightly hard when dry, firm when moist and slightly sticky and plastic when wet; pH 6.2; gradual smooth boundary; few roots.
B1	33 - 83	Reddish yellow (5YR 7/6 dry and 5YR 6/6 moist) sandy clay loam; medium strong sub-angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; pH 6.3; gradual to diffuse wavy boundary.
B2	83 - 114+	Reddish yellow (5YR 6/6 dry and moist) clay loam with few quartz gravel; medium strong sub-angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; pH 6.3.

Range in characteristics: Loamy sand and sandy loam are the major types. Occasionally sand and sandy clay loam types are noticed. The colour of the Ap horizon and the sub-soil remains almost uniform. Sometimes quartz gravel is noticed in the profile.

Topography: Nearly level to very gently sloping with slope gradients below 3 percent.

Drainage and permeability: Excessively drained externally and moderately welldrained to welldrained internally with moderate permeability.

Vegetation: Deciduous forest vegetation having a few species of evergreen; important among the trees are Sal (Shorea robusta), Assan (Terminalia tomantosa) Bija sal (Pterocarpus marsupium), Bandan (Eugenia delbergidious) Sisoo (Dalbergia sisoo), Dalbergia latifolia, jamoon (Eugenia Jambolona), Mahua (Madhuka indica), Daura (Anogeissus latifolia), Sialia (Bohemea uality), Bahada (Terminalia balarica) and Ongla (Eagle marmelos). Grasses include cenchrus ciliaris and Saccharum spontaneum.

Use: Mostly cultivated to paddy, til, niger and mestha.

Distribution: In the villages Boregaon east, Boregaon west and Jugani villages of Kondagaon zone.

The following units are mapped under Boregaon series.

Mapping unit	Area (hectares)	Land capability class and sub-class
Bgn ls d5 Ael	8.70	IIes

Bgn sl d5 / Ael	101.97	Iles
Bgn ls d5 / Bel	104.36	Iles
Bgn sl d5 / Bel	189.34	Iles

Gobri series: (Gbr)

The Gobri series consists of very dark gray to dark gray brown soils derived from the chlorite schists in the wet subtropical parts of Koraput and Bastar districts of Orissa and Madhya Pradesh respectively. The parent material specially in valleys is quite deep and cannot be easily seen. Very deep, moderately welldrained to poorly-drained clay loam to clayey soils occurring on level to gently sloping lands; they have a thick Ap horizon grading to B1 and B2 horizons where the clay content increases with depth. Geographically associated soils are the Chattiguda and Mahuli series.

Gobri clay loam - A typical profile in Boregaon west about 90 metres West of 210 K.M. mile stone on N.H. 43 from Raipur to Jagadalpur is described below.

Horizon	Depth (cms.)	Description
A	0 - 10	Very dark gray to very dark brown (10YR 3/1 dry, 10YR 2/2 moist) clay loam; medium strong crumb structure; hard when dry, firm when moist, sticky and plastic when wet; pH 5.7; clear smooth boundary; many roots.
B1	10 - 55	Very dark brown to very dark gray brown (10YR 2/2 dry and 10YR 3/2 moist) silty clay; medium coarse subangular blocky structure; very hard when dry, very firm when moist, sticky and plastic when wet; pH 6.6; gradual smooth boundary; few roots.
B2	55 - 124	Dark gray brown (2.5Y 5/2 dry and moist) clay with many lime concretions; medium coarse prismatic structure; very hard when dry, very firm when moist, very sticky and plastic when wet; pH 7.8.

Range in characteristics: Clay loam, silty clay loam and clay are the important types. The colour changes according to the topography i.e. from upland to lowland. Occasionally quartz and lime concretions are observed in the profile.

Use: Mostly cultivated to paddy, arhar, mango etc.

Distribution: Umarkote mixed farm and a small area in the Mahuli and Kusumpur villages of Umarkote zone.

The following units are mapped under Mahuli series.

Mapping unit.	Area (hectares)	Land capability class & sub-class.
Mhl cl d5 Ael	19.23	IIw
Mhl cl d5 Bel	5.06	IIw

LAND CAPABILITY CLASSES AND RECOMMENDATIONS FOR BETTER LAND USE AND CROPPING PATTERNS.

Capability grouping is a system of interpretation to show the relative suitability of soils for crops, grazing, forestry and wild-life. It is a practical grouping based on the needs, limitations and risks of damage to the soils and also their response to management. The land capability class is identified by Roman numerals. There are eight classes. All the soils in one class have limitations and management problems of about the same degree but of different kinds as shown by the sub-classes "e" for erosion susceptibility and past erosion damage, "w" for poor soil drainage, wetness and overflow and "s" for shallowness of rooting zone, low moisture holding capacity and low fertility.

In classes, I, II and III are soils that are suitable for annual or periodic cultivation of annual or short duration crops. In class IV are soils that should be cultivated occasionally or only under careful management. In classes V, VI and VII are soils that normally should not be cultivated for annual or short duration crops but they can be used for pasture and range as forest land or wildlife. In class VII are soils that have practically no agricultural use. Class VIII lands have value as watersheds, wildlife habitats or scenery. In the land capability map of the settlers' villages surveyed in Raighar region, only the following classes and subclasses are differentiated and mapped. The details of the limitation in each of these and their management requirements are given below:-

Class IIs:

This class of land comprises 251.54 hectares. It consists of level to nearly level land with deep to very deep, sandy clay loam soils of Purla series, slightly eroded. The limitation is drainage in the sense that soils are excessively drained and the moisture holding

capacity is low. Fields have been contour bunded. Although the top soil in Purla series is of sandy clay loam texture, water drains out from the field very fast and does not stand. With deep ploughing, individual field bunding, levelling and construction of level terraces, application of organic and green manuring, paddy can be cultivated. Deep ploughing up to a depth of 20 to 25 cms. should be tried which is likely to improve the moisture retentive capacity of such soils. Green manuring plants like glyricedia, dhaincha and sesbania species should be introduced on the bunds and the leaves can be used for green manuring paddy crop. Application of suitable fertiliser mixtures with 13.6 Kg. N, 30 Kg. of P_2O_5 and 13.6 Kg. of K_2O should be encouraged.

Class IIw:

This comprises 1910.34 hectares or nearly 34 percent of the surveyed area. It consists of nearly level to very gently sloping land with deep to very deep sandy clay loam to clayey soils of Chattiguda, Gobri, Hatibena and Mahuli series, slightly eroded. The limitation is poor soil drainage. But still they are the most suitable soils for paddy. Individual field bunding, levelling, preparation of level terraces and application of organic and green manuring are required. For clayey soils of Gobri series on level to gently sloping lands mapped in Mohand village, provision should be made for drainage. Open trenches of .91x91 metres size may be excavated at regular intervals. Green manuring plants like glyricedia, dhiancha and sesbania species should be introduced on the bunds and the leaves can be used for green manuring paddy crop. Application of farm yard manure at the rate of 12 to 24 cart loads per hectare and preparation of compost with the available resources should be popularised. Application of suitable fertilizer mixtures with 13.6Kg. N, 13.6Kg. P_2O_5 and 13.6Kg. of K_2O should be encouraged and Japanese method of paddy cultivation tried.

Class IIes:

This class comprising 2043.60 hectares, consists of nearly level to very gently sloping land with deep to very deep loamy sandy to clay loam soils of Purla and Boregaon series, slightly to moderately eroded. The limitations are susceptibility to moderate sheet erosion and low moisture holding capacity. Fields have been contour bunded. Since the moisture retention is poor and even with high intensities of rainfall, water does not stand in the fields, such lands are not fit for paddy cultivation. They are recommended for arhar, maize, jowar, groundnut and mestha. Although fields have been contour bunded, individual field bunding and levelling followed by proper management practices as recommended is essential. Application of farm yard manure at the rate of 12 to 24 cart loads per hectare and preparation of compost with the available resources should be popularised.

Class IIew:

693.20 hectares of land are classified under class IIw i.e. about 10 percent of the total area. This consists of very gently sloping lands of deep sandy clay loam to clay loam soils of Chattiguda Series, slightly eroded. The limitations are susceptibility to erosion and poor drainage. These soils are fit for paddy cultivation with certain management practices as stated under Class IIw.

Class IIIes:

This comprises 266.36 hectares This consists of nearly level to gently sloping lands with moderately deep to deep sandy loam to clay loam soils of Purla and Hatibena series, slightly to moderately eroded. The limitations are susceptibility to erosion, low moisture holding capacity and occasionally root zone limitation. The land is not fit for paddy cultivation. The top soil of Purla series is of sandy loam to sandy clay loam texture. Water does not stand in the fields thus getting excessively drained. Moisture retention is poor even with a heavy intensity of rainfall. In place of paddy other crops like groundnut, arhar, jowar, niger and til may be grown. Although fields have been contour bunded, individual field bunding and leveling followed by proper management and improved agricultureal practices should be given due consideration. Application of farm yard manure at the rate of 12 to 24 cart loads per hectare should be popularised.

Class IIIew.

Class IIIew comprising 189.40 nectares includes very gently sloping to gently sloping land with moderately deep to very deep sandy clay loam to clayey soils of Chattiguda, Gobri and Hatibena series, slightly to moderately eroded. The limitations are susceptibility to erosion and poor drainage. Deep soils of Gobri series of clay loam to clay texture on very gently sloping lands of moderate erosion are recommended for paddy cultivation with proper individual field bunding, levelling, preparation of level terraces and application of organic manure, green manure and suitable fertiliser mixture as suggested earlier. Clayey soils of Gobri series under this class require proper drainage as mentioned under class IIw. The moderately deep to very deep soils of Hatibena and Chattiguda Series having gravelly sandy clay loam to silty clay loam texture on 1 to 5 percent slopes are recommended for crops like mestha, jute, Bengalgram, greengram, blackgram, niger and til. Although fields have been contour-bunded, individual field bunding, levelling, proper maintanance of bunds followed by proper management, and improved agricultural practices as recommended above are essential. Application of farm-yard manure at the rate of 12 to 24 cartloads per hectare and preparation of compost with the available resources should be encouraged.

Class IVes:

This comprises 195.62 hectares and includes nearly level to gently sloping land with shallow gravelly sandy clay loam,,sandy clay loam and clay loam soils of Purla and Chattiguda series and clay loam to gravelly clay loam soils of Hatibena series, severely eroded. The limitations are severe susceptibility to erosion and shallowness of rooting zone. These soils are not fit for paddy cultivation. Cultivation of pulses like greengram, blackgram, Bengalgram, and oil seed crops like til and niger are recommended with proper soil management practices.

VII. SUMMARY

Detailed soil survey of 24 Settlers' villages in Raighar region and 3 villages in Kondagaon zone of Dandakaranya Project covering an area of 5549.89 hectares has been completed. The soil survey report is appended with soil and land capability maps on various scales. 6 soil series with the various mapping units are delineated on the soil map and classified under the land capability classes and sub-classes, IIs, IIw, IIes, IIew, IIIes, IIIew and IVes. Recommendations for better land use, cropping patterns and improved agricultural practices are specified in the report.

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APPENDIX I.

Analytical data of the soil series identified and mapped in Raighar region and Kondagaon zone, Dandakaranya Project.

Sl.	Series name	Horizon.	Depth (cms.)	pH	Organic Carbon %	Gravel %	Mechanical composition (Percent)				Moisture equivalent	Total cation exchange capacity me/100gm soil	Exchangeable Ca%	Total Cao%	Total P_2O_5%	Total K_2O%	R_2O_3%	Fe_2O_3%
							Clay	Silt	Fine sand	Coarse sand								
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		Ap	0 - 15	6.2	0.78	Nil	25.20	16.80	30.90	25.55	17.35	8.35	0.065	0.112	0.103	0.163	7.45	2.80
1.	Chattiguda	AC	15 - 36	5.4	0.66	"	23.40	13.60	29.65	30.85	20.41	8.10	0.055	0.070	0.044	0.360	16.07	3.36
		B1	36 - 69	5.2	0.30	"	32.20	16.80	23.70	22.95	23.66	10.70	0.090	0.098	0.035	0.425	21.00	4.16
		B2	69 - 86	5.2	0.36	1.50	29.80	18.20	19.90	27.40	23.14	12.10	0.095	0.140	0.022	0.384	19.58	4.48
		B3	86 -	5.8	0.36	54.48	30.60	14.80	28.50	24.65	24.46	15.10	0.215	0.245	0.029	0.738	23.49	6.32
2.	Purla	Ap	0 - 13	6.2	0.60	Nil	14.40	14.40	28.70	38.50	15.00	4.70	0.025	0.042	0.046	0.149	4.78	1.60
		A3	13 - 33	6.0	0.30	"	14.52	14.20	25.45	42.05	15.84	3.70	0.035	0.168	0.040	0.170	5.52	2.08
		B1	33 - 71	6.1	0.18	"	21.32	17.00	22.70	36.20	18.00	4.50	0.045	0.112	0.014	0.309	9.18	3.12
		B2	71 - 112	6.2	0.12	1.50	28.20	15.20	17.65	35.55	18.85	13.50	0.065	0.112	0.038	0.360	11.09	3.60

Conted.....

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3. Hatibena	1	0 - 13	6.4	1.68	Nil	26.40	25.60	20.15	25.20	21.58	12.30	0.220	0.308	0.101	0.187	16.97	5.84
	2	13 - 25	6.5	1.26	"	29.40	22.20	18.25	28.35	22.05	11.00	0.155	0.224	0.050	0.320	23.20	6.72
	3	25 - 53	6.5	0.84	"	50.80	16.20	13.20	16.20	25.02	9.80	0.085	0.126	0.069	0.347	26.38	7.68
	4	53 - 112	6.2	0.54	"	52.00	16.00	13.25	17.65	25.65	11.50	0.080	0.140	0.031	0.353	26.26	7.84
4. Boregaon	Ap	0 - 15	5.6	0.48	Nil	5.60	8.80	36.65	44.60	11.69	3.70	0.045	0.063	0.024	0.149	4.16	1.20
	A3	15 - 33	6.2	0.24	"	8.80	9.40	35.90	43.00	13.56	3.60	0.015	0.028	0.046	0.224	5.73	1.60
	B1	33 - 84	6.3	0.24	"	18.20	11.20	33.20	36.80	16.47	5.00	0.020	0.042	0.026	0.336	10.44	2.24
	B2	84 114	6.3	0.54	2.47	24.20	14.40	28.90	35.75	17.97	7.20	0.025	0.042	0.031	0.302	13.38	2.96
5. Gobri	A	0 - 10	5.7	1.02	Nil	24.52	29.60	24.15	18.80	29.88	29.80	0.500	0.581	0.024	0.640	15.64	4.16
	B1	10 - 56	6.6	1.50	2.22	31.72	28.00	21.45	17.70	32.35	35.60	0.635	0.763	0.023	0.578	16.45	4.32
	B2	56 - 124	7.6	0.18	2.72	32.20	29.40	16.50	19.55	35.57	36.60	0.670	0.735	0.040	0.707	18.54	4.56
6. Mahuli	Ap	0 - 15	6.3	0.96	Nil	17.20	29.40	33.50	17.15	21.85	12.50	0.075	0.112	0.047	0.343	12.85	4.24
	AB	15 - 36	5.2	0.60	"	25.72	25.60	30.65	13.65	32.60	17.10	0.085	0.112	0.041	0.377	16.86	5.76
	B1	36 - 6	5.9	0.30	"	36.12	26.40	21.70	13.05	26.65	23.60	0.105	0.168	0.041	0.486	24.19	7.52
	B2	61 - 152	6.5	0.36	3.78	26.20	36.80	16.15	17.45	29.16	8.30	0.210	0.336	0.035	0.513	23.26	7.52

Laboratory analysis by S/ Shri S. Mahadevaiah, R. Swamynatha, S. Subramanyam and C. Ramaiah.

From the table of analysis it is seen that the soils of Hatibena series have heavy sub-soils with clay content ranging from 50 to 52 percent. Chattiguda and Gobri series come next among the heavy textured soils. In the latter, silt content is also fairly appreciable throughout the depth of the profile. Boregaon series comes among the light-textured soils while Purla and Mahuli series lie midway between the heavy and light textured soils.

The moisture equivalent and total cation exchange capacity figures are also high for Gobri series as compared to Hatibena and Chattiguda, which have high percentages of clay. The surface soils of Chattiguda, Purla, Hatibena and Mahuli are slightly acidic in reaction, pH ranging between 6.2 and 6.4. In Boregaon and Gobri series, the top soil is medium acid in reaction, pH ranging from 5.6 to 5.7. Both Hatibena and Gobri soils have comparatively higher percentages of organic matter compared to other soils. Soils are generally deficient in other nutrients like phosphorus and potash.

In Purla series, sand content is high and the total of silt and clay fractions amount to about 28% in the first two horizons. Whereas in Chattiguda, Hatibena, Gobri and Mahuli series, the total of silt and clay constitute nearly 50 percent or more of the fine fractions. This is probably the reason why the soils are not able to retain moisture. It will be interesting to carry out permeability experiments in all the soils to ascertain the rate of percolation and assess the internal drainage.

APPENDIX II

Soil Map Legend

Series

Cgd - Chattiguda

Prl - Purla

Htb - Hatibena

Bgn - Boregaon

Gbr - Gobri

Mhl - Mahuli

Depth

d1 - 0 - 7.50 cms. very shallow.
(0 - 3 inches)

d2 - 7.50 - 23.00 cms. shallow.
(3 - 9 inches)

d3 -23.00 - 46.00 cms. moderately deep.
(9 -18 inches)

d4 -46.00 - 91.00 cms. deep.
(18 -36 inches)

d5 - more than 91.00 cms. very deep.
(more than 36")

Type

ls - loamy sand

sl - sandy loam

gscl - gravelly sandy clay loam

scl - sandy clay loam

gcl - gravelly clay loam

gsicl- gravelly silty clay loam

sicl - silty clay loam

cl - clay loam

c - clay

Slope

A - 0 - 1% level to nearly level

B - 1 - 3% very gently sloping

C - 3 - 5% gently sloping

Erosion.

e1 - slight

e2 - moderate

e3 - severe

e4 - very severe

SOIL MAP READING

A soil mapping unit delineated on the map includes the soil series symbolised by three letters, the surface texture, and soil depth in the numerator and slope and erosion classes indicated by capital letters A to C and e1 to e3 respectively in the denominator. Soil series name is indicative of the characteristic of the kind of soil in respect of morphology represented by colour, texture, structure, consistency, pH, presence of roots, boundary and thickness of each horizon. The various units mapped under each series are interpreted into land capability classes and subclasses which are shown by Roman numerals with sub-script and represented by standard colours prescribed for land capability classes. The legends for soil and land capability maps are supplied with the maps separately.

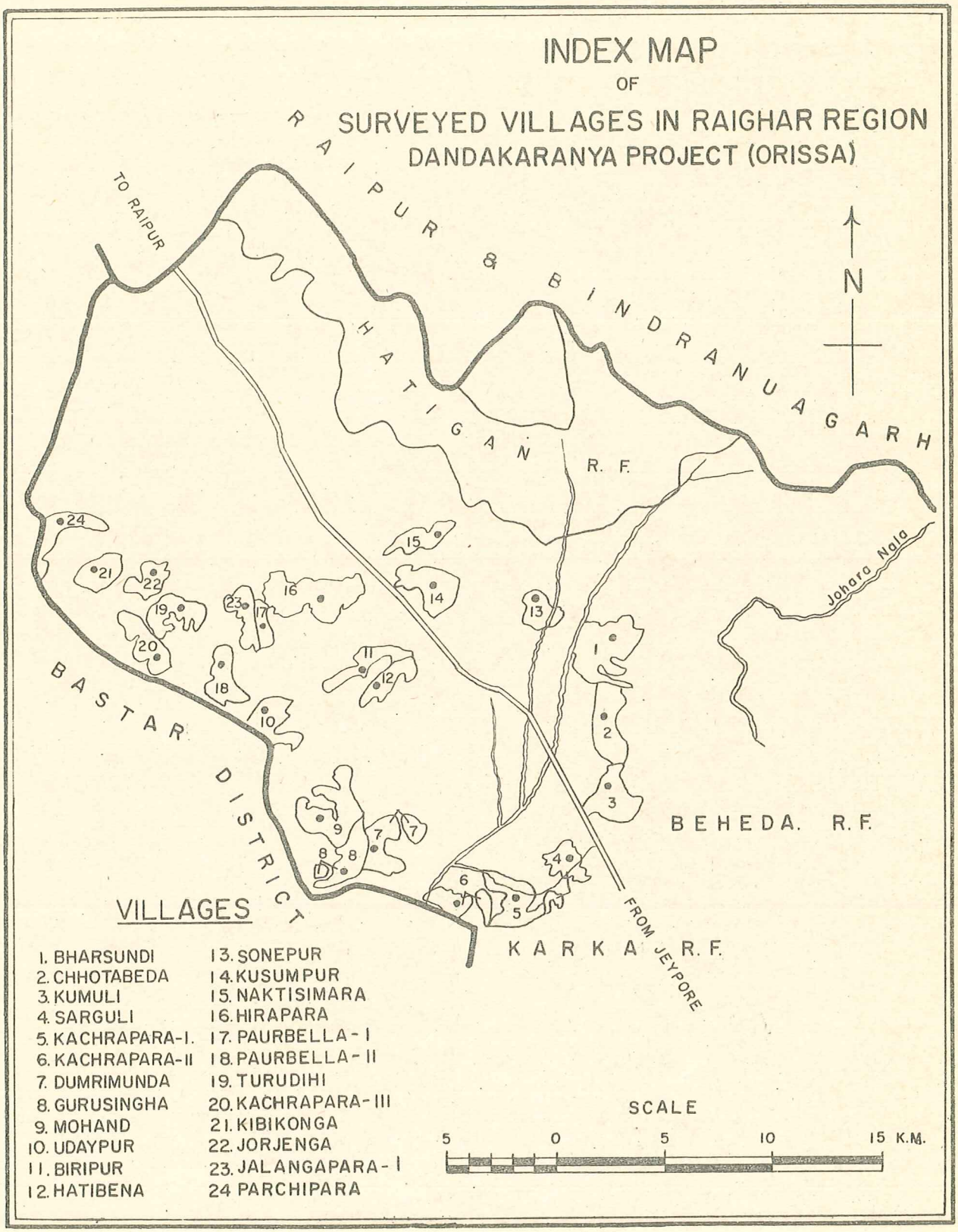

INDEX MAP
OF
SURVEYED VILLAGES IN RAIGHAR REGION
DANDAKARANYA PROJECT (ORISSA)
TO RAIPUR
RAIPUR & BINDRANUAGARH
HATIGAN R. F.
N
Johara Nala
BASTAR DISTRICT
BEHEDA. R.F.
KARKA R.F.
FROM JEYPORE
VILLAGES
1. BHARSUNDI
2. CHHOTABEDA
3. KUMULI
4. SARGULI
5. KACHRAPARA-I.
6. KACHRAPARA-II
7. DUMRIMUNDA
8. GURUSINGHA
9. MOHAND
10. UDAYPUR
11. BIRIPUR
12. HATIBENA
13. SONEPUR
14. KUSUMPUR
15. NAKTISIMARA
16. HIRAPARA
17. PAURBELLA - I
18. PAURBELLA - II
19. TURUDIHI
20. KACHRAPARA-III
21. KIBIKONGA
22. JORJENGA
23. JALANGAPARA - I
24 PARCHIPARA
SCALE
5 0 5 10 15 K.M.

FIG. 1

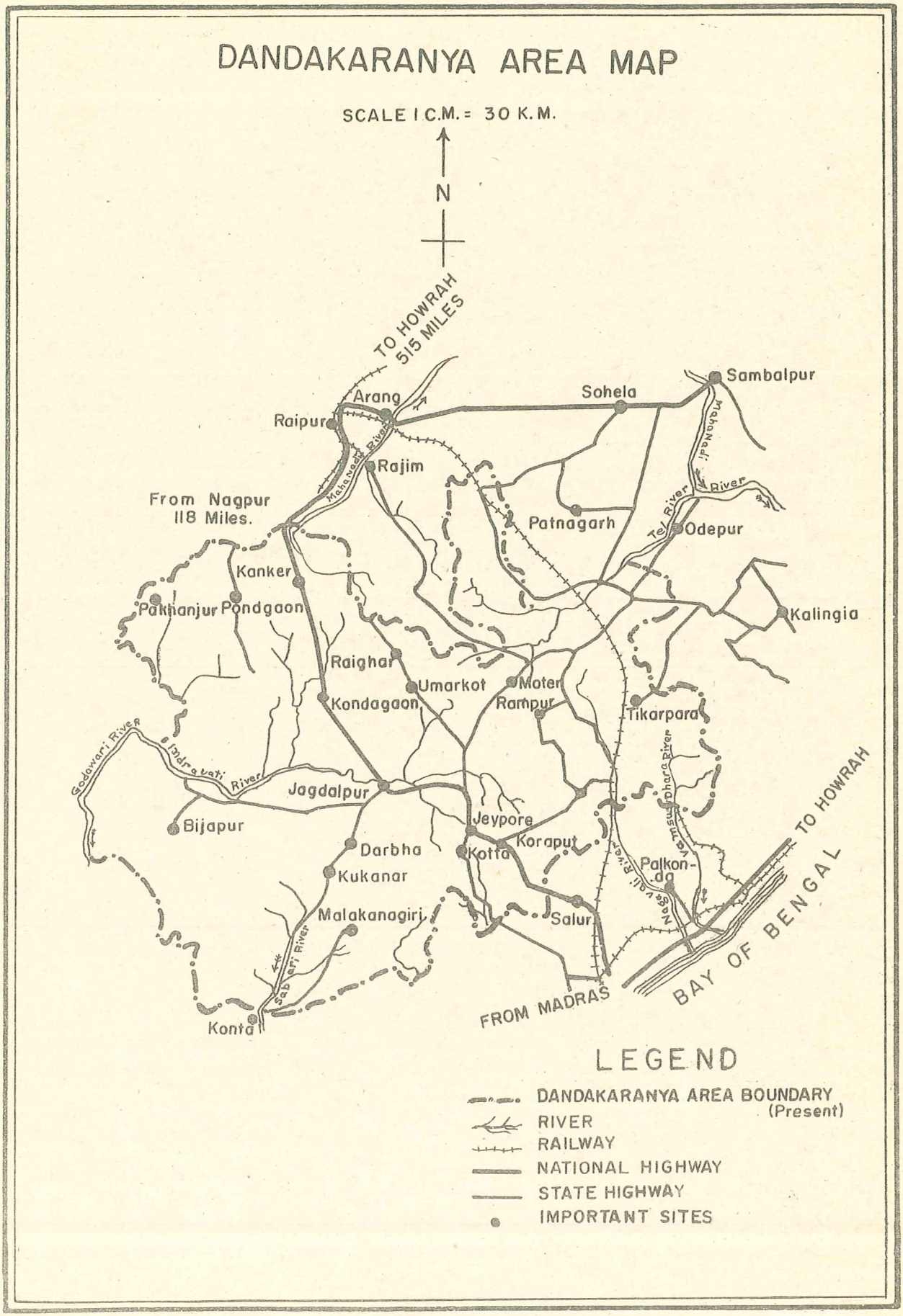

DANDAKARANYA AREA MAP
SCALE I C.M. = 30 K.M.
N
TO HOWRAH
515 MILES
Arang
Raipur
Rajim
Mahanadi River
From Nagpur
118 Miles.
Sohela
Sambalpur
Mahanadi River
Tel River
Patnagarh
Odepur
Kanker
Pakhanjur
Pondgaon
Kalingia
Raighar
Umarkot
Moter
Rampur
Kondagaon
Tikarpara
Godawari River
Indravati River
Jagdalpur
Bijapur
Jeypore
Koraput
Kotia
Darbha
Kukanar
Malakanagiri
Salur
Palkonda
Vamsadhara River
Nagavali River
Sabari River
Konta
FROM MADRAS
TO HOWRAH
BAY OF BENGAL
LEGEND
DANDAKARANYA AREA BOUNDARY (Present)
RIVER
RAILWAY
NATIONAL HIGHWAY
STATE HIGHWAY
IMPORTANT SITES

FIGURE. 2.

LEGEND

STANDARD MAP SYMBOLS USED FOR SOIL AND CAPABILITY MAPS OF DANDAKARANYA PROJECT

SOIL AREAS

Prl sc1 d_5 / Be_1	SOIL MAPPING UNIT BOUNDARY WITH SYMBOLS.
IIes	LAND CAPABILITY CLASS, SUB-CLASS WITH BOUNDARY.
P	PROFILE SITE.
Cgd	CHATIGUDA. SERIES
Prl	PURLA "
Htb	HATIBENA "
Bgn	BOREGAON "
Gbr	GOBRI "
Mhl	MAHULI "

TYPE

ls	LOAMY SAND
sl	SANDY LOAM
gscl	GRAVELLY SANDY CLAY LOAM.
scl	SANDY CLAY LOAM
gsicl	GRAVELLY SILTY CLAY LOAM
sicl	SILTY CLAY LOAM
cl	CLAY LOAM
c	CLAY

DEPTH

d_1	0"–3" OR 0 – 7·62 Cm. VERY SHALLOW
d_2	3"–9" OR 7 · 62 – 22·86 Cm. SHALLOW
d_3	9"–18" OR 22·86 – 45·72 Cm. MODERATELY DEEP
d_4	18"–36" OR 45·72 – 91·44 Cm. DEEP
d_5	> 36" OR 91·44 Cm. AND ABOVE VERY DEEP

SLOPE

A	0 – 1% NEARLY LEVEL TO LEVEL
B	1 – 3% VERY GENTLY SLOPING
C	3 – 5% GENTLY SLOPING
↘	SLOPE DIRECTION

EROSION

e_1	SLIGHT
e_2	MODERATE
e_3	SEVERE
e_4	VERY SEVERE

GENERAL MAPPING

	HABITATION
	VILLAGE BOUNDARY
	ROAD
	TANK
H.W.T.	HEAD-WATER TANK
	ROCK OUTCROP
	GRAVEL
	REJECTED LAND

DESCRIPTIONS OF THE LAND CAPABILITY CLASSES & SUBCLASSES MET WITH IN THE SURVEYED AREAS.

IIs. Soils in the unit occur on nearly level to level and with deep to very deep sandy clay loam soils. These are mainly Purla series, slightly eroded soils. The soils are subject to moisture deficit due to excessive drainage and hence root zone limitations are the hazands in these soils.

IIw. Soils in this unit occur on nearly level to very gently sloping land with deep to very deep sandy clay loam to clayey soils of Chattiguda, Gobri, Hatibena and Mahuli series, slightly eroded soils. The limitation is poor soil drainage.

II

IIes. The lands under the class are nearly level to gently sloping with deep to very deep soils of loamy sand to clay loam texture represented by Purla and Boregaon series. The soils are slightly to moderately eroded and have low available water capacity. Susceptibility to erosion and draughty nature of the soils limit optimum use of these lands for a variety of crops and their production.

IIew. The lands under the class are very gently sloping with deep soil of sandy clay loam to clay loam texture represented by Chattaguda series. The soil suffer from slight erosion and impeded drainage creating condition of wetness to favour cultivation of paddy.

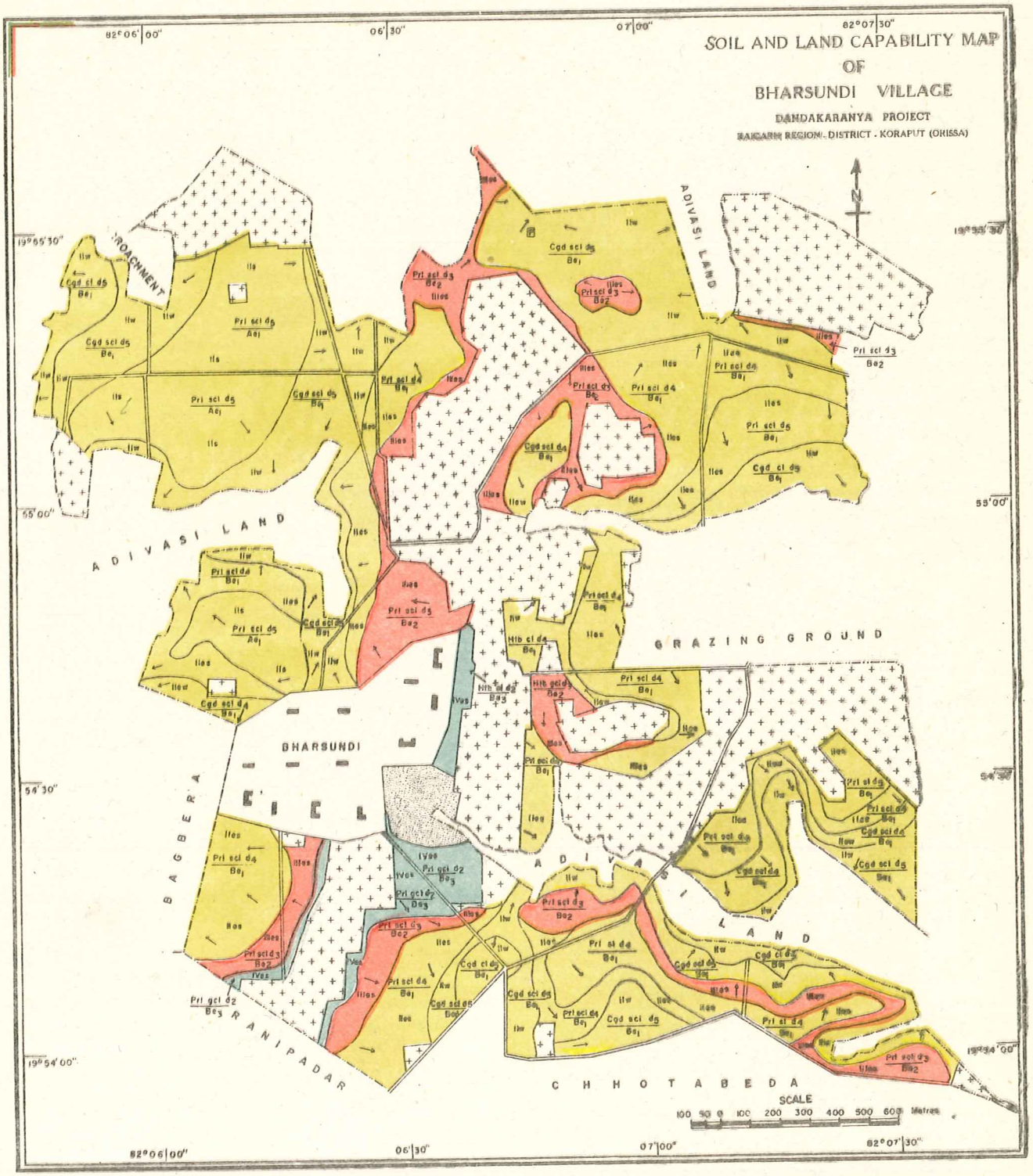
IIIes. The lands under the class are nearly level to gently sloping with moderately deep to deep soil of sandy loam to clay loam texture represanted by Purla and Hatibena series. The soils suffer from moderate erosion and are as such susceptible to the erosion. The limitation of depth has adverse effect on root development and creates conditions of draughtiness. The above conditions limit the use of these soils for growing short duration close growing crops.

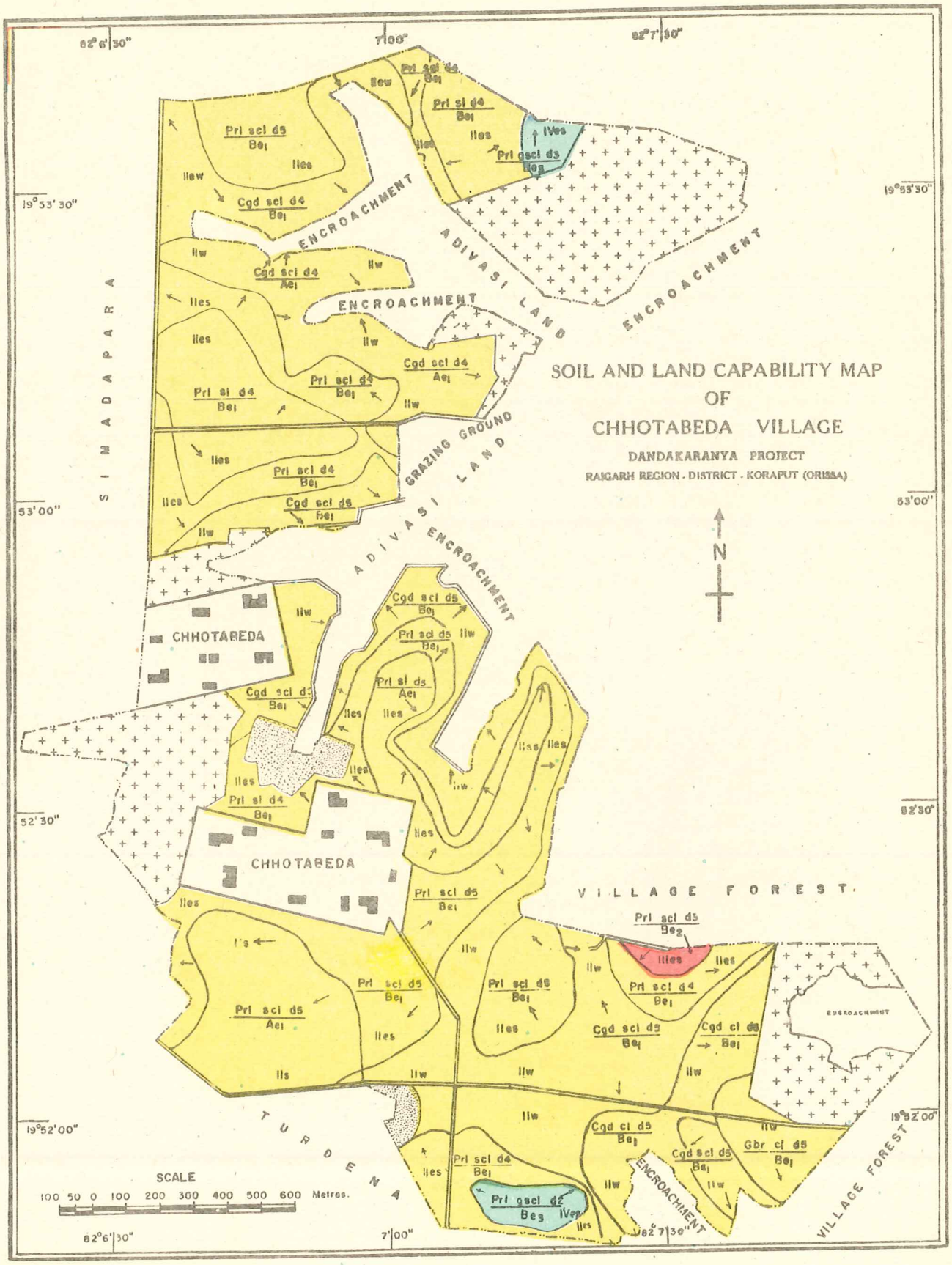
III

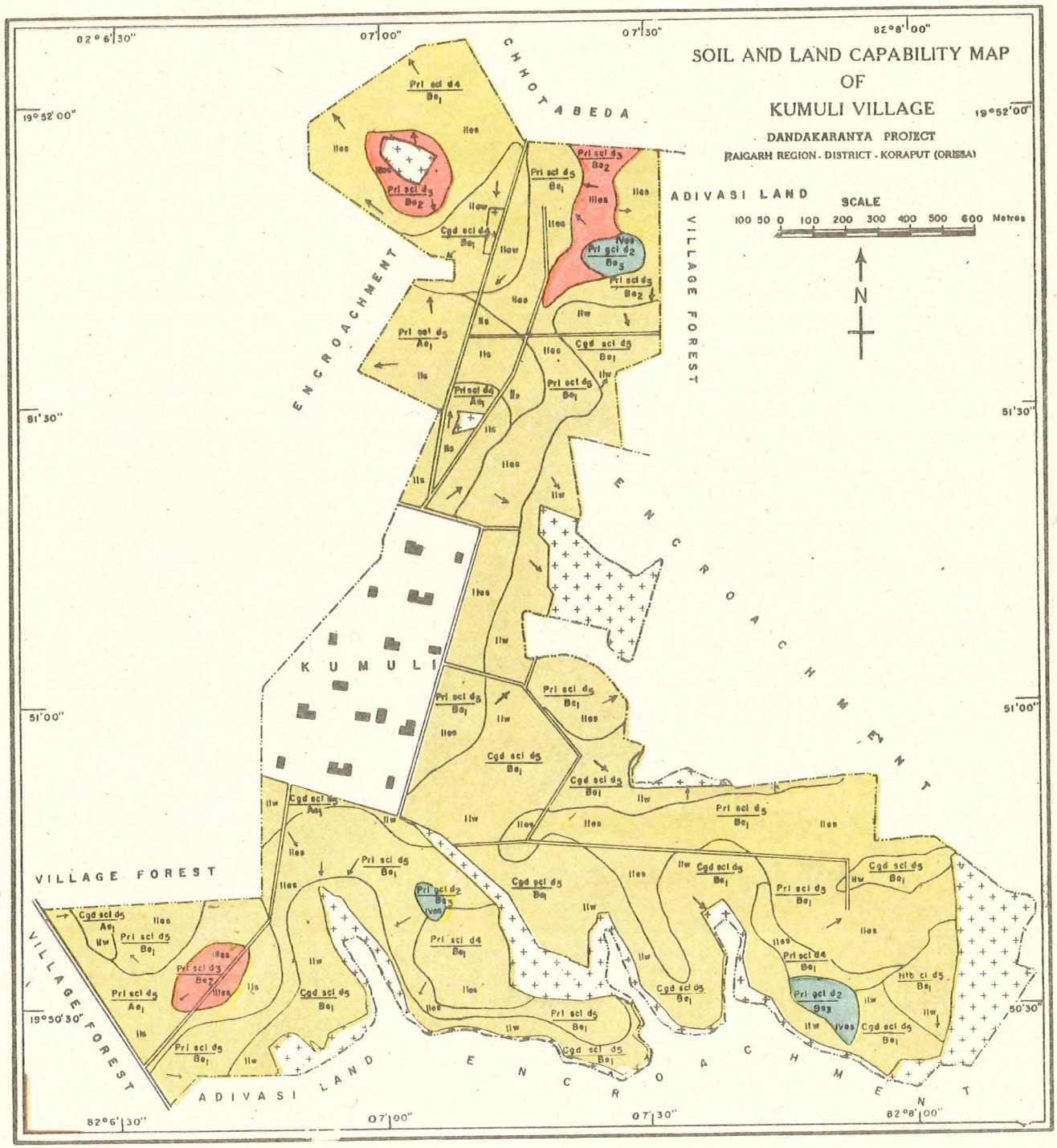
IIIew. The lands under the class are very gently sloping to gently sloping with moderately deep to deep soils of sandy clay loam to clay texture represented by Chattiguda, Gobri and Hatibena series. The soils are susceptible to erosion and suffer from drainage impedence creating condition of wetness.

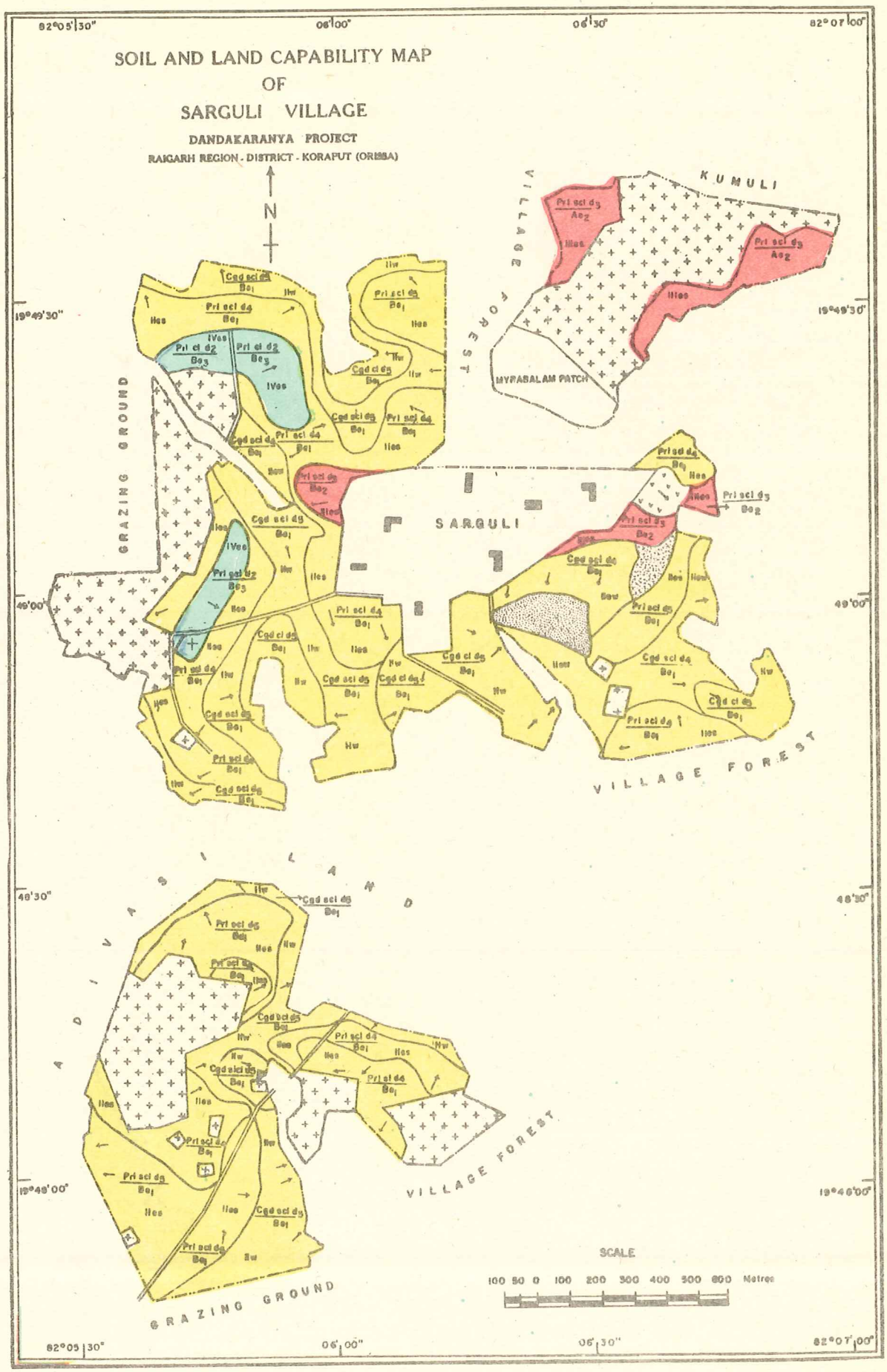
IVes. The lands under the class are nearly level to gently sloping with shallow soil of gravelly sandy clay loam to clay loam texture represented by Purla, Chattiguda and Hatibena series. Soils are severely eroded and are extremely susceptible to erosion. Limitation of depth makes the soils extremely draughty and adversely affects root development. The soils are thus capable of sustaining occassional crops.

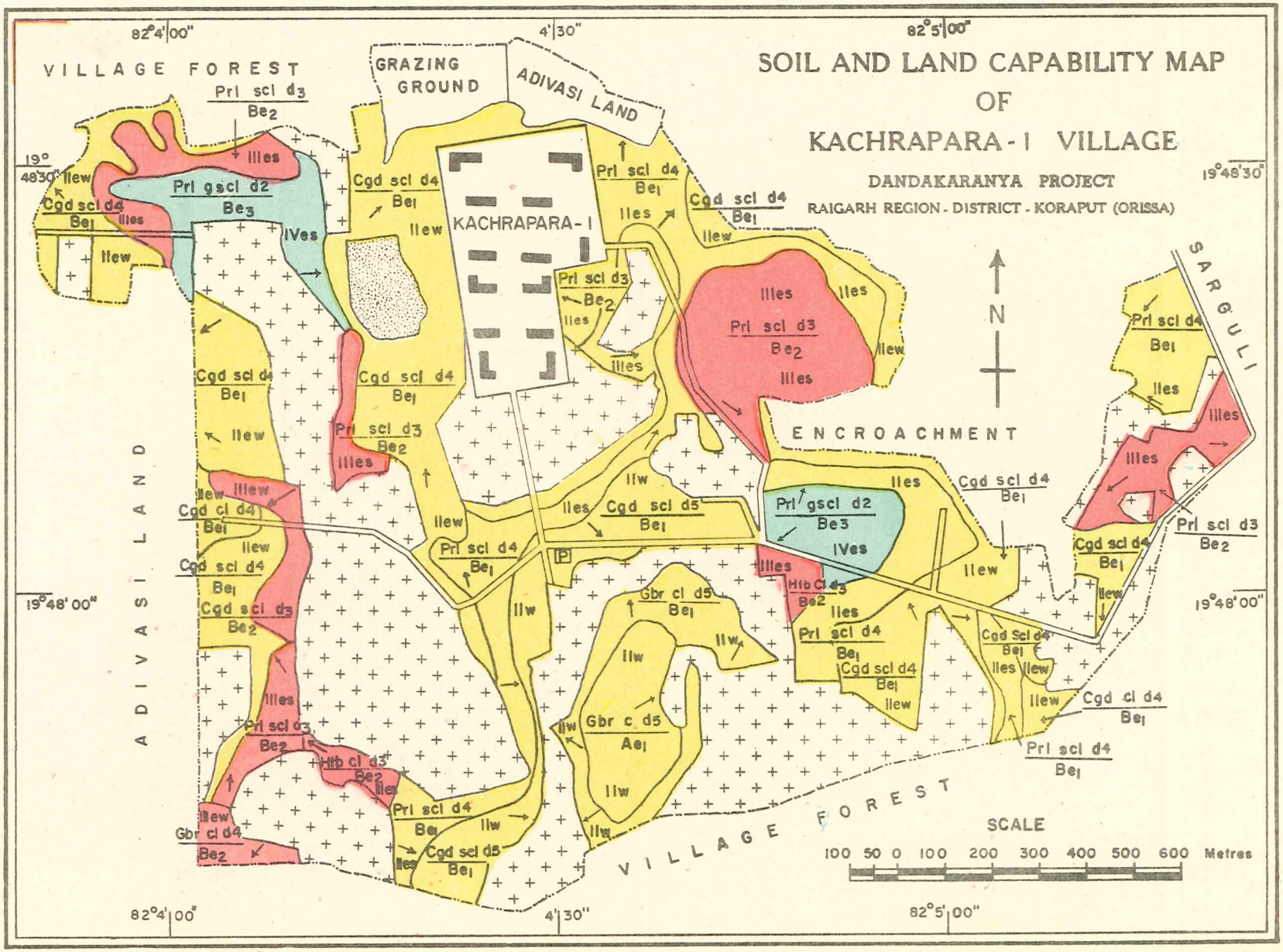
IV

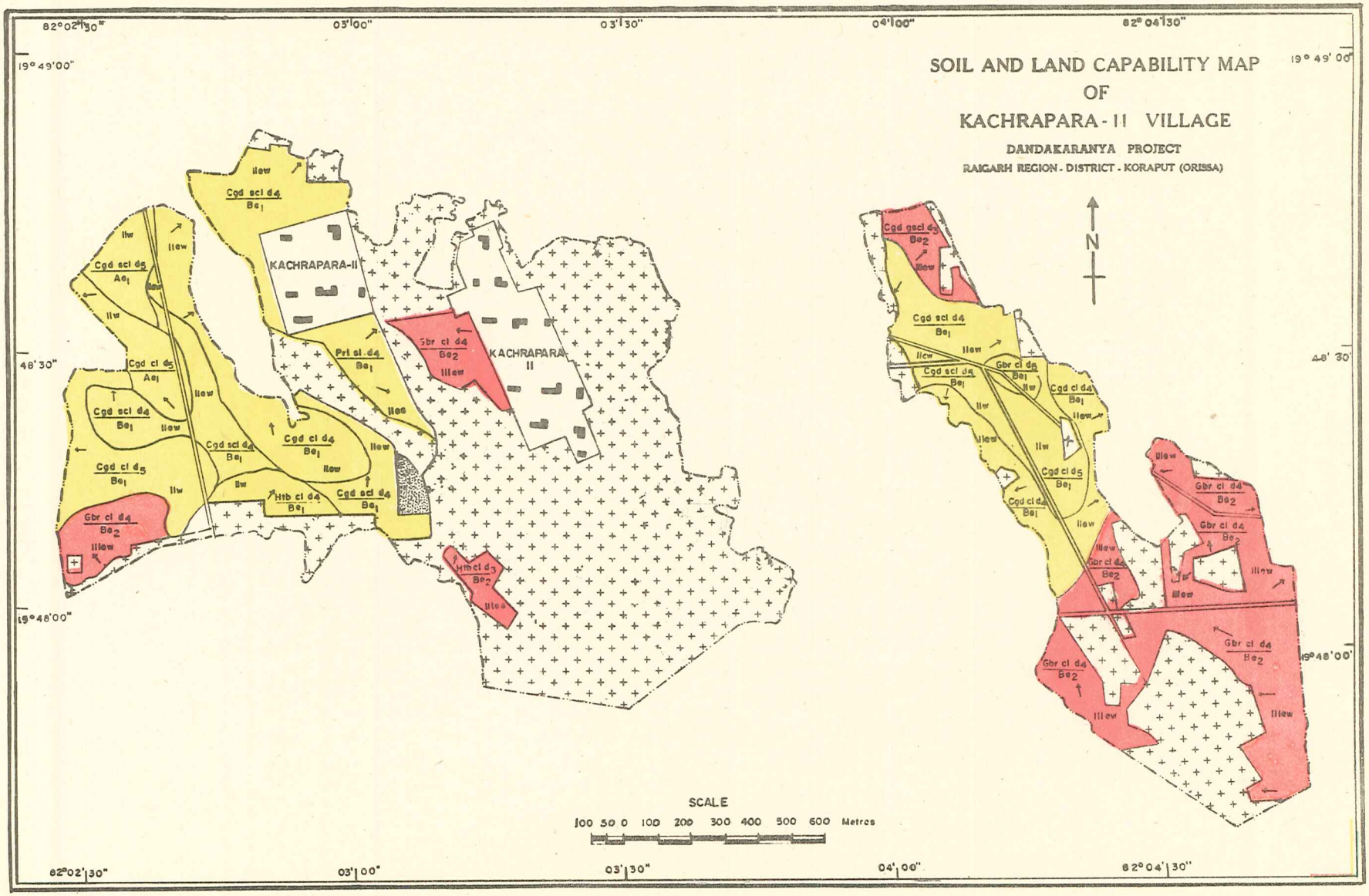

SOIL AND LAND CAPABILITY MAP
OF
BHARSUNDI VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
82°06'00"
06'30"
07'00"
82°07'30"
19°55'30"
55'00"
54'30"
19°54'00"
N
ADIVASI LAND
ENCROACHMENT
GRAZING GROUND
BHARSUNDI
BAGBERA
RANIPADAR
CHHOTABEDA
SCALE
100 50 0 100 200 300 400 500 600 Metres


SOIL AND LAND CAPABILITY MAP
OF
CHHOTABEDA VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
82°6'30"
7'00"
82°7'30"
19°53'30"
53'00"
52'30"
19°52'00"
SIMADAPARA
ENCROACHMENT
ADIVASI LAND
ENCROACHMENT
ENCROACHMENT
GRAZING GROUND
ADIVASI LAND
ENCROACHMENT
CHHOTABEDA
CHHOTABEDA
VILLAGE FOREST
TURDENA
ENCROACHMENT
ENCROACHMENT
VILLAGE FOREST
N
SCALE
100 50 0 100 200 300 400 500 600 Metres.


SOIL AND LAND CAPABILITY MAP
OF
KUMULI VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
SCALE
100 50 0 100 200 300 400 500 600 Metres
N
82°6'30"
07'00"
07'30"
82°8'00"
19°52'00"
19°51'30"
19°51'00"
19°50'30"
CHHOTABEDA
ADIVASI LAND
VILLAGE FOREST
ENCROACHMENT
KUMULI
VILLAGE FOREST
ADIVASI LAND ENCROACHMENT


82°05'30"
06'00"
06'30"
82°07'00"
SOIL AND LAND CAPABILITY MAP
OF
SARGULI VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
N
KUMULI
VILLAGE FOREST
MYRABALAM PATCH
19°49'30"
GRAZING GROUND
SARGULI
49'00"
VILLAGE FOREST
48'30"
ADIVASI LAND
19°48'00"
VILLAGE FOREST
GRAZING GROUND
SCALE
100 50 0 100 200 300 400 500 600 Metres

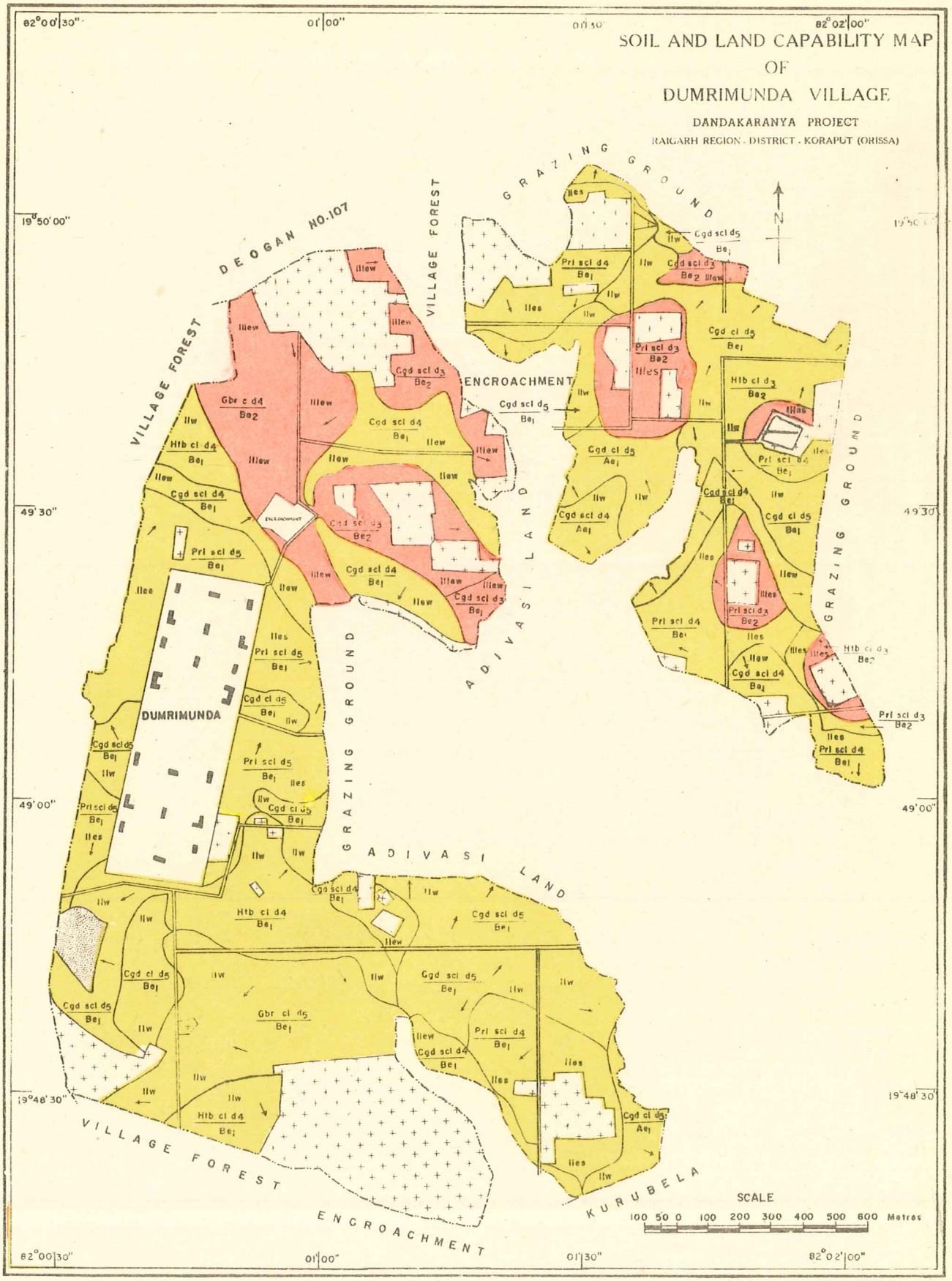

SOIL AND LAND CAPABILITY MAP
OF
KACHRAPARA - I VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
82°4'00"
4'30"
82°5'00"
19°48'30"
19°48'00"
VILLAGE FOREST
GRAZING GROUND
ADIVASI LAND
KACHRAPARA - I
ENCROACHMENT
SARGULI
ADIVASI LAND
VILLAGE FOREST
N
SCALE
100 50 0 100 200 300 400 500 600 Metres
Prl scl d3 Be2
IIIes
Prl gscl d2 Be3
IVes
Cgd scl d4 Be1
IIew
Prl scl d4 Be1
IIes
Cgd scl d5 Be1
IIw
Gbr cl d5 Ae1
Hlb cl d3 Be2
Gbr cl d4 Be2
Cgd cl d4 Be1
Cgd scl d4 Be1
Prl gscl d2 Be3
Prl scl d3 Be2
Cgd scl d3 Be2
Hlb cl d3 Be2
Gbr cl d5 Be1
Prl scl d4 Be1
Cgd scl d5 Be1
Cgd cl d4 Be1
Prl scl d4 Be1

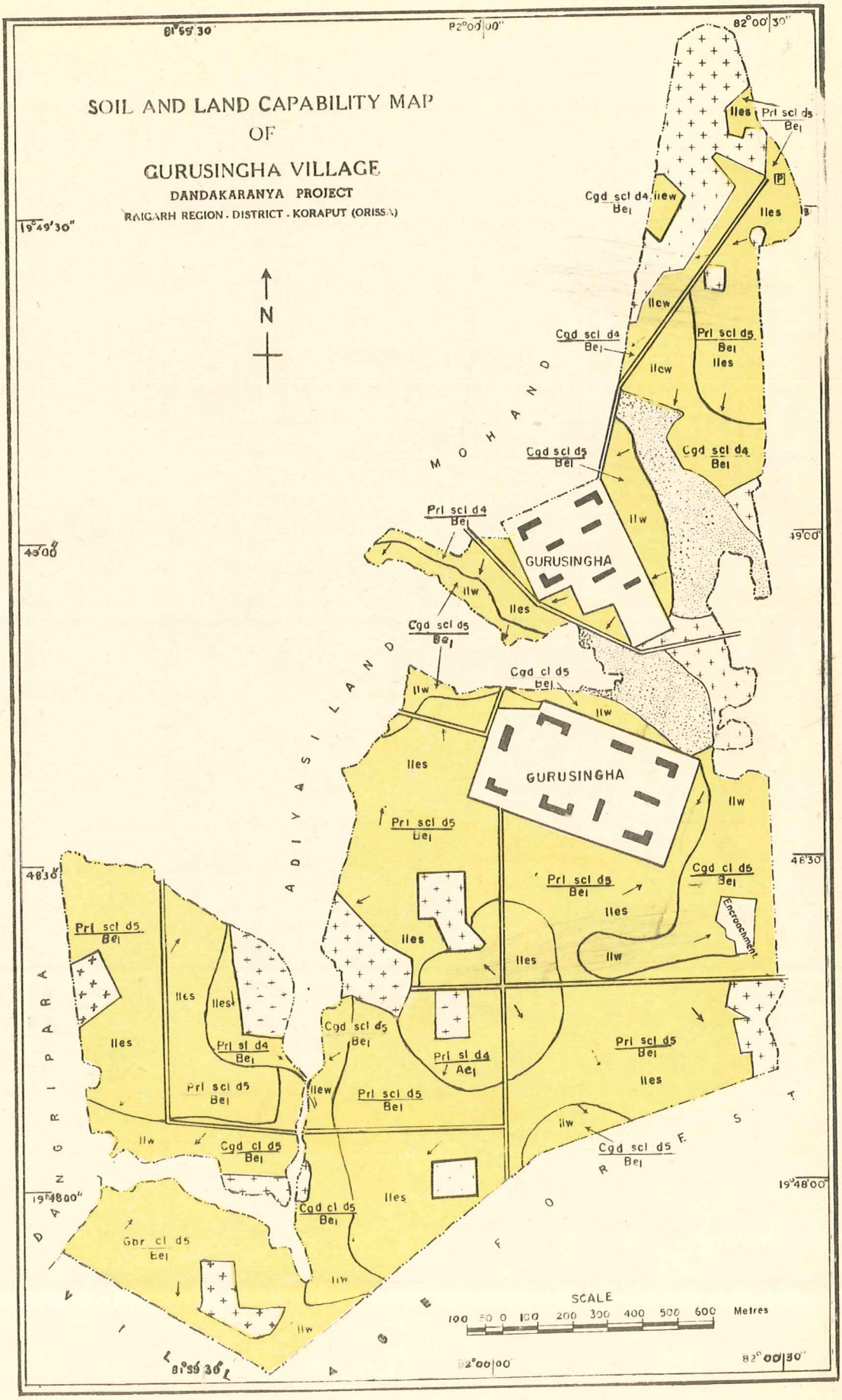

SOIL AND LAND CAPABILITY MAP
OF
KACHRAPARA - II VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
KACHRAPARA-II
KACHRAPARA II
N
SCALE
100 50 0 100 200 300 400 500 600 Metres
82°02'30"
03'00"
03'30"
04'00"
82°04'30"
19°49'00"
48'30"
19°48'00"

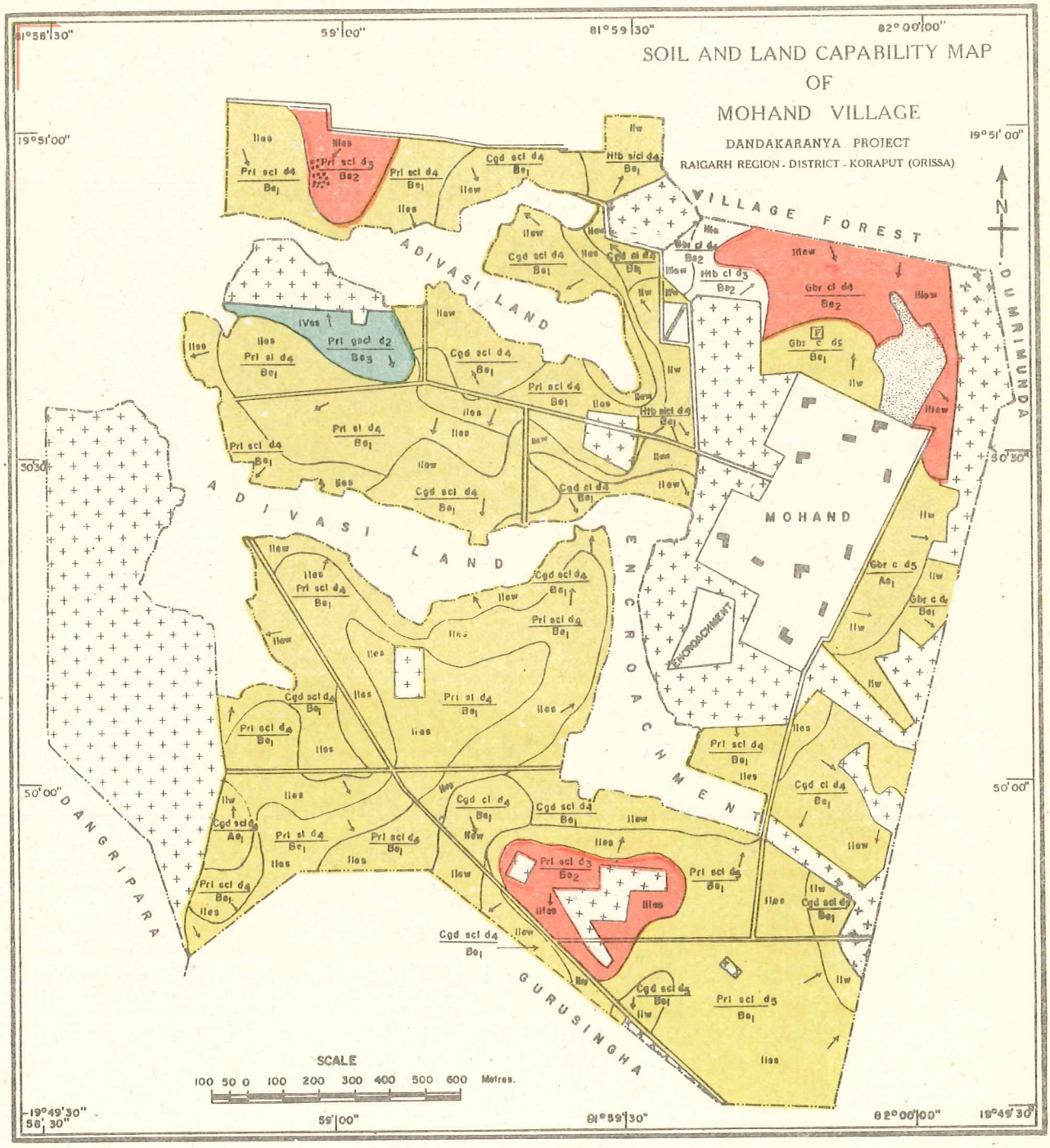
SOIL AND LAND CAPABILITY MAP OF DUMRIMUNDA VILLAGE

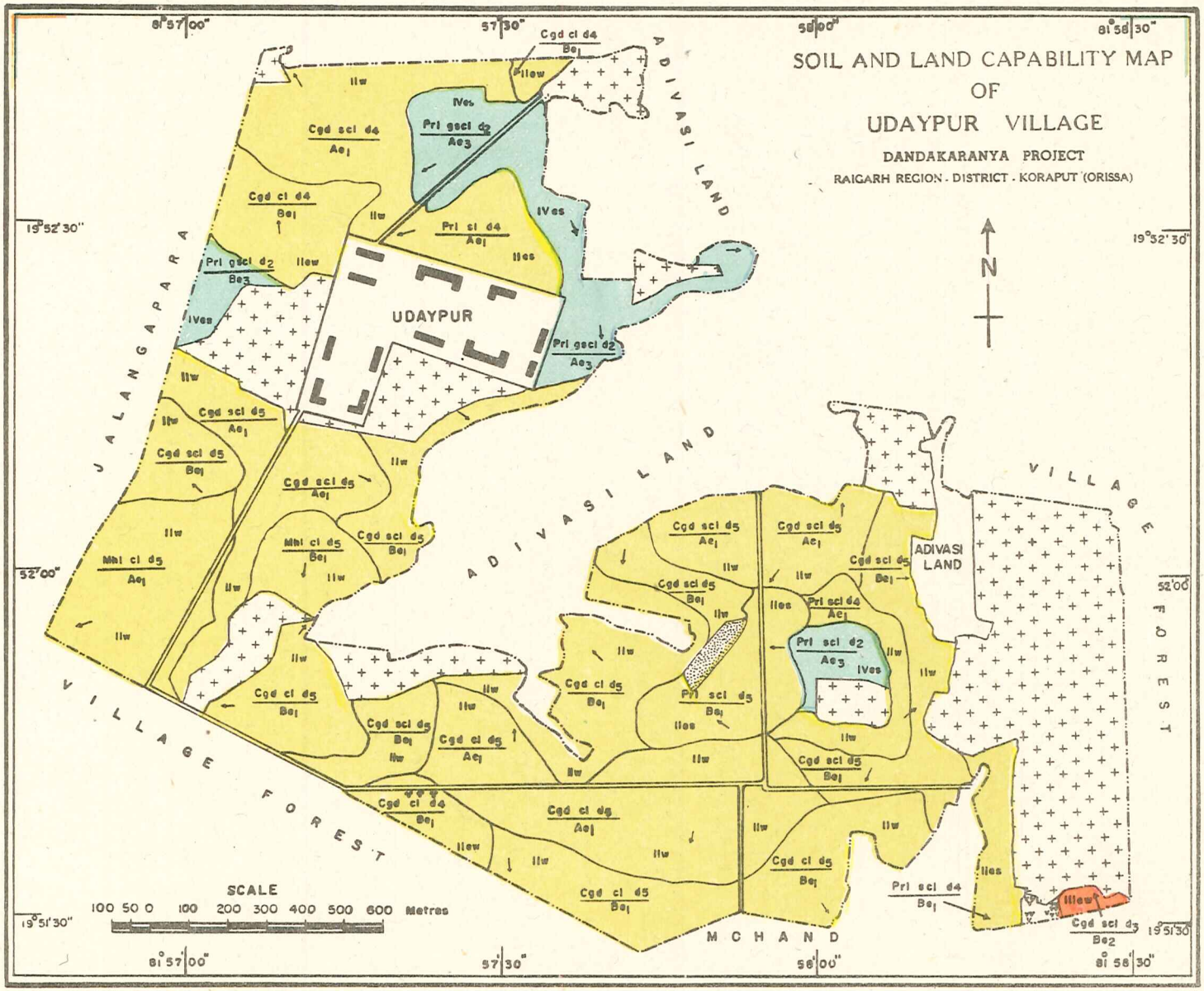
DANDAKARANYA PROJECT

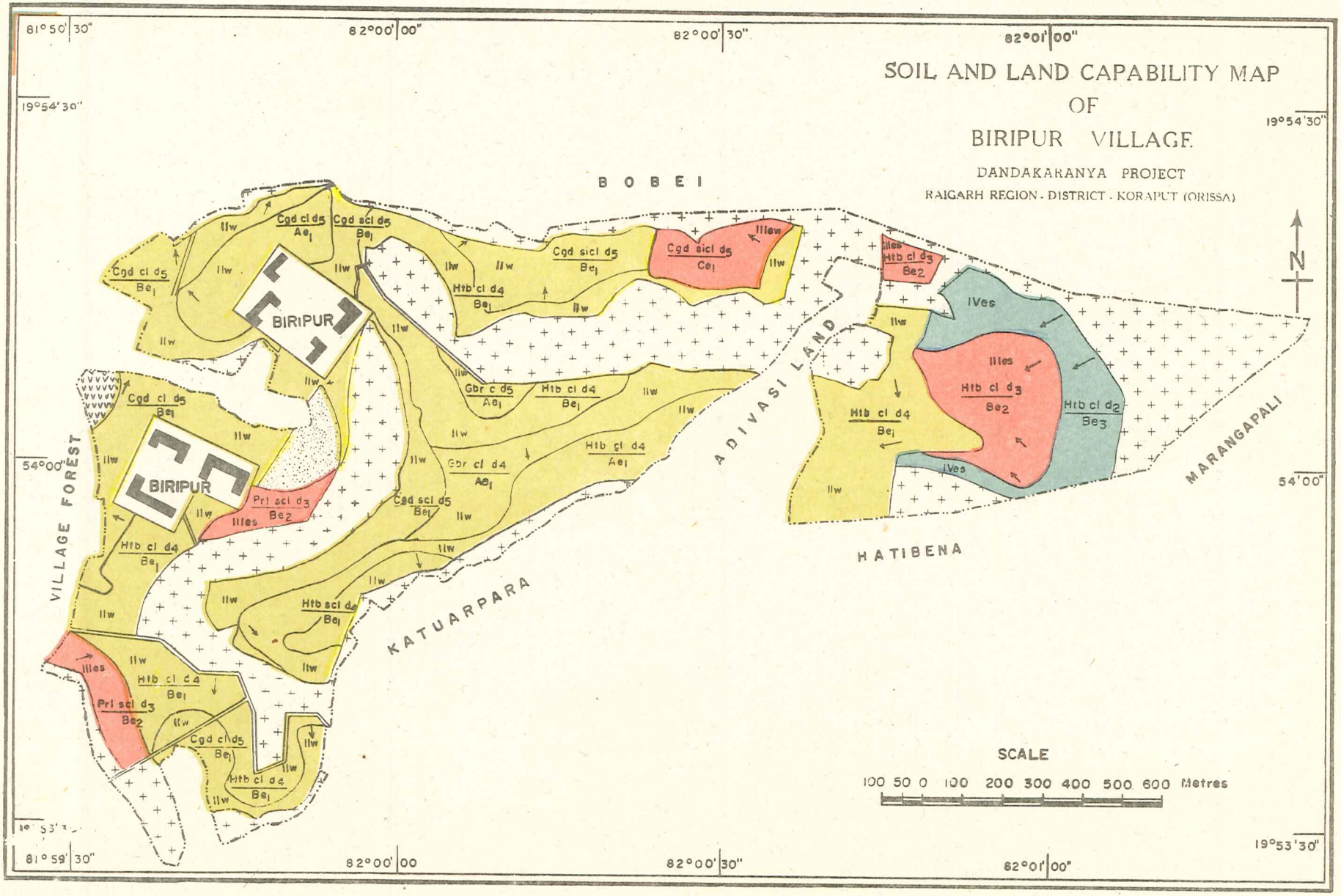
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)




SOIL AND LAND CAPABILITY MAP
OF
GURUSINGHA VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
81°59'30"
82°00'00"
82°00'30"
19°49'30"
19°49'00"
19°48'30"
19°48'00"
N
GURUSINGHA
GURUSINGHA
ADIVASI LAND
MOHAND
DANGRIPARA
Encroachment
SCALE
100 50 0 100 200 300 400 500 600 Metres
IIes
IIew
IIw
Pri scl d5 Bei
Cgd scl d4 Bei
Cgd scl d5 Bei
Pri scl d4 Bei
Cgd cl d5 Bei
Pri sl d4 Bei
Pri sl d4 Aei
Gbr cl d5 Bei


SOIL AND LAND CAPABILITY MAP
OF
MOHAND VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
81°58'30"
59'00"
81°59'30"
82°00'00"
19°51'00"
19°50'30"
50'00"
19°49'30"
58'30"
N
VILLAGE FOREST
DUMRIMUNDA
ADIVASI LAND
ADIVASI LAND
MOHAND
ENCROACHMENT
ENCROACHMENT
DANGRIPARA
GURUSINGHA
SCALE
100 50 0 100 200 300 400 500 600 Metres.

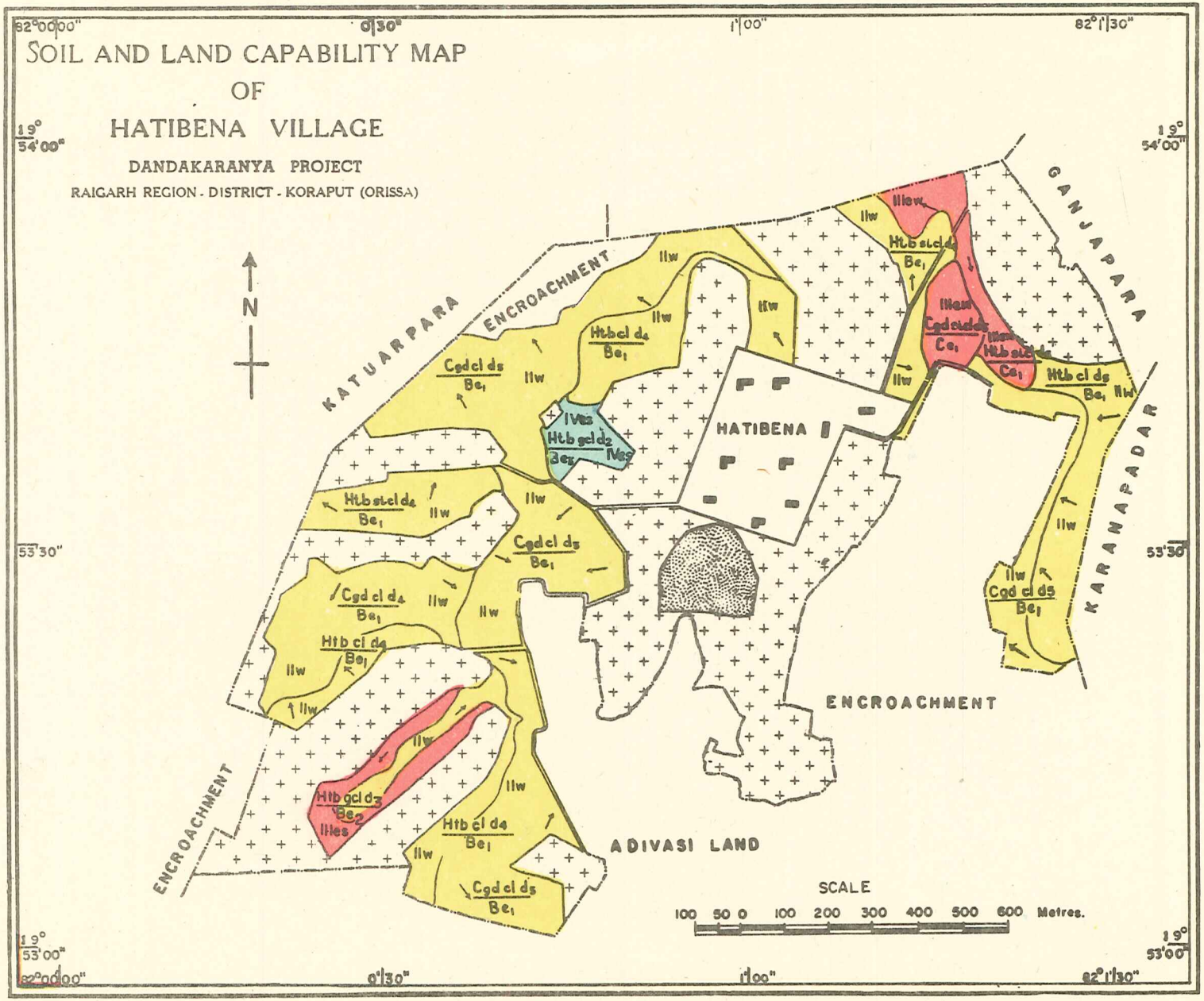

SOIL AND LAND CAPABILITY MAP
OF
UDAYPUR VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
UDAYPUR
ADIVASI LAND
JALANGAPARA
VILLAGE FOREST
ADIVASI LAND
VILLAGE FOREST
ADIVASI LAND
MCHAND
N
SCALE
100 50 0 100 200 300 400 500 600 Metres
81°57'00"
57'30"
58'00"
81°58'30"
19°52'30"
52'00"
19°51'30"

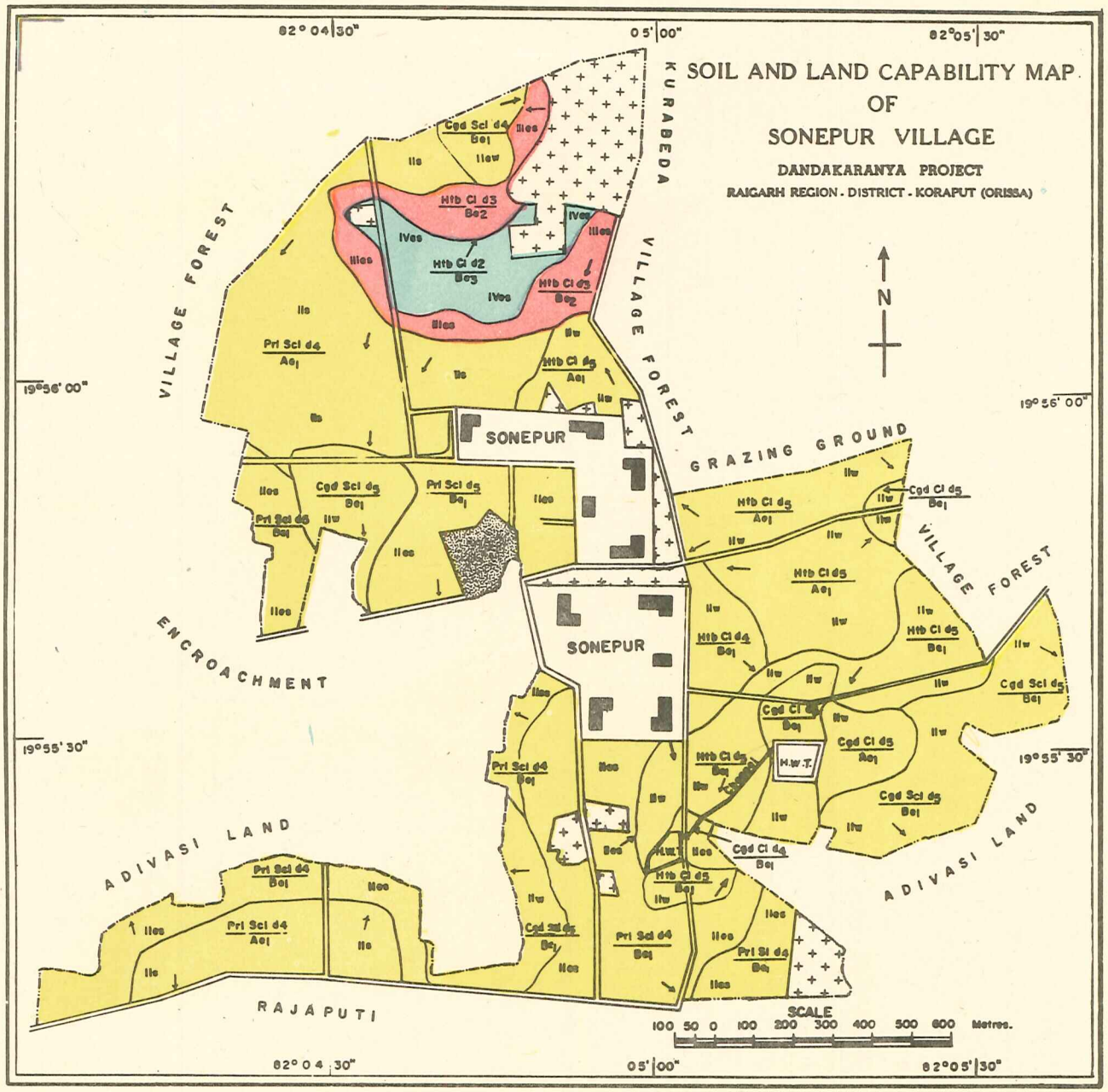

81°50'30"
82°00'00"
82°00'30"
82°01'00"
19°54'30"
19°53'30"
54'00"
SOIL AND LAND CAPABILITY MAP
OF
BIRIPUR VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
BOBEI
BIRIPUR
BIRIPUR
VILLAGE FOREST
ADIVASI LAND
MARANGAPALI
HATIBENA
KATUARPARA
N
SCALE
100 50 0 100 200 300 400 500 600 Metres

SOIL AND LAND CAPABILITY MAP OF HATIBENA VILLAGE

DANDAKARANYA PROJECT

RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)

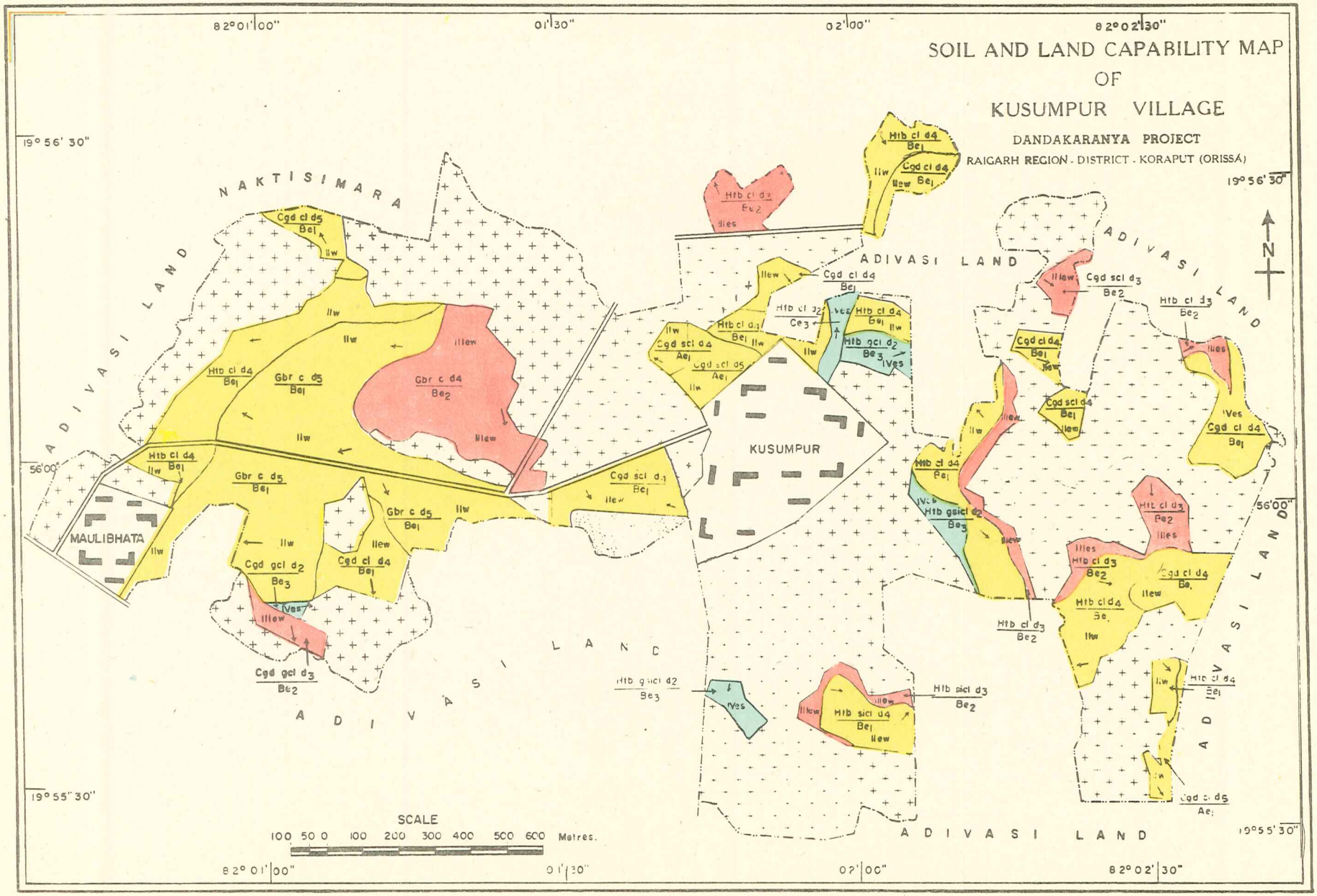



SOIL AND LAND CAPABILITY MAP
OF
SONEPUR VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
82° 04' 30"
05' 00"
82° 05' 30"
19° 56' 00"
19° 55' 30"
N
KURABEDA VILLAGE FOREST
VILLAGE FOREST
GRAZING GROUND
VILLAGE FOREST
ENCROACHMENT
ADIVASI LAND
ADIVASI LAND
RAJAPUTI
SONEPUR
SONEPUR
H.W.T.
SCALE
100 50 0 100 200 300 400 500 600 Metres.

SOIL AND LAND CAPABILITY MAP OF KUSUMPUR VILLAGE

DANDAKARANYA PROJECT

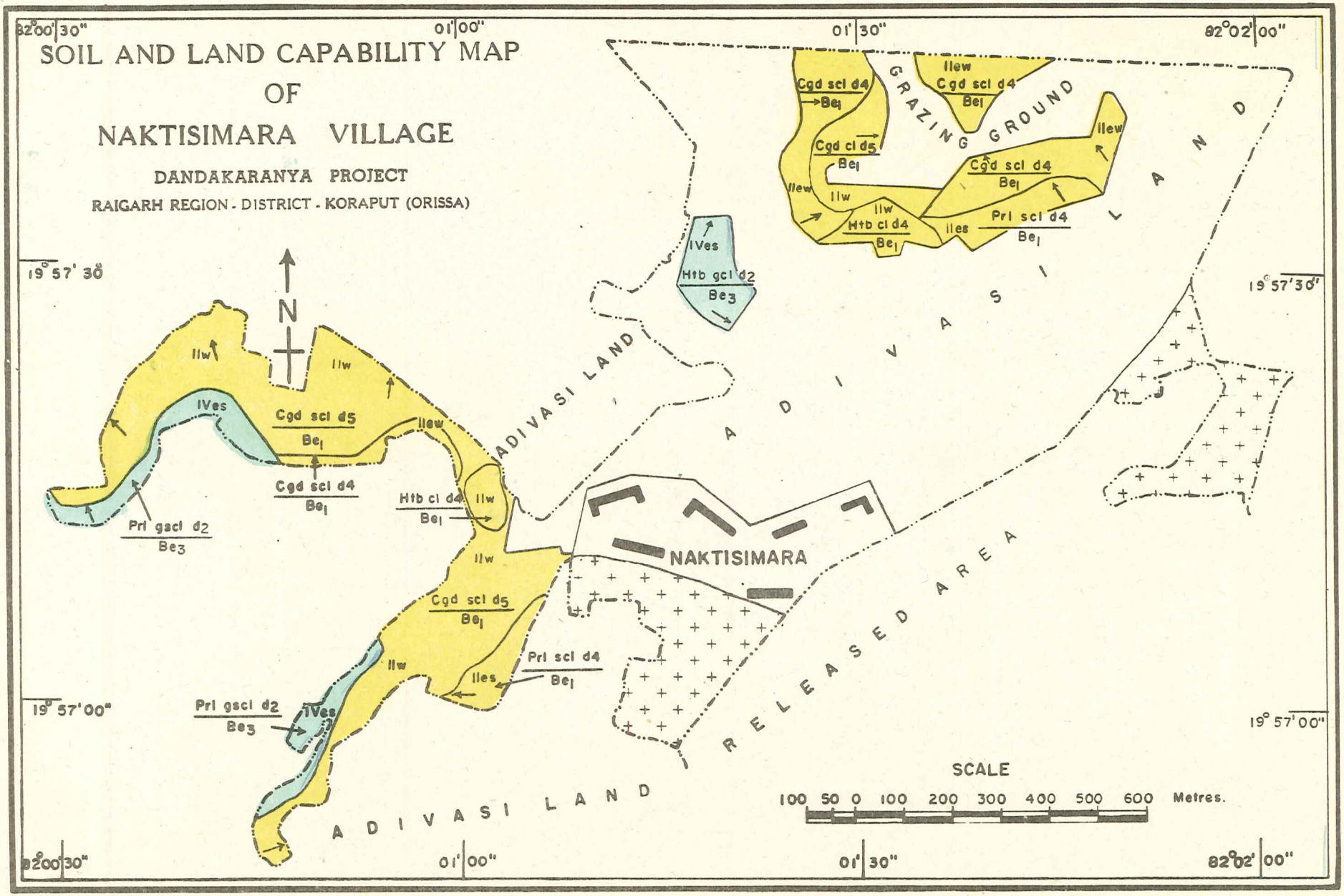
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)



SOIL AND LAND CAPABILITY MAP OF NAKTISIMARA VILLAGE

DANDAKARANYA PROJECT

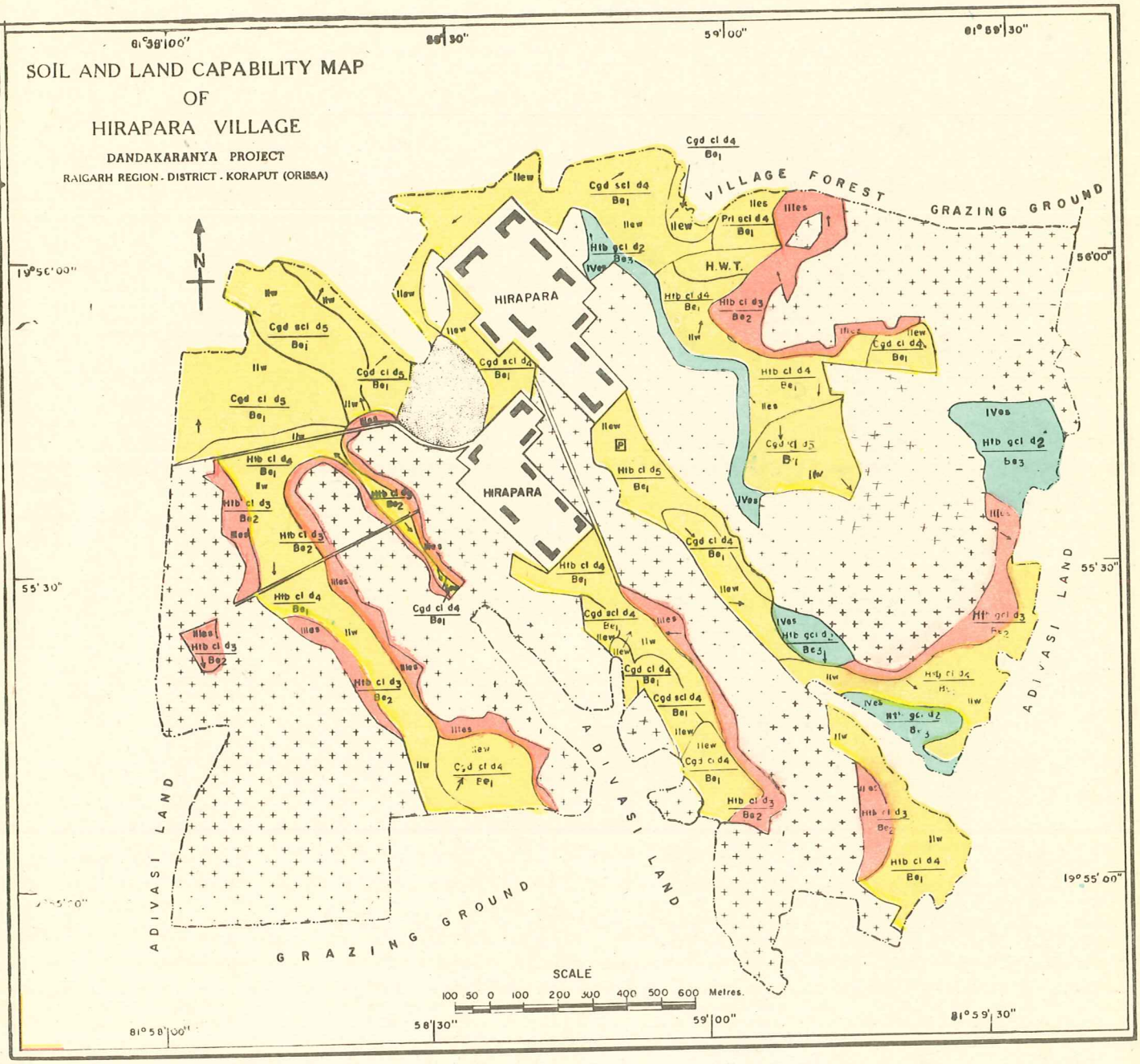
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)



SOIL AND LAND CAPABILITY MAP OF HIRAPARA VILLAGE

DANDAKARANYA PROJECT

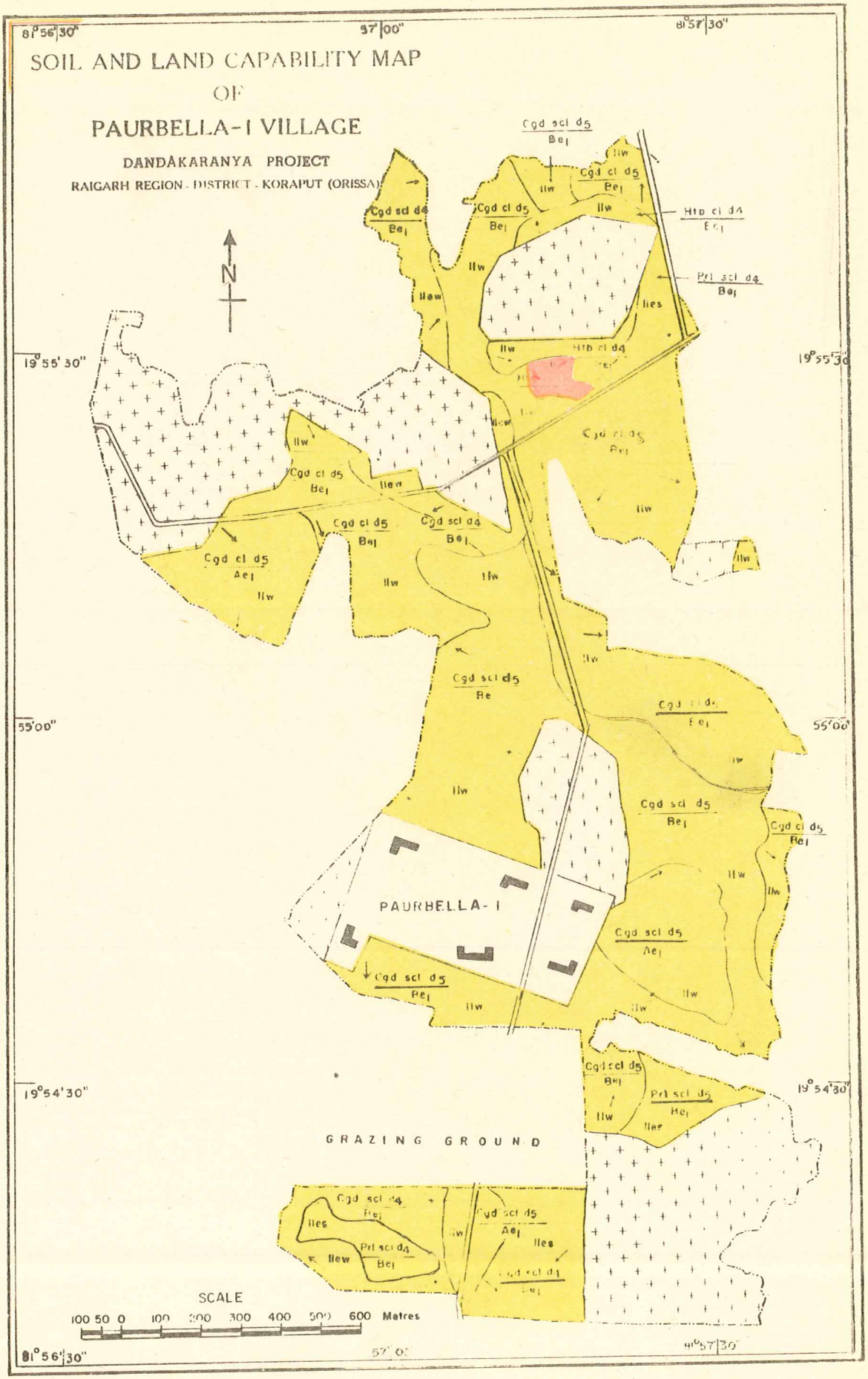
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)

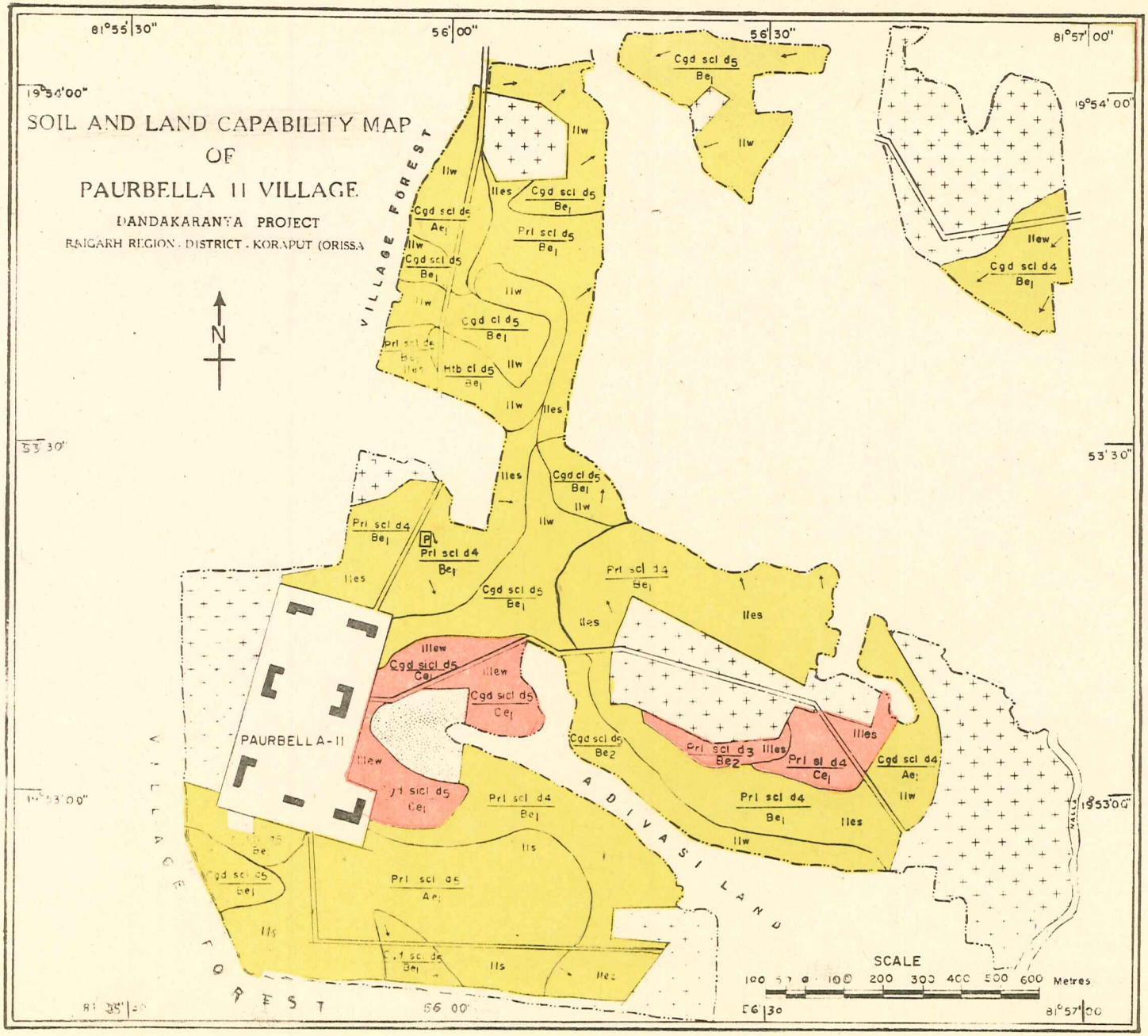


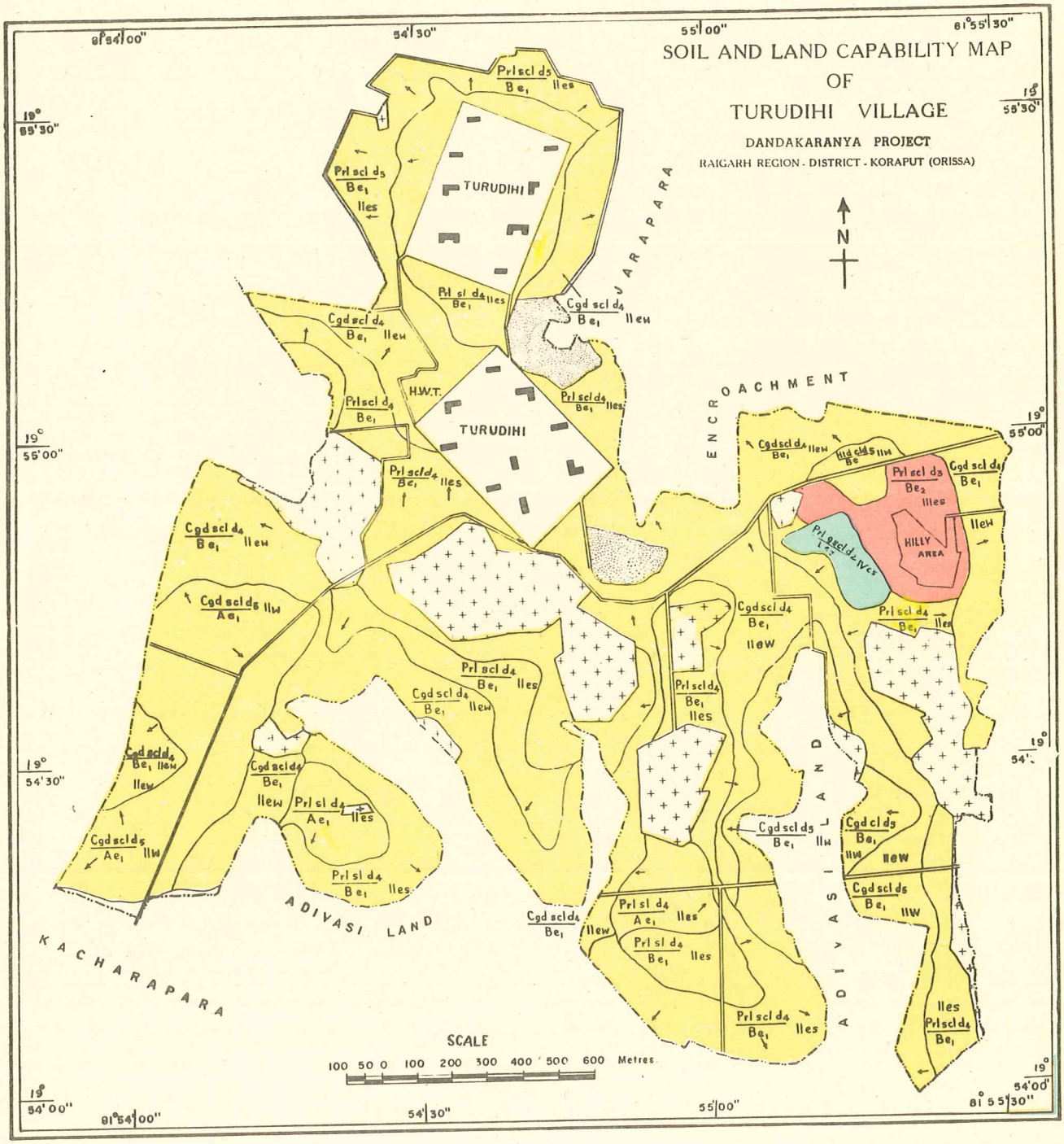
SOIL AND LAND CAPABILITY MAP
OF
PAURBELLA-I VILLAGE

DANDAKARANYA PROJECT

RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)



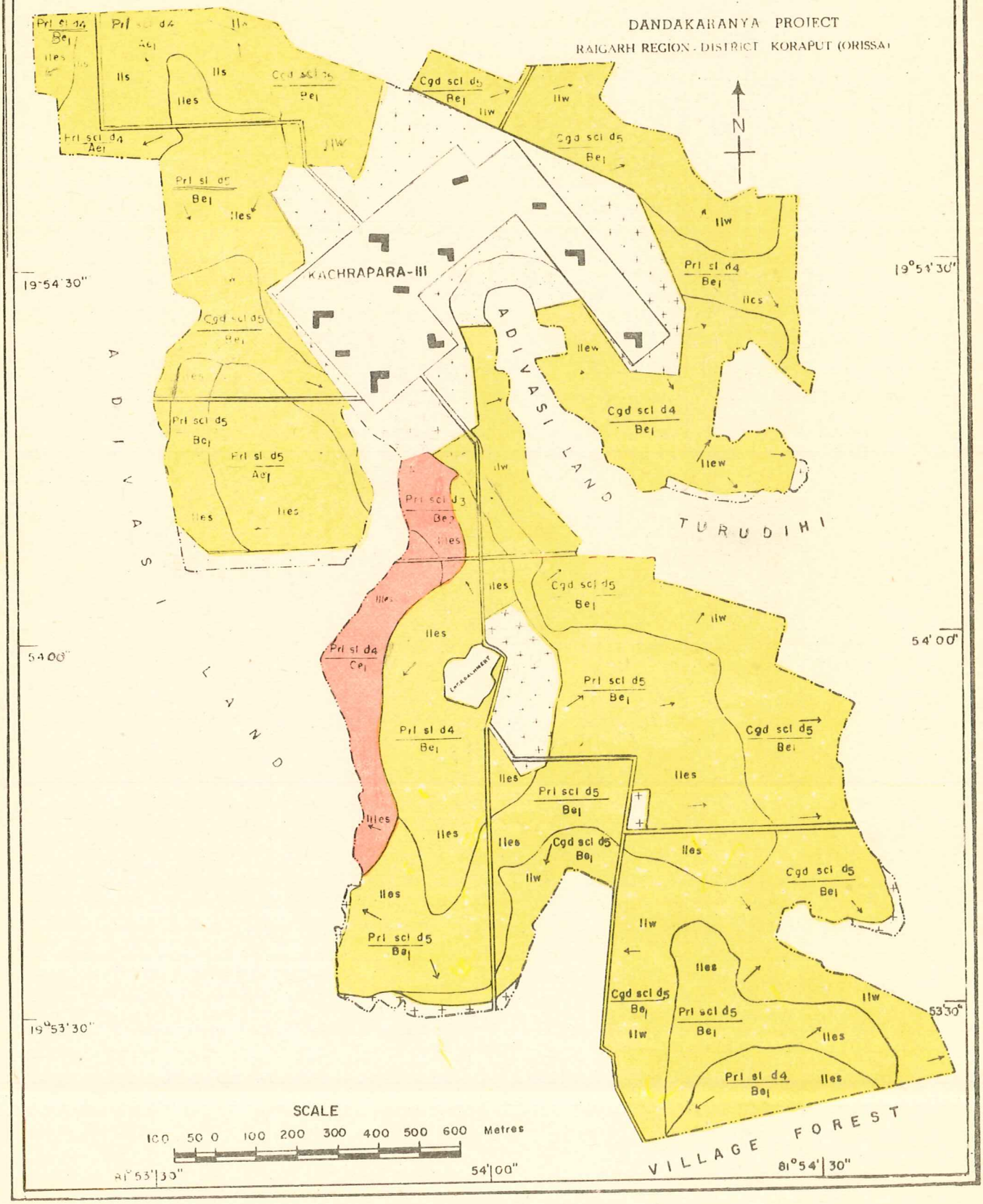

SOIL AND LAND CAPABILITY MAP
OF
PAURBELLA II VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA
81°55'30"
56'00"
56'30"
81°57'00"
19°54'00"
53'30"
19°53'00"
N
VILLAGE FOREST
PAURBELLA-II
ADIVASI LAND
SCALE
100 0 100 200 300 400 500 600 Metres

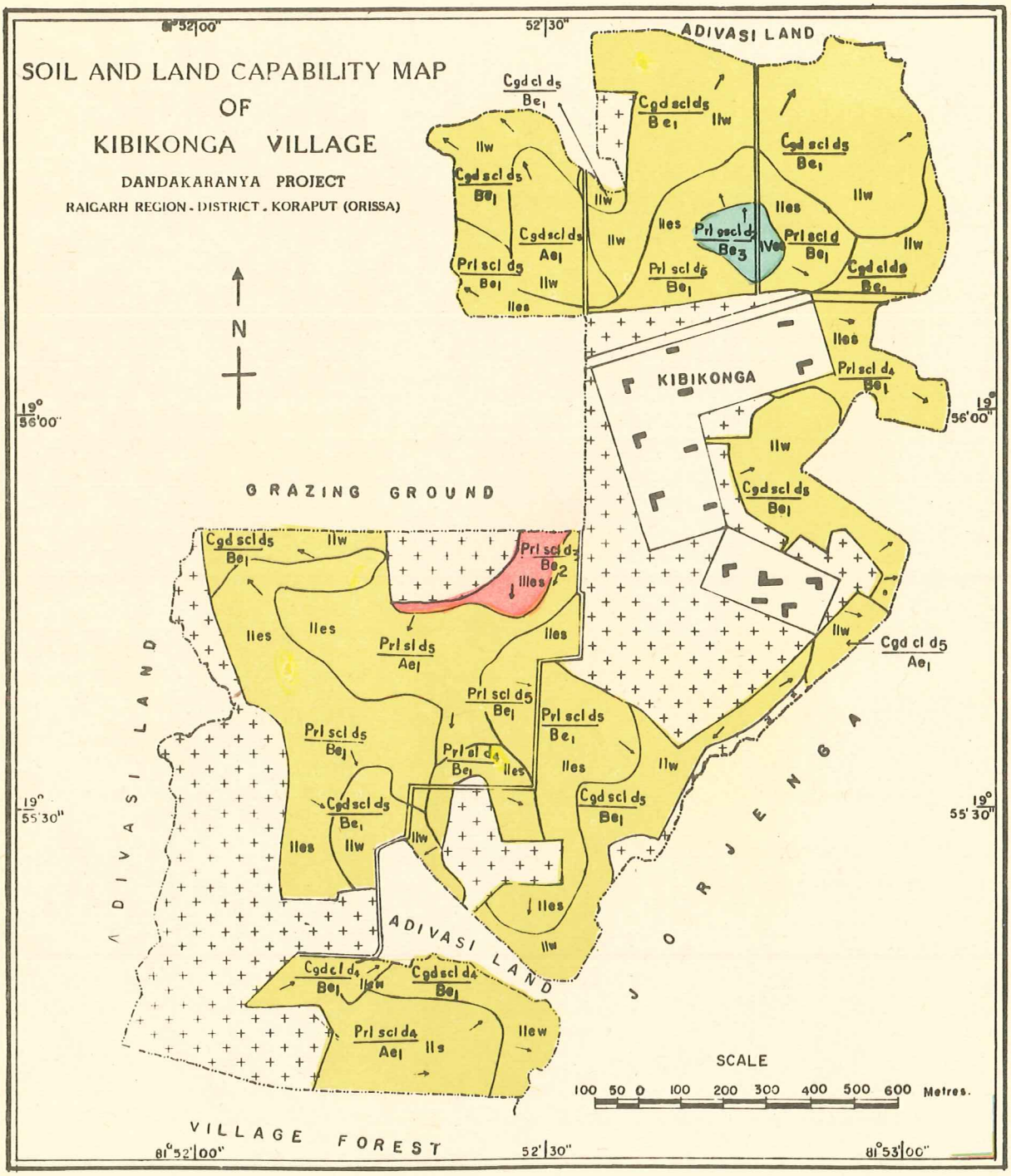

SOIL AND LAND CAPABILITY MAP
OF
TURUDIHI VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
N
TURUDIHI
TURUDIHI
H.W.T.
ENCROACHMENT
HILLY AREA
ADIVASI LAND
KACHARAPARA
SCALE
100 50 0 100 200 300 400 500 600 Metres
81°54'00"
54'30"
55'00"
81°55'30"
19° 55'30"
19° 55'00"
19° 54'30"
19° 54'00"

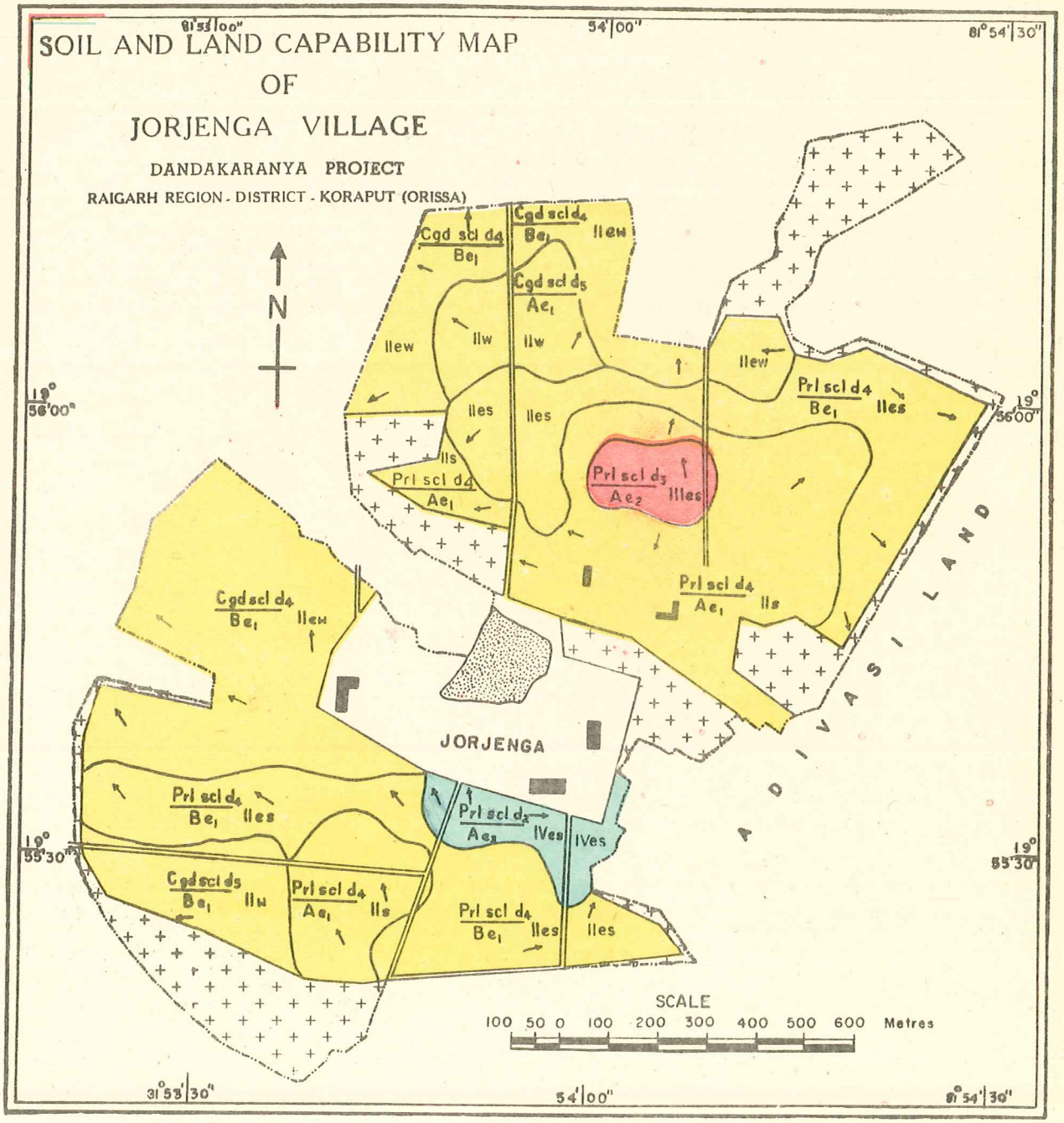
SOIL AND LAND CAPABILITY MAP
OF
KACHRAPARA - III VILLAGE

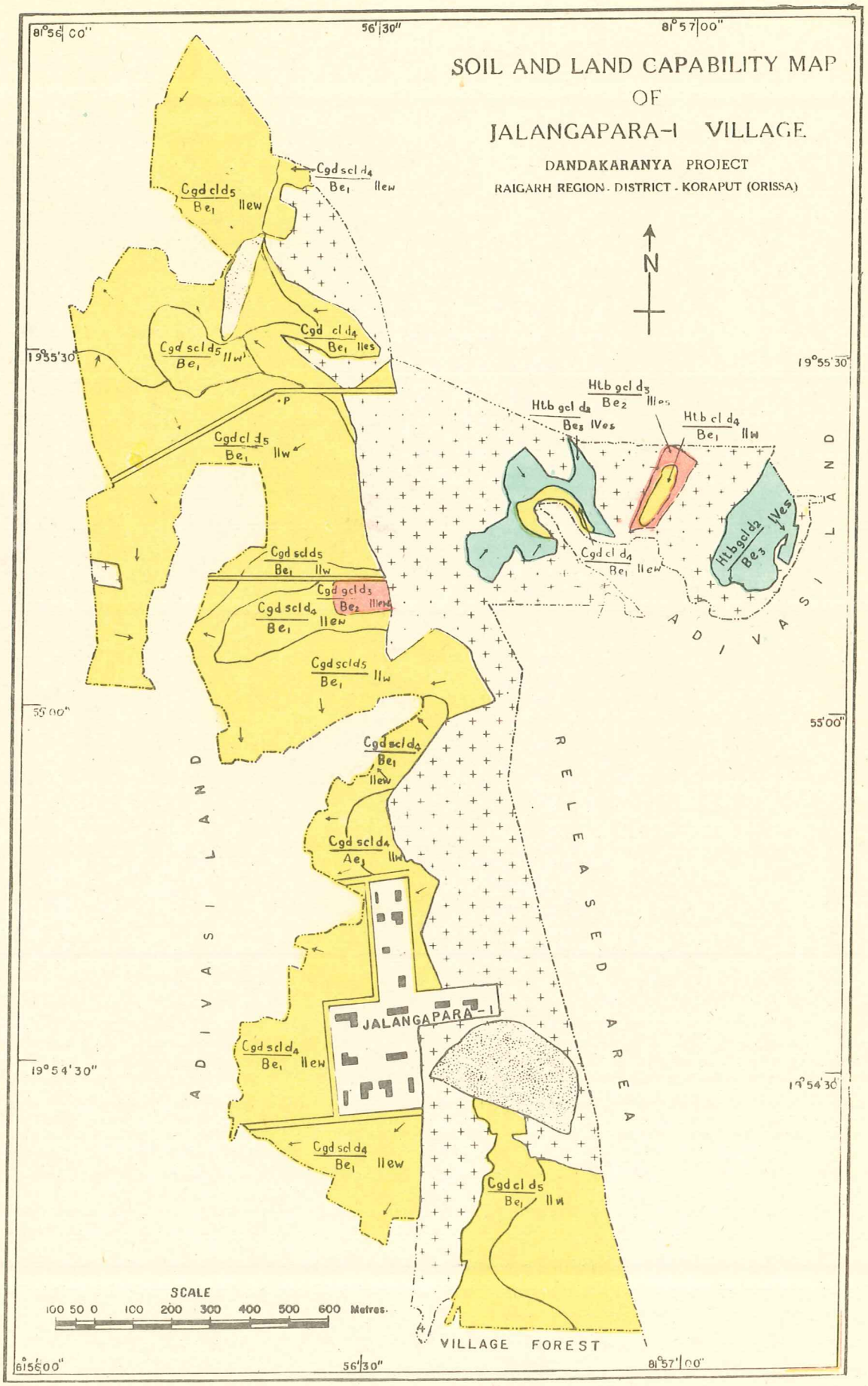
DANDAKARANYA PROJECT

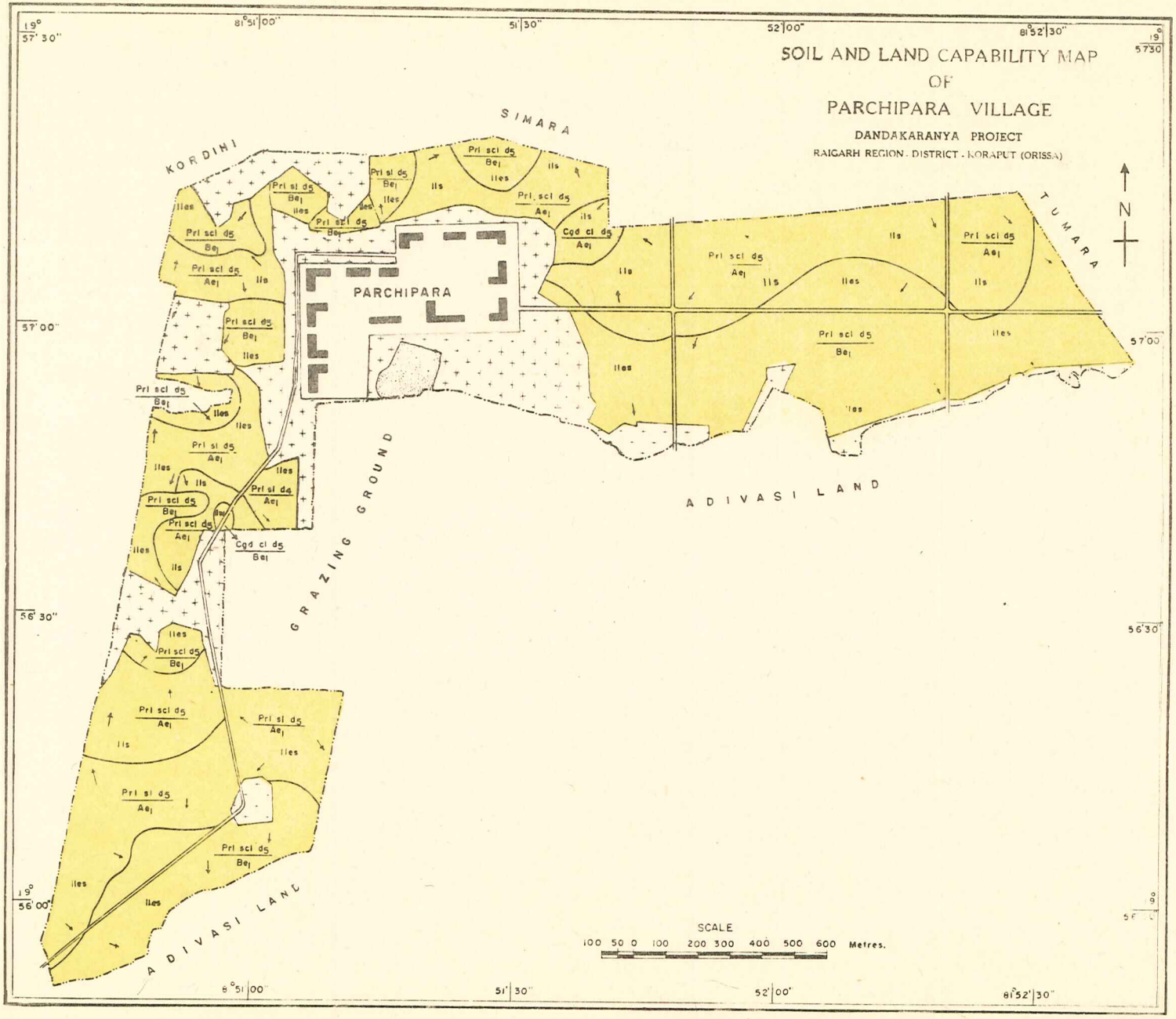
RAIGARH REGION - DISTRICT KORAPUT (ORISSA)

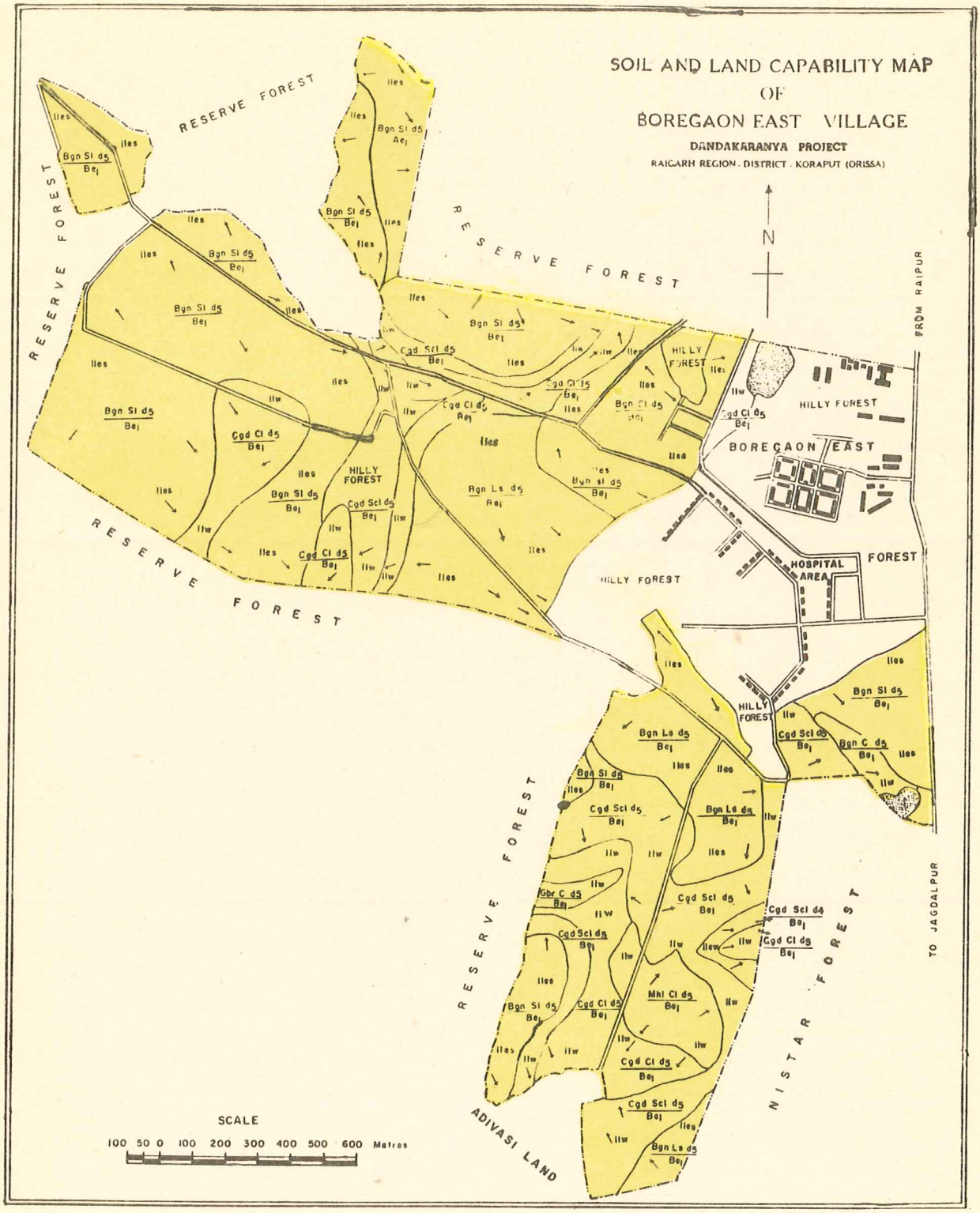



SOIL AND LAND CAPABILITY MAP
OF
KIBIKONGA VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
81°52'00"
52'30"
81°53'00"
19° 56'00"
19° 55'30"
N
ADIVASI LAND
KIBIKONGA
GRAZING GROUND
ADIVASI LAND
ADIVASI LAND
JORJENGA
VILLAGE FOREST
SCALE
100 50 0 100 200 300 400 500 600 Metres.


SOIL AND LAND CAPABILITY MAP
OF
JORJENGA VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
81°53'00"
54'00"
81°54'30"
19°56'00"
19°55'30"
31°53'30"
N
Cgd scl d4 / Be1
IIeW
Cgd scl d5 / Ae1
IIw
IIes
IIs
Prl scl d4 / Ae1
Prl scl d3 / Ae2
IIIes
Prl scl d4 / Be1
Cgd scl d5 / Be1
IIIW
IVes
JORJENGA
ADIVASI LAND
SCALE
100 50 0 100 200 300 400 500 600 Metres


SOIL AND LAND CAPABILITY MAP
OF
JALANGAPARA-I VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
N
81°56'00"
56'30"
81°57'00"
19°55'30"
55'00"
19°54'30"
Cgd scl d4 / Be1 IIew
Cgd cl d5 / Be1 IIew
Cgd scl d5 / Be1 IIw
Cgd cl d4 / Be1 IIes
Cgd cl d5 / Be1 IIw
Htb gcl d5 / Be2 IIIes
Htb gcl d3 / Be3 IVes
Htb cl d4 / Be1 IIw
Htb gcl d2 / Be3 IVes
Cgd cl d4 / Be1 IIew
Cgd scl d5 / Be1 IIw
Cgd gcl d3 / Be2 IIIew
Cgd scl d4 / Be1 IIew
Cgd scl d5 / Be1 IIw
Cgd scl d4 / Be1 IIew
Cgd scl d4 / Ae1 IIw
ADIVASI LAND
RELEASED AREA
JALANGAPARA-I
Cgd scl d4 / Be1 IIew
Cgd scl d4 / Be1 IIew
Cgd cl d5 / Be1 IIw
SCALE
100 50 0 100 200 300 400 500 600 Metres.
VILLAGE FOREST

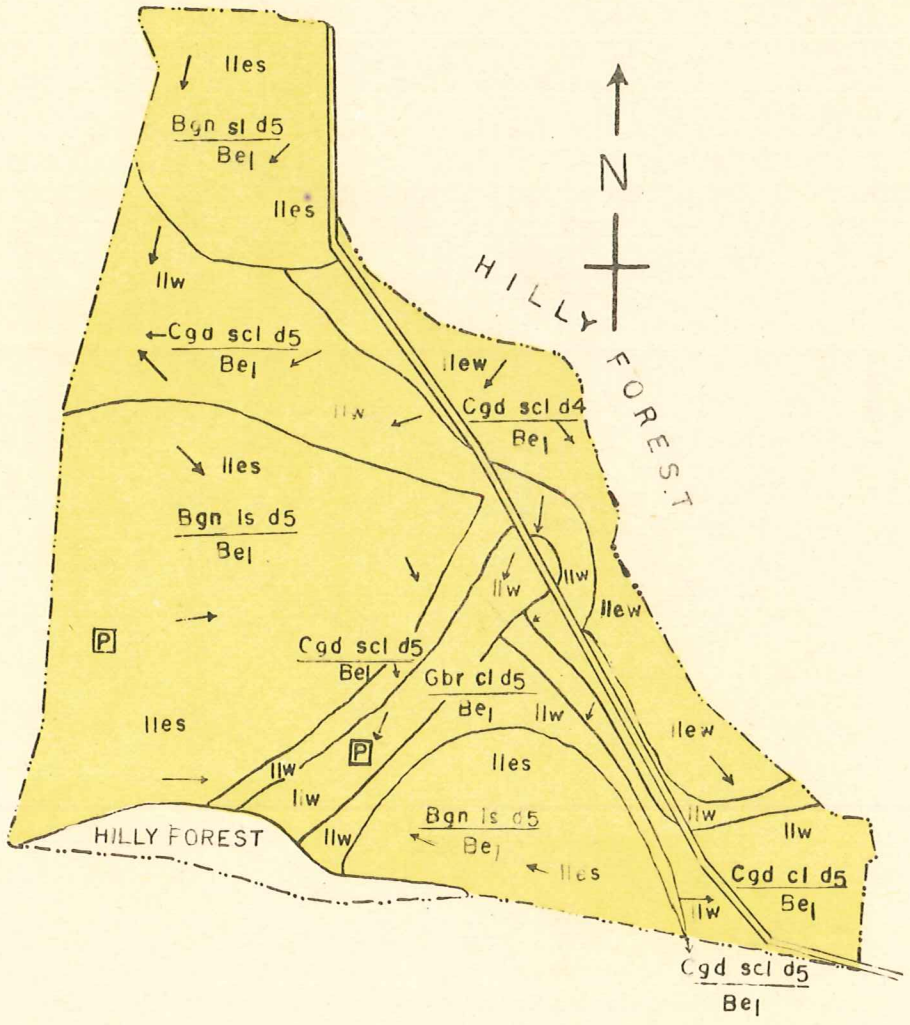

SOIL AND LAND CAPABILITY MAP
OF
PARCHIPARA VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION - DISTRICT - KORAPUT (ORISSA)
SIMARA
KORDIHI
TUMARA
PARCHIPARA
GRAZING GROUND
ADIVASI LAND
ADIVASI LAND
N
SCALE
100 50 0 100 200 300 400 500 600 Metres.
19° 57' 30"
81°51'00"
51'30"
52'00"
81°52'30"
57'00"
56'30"
19° 56'00"


SOIL AND LAND CAPABILITY MAP
OF
BOREGAON EAST VILLAGE
DANDAKARANYA PROJECT
RAIGARH REGION. DISTRICT - KORAPUT (ORISSA)
N
RESERVE FOREST
RESERVE FOREST
RESERVE FOREST
RESERVE FOREST
RESERVE FOREST
HILLY FOREST
HILLY FOREST
HILLY FOREST
HILLY FOREST
BOREGAON EAST
HOSPITAL AREA
FOREST
FROM RAIPUR
TO JAGDALPUR
NISTAR
ADIVASI LAND
SCALE
100 50 0 100 200 300 400 500 600 Metres

SOIL AND LAND CAPABILITY MAP
OF
BOREGAON WEST VILLAGE

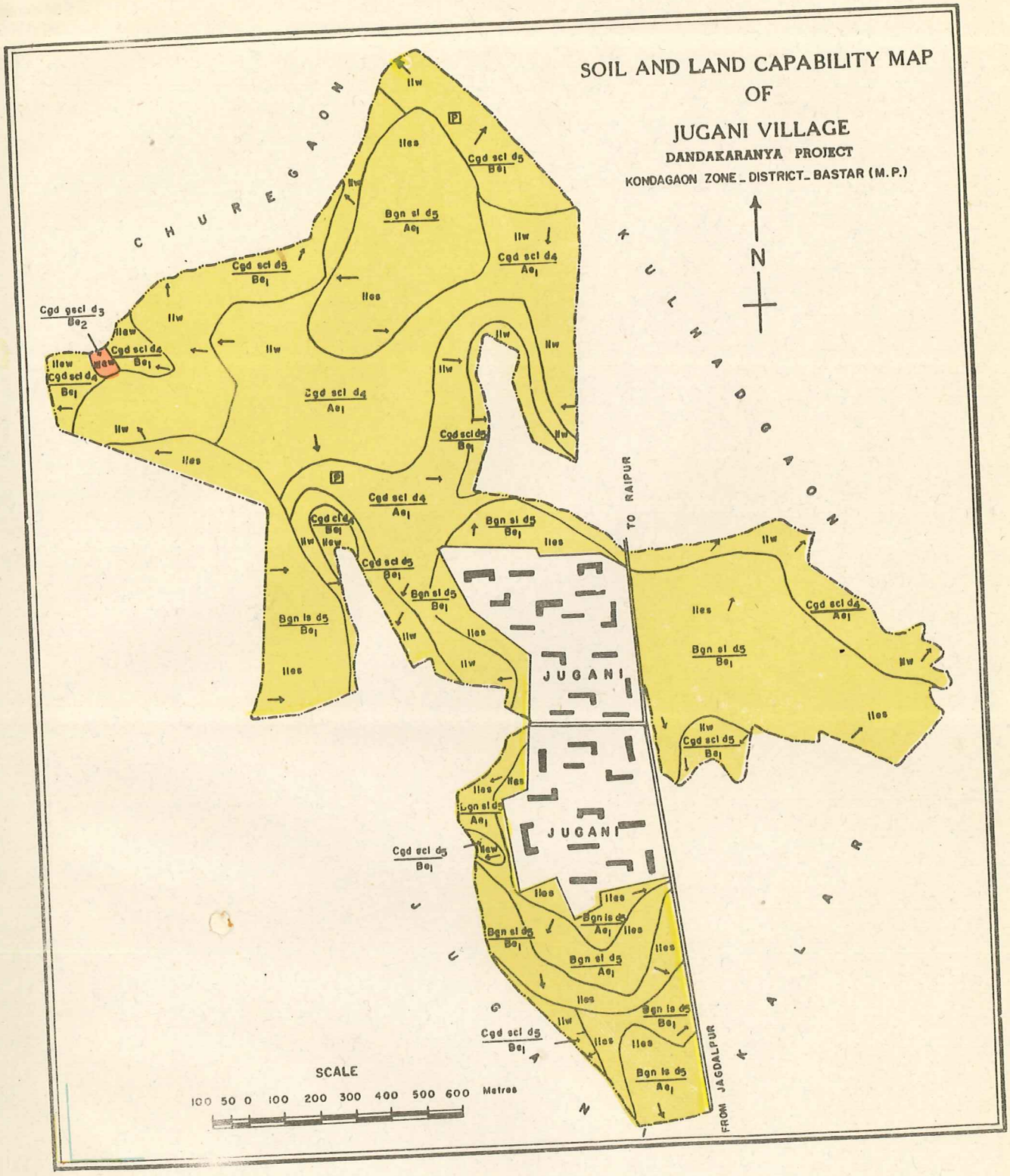
DANDAKARANYA PROJECT

RAIGARH REGION DISTRICT - KORAPUT (ORISSA)



SCALE

100 50 0 100 200 300 400 500 600 Metres.


SOIL AND LAND CAPABILITY MAP
OF
JUGANI VILLAGE
DANDAKARANYA PROJECT
KONDAGAON ZONE _ DISTRICT _ BASTAR (M.P.)
N
CHUREGAON
KONDAGAON
TO RAIPUR
FROM JAGDALPUR
JUGANI
JUGANI
IIw
IIes
IIew
Cgd scl d5 Be1
Bgn sl d5 Ae1
Cgd scl d4 Ae1
Cgd gscl d3 Be2
Cgd scl d4 Be1
Bgn sl d5 Be1
Cgd scl d5 Be1
Bgn is d5 Be1
Bgn is d5 Ae1
SCALE
100 50 0 100 200 300 400 500 600 Metres

PHOTOLITHOGRAPHED AT
THE CARTOGRAPHIC LABORATORY
ALL INDIA SOIL & LAND USE SURVEY
I. A. R. I. BUILDINGS, NEW DELHI.