

CHAPTER I

GENERAL

1. Introducing the District

Sambalpur saw the dawn of civilisation. Long before the introduction of any regular script in India, ancient man has left at Vikramkhol on the wall of a cave pictograph writing still undeciphered.

After a long gap of many thousand years, Sambalpur then called Sambhal, again led the world by founding Vajrayan Buddhism propounded by its king Indrabhuti in the 8th century A. D. He was one of the 84 traditional Siddhas of India¹.

This district was long under Gond and Binjhal chiefs before historical dynasties like Gangas, Kadambas and Chauhans appeared and became masters of different regions. The Chauhans, a branch of the Patna house, were the most powerful and ruled over a cluster of 18 States in western Orissa and the eastern parts of Madhya Pradesh. The Chauhan rule crumbled by the onslaught of British imperialism. Surendra Sai, a scion of the dynasty, led the people of the district against the British at the time of the famous Indian Mutiny of 1857 and continued the struggle long after the Mutiny had collapsed in the rest of India.

The district has thick and inaccessible forests and a large variety of wild life from elephants to rabbits. One of its waterfalls, though sung by poets and princesses, has, for over half a century, been put to the prosaic use of generating hydroelectric power.

The cultivated plains yield numerous varieties of paddy some of which are the finest in India. Irrigation provided by the Hirakud canals in Sambalpur and Bargarh subdivisions had caused a "green revolution". Land which was dusty brown previously now looks flush green even in April. Sambalpur had the tradition of producing diamond which was being extracted from the sands of the Mahanadi at Hirakud—which means the diamond island.

The district is noted for "tie and dye" weaving in cotton and tassar silk bringing out most artistic designs from the loom almost like magic with the help of formulae which have passed down from father to son for generations. The people have evolved their own romantic dialect known as Sambalpuri Oriya which is prevalent in all the districts of western Orissa.

1. For a discussion of this claim see chapter II

Achievement of the district in modern times is the Hirakud Dam across the Mahanadi, having a water spread of 777 square kilometres and having 21 kilometres of earthen dyke, the longest in the world.

People living in 3,736 villages are simple, law-abiding and God-fearing. They are hospitable and artistic. Their songs are poetic and full of pathos. Having lived with nature for centuries, their culture has merged in nature.

2. Origin of the name of the district

The district of Sambalpur has been named after the headquarters town Sambalpur. According to O' Malley, the town itself derives its name from the presiding goddess Samalai whose image was found by Balaram Dev, the first Chauhan Raja of Sambalpur, beneath a Simuj (silk-cotton) tree. Regarding the origin of the name of Sambalpur town, O' Malley narrates the following episode;

“One day while hunting, he (Balaram Dev) crossed the river, and set his hounds at a hare, only to find after a long chase that they had been repulsed by it. Struck by this extraordinary exhibition of courage by the most timid of animals, he concluded that there must be some supernatural virtue in the land. He, therefore, determined to make his capital there, and having built a town, installed in it the tutelary goddess of his family. The place where her image was set up was an island (Kud) on which stood a silk-cotton tree, and hence was called Semal-kud, while the goddess was given the name of Samalai. Local tradition asserts that the place where the Raja's dogs were repulsed by the hare is a spot, known as Badiraj, in front of the old city police-station near the Balibandha tank, and that the old town founded by Balaram Deva was between the city police-station and Samalai Devi's temple.”¹

The town of Sambalpur is known to be much older than the time of Balaram Dev who became the ruler of Sambalpur kingdom about the middle of the 16th century A. D. The Greek Geographer Ptolemy (middle of the 2nd Century A. D.) in his book *Geographike* refers to a town named Sambalaka situated on the bank of the Manada. Sambalaka and Manada may perhaps be identified with modern Sambalpur and the river Mahanadi, respectively. In medieval Tibetan literature, we find description of the territory of Sambhal in Uddiyana. We gather

1. L. S. S. O' Malley, *Bengal District Gazetteers, Sambalpur* (1909) P. 217. Identical stories prevail about origins of other places like Cuttack and Baripada where crows take the place of the hare and hawks take the place of hounds.

from the *Bstanhgyur* Catalogue that Indrabhuti, the propounder of Vajrayana Buddhism, was the Raja of Sambhal in Uddiyana. This Sambhal is probably no other than modern Sambalpur¹. The suffix 'pur' was later added to the original name Sambhal when the territory came under the rule of the Chauhans. The French traveller Tavernier, writing about the middle of the 17th century A. D., referred to "Sumelpur" as a region rich in diamonds obtained from the most ancient mines. The historian Edward Gibbon (1737—1794) in his "Decline and Fall of Roman Empire" states that Rome was being supplied with diamonds from the mines of "Sumelpur" in Bengal. "Sumelpur" in Bengal is no other than the present Sambalpur of Orissa. The presiding goddess Samalai is probably named after the territory of Sambhal.

3. Location, general boundaries, total area and population of the district

The district of Sambalpur lies between 20°43'N and 22°11'N latitudes and 82°39'E and 85°13'E longitudes.

It is one of the western-most districts of the State of Orissa and is roughly triangular in shape. It is bounded on the north by the district of Sundargarh and on the east by the district of Dhenkanal, on the south lies the district of Balangir and on the west the district of Kalahandi while along its north-western and western boundaries lie the districts of Raigarh and Raipur of Madhya Pradesh.

The district has an area of 6,764·6 square miles or 17,520·3 Sq. Km. (6,763 square miles according to Surveyor-General of India). According to the Census of 1961, the district had a population of 1,508,686 out of which 756,163 were males and 752,523 females. In order of size and population it holds the second and the fourth places, respectively among all the districts of Orissa.

4. History of the district as an administrative unit and the changes in its component parts.

In this regard, we get the following account from King's* Gazetteer: "Few districts have been affected by so many administrative changes as Sambalpur. After the cession by the Marathas in 1817, though the direct rule rested with the Raja, a general power of control was reserved for the British authorities, and soon after the accession of the last Raja (1833) the State was placed under the Agent of the Governor-General for the South-West Frontier. This Agency, it may be explained, was called into existence by Regulation XIII of 1833 after the suppression of the Kolh Rebellion of 1831-32, and at first comprised the greater part of

1. This view is controverted by R. M. Nath, N. N. Das Gupta and Prof. M. Levy who locate it in Assam, Bengal and Wat valley of Kabul on the north-west of India vide M. Winternitz, History of Indian literature Vol. II, p. 400, Journal of Assam Research Society, Vol. VI Nos. 1 and 2, 1937, pp. 14-57, Indian Historical Quarterly Vol. XI, p. 142 ff and Journal Asiatique 1915, p. 105 ff.

* Sambalpur District Gazetteer (1932)—By F. C. King.

what is now the Chotanagpur Division, but subsequently Sambalpur with other Tributary States, was added to it. In 1849, Sambalpur came under the direct rule of the British.”

The Kingdom of Sambalpur which was under the rule of the Chauhan Kings lapsed to the East India Company in 1849 when the last Raja Narayan Singh died without any issue. It was then administered by the Principal Assistant of the Agent for the South-West Frontier, the latter having his headquarters at Ranchi. The designation of the Agent changed in 1854 to Commissioner of Chotanagpur and that of his Principal Assistant to Senior Assistant Commissioner. In 1860, Sambalpur was transferred to Orissa Division of Bengal but on the 30th April, 1862 it was made over to the newly constituted Central Provinces. In October 1905, the bulk of the district was retransferred to the Province of Bengal and was made a part of Orissa Division. On the 1st April, 1912, the Province of Bihar and Orissa was separately constituted. Orissa was made a separate Province on the 1st April 1936 when the Zamindari of Khariar, which was in the Raipur district of Central Provinces, was brought to Orissa and made a part of the district of Sambalpur. It constituted a new subdivision of the district, named, Nawapara subdivision. In that chain of readjustment of areas 61 villages (54 villages of Padampur Taluk and 7 Khalsa villages) with a population of 23,773 which were in Raigarh district of the Central Provinces were transferred to Sambalpur and included in the Sambalpur subdivision of the district. The total area of these villages was 5,099.14 acres and the police-station of Padampur which had jurisdiction over the villages was renamed as Mahadeopali police-station. After the construction of Hirakud Dam submerging many of the villages, a new police-station was started at Rengali (not Railway station Rengali) and the police-station at Mahadeopali was abolished. After merger of the States on the 1st January 1948 Bamra was amalgamated in the district of Sambalpur, being divided into two subdivisions, namely, Deogarh and Kuchinda; and another ex-State Rairakhhol which was a subdivision in Dhenkanal after merger was transferred to Sambalpur on 26th October 1949. On the 1st November, 1949, Sambalpur lost Nawapara subdivision to the district of Kalahandi. A new subdivision, called Padampur subdivision, was formed on the 1st July 1969 taking out the areas of 7 police-stations from Bargarh subdivision.

Subdivisions and police-stations

The district is divided into six subdivisions, namely, Sambalpur, Bargarh, Rairakhhol, Kuchinda, Padampur, and Deogarh. Sambalpur and Bargarh are the two old subdivisions of the district and are roughly separated by the Mahanadi river, although a few villages of Sambalpur subdivision lie on the west of the river.

The subdivision of Sambalpur has an area of 4382.3 square Km and its population, according to the Census of 1961, was 510,077 out of which 259,206 were males and 250,871 females. Out of the total population of the subdivision 416,916 persons live in villages numbering 738. There are five towns in the subdivision, namely, Sambalpur, Hirkud, Burla, Jharsuguda, and Brajarajnagar with a total population of 93,161.

The Bargarh subdivision has an area of 2689.1 square Km. and a total population of 356,350 and the headquarters Baragarh is the only town of the subdivision having a population of 15,375.

The subdivision of Deogarh has an area of 2703.9 square Km. with a population of 120,213 out of which 60,043 are males and 60,170 females. There are 620 villages with 113,374 persons, while Deogarh is the only town of the subdivision with a population of 6,839.

The subdivision of Kuchinda has an area of 2445 square Km. and it has a population of 132,726 out of which 66,186 are males and 66,540 females. There is no township in the subdivision. The entire population inhabits 520 villages.

The Padampur subdivision has an area of 3142.5 square Km. and a population of 336,772 of which 167,150 are males and 169,622 are females.

The subdivision of Rairakhol has an area of 2157.5 square Km. having a population of 52,548 out of which 26,324 are males and 26,224 females. There is no town in the subdivision. The people live in 399 villages.

The following table shows the subdivision-wise police-stations of the district with area and population according to 1961 Census:

Name of the subdivision	Name of the police-station	Area		Population in 1961
		Sq. Km.	Sq. mile	
(1)	(2)	(3)	(4)	(5)
1. Sambalpur, (A. 1,692 square miles (4382.3 Sq. Km.) P. 510,077)	1. Brajarajnagar ..	207.4	83.1	43,783
	2. Burla	194.5	75.1	32,546
	3. Dhama	352.2	136.0	39,338
	4. Hirkud ..	97.4	37.6	43,783
	5. Jharsuguda ..	240.6	92.9	12,264
	6. Jujomura ..	543.9	210.0	32,546
	7. Katarbaga ..	569.8	220.0	27,497
	8. Laikera ..	707.1	273.0	26,133
	9. Lakhanpur ..	642.1	247.9	39,338
	0. Rengali ..	342.1	132.1	33,677
	11. Sambalpur ..	158.8	61.3	54,651
	12. Sason ..	318.6	123.0	66,881

1 Square mile = 2.59 Square Kilometres.

Name of the subdivision	Name of the police-station	Area		Popu- lation in 1961
		Sq. Km.	Sq. mile	
(1)	(2)	(3)	(4)	(5)
2. Bargarh (A. 1,038.3 Sq. miles (2689.1 Sq. Km.) P. 356,350	1. Ambabhona ..	579.6	223.8	37,318
	2. Attabira	613.6	236.9	63,982
	3. Bargarh ..	388.2	149.9	82,594
	4. Barpali ..	282.8	109.2	62,045
	5. Bhatli ..	450.9	174.1	52,769
	6. Bheran (Bheden) ..	374.0	144.4	57,642
3. Deogarh, A. 1,044 Sq. miles (2703.9 Sq. Km.) P. 120,213	1. Barakot ...	751.1	290.0	31,970
	2. Deogarh	838.0	312.0	34,676
	3. Naikul	616.4	238.0	26,950
	4. Riamal (Portion- lying in Deogarh Subdivision)	528.4	204.0	26,617
4. Kuchinda, A. 944 Sq. miles (2445 Sq. Km.) P. 132,726	1. Gobindpur ...	373.0	144.0	28,900
	2. Jamunkira (Jamankira)	756.3	292.0	25,884
	3. Kuchinda ...	632.0	244.0	39,633
	4. Mahulpali	606.0	234.0	35,888
	5. Riamal (portion- l y i n g i n Kuchinda Sub- division)	77.7	30.0	2,421
5. Rairakhol, A. 833 Sq. miles (2157.5 Sq. Km.) P. 52,548	1. Charmal ...	481.7	186.0	12,847
	2. Naktideul	891.0	344.0	20,428
	3. Rairakhol	784.8	303.0	19,273
6. P a d a m p u r, A. 1,213.3 Sq. miles (3142.5 Sq. Km.) P. 336,772	1. Bijepur	325.8	125.8	57,544
	2. Gaisilat	313.4	121.0	39,085
	3. Jagdalpur	660.5	255.0	49,814
	4. Melchhamunda	309.0	119.3	36,969
	5. Padampur	527.3	203.6	55,849
	6. Paikmal	579.4	223.7	40,004
	7. Sohela	427.1	164.9	57,507

SOURCE: 1961 Census

5. Topography

(i) Natural Division

The district consists of a wide expanse of fairly open country fringed by forest-clad hills as well as a series of low hill ranges of extremely irregular shape. Sambalpur and Bargarh (including Padampur) Subdivisions together broadly speaking form an undulating upland varying in elevation from 479 feet (146m.) to 750 feet (228.60m.) above sea-level excluding hills and table lands, the general slope of which is from north to south, but it is much broken up by rugged ranges of hills, and is traversed in all directions by drainage channels mostly leading from the hill ranges to the Mahanadi and its tributaries. Isolated hills rising abruptly from the plains and hill ranges are also common and a considerable area consists of ground cut up by ravines or broad sandy ridges.

The district may be divided into five natural divisions (1) Bargarh plain, (2) Borasambar, (3) Ambabhona and Lakhanpur, (4) Sambalpur subdivision, and (5) the hilly regions of Rairakhol, Deogarh, and Kuchinda subdivisions.

The Bargarh plain itself is divided into 3 natural divisions. The greater portion is an open plain of considerable fertility drained by the Danta and the Jira, the two tributaries of the Mahanadi. To the north of this plain runs the Barapahar range of hills and to the south-west lie the valley of river Ong (Ang). The Bargarh plain is not a flat alluvial tract but an expanse of undulating country sloping down from the Barapahar hills in the north, to the Mahanadi valley in the east. It contains a good portion of the cultivated land of the district and its undulating character affords excellent scope for irrigation reservoirs. The soil is a mixture of sand and gravel as well as of clay. It is a good light rice soil and unlike the more fertile black cotton soil it grows few weeds and does not harbour dangerous insect pests. This tract is nowhere bare of vegetation and the villages are found embowered with mango groves.

The Borasambar tract lies to the south-west of the Bargarh plain. It is bounded by high hills on the north and south and the intervening plain is drained by river Ong (Ang), the valley of which particularly in the eastern portion is best suited to agriculture. Its soil contains some river silt and is enriched by hill drainage.

The Ambabhona and Lakhanpur area is cut off from the rest of Bargarh subdivision by a long spur of the Barapahar hills running south-west for a distance of nearly 48 km. This hill forms a barrier to

communication with the rest of the subdivision. Only one motorable road, the Bargarh-Bhatli-Ambabhona Road crosses the hill ranges. In February 1967, a metre gauge railway line from Bargarh to the limestone quarry at Dungri has been opened which also crosses the ranges. Ambabhona is a fairly level tract sloping down from the hills to river Mahanadi and is under close cultivation. Lakhanpur is a wide valley surrounded by forest-clad hills and is also closely cultivated.

The Sambalpur subdivision does not contain any large plain like that of the Bargarh subdivision. The chief areas of cultivation lie along the banks of the Mahanadi, in the valley of the Ib river, in the valleys and glens of Garh-Loising and Jujomura ex-Zamindaris and in the flat but well wooded country to the east of Sambalpur-Jharsuguda Road. The Hirakud Dam has changed the face of this part of the district as some of the most fertile tracts of this subdivision have been submerged and permanently lost to cultivation. Green rice fields have been converted into a vast expanse of water as far as the eye can reach.

Rairakhol, Deogarh, and Kuchinda subdivisions have no rich and pronounced plains like Bargarh and Sambalpur. They, however, contain valleys and plateaus unevenly distributed, which appear like patches of plain lands. The Rairakhol subdivision contains a series of low hill ranges extending towards the valley of the Mahanadi. Although there are high isolated lands, there are no regular uplands except towards the border of Deogarh subdivision in the north. The Deogarh subdivision is entirely a hilly tract. There are ranges of hills with extensive plateau lands and valleys which are suitable for cultivation. The subdivision of Kuchinda can be broadly divided into two natural divisions, the hilly regions and the plains. The hilly regions lie to the north, east and south of the subdivision, covering an area of about 1036 square Km., while the remaining 1409 square Km. are plain lands lying on the west and central part of the subdivision.

6. Hill System

The Barapahar (literally, 12 hills) are the main hill ranges in the Bargarh subdivision covering an area of over 777 square Km. and attaining a height of 2,267 feet (691 m.) at the peak of Debrigarh. Debrigarh is one of the few hills of the range offering level ground and good water-supply near the summit. It is one of the few hill sites in the district suitable for health resort. The main portion of the range is situated in the north-west of the Bargarh subdivision where it separates Ambabhona and Lakhanpur from the rest of the district. To the east of the Mahanadi, it is continued in a long chain, which gradually decreases in height till it crosses into Sundargarh district. The Mahanadi formed a lake in geological times to the north

of this range till it burst through and the lake emptied out. The Hirakud Dam has reconstructed the barrier and repeated the ancient lake. To the south-west, an outlying ridge projects for about 48 km. as far as the Singhora pass, just beyond the border of the district where the Sambalpur-Raipur Road winds through it.

The second group of hills is the Gandhamardan range running along the southern boundary of the ex-Zamindari of Borasambar, separating it from the district of Balangir. This hill range rises to 2,000—3,000 feet (629·60m. 914·40 m.) in height and reaches its highest point (3,234 feet or 985·72 m.) in the peak of Nrusimhanath, one of the picturesque places in the district. Another range branches off to the west of Nrusimhanath running first north-south and then north-east near Jagdalpur, where it is broken by the Ong (Ang) river. Another range runs eastward to Tal and then to the north-east forming the boundary between the district and Raipur district of Madhya Pradesh.

In Sambalpur subdivision, one of the principal ranges is the Jharghati which crosses the State Highway No. 10 some 22 km. north of Sambalpur near Rengali railway station. Its highest point is 516 metres above the plain. To the south are a succession of broken ranges running parallel with the Mahanadi having a height of 476 metres at Mundher and 710 metres at Bodhanpali. There are other small ranges and isolated hills, scattered over the subdivision. Among them may be mentioned a range running south-east of Sunari (a village 32 km. north-west of Sambalpur), the highest point of which is 472 metres above sea-level, and two hills close to one another about 16 km. north-west of Sambalpur, called the Gotwaki and Guja hills, with a height of 353 metres and 385 metres respectively. Another high hill is that called Maula Bhanja (428 metres) in the range west of Rengali which is known as the Katarbaga range from the village of that name to the north. A noticeable feature of this hill system is absence of flat topped trap hills which are so common to the north and west.

The hill system of Deogarh subdivision can be grouped mainly under 4 ranges:—

(a) The Khajuria range on the north running from west-east in Badbar pragna of Deogarh police-station with a maximum height of 745 metres.

(b) The Pradhanpat and Kaidanta ranges 743 metres and 816 metres respectively are on the north, just below the Khajuria, leaving a vast plateau in between running from west-east up to the bank of the river Brahmani in Batispada pragna of Deogarh police-station.

(c) On the eastern side of the river Brahmani runs a range of hills called Pawri (Poudi) 678 metres in height probably named after the Pauli Bhuyans, who live in the Pawri (Paudi) reserved forest in Barakot police-station.

(d) The Ushakothi range in Kansar and Riamal police-stations extending into Kuchinda and Jamunkira (Jamankira) police-stations towards the west. The hill ranges of the subdivisions are thickly wooded and their elevation is from 610 metres to 762 metres above sea-level.

In Kuchinda subdivision, there are, mainly, two hill ranges one of which runs from Bandhabar pragana on the north-west of the subdivision touching the boundary of Bonai subdivision of Sundargarh district and meeting Khajuria and Pravasuni reserved forests. The second range consisting of Ushakothi and Badarama reserve, starts from the south-west of the subdivision in Gourpali pragana and meets the Kandh area of Deogarh subdivision. Besides these two notable ranges, there are small hills here and there scattered in the plains area of the subdivision.

The Rairakhol subdivision is, on the whole, hilly and hills form continuous ranges in the west, east, north, as well as in the upper central part of the subdivision. The northern hill range extends between the Baudh border and Kisinda valley covering about 259 sq.km, while the central ranges of hills extend from Sambalpur to the borders of Athmallik, and Angul subdivisions of Dhenkanal district. Important peaks on the west and east ranges are Paria (759 metres), Ghomel (723 metres), Buria Pahar (693 metres), Khajurdiha (625 metres), and in the north ranges Pali (565 metres), Derajuri (552 metres), Sursuri (577 metres), Bhaleswar (598 metres), and Bhalodari (564 metres). The southern part of the subdivision has extensive plains which are quite fertile.

7. River System

The district forms a part of the central basin of the Mahanadi which traverses it from the north-west of Sambalpur subdivision to the south-east of that subdivision for a distance of about 122 km. The second big river is the Brahmani which flows from north to south in Deogarh subdivision for a distance of 48 km. in the district. The other rivers are of minor importance as they are either tributaries of the Mahanadi or small Nullahs forming internal drainage in the hill areas of the district.

(i) Mahanadi

The Mahanadi enters the district in the north-west of Sambalpur subdivision and flows into the Hirakud reservoir which covers an area of 774.41 sq.km. when the storage water stands at 192 metres. After

crossing the Hirakud Dam it takes a wide curve and continues due south flowing into the Sonapur subdivision of Balangir district. Before construction of the Hirakud Dam the river contained, in between Padampur and Sambalpur, masses of rocks and huge boulders all over its bed which rendered it very dangerous for navigation. Even after leaving Sambalpur, its course is interrupted at places by great rocks which have been described by Sir Charles Grant as "the terror of boatmen standing up in midstream and realising the exact notion of Scylla and Charybdis". At Kansamra, 10 km. below Sambalpur, there are dangerous rapids. Further down at Huma there is sufficient shelter among these rocks to harbour large fish which respond to the call of the priests of the leaning temple and come to the steps of the bathing-ghat to be fed by the pilgrims. Nobody is allowed to catch these fishes. In spite of rocks and rapids, boats can ascend the river and before construction of the Bengal-Nagpur Railway (now renamed South-Eastern Railway), it was the main outlet for the produce of the district which was carried in boats to Cuttack. Commodities brought back were salt, cloth, kerosene, dried fish and other articles. The through traffic has now been almost entirely appropriated by the Railway and for lighter goods to a large extent by road transport. At Sambalpur, a ferry was being maintained in monsoon months and a Pontoon bridge during dry season, but a bridge over Mahanadi at Durgapali was constructed in 1951 as a part of the Hirakud Dam project. With the construction of the Railway line connecting Sambalpur with Titlagarh, a railway bridge was laid over the extension of the piers parallel to the road bridge. From the Mahanadi bridge one can get a magnificent view of the Hirakud Dam up the river and of the town of Sambalpur downstream.

The principal tributary of the Mahanadi in this district is the Ib which enters Sambalpur from Sundargarh district in the north. Pursuing a southerly course it forms a borderline between the police-stations of Brajarajnagar and Jharsuguda and then falls into the Hirakud reservoir about 26 km. north of Sambalpur. Its main tributary is the Bhedan (or Bonam) which flows from Kuchinda subdivision and joins it near Rampur. Other important tributaries of the Mahanadi on the east are the Maltijhor, Harad, and Jamli. The Maltijhor rises near the boundary of Sambalpur and Rairakhol subdivisions and for some distance passes on the border of Sambalpur and Kuchinda subdivisions. It then pursues a circuitous course to the west and south-west till it falls into the Mahanadi some 6.24 km. south of Sambalpur. The Harad flows from north-east and joins the Mahanadi close to Sambalpur, while the Jamli traverses the southern portion of Sambalpur subdivision and joins the Mahanadi at Huma.

Kuchinda subdivision is, broadly speaking, a hinterland of the Mahanadi. It is drained by four important rivers, namely, Sapai, Bhedan, Kharla and Malti. Out of these four, Bhedan and Kharla meet together at Lasa 3·22 km. away from Kuchinda and the joint stream ultimately flows into river Ib, the tributary of the Mahanadi. All these rivers, except Malti, flow from east to west of the subdivision. The Bhedan rises from the Bonai subdivision of Sundargarh district and falls into river Ib after flowing for about 129 km. Its total length in this subdivision is 64 km. The Kharla has its rise from Bonai border and it meets the Bhedan at Mahaladihi. Out of its total length of 64 km. it flows about 56 km. in this subdivision. The Malti rises from Rairakhol and falls into the Mahanadi flowing about 80 km. It flows in this subdivision for about 24 km. The Sapai has its rise from Sundargarh district and it falls into the Ib river after flowing about 56 km. of which about 24 km. are in this subdivision. These rivers are not perennial. They dry up in summer, while during rains they become torrential. They are not navigable, nor are they harnessed for any big irrigation project.

To the west, the principal tributaries of the Mahanadi are Jira and Jhaun which flow through the Bargarh plain and join the river Mahanadi in the extreme south of the district. The Jira has a main tributary, the Danta, which joins it a few miles north of its confluence with the Mahanadi near the village Gandturm in Bheran (Bheden) police-station. The Jira has been bridged on National Highway No. 6 at Bargarh by a screw-pile bridge.

The only other river calling for separate mention is the Ong (Ang) which rises in the Nawapara subdivision of Kalahandi district and enters Borasambar at its extreme south-west corner. It flows through it in a wide semi-circle from west to east and leaves the district a few miles to the east of Gaisilat eventually joining the Mahanadi in the Sonapur subdivision of Balangir district.

(ii) Brahmani

The second biggest river in the district is the Brahmani which passes through Deogarh subdivision from north to south dividing the Barakot Tahsil into almost two equal parts. Near the village Kulsara in Barakot police-station the river has a small island in its bed which is called Badkudar and the local people utilise it for the purpose of growing post-monsoon crops. The river has been bridged near Barakot by the National Highway No. 6.

(iii) Minor rivers

A small Nallah called Kharla runs east-west in the valley between the Khajuria and Pradhanpat hills and enters Kuchinda subdivision where it meets river Ib at Purunapali. The Malti has been bridged

on the National Highway No. 6 at the boundary between Sambalpur and Deogarh subdivisions. The Gohira Nallah has its origin from the village Pravasuni and flowing from west to east in the heart of Deogarh subdivision joins river Brahmani near the village Gogwa (Gogua). The Gohira has its tributary called the Motuali Nallah which rises near the village Tusula and joins Gohira at village Trib. The Arkhai Nallah which has its origin from the Hiran hill flows from west to east for about 14 Km. forming a natural boundary between Deogarh and Rairakhol subdivisions from the village Hiran to Thakramal where it joins the river Tikra in Riamal police-station. The river Tikra rises from the Kisinda hills in the north of Rairakhol subdivision and passing through some important villages like Kisinda Sarapali, and Hitasara enters into south-east of Deogarh subdivision and ultimately joins the river Brahmani at Bijigol in Talcher subdivision of Dhenkanal district. The Tikra river is formed by a combination of several hill Nallahs in the northern part of Rairakhol subdivision, namely Champali, Sankha, Andhari and Arkhai Nallah. The southern part of Rairakhol subdivision is drained to the Mahanadi by the Karandijhor, Surubali, and Harihar Nallahs. The Aunli Nallah forms the boundary between Rairakhol and Athmallik subdivisions and enters Angul subdivision. It touches Deogarh subdivision at village Aunli and Nuapara. It meets the river Tikra near Joradong⁴ in Deogarh subdivision. There are two other small rivers in Deogarh subdivision, namely Kola (Kalla) and Mankra (Makla). The Kola (Kalla) has its origin near the village Jalisuan and it meets the Brahmani at Kulsara in Barakot Tahsil flowing from east to west. It runs for about 9 miles within this subdivision. The Mankra (Makla) has its origin at Pallahara and flowing from north to south, forms a natural boundary between Pallahara, and Deogarh subdivisions for about 10 km. It meets the river Brahmani near Bindpur.

8. Springs, Waterfalls, Lakes and Tanks

There are natural springs at Narsinghnath at the foot of Gandhamardan hills of Padampur subdivision forming streams flowing in cascades down the steep hill side. The waterfalls are called *Kapildhar*, *Bhim dhar*, and *Chal dhar*, which are considered to be very sacred. Thousands of people congregate every year on Sivaratri in February and on Nrusingha Chaturdasi in May to bathe in these falls.

In the Barapahar hills there are a few springs notable among which is the one near the village Ghens.

In Deogarh subdivision there are 3 small hill springs, namely Pradhanpat, Koradkot, and Liamura. Being located on hill top they fall down the slope of hills creating several waterfalls. The Pradhan

waterfall in Deogarh subdivision supplies water to Deogarh town throughout the year while hydro-electric¹ power is generated from the Koralkot fall and supplied to Deogarh town. Koralkot and Liamura falls provide irrigation to the neighbouring areas, 50 acres of land are irrigated by the former. The latter irrigates about 30 acres.

There is no natural lake in the district. The Hirakud reservoir covers a large area in the northern part of Sambalpur subdivision. The total length of the main dam is 4,800 metres with nearly 21 km. of low earthen dyke at the flanks. The reservoir formed by the dam has a water spread of about 777 sq. km. at high level and shore line of 251 km. Its gross storage capacity is 6.60 million acre feet of which 1.88 million acre feet form a dead storage providing the minimum head for power generation. The remaining capacity of 4.72 million acre feet provides a sufficient reserve for flood control, live storage for irrigation and power generation. It is considered to be the largest artificial lake in the continent of Asia.

The natural springs which come down the Narsinghnath hills create a pool of water at the foot of the hill close to Narsinghnath Temple. The pool is called Haranpapa, the water of which is believed to be capable of washing away all sins. People accused of slaughter of cows can wipe out their sin only by a dip in this pool. A legend found in the 'Nrusimha Mahatmya' states that Lord Siva after killing the cow demon could not free himself from his sin anywhere in the world and subsequently came to this place to take a dip in the holy water and got himself released of the stigma. Many people of the neighbouring areas immerse the ashes of their forefathers in this pool, believing that they would attain heaven thereby.

There are many tanks in this district, some of which serve the purpose of irrigation. In Rairakhol subdivision alone, there are as many as 269 tanks out of which 197 tanks irrigate about 6,200 acres. Among the important tanks in Bargarh subdivision, mention may be made of the Victoria Sagar near Ghens, Yogimunda in Barpali, and Ranisagar in Bijepur. In the town of Sambalpur, the most important tank is the Chhatrasagar excavated by the Chauhan ruler Chhatra Sai. Recently, a small lake has been formed by putting a weir across the Mahanadi river in order to give people of Sambalpur easy access to river water. It has been named Ajudhia Sagar after Dr. Ajudhia Nath Khosla, former Governor of Orissa, and a boulevard made on the bank of the lake is named Sushila Vihar after the name of the late wife of the Governor. Both Ajudhia Sagar and Sushila Vihar were inaugurated on the 10th June 1964 by Dr. Ajudhia Nath Khosla.

1. It is the oldest hydro-electric Project in India and was started by Raja Sir Sudhal Deb at the beginning of the 20th Century.

14/03/2

9. Geology

The geological formations represented in this district can be arranged in the following order of increasing antiquity :

Recent	..	Soil and alluvium
Tertiary	..	Laterites and Lateritic iron-ore---usually mangani-ferous.
Lower Gondwana	}	Damuda series .. Kamthi stage
		Talchir series } Barakar stage, Needle shales & Sandstone. Boulder bed.
UNCONFORMITY		
Cuddapah	..	Shales and Sandstones. Quartzites and Limestones.
		Newer Dolerites, Pegmatites, Quartz Veins Amphibolites.
Dharwars	..	Gondites, Mica schists, Dolomite-marble, phyllites.
Archaeans	..	Gneisses, granites, charnockites, Mica-schist, Quartzites and Khondalites, etc.

Geological formation

Within the Archaean sediments, the relative ages of the various representatives are uncertain. The Archaean metamorphic rocks are probably of Dharwarian and post-Dharwarian age. The strike of the rock formation is NNE-SSW to NE-SW with some local variation trending north-south. Around Sambalpur town, the strike is variable in places becoming ENE-WSW.

The gneisses of the Archaean formations may be classified into porphyritic granite-gneiss, garnetiferous granitoid gneiss, fine-grained biotite gneiss and charnockites. The porphyritic granite gneiss is the most prevalent type. In Sambalpur district, this is mainly represented by biotite granite, although at places hornblende is also present. Pegmatite and quartz veins are common and some dykes of amphibolite and dolerite are also noticed. The dolerite and amphibolite dykes intrude the granite and biotite gneiss trending in NW-SE direction. The pegmatite veins are seen running in NE-SW direction.

The Cuddapah formations rest unconformably over the Archaean. The rocks are normally horizontally bedded, but marginally they are frequently folded and faulted. The rocks are purple shale and slate with intercalations of limestones. The lowest beds consist of sandstones overlain in many places by clays, clayey shales and limestone.

Overlying Cuddapah are the Gondwana formations separated by a great hiatus from the older rocks of the Indian Peninsula. The basal beds of the formation are composed of grooved, striated and scratched boulders and pebbles, grits and fine clays now forming shale, the whole comprising a group of glacial deposits. These comprise the Talchirs and their contact with the metamorphics at places is a faulted one. The formations consist of Talchir boulder bed, dirty-green micaceous sandstone and needle shales in Rampur coalfield.

The coal bearing beds are fluvial and lacustrine sediments, consisting of sandstones, shales, fireclays and coal seams. These formations are known as Barakars which carry coal and coaly shale interbedded with sandstone. The uppermost series of sandstones is correlated as Kamthi stage. The Gondwanas of the district belong to the lower division and their strike is NW-SE. Plant fossils from the Barakars east of Patrapali ($21^{\circ} 45' : 83^{\circ} 57' 30''$) have been identified as *Glossopteris indica* and *Sphenopteris polymorpha*. A fossil plant specimen collected from Kamthi horizon has been identified as *Schizoneura gondwanensis*.

Kamthis are a group of beds of conglomerate, sandstone and shale which are devoid of carbonaceous matter and present a reddish appearance due to the freely disseminated iron oxide. Analysis of two samples of the ironstone from Rampur coalfield gave Fe_3O_4 —31.11 and 33.59 per cent and silica 46 and 56.06 per cent, respectively.

A part of the district is covered with irregular deposits of laterite and lateritic iron-ore at various altitudes. High level laterites are known at heights of 914 m to 1220 m capping the Khondalite of Gandhamardan hills on the Sambalpur-Balangir border. The extension of laterite capping is usually in NW-SW direction. These laterites are bauxite bearing.

Soil forms merely a cap of varying thickness derived by alteration of the rocks below so that their nature depends on the rocks from which they have been derived. The unclassified granites which is so widespread, give rise to a rather coarse sandy soil. Over the mica-schists, which occurs as patches of variable extent in the granitic area of Sambalpur the soil cap met with are argillaceous. The Gondwanas comprise of alternating shales and sandstones. The latter containing a considerable proportion of feldspathic grains have weathered to Kaolin. On the whole, the flatter low-lying coal field country is more widely covered with redistributed surface capping than are the high lands.

10. Economic Minerals and Rocks

A large variety of minerals and ores occur in this district. These include bauxite, beryl, clay, coal, dolomite, graphite, limenite, iron-ore, galena, limestone, mica, ochres, quartz, etc. It has also been reported that diamond was once being collected from the bed of Mahanadi river near Hirakud. Gold is still being recovered at some places.

The district has abundant quantities of building stones and Kankar.

(1) Abrasives

Coarsely crystallised quartz are found near Satsama ($21^{\circ}9' : 84^{\circ}05'30''$) in Rairakhol subdivision. The crystal aggregates attain considerable size but undisturbed crystal is rather scarce. These can be utilised as abrasives. Pebbles of flint, chert, etc., are also found in the stream beds at some places in the district.

(2) Beryl

Large crystals of Beryl have been found in the Pegmatite near Burhiakata ($21^{\circ}18' : 84^{\circ}08'$). The occurrence is a small one.

(3) Bauxite

Bauxite has been found to occur in the Gandhamardan plateau situated at the border of Sambalpur and Balangir districts. The potentiality of this occurrence was brought to light by the State Directorate of Mines in the year 1960-61. Bauxite occurs in the form of lenses pockets and thin blankets under a lateritic cover varying in thickness from nothing to 3-4 metres. The thickness of bauxite horizon has been found to be as much as 6 metres. The total reserves in this plateau, which covers a portion of Balangir district, have been estimated at over 2 million tonnes.

(4) Clays

The clays occurring in Sambalpur district are of three types :

- (a) Sedimentary clay
- (b) China-clay
- (c) Lithomarge

The sedimentary clays which occur in beds are mainly of Gondwana age although some occurrences have been recorded in Cuddapah formations. China-clays have been derived as alteration products of grinites and other felspar-rich rocks. Lithomarge occurs in association with the laterites.

(a) FIRECLAY

Fireclay occurrences are mostly confined to the Ib river (Rampur-Hingir) Coalfield. The important occurrences are the following :—

- (i) Jurabaga-Darlipali area
- (ii) Kadelmunda-Kudopali-Lajkuria area
- (iii) Gamhadera area
- (iv) Banjari area
- (v) Khaliabahal area north of Banjari

(i) *Jurabaga-Darlipali area*—The Jurabaga fireclay deposit occurs 3 kilometres south of Belpahar ($21^{\circ}49'20''$: $83^{\circ}51'$), having a total thickness of 15 metres and strike length of 3,540 metres.

The clay is reported to have fusion points varying between $1,600^{\circ}$ C and $1,640^{\circ}$ C.

A test made on a sample of clay from the locality gave the following results:

Very hard, fine, plasticity good, colour (unburnt) dirty white, colour (burnt) white, linear shrinkage about 10 per cent, neither cracks nor fuses at about $1,400^{\circ}$ C.

A 0.6 m. thick clay bed has been located in the nala section about 0.8 Km. north-west of Darlipali ($21^{\circ}46'$: $83^{\circ}51'$) village. The colour varies from white to different shades of grey but are usually stained yellow or red due to iron.

(ii) *Kadelmunda-Kudopali-Lajkuria area*—A fireclay bed is extensively developed in the Kudopali ($21^{\circ}47'$: $83^{\circ}54'30''$) and Lajkuria ($21^{\circ}48'20''$: $83^{\circ}54'30''$) area overlying the Lajkuria seam and extends over a distance of nearly 2.4 Kms. Dip of the beds varies from 8° to 10° .

(iii) *Gamhadera area*—Overlying the Gamhadera seam a 1.2m. thick horizontal bed of fireclay can be traced over a length of 1710m.

The same bed can be found between Mirdnadera and Junadih and also at Chuakani ($21^{\circ}50'30''$: $83^{\circ}53'40''$).

(iv) *Banjari area*—Fireclay is seen west of Banjari ($21^{\circ}48'30''$: $83^{\circ}49'30''$) in a well. The thickness of the bed is about 1.5 metres and it extends in a general N 60° E direction with 6 to 8° dip towards north.

(v) *Khaliabahal area north of Banjari*—North of Banjari in the Lilari Nalla, fireclay is exposed near Khaliabahal, where it is associated with inferior grade of coal and coaly shale. The thickness is 1.8 metres and

it extends over a length of about 300 metres. It is covered by laterite and alluvium.

The reserves of fireclay estimated in the deposits mentioned above (i to v) are as follows :

	Million Tons.
(1) With overburden and fireclay ratio of 1 : 1	10.45
(2) Overburden and fireclay ratio of 2 : 1	10.45
(3) Overburden and fireclay ratio of 3 : 1	15.68

Good deposits of fireclay are also found near Khinda ($21^{\circ}43' : 83^{\circ}58'$), Bari Pahar ($21^{\circ}46' : 83^{\circ}47'$), Rampur ($21^{\circ}46' : 83^{\circ}55'$), Bundia ($21^{\circ}47' : 83^{\circ}55'$), Katabaga ($21^{\circ}47' : 83^{\circ}56'$), Kudopali ($21^{\circ}47' : 83^{\circ}54'$), Ainlapali ($21^{\circ}47' : 83^{\circ}54'$), Kirarama ($21^{\circ}46' : 83^{\circ}53'$) Talabira ($21^{\circ}44' : 83^{\circ}58'$). The reserves at Talabira are sizable where a thick band of fireclay overlies coaly shales. The deposit is being worked and the present output is of the order of 4,000 tonnes a month.

(b) CHINA-CLAY

The following china-clay deposits have been recorded :—

(i) *Ghichamura* ($21^{\circ}46' : 84^{\circ}06'$)—About 2 Kms. east of Ghichamura yellow and red stained china-clay is seen.

(ii) *Sagunpali* ($21^{\circ}35' : 84^{\circ}91'$)—A pocket of china-clay having yellowish and greenish tinge, resulting from the decomposition of gneisses and pegmatites, occurs about 1.2 Km. north of Sagunpali. The extent is, however, small.

(iii) *Chuhukitikra* ($21^{\circ}39' : 84^{\circ}09'$)—About 1 Km. north-east of Chuhukitikra, coarse-grained gneiss and pegmatites have been much altered over a large area. The weathered gneiss is associated with occasional yellow and red, impure but soft clayey bands of variable thickness. A network of coarse kaolinised pegmatite in the gneiss was encountered at the bottom of the pit and the gneiss enclosed in this network has been altered by hydrothermal action to a gritless, fine-grained creamy, soft rock, composed essentially of about 75 per cent of good clay.

The pegmatites have been completely kaolinised. The altered pegmatites consist of over 90 per cent of almost grit free, excellent white-clay. The washed clay is of excellent grade, perfectly white, gritless and plastic.

(iv) *Piplipali* ($21^{\circ}11' : 83^{\circ}46'$)—Kaolin is reported from altered granite gneiss and pegmatite about 0.5 Km. north of Piplipali.

(v) *Katapali* ($21^{\circ}24' : 83^{\circ}38'$)—The country around Katapali is flat, with occasional rocky exposures of granite gneiss, sporadically altered to kaolin.

(vi) *Baresinghari* ($21^{\circ}25' : 83^{\circ}56'$)—About 1.5 Km. south-west of the village, the clay is derived from the alteration of quartz-sericite-schist and sericite-schists, which have been kaolinised by the adjacent granitic magma. The proportion of clay varies from 25 to 50 per cent of the bulk of the altered rock.

The clay is not plastic. On burning it retains its whiteness and its linear shrinkage is about 20 per cent. It does not crack but softens slightly at about $1,400^{\circ}$ C.

Other deposits have been recorded from Desar ($21^{\circ}37' : 83^{\circ}52'$) and Paharsingira ($21^{\circ}28' : 83^{\circ}46'$), Katapali ($21^{\circ}24' : 83^{\circ}38'$), Banjipali. ($21^{\circ}21' : 83^{\circ}46'$) and Danga Chancha ($20^{\circ}54' : 83^{\circ}02'$).

(c) WHITE CLAY (LITHOMARGE)

(i) *Khola* ($21^{\circ}39' : 83^{\circ}39'$)—To the south-east of Khola village in Bargarh subdivision, a bed of white clay with traces of creamy or yellowish clayey layers occur associated with ferruginous quartzitic sandstones of Cuddapah age.

This clay is soft, fine and of good plasticity. The colour when unburnt is cream-white and it is greyish white when burnt. Linear shrinkage is about 12.5 per cent. It neither cracks nor fuses at about $1,400^{\circ}$ C.

(ii) *Baripahar* ($21^{\circ}46' : 83^{\circ}47'$)—Clay beds occur interbedded with sandstones in the hill 0.6 Km. north of Baripahar village. These clays presumably persist laterally around the hills. There are three bands of clay found in this locality.

The physical properties are almost similar to Khola deposits. These can be utilised either as refractory clays or for glazed stoneware tiles, etc.

Deposits of white lithomarge associated with ochre occur about 0.5 Km. north-west of Akhradand ($21^{\circ}39' : 84^{\circ}12'$) in the Nalibassa hill range bordering Bamra. The deposits occur along a ridge of laterite striking WNW-ESE. The white lithomarge and ochre occur as bands in the lateritised rocks. Dips are vertical or steep. The width of the bands varies from a few cms. to 6 m. The washed white clay is of excellent type, because of its white colour, fineness, plasticity and freedom from grit.

Test results

Colour (unburnt)—Pink, colour (burnt): yellowish grey, linear shrinkage: about 10 per cent, neither cracks nor fuses at about $1,400^{\circ}$ C, brick friable.

Rail (21°07': 84°34')—White clays have been marked at about 2.5 Kms. NE of Rail near Rairakhol. This has been derived from the alteration of Gondwana sandstones. It is fairly free from ferruginous materials but much admixed with quartz. The washed material shows excellent plasticity but the quality is variable from place to place.

(5) Coal

Mention about the occurrence of coal, which in this district is confined to the area known as Ib river (Rampur-Hingir) coal field was made as early as 1884 by the Asiatic Society of Bengal. This coalfield forms the eastern end of a basin of Gondwana rocks extending north-west wards up to Cheraipani, north of Raigarh in Madhya Pradesh. Within the coalfield there are several seams of coal of which the Rampur, Lajkuria and Gamhadera are important. Rampur seam is exposed in the Lilari Nala section north of Darlipali (21°46': 83°52'). Lajkuria seam has been encountered in a pit south-west of Kadelmunda (21°46'30": 83°51'30"), whereas Gamhadera seam has been exposed in the Gamhadera nala N. E. of Bholamal (21°47'30": 83°50'). Another seam known as Ib river seam, which has been encountered in pits put on the eastern bank of the river, is often correlated with Rampur seam by some and with Banglow seam (a seam occurring below Rampur seam) by others.

The Rampur seam is about 30 metres thick with 15 metres of workable coal; the bottom 3 metres is classified as Grade I and is being worked. The rest of the coal in the field is inferior in quality with ash content ranging from 20 to 35 per cent. The coal from the field is non-coking.

Analysis of coal of the different seams are as follows:

	Moisture	Ash	Volatile matter	Fixed carbon	Calorific value
Rampur seam (Bottom section).	4—10%	13—20%	30	45—50%	About 10,000 B.Th.u/Lb
Lajkuria seam (Average analysis of 1'8 metre section).	9.90	21.21	31.45	37.44	9,036
Gamhadera seam ..	12.22	25.00	29.44	33.34	8,204
Banglow (Ib) seam (Average of 2'2 m. section).	9.80	12.80	28.44	48.96	10,840

The recoverable reserves available up to a depth of 152 metres (500 ft.) are estimated at 33.5 million tonnes of Grade I coal and about 195 million tonnes of inferior coal. The total reserves in the whole field may be over 730 million tonnes.

(6) Diamond

Collection of diamonds from the beds of the Mahanadi, Ib, and other tributaries has been recorded. The best known locality is Hirakud (21°32' : 83°56') but so far no diamond bearing horizon has been located.

(7) Gold

Alluvial gold is reported from river sands and gravels over the metamorphic rocks of the district but no auriferous vein has yet been located in the associated rocks. Gold washing is practised around Sonamohan (21°46' : 84°13'), Dantamura (21°43' : 83°56'), Hirakud (21°32' : 83°56') and other places. The yield is negligible.

(8) Graphite

Occurrences of graphite have been recorded at Dangachancha (20°0'59" : 83°02'26"), Sargipali (20°54'32" : 83°04'46"), Dahigaon (20°55'55" : 83°05'26"), Semilamunda (20°56'30" : 83°13'30"), Tentulikhunti and south of Doigma (20°56' : 84°08'), Kukrimunda (20°52' : 83°3'30"), Siletpara (20°52' : 83°01'30"), Bardapali (20°52'30" : 83°02'30") near Buren (Buden) (20°53' : 83°33'30"), and Dahita (20°54'30" : 83°08'), and at Kholgarh State Forest 1.2 Km. north of Rampur (20°04' : 84°21') and Hariharjhor valley about 1.6 Km. ESE of Kantibahal (21°04' : 84°02').

The mineral occurs as veins, pockets or bands in the garnetiferous gneiss, which are a variety of khondalites. At Sargipali, which is the most important occurrence in this district, graphite occurs in the form of a lense shaped vein, of about 6 metres thick at its centre. The quality of the graphite is quite high, the fixed carbon content being about 45 per cent on the average.

(9) Iron-ore

About 4 occurrences of iron-ore have been recorded, scattered irregularly in the district. The ores vary in composition from hematite-quartz-limonite rock, to nearly pure hematite with traces of pyrolusite and wad. The ore contains 55 to 58 per cent iron, 0.75 per cent manganese and 0.31 per cent phosphorous on an average. The deposits are usually of superficial laterite, capping granite gneiss or ferruginous quartzite. The localities and reserves are detailed below:

1. Lohakhand (21°41' : 84°09')	..	5.08 million tonnes.
2. Akhradand (21°39' : 84°12') in Nalibassa hill :	15.24	Ditto
3. 1.6 Km. S.-E. of Khirapali (21°09' : 82°58') :	3.04	.. Ditto
4. 3.2 Km. S.-E. of Mahubata (21°47' : 82°33') :	1.01	.. Ditto

Specimen of fine-grained magnetite and limonite from around **Mun-dher** ($21^{\circ}20':84^{\circ}05'$) have been identified. They contain traces of nickel, but no vanadium could be found.

(10) Lead and Silver Ore

Occurrences of lead and silver ore are reported from Junai ($21^{\circ}32':83^{\circ}51'$), Thuntikatarbaga ($21^{\circ}42':84^{\circ}00'$), Gangajal ($21^{\circ}38'30'' : 84^{\circ}32''$), Talpatia ($21^{\circ}57':84^{\circ}01'$), and Padampur ($21^{\circ}45' : 83^{\circ}34'$). These are of no economic importance.

(11) Limestone and Dolomite

Extensive deposits of limestone suitable for lime burning, fluxing in the iron and steel and other metallurgical industries and cement making, occur in Sambalpur district. Also found associated with limestone are deposits of Dolomite and Dolomitic limestone.

The occurrences are near Sulai ($21^{\circ}58' : 84^{\circ}06'$), Padampur ($21^{\circ}45' : 83^{\circ}34'$), Lakhanpur ($21^{\circ}38' : 83^{\circ}37'$), Dungri ($21^{\circ}42' : 83^{\circ}34'$), Sauntmal ($21^{\circ}41' : 83^{\circ}33'$), Badmal ($21^{\circ}41' : 83^{\circ}30'$), Behera ($21^{\circ}39' : 83^{\circ}32'$), Banjipali ($21^{\circ}38' : 83^{\circ}30'$), Kusmuda ($21^{\circ}37' : 83^{\circ}30'$), Putka ($21^{\circ}10' : 22^{\circ}58'$), Ruchida ($21^{\circ}36' : 83^{\circ}24'$), Duari ($21^{\circ}33' : 83^{\circ}26'$), Purapali ($21^{\circ}32' : 83^{\circ}24'$), Jampali ($21^{\circ}33' : 83^{\circ}24'$), Darlipali ($21^{\circ}31' : 83^{\circ}23'$), Pikrijharan ($21^{\circ}31' : 83^{\circ}23'$), Kutrapali ($21^{\circ}31' : 83^{\circ}22'$), and Kandaipali ($21^{\circ}36' : 83^{\circ}29'$).

The deposits, a brief description of which follows, may be grouped into the following eight areas:

- (i) Dungri-Banjipali
- (ii) Lakhanpur
- (iii) Padampur
- (iv) Sulai
- (v) Putka
- (vi) Ruchida
- (vii) Duari-Kutrapali
- (viii) Kandaipali

Portions of the deposits grouped under (1) and (3) have been submerged in the Hirakud reservoir.

(i) DUNGRI-SAUNTAL-BADMAL-BEHERA-KUSUMDA-BANJIPALI AREA

Extensive deposits of massive, pink coloured and hard limestone occur in a strip of plain country between Dungri in the north and Banjipali in the S. W. over a strike length of about 13 Kms. The limestone is interbedded with shales and quartzites and dip at angles of 8° — 12° , the direction varying from west to N. W. and at 15° — 35° towards N. E. The maximum thickness of limestone beds exposed in places is of the order of 8 metres. A reserve of 38 million tons of limestone of cement grade has been proved by the State Directorate of Mines.

(ii) LAKHANPUR

Outcrops of limestone with shales and quartzites are to be found near Lakhapur in a valley East of Dungri. These beds are folded in the form of an asymmetric syncline, with a steeply dipping western limb. A small band of limestone in the centre is reported to contain less than 2 per cent magnesia.

Outcrops of Dolomite are found about 1.2 Km. East of Leleher ($21^{\circ}40' : 83^{\circ}37'$) and 400 m. S. W. of Paruabhadi ($21^{\circ}40' : 83^{\circ}38'$).

(iii) PADAMPUR

Exposures of Dolomitic and high silica limestones are found near Tamdei ($21^{\circ}43'30'' : 83^{\circ}35'30''$), Launsara ($21^{\circ}43'30'' : 83^{\circ}33'$), Padampur ($21^{\circ}45' : 83^{\circ}34'$), Bardarha ($21^{\circ}48' : 83^{\circ}31'$), Kushumal ($21^{\circ}45' : 83^{\circ}33'$), and Gudum ($21^{\circ}44' : 83^{\circ}32'$).

(iv) SULAI

Deposits of Dolomite occur around Sulai, Kainsara and Singipali along Sapai Nadi. A reserve of 5.52 million tons has been estimated by the Directorate of Mines. The average range of chemical composition shows MgO : 17—22 per cent, CaO : 22—30 per cent, and SiO₂-6 per cent.

(v) PUTKA

Limestone, dolomitic limestone and dolomites interbedded with quartzites and shales occur as scattered exposures in and around the villages Putka and Saramsil. The deposit is reported to be extensive. A sample analysed as follows : CaO : 26.88 per cent, MgO : 20.04 per cent, SiO₂ : 8.1 per cent, Al₂O₃ : 0.82 per cent.

(vi) RUCHIDA

Outcrops of dolomitic limestones have been noticed for a length of 270 m. The reserve will be about 0.78 million tons.

(vii) DUARI-KUTRAPALI

All the limestone outcrops show a strike of ENE-WSW with very little deviation at places. The amount of dip is low and varies between 4° to 5° in a WNW direction. The rock is homogeneous and is of uniform quality. Isolated patches met with are in cultivated fields. A reserve of about 75,000 metric tons have been estimated for this band.

(viii) KANDAIPALI

The limestones are very hard compact light-pink colour, siliceous in nature. These have a general trend of N 50° E-S 50° W and dip of about 15° towards N 40° W. The reserve is scanty.

12. Manganese Ore

Near Kandhal ($21^{\circ}3' : 84^{\circ}10'15''$) in Rairakhol subdivision on the precipitous slope midway between hill 1902 and hill 1548, boulders of manganese ore were seen. The manganese ores occur in association with Khondalite rocks and are mostly low grade.

13. Mica

Ruby mica occurs in Bargarh (including Padampur) subdivision in pegmatites at Fraserpur ($20^{\circ}59' : 82^{\circ}51'$), Kenchhododar ($20^{\circ}59' : 82^{\circ}51'$), Hirapur ($20^{\circ}58' : 82^{\circ}50'$), Maharanimeripur ($20^{\circ}56' : 82^{\circ}50'$), Jharmunda ($20^{\circ}57' : 82^{\circ}51'$) and other neighbouring localities. Mica is also reported to occur around Bartunda ($20^{\circ}50' : 82^{\circ}45'$), Jamseth ($20^{\circ}49' : 82^{\circ}43'$) and Temrimal ($20^{\circ}45' : 82^{\circ}44'$) in the same subdivision. Occurrences have been reported in Rairakhol area at Laiza ($21^{\circ}10' : 84^{\circ}24'$), Kuakhol ($21^{\circ}4' : 84^{\circ}6'$) and Rampur. But all these occurrences are not of economic importance.

14. Mineral Pigments

Lateritised rocks, altered Khondalite, Carbonaceous phyllites, Cuddapah and Gondwana red shales of the district can be used as mineral pigments. In the Gondwanas, thin bands of soft red shales occur near Liakhai ($21^{\circ}51' : 83^{\circ}50'$) and Ulap ($21^{\circ}51' : 83^{\circ}49'$). The nodular iron stone bands occasionally weather into concentric scaly ochrous patches. The material is usually soft and the black shales in the western Jurabaga fireclay quarries may be used as a black pigment.

15. Rock Crystals

Rock crystals are common in the gneissic tracts of Sambalpur district. Such deposits have been found around Pandri ($21^{\circ}11' : 84^{\circ}06'$), Koinsar ($21^{\circ}15' : 84^{\circ}07'$), Bharimura ($21^{\circ}13' : 84^{\circ}06'$), Jujomura ($21^{\circ}14' : 84^{\circ}08'$), Bhoipali ($21^{\circ}26' : 84^{\circ}06'$), Meghpal ($21^{\circ}20' : 84^{\circ}15'$) and Satsama ($21^{\circ}09' : 84^{\circ}06'$).

Rose quartz has been noted in some of the quartz veins near Raangiatikra ($21^{\circ}11' : 84^{\circ}17'$), Ghichamura ($21^{\circ}46' : 84^{\circ}06'$) and Burhiakata ($21^{\circ}18' : 84^{\circ}08'$).

(16) Building Materials

A major portion of the district is composed of Archaean basement rocks which are quite suitable for use as building materials. The quartz sillimanite schists at Dudkabahal ($21^{\circ}57' : 84^{\circ}15'$) have been quarried for building purposes. Black slates, at times also red, obtained from the Mahanadi bed are used for roofing and flooring in Sambalpur town. The small ridges about 1.6 Km. of Khantamal ($21^{\circ}55' : 84^{\circ}17'$) consist of angular fragments of epidote and quartz cemented by a network of secondary quartz of variegated colour, which are used for decoration of

the buildings. The silicified fault breccia near Putka ($21^{\circ}10' : 82^{\circ}58'$) containing network of chalcedony, flint, Jasper and bloodstones are also suitable for ornamental purposes.

The extensive deposits of Cuddapah sandstones quartzitic sandstones and flagstones of Bargarh subdivision find their importance as building material in the locality. Fine grained Gondwana sandstones of Ib river valley are quarried and dressed to be used as a building material. The thin red flagstones of Liakhai ($21^{\circ}51' : 83^{\circ}50'$) and Ulap ($21^{\circ}51' : 83^{\circ}49'$) are suitable for roofing purpose. Laterites are also found in abundance in the district which can be used for construction of buildings and the loose laterites are used as road material.

Superficial Kankar locally known as *Asurahada* occurs widespread as concretionary matter in the alluvium covering rocks of widely different composition. It is used locally for lime making.

The dolerites and epidiorites and other intrusives are used as road metal. Huge deposits of quartzite pebbles and conglomeratic sandstones are used as railway ballasts. Some vein quartz around Jharsuguda ($21^{\circ}51' : 84^{\circ}01'$) may be used as road metals.

Gneisses, quartzites and porphyritic granites are also quite widespread. These constitute excellent building stones.

11. Mineral Production and Mines

An area of 45.44 Sq. Kms. is now covered under mining lease in this district and the number of leases is 27 (1969).

Among the minerals/ores produced in the district are included coal, fireclay, limestone, graphite and chinaclay.

12. Flora

The district lies within the great sal belt and in the south-east, where the climate is somewhat moist the forest has a tendency to become nearly evergreen. With the *sal* are found certain of its usual associates such as *sahaj* (*Terminalia tomentosa*) which yields the commonest of all building materials, its bark being also used for tanning, *Bijasal* (*Pterocarpus marsupium*), which is used for making furniture, *dhaura* (*Anogeissus latifolia*) which is also used for building and invariably for cart axles, *arjun* (*Terminalia arjuna*) and *Jamun* (*Eugenia jambolana*). In this district, however, *sal* forests do not reach their full expression. They are situated chiefly on dry hills or on flat lands where past uncontrolled cultivation has affected soil drainage. In consequence, a drier type of mixed deciduous species occupy a large portion of the forests. These species include Karla (*Cleistanthus collinus*), which is very common,

Jhingan (*Odina Wodier*), Dhaura (*Anogeissus latifolia*), and kendu (*Diospyros melanoxylon*) which is common everywhere, persisting as a weed in land cleared for cultivation, its leaves being extensively collected every spring for wrapping tobacco for Biri making.

This dry mixed formation has, in its turn, to fight a stern battle with Bamboos (*Dendrocalamus strictus*), especially where the underlying rock is a granite or a gneiss. In fact, bamboos, almost pure or mixed with a dry deciduous type of forest, approximate in extent to the more valuable and gregarious *sal*.

Amongst other trees of economic importance found in the district are teak (*Tectona grandis*) which is found only in small plantations, Sisoo or rosewood (*Dalbergia latifolia*), Gambhari or Kumar (*Gmelina arborea*), Bhira or satin-wood (*Chloroxylon swietenia*). From the Harrida or Harra (*Terminalia chebula*) the myrobalans of commerce are obtained and its allied species Bahera (*Terminalia belerica*) yields an inferior timber and a fruit which is used medicinally. The wood of the Kusum (*Schleichera trijuga*) is commonly used for making sugarcane and oil pressing, while its fruit is eaten, and oil is extracted from its seed. The Simul or silk-cotton tree (*Bombax malabaricum*) is common in the forests and also in the open country, the cotton surrounding the seeds being used to stuff quilts and cushions and the wood for making match sticks.

Among trees conspicuous for their beautiful flowers may be mentioned the Sunari or Amaltas (*Cassia fistula*) with long pearlescent racemes of yellow flowers, which have given it the name of the Indian laburnum, and also the Ganiari (*Cochlospermum gossypium*) a tree with large yellow flowers growing on dry stony slopes; the wood of the latter tree was used by postal runners for torches during night time, while its gum furnishes an article of food. Of other flowering trees the most common are the Kuthar or Kachnar (*Bauhinia variegata*) with large blossoms of four white petals and one pink or variegated petal, and the Palas or Palsa (*Butea frondosa*), remarkable for its brilliant scarlet-orange flowers appearing when the tree is quite leafless; the latter are useful for dyeing, while its fibrous roots are made into ropes. The Siris (*Albizia lebbek*), a handsome tree with greenish yellow flowers is found in the forest, but is rare. The principal flowering shrubs are the Kharkhasa or Siharu (*Nyctanthes arbor-tristis*), with fragrant yellowish-white flowers used for garlands and also for dyes, and the Dhatuki or Dhauri (*Woodfordia floribunda*) bearing red flowers, which are made into the vermilion dye so familiar during the Holi festival. Flowering herbaceous plants are few and the most brilliant flowers are found on the trees.

Among small trees or shrubs growing in scrub-jungle may be mentioned the Char (*Buchanania latifolia*) the fruit of which is an ingredient of sweetmeats and is also bartered for salt ; the graceful Anla (*Phyllanthus emblica*), the leaves of which are used for tanning ; and Dhaman (*Grewia vestita*), the wood of which is made into cart shafts. There are two species of Zizyphus very common in the forests, viz., Bair (*Zizyphus jujuba*), which is found on the sites of old deserted villages, and Chanto or Chato (*Zizyphus xylopyra*). There are also two species of Gardenia viz., Kurdu or Dekamali (*Gardenia gummifera*) the gum of which is used medicinally, while its fruit is eaten when ripe, and Damkurdu (*Gardenia latifolia*), from the wood of which combs are made. The fruit of the Patwapahal or Mainphal (*Randia dumetorum*) is used medicinally and the roots of the Dure or Duda (*Holarrhena antidysenterica*) are an antidote for diarrhoea and dysentery. Three other trees common in scrub-jungle on the dry slopes of the hills are Sahnia or Salai (*Boswellia serrata*), Girungila or Kuli (*Sterculia urens*) and Mai or Mowai (*Odina Wodier*).

The principal creepers are Sailpatta or Mahula (*Bauhinia vaillii*) the leaves of which are used for making country umbrellas and for plates, while the pods are fried, the seeds are eaten, and the fibrous bark is converted into string ; and Budhla (*Butea superba*), the leaves and flower of which resemble those of the Palas (*Butea frondosa*). *Dendrocalamus strictus* is the only bamboo found in the forests.

Of trees growing in the open country, the most important is the Mahula or Mahua (*Bassia latifolia*) with its lofty spreading foliage. Its flowers are used as an article of food and also for the manufacture of country spirit. Babul (*Acacia arabica*) is a tree favouring black cotton soil and except on the banks of tanks and in Borasambar ex-Zamindari, it is rare in the district. Of the *Ficus* family, Dumri or Gular (*Ficus glomerata*), Bar or banyan (*Ficus bergalensis*) and pipal (*Ficus religiosa*) are abundant in the open country, and are also planted in village from religious motives, for they are believed to be the resort of the Gods and Goddesses of Hindu pantheon. The most common tree planted in groves in the neighbourhood of villages is the mango. Other trees planted for the sake of their fruit are Tentuli or tamarind (*Tamarindus indica*), Kaith (*Feronia elephantum*), Bair or wild plum (*Zizyphus jujuba*), Panus or jack-fruit (*Artocarpus integrifolia*), Manuage (*Moringa pterygosperma*) Jambu or Jamun (*Eugenia jambolana*), and Bahalphal (*Cordia myxa*) Limb or Nim (*Melia indica*) is planted freely, as it is supposed to be a disinfectant purifying the air ; karanj (*Pongamia glabra*) is planted for the sake of its fruit and the oil extracted from its seeds, which is used medicinally for itches. The following trees are generally planted about the precincts of temples : Bel (*Aegle marmelos*), Baula or Molsuri (*Mimusops Elengi*) and Asoka (*Polyalthia longifolia*). The leaves of the first

are sacred to Siva, the fragrant star-like flowers of the second are an object of worship, and the twigs and leaves of the third are used on festival occasions for festooning the shrines. Of the trees mentioned above, the Gular, banyan, Pipal, mango, Jamun, Karanj and Asoka are commonly grown in avenues, and other avenue trees often planted are Bakam (*Millingtonia hortensis*) and Siris (*Albizia lebbek*). The palmyra palm (*Borassus flabellifer*) is planted in many villages, as its fruit when ripe is used as an article of food. The date palm (*Phoenix sylvestris*) is also met with, but not in all parts of the district. The Kattang bamboo (*Bambusa arundinacea*) is often found planted in towns and villages.

There is a dearth of good grazing grasses, but the succulent Dub (*Cynodon dactylon*), which is sacred to Ganesh, grow all over the district on sandy soil where there is some moisture. Another good grass called Musakani or Musyal (*Iseilema Wightii*) is generally confined to old fallows or the ridges which form the boundaries of fields ; it prefers clay soil and is rarely found in the forests. The commonest grass of all is the Sukla or Kusal (*Poilinia argentea*), which is found everywhere in the forests, and elevated places ; it is really the common fodder grass of the district, and is excellent while young. Another grass found all over the district in small quantities is Panasi or Bhaber (*Pollinia eriopoda*), which is used for rope-making. Among rarer grasses may be mentioned Kel or Kaila (*Andropogon annulatus*), Khas (*Andropogon squavrosus*), Tikhari (*Andropogon Schaenanthus*), which yields the aromatic rusa oil, and Kans (*Saccharum spontaneum*), which is used in religious ceremonies and is an enemy dreaded by the wheat cultivator. There are two weeds of the *Cassia* species, of which *Cassia tora* (known as Chakhanda) is very common ; it is eaten when young as a vegetable.

Spear-grass (*Heteropogon contortus*) is very common in the forests. Tigers and leopards avoid it in winter as the spear pricks them. The spear takes the form of an obtuse angle. The long arm if wetted with spit goes round and straightens itself. This provides considerable amusement to visitors to the forests in winter.

The following gives a list of common grasses found in this district :

FODDER GRASS

1. *Cynodon dactylon* (Dub)
2. *Cyperus rotundus* (Mutha)
3. *Cynodon barberi*
4. *Ischaemum nervosum*
5. *Amphilophis pertusus*
6. *Eremopogon foveolatus*
7. *Digitariamarginata*
8. *Cenchrus ciliaris*
9. *Enteropogon monostachyos*

THATCHING GRASS

10. *Eulaliopsis binata* (sabai)—Used for paper pulp and also fodder in young stage.
11. *Sachharum spontaneum* (Kans)
12. *Themeda triandra*—eaten by cattle, in succulant stage
13. *Themeda cymberia*
14. *Apluda aristate*
15. *Cymbopogon gidarba*—also used as fodder
16. *Aristida setacea*—(Kanta badhuni) used for brooms
17. *Oropelium thonacum*
18. *Chlorio bonore*
19. *Sachha um munja*—(Munja grass)
20. *Vetiveria zizanoides* (Khuskhus)
21. *Imperata arundinacea* (Jhun)
22. *Heteropogon contortus*—(Spear grass)—also relished by cattle as fodder before flowering.
23. *Cymbopogon martini* (Lemon grass)—Oil is extracted

13. Fauna or Zoology

King's Gazetteer of 1932 has the following :

“Sambalpur”, writes Mr. Dewar*, “is reputedly a good big game district, and in past years has been one of the happiest hunting grounds in the Central Provinces. But the cutting out of the forests and the spread of rice and cane cultivation into all the valleys and up all the streams have of late years curtailed the grazing grounds of wild animals and cut off their water-supplies. The available watering places are few and are easily watched by the poacher who does much killing by night in the hot months. This abuse is very difficult to stop so long as the profitable trade in hides and horns is not restricted”.

King's Gazetteer continues “In spite, however, of this diminution in the number of wild animals, and especially of ruminants, few districts in Bihar and Orissa have such a wealth and variety of animal life. Though their numbers have greatly decreased in recent years, tigers are still fairly numerous. They are found mostly in the forest-clad hills bordering the district, from which they move into the neighbouring States if disturbed by wood-cutting, coming back again when felling begins there. Panthers are more common than tigers, though more rarely seen by the sportsman ; they frequent open scrub-jungle throughout the district, and, like tiger, are very destructive to cattle. Black panthers have been shot in the south-west of the district. Leopards are common in the wooded tracts and are found in most of the small hills near villages.

* Mr. Dewar did the Settlement of Sambalpur in 1902—1906.

They are most daring in their depredations, often scaling the walls of a goat or sheep pen in the heart of a village and carrying off village dogs in the coolest manner. Among other species of the family *Felidae* may be mentioned the large civet cat, the lesser civet cat, the tree cat, the common jungle cat, and the leopard cat.

The Indian wolf (*Canis Pallipes*) is occasionally found. Wild dogs (*Cuon alpinus dukhunensis*) frequent the forests and are very destructive to game. The striped hyena and jackal are found all over the district. The Indian fox is fairly common in the more open parts. The Indian black bear or sloth bear is very common in the forests, where his surly temper makes him more dangerous to the wayfarer even than tiger. Maulings by bear are frequent, most of the victims being women going along the jungle paths with loads to market or gathering mahua flowers in the early morning on the skirts of the forests. They also do a considerable amount of damage in the cane fields.

Wild elephants have reappeared in the east and south-east of the district, and during their visits cause very serious damage to crops, especially in the rice fields adjoining the jungles. Wild pig is also responsible for such mischief to crops.

Wild buffalo (*Bubalus bubalis*) is very rare. They may be found across the border in Patna State, but only a rare visitor ever enters the Sambalpur district. Bison (*Bos gaurus gaurus*) are fairly common especially in the forests bordering Rairakhhol and Bamra States. Among deer, chital or spotted deer (*Axis axis*), Sambhur (*Cervus unicolor tiger*) and barking deer (*Muntiacus muntjak*), are all fairly well represented, though not plentiful. The four-horned antelope (*Tetracerus quadricornis*), gazelle or chinkara (*Gazelle bennetti*) and mouse deer (*Tragulus memina*) occur but are not common. The nilgai or blue bull is fairly common. The black buck (*Antelope cervicapra*) is found in open country in the south of the district, especially south-west of Barpali.

Amongst other animals found in the district may be mentioned the rare brown flying-squirrel (*Petaurista petaurista philippensis*) which can glide from tree to tree. The langur or grey ape is common, and the red-faced monkey is also frequently encountered. Hedgehog, porcupine, mongoose, hare, badger and scaly ant-eater are also to be found in the district."

In spite of diminution of wild life noticed by King, Sambalpur district, even without the Princely States of Bamra and Rairakhhol, was a paradise for hunters. The Deputy Commissioner of Sambalpur who did not take interest in wild life was a misfit. It was an unwritten convention of the Appointment Department of Government of the then Bihar and Orissa that the Deputy Commissioner of Sambalpur should co-operate with officers of the Forest Department in enforcing shooting rules and be able to organise controlled shooting. This was a consideration for posting officers.

Today it has to be recorded with a deep sense of disappointment that during the last 20 years not only in the old Sambalpur district but also in the added subdivisions which have come from the Princely States, wild life has been almost completely exterminated except what exists in the sanctuaries of Ushakothi and Debrigarh. Even there, wild animals are disturbed either by poachers or by spot-lights of visiting motorists. Between 1930 and 1934, the Chief Editor (Shri Nilamani Senapati, I. C. S.) could count 50 tigers in the old Sambalpur district of which he was Deputy Commissioner. In that area today there is not one. He had seen twice or thrice as many leopards and bears and as many bisons and Sambars. Today there are few. This unfortunate state of affairs has been brought about by large scale extension of cultivation, working of timber and fuel coupes, poaching both by day and by motor vehicles at night shooting over water holes and salt licks and by poisoning of carcasses with pesticides.

The state of wild life and the state of forests in 1932-33 has been described in Appendix-I, which has been taken from the auto-biography of the Chief Editor with reference to the period when he was Deputy Commissioner of Sambalpur.

The following list gives the common wild animals of the district :—

Ungulates	..	Elephant, Bison, Sambar, Nilgai, Spotted deer, Barking deer, Chousinga (Four horned antelope) Mouse deer, Wild boar.
Carnivora	..	Tiger, Panther or Leopard, Sloth bear, Ratel or Honey badger, Hyena, Jackal, Indian fox, Wild dog, Leopard Cat, Jungle Cat, Civet Cat, Palm Civet, Mongoose, Otter.
Rodents	..	Porcupine, Malabar-Squirrel, Indian Giant Squirrel, Hare.
Pre-historic	..	Scaly Ant-eater or Indian Pangolin (This has become rare).
Primates	..	Common Langur, Rhesus macaque
Reptiles	..	Crocodile, Land monitor, Chameleon, other Lizards Python, Branded-Krait, King-Cobra, Cobra Vipers, other snakes.
Aves water Resident	..	White necked stork, Open-billed stork, Black Ibis, White Ibis, Cranes, Egrets, Herons, Cormorants, Darters, Moor-hen, Jacanas, Whistling Teal, Cotton Teal, Kingfisher, Pheasants.
Migratory	..	Croleg-geese, Barheaded geese, Red-headed-pochard, Pin-tail, Brahminy Duck, various teals and other pochards, flamingo, Pelicans, open bill, snipes, stilts.

- Ground Birds .. Peacock, peafowl, red Jungle fowl, grey partridge
black partridge, common quail, fowl, etc.
- Other land Birds Malabar-pied hornbill, grey horn-bill, mynas
(including greater hill Myna), parrots, parakeets
lorikeets, orioles, drongos (including rocket-
tail drongo), fly-catchers, barbets, minivets,
finches, bul-bul, munias, robins, shama,
doves (turtle, emerald, ring, common), pigeons
(imperial and green) and many other varieties
of diurnal and nocturnal birds.

14. Game Birds

The district also possesses a comparatively rich variety of game birds. The common peafowl (*Pavo Cristatus*) the red jungle fowl (*Gallus gallus*) and bush and button quail (*Turnix Dussumier* and *Turnix Tanki*) are all common in the forests. Grey partridge (*Francolinus po. dicerianus*) are not very common but spur fowl (*Galloperdix Spadicea* and *Galloperdix lunulata*) are met with fairly frequently. Green pigeon of the large and small variety and blue imperial pigeon are common in all jungle villages. An occasional florican, or lesser bustard, may also be found.

Of water-fowl there are many representatives. Duck and teal abound on the many tanks scattered throughout the district and also on the Mahanadi and Ib while snipe is equally plentiful on the marshy ground and irrigated rice-fields below tanks. Other varieties of immigrant duck are the pintail, the gadwall and the Brahminy. The common whistling teal, the large whistling teal and the cotton teal are plentiful and the blue-winged teal is also fairly frequently found. Good snipe-shooting can be had in many places in the district though the snipe grounds are seldom more than a hundred acres in area, so that big bags cannot be made. Pintail, fan-tail and painted snipe are all found in the district.

15. Reptiles

Snakes, including the very poisonous Krait (*Bungarus caeruleus*), cobra (*Bara tripudians*), and Russell's Viper (*Vipera Russelli*) are numerous. Lizards of all kinds are common, and the iguana is caught for its skin and eaten by the lowest classes. Crocodiles and alligators are now common in the Hirakud lake.

16. Sanctuaries

(i) Ushakothi

The Ushakothi sanctuary covers the Ushakothi Forest Block in Bamra Forest Division over an area of 194 Sq. km. It lies about 48 km. to the north-east of Sambalpur town on National Highway

No. 6. The most important animals in this Block are elephant, bison, sambar, barking deer, pig, tiger, and leopard. Bisons are found in large herds in this block. There are a few forest roads and extraction paths and a well furnished Forest Rest House adjacent to it on the National Highway No. 6 at Badarama. A large number of tourists get attracted each year to this Sanctuary and rarely miss the interesting fauna. A register, maintained in the Forest Rest House at Badarama, indicates the interesting remarks and satisfaction of the tourists. Spot lights are also available in the Forest Rest House for use by the tourists during night. Watch towers have been erected at places to provide for a close watch or photographing the animals. Shooting has been strictly prohibited.

(ii) Debrigarh

(In old Barapahar Forest Division now under Sambalpur Division)

It was established in 1930 with the initiative of the then Deputy Commissioner of Sambalpur. It extends over an area of about 1424 Sq. km. This sanctuary is situated in Debrigarh Felling Series in Bhatli Range in old Barapahar Division. Elephants, wild buffaloes and black bucks are not found in this area. All other species are well represented. In recent years there has been gradual decrease in animals due to proximity to habitation. Spotted deer and sambars are some of the most extensively occurring species here, but have been sadly depleted.

The proposed Debrigarh (Extension) sanctuary is situated in the reserved forests under old Barapahar Division. It comprises of Lohara, Debrigarh, and Dechua blocks covering a total area of 419.58 Sq. km. adjoining the vast expanse of 745.92 Sq. km. of the reservoir of Hirakud Dam. Except for elephants, wild buffaloes and black bucks, most of the other important animals in the State are more or less represented here. The Hirakud Dam water spread into these forests will have much influence on the ecology of many parts of the forests favourable to wild life management. It will further attract numerous water birds both native and migratory. This area is approachable from Bargarh, on National Highway No. 6, wherefrom it is only 30 km. Inside, there are a number of good forest roads. There is a 2nd Class well furnished Rest House at Dechua, a 3rd Class two-roomed, one at Khajuria and one-roomed rest shed at Mundkati within the sanctuary. With better protection the interesting wild life in the sanctuary will provide added attraction to the Hirakud Dam and visitors from the adjacent industrial cities of future. The sanctuary will be under the Divisional Forest Officer, Sambalpur.

(iii) Sardhapali

The Sardhapali sanctuary covers Ghichamura-Phuljhar Block of Sambalpur Forest Division over an area of 29.78 Sq. km. It is about 48 km. from Sambalpur via Rengali. There is a one roomed Forest Rest-Shed at Sardhapali. The important animals of this Block are Sambar, barking deer, pig and leopard. Due to proximity to habitation, the fauna have been sadly depleted in recent years.

17. Fish

Fish of different varieties are found in big rivers like the Mahanadi and Brahmani. The Hirakud reservoir offers great scope for pisciculture. Fish-rearing also is taken up by the Grama Panchayats in small tanks. A detailed account of pisciculture is presented in Chapter IV—Agriculture and Irrigation. Important varieties of fish are : *Catla-catla* (Bhakur), *Labeo rohita* (Rohi), *Cirrhina mrigala* (Mirkali) *Labeo kalbasu* (Kalachi), *Wallagoniattu* (Balia), *Pseudegropius garua* (Katrang), *Bagarius bagarius* (Kanabudhia), *Barbus tor* (Kudi), *Gabies* (Ghesada), *Murels* (Seula), Minor *Murels* (Khapsi), *Rincobdila* (Bainri), *Barbus* minor species (Putia), *Chela Gora* and *Chela phulo* (Jarda), *Barbus* minor species (Kuturi), *Clarias batrachas* (Magur), *Sacoraichus fosilis* (Singhi), *Gobies* (Matul), *Mystus aor* (Adi), *Eutropiichthys vacha* (Batcha), *Belerey hemiramphus* (Gaurchela), *Barbus* minor species (Dandikiri and Dandei), *Ambly pharyngdon* (Mahurali), very minor *Barbus* species (Jhima), Major prawns (Chingda), Minor prawns (Chingda), *Notopterus notopterus* (Phali), Chital, *Barbus serana* (Serna), Minor Crabs (Kankra), *Amphipoda* *Ketchia* (Thumbi), *Nandus nandus* (Bhadra), *Mungli tadi* (Kainga), Glass fish (Pat Pania).

18. Climate

The climate of this district is characterised by a very hot dry summer and well distributed rains in the south-west monsoon season. The cold season commences from November and lasts till the end of February. The hot season follows thereafter and continues till about the second week of June. The south-west monsoon season is from mid June to the end of September.

I. Rainfall

Records of rainfall are available for 9 stations in the district for periods ranging from 32 to 84 years. The rainfall at these stations and for the district as a whole are given in tables (Appendices II and III). The average annual rainfall in the district is 1,527 mm. (60.11"). The eastern half of the district gets more rain than the western half, the region around Dhama and Sambalpur, getting the highest rainfall. About 90 per cent of the annual rainfall is received in the monsoon

season—July being the rainiest month in the year. The variation in the rainfall from year to year is not large. In the fifty-year period from 1901 to 1950, the annual rainfall was the highest in 1939 and 1943 when it was 128 per cent of the normal in both the years. The lowest annual rainfall which amounted to 74 per cent of the normal occurred in 1912. In the same fifty-year period, the annual rainfall in the district was less than 80 per cent of the normal in five years and two of them were consecutive. It will be seen from table at appendix III that the rainfall in the district was between 1300 and 1800 mm. (51'18" and 70'87") in 34 years out of fifty.

On an average, there are 70 rainy days, i. e., days with rainfall of 2.5 mm.—10 percents or more in a year in the district. This number varies from 61 at Bijepur to 78 at Deogarh. The highest rainfall in 24 hours recorded at any station in the district was 401.5 mm. (15'80") at Sambalpur on 20th July, 1889.

The annual rainfall charts are appended to this Chapter. * They show that rainfall increases as one goes north. It is lowest at Bargarh the average being 1556 mm. It is higher at Sambalpur and Nildungri where the average is 1646 mm. It is highest at Deogarh, 60 miles north of Sambalpur, the average being 1705 mm. It confirms the theory that forests attract rain. Bargarh is a completely de-forested plain. Sambalpur has a number of forested hills all round. Deogarh is in the midst of thickly forested hills.

These annual rainfall charts follow no uniform pattern. Years of heavy rain-fall follow in successions of 2 to 10 years. Similarly years of drought also follow in successions of 3 to 10 years. Sometimes 2 or even 3 years of heavy rainfall comes one after another. It is not so in the case of drought. Successive years of drought are rare.

II. Temperature

There were meteorological observatories at Jharsuguda, and Sambalpur. The records of temperature and other meteorological elements which are available for Sambalpur for a longer period may be taken as representative of the conditions over the district as a whole. The data for Jharsuguda are available only for a few years. Temperature begins to rise from about the beginning of March steadily till May which is usually the hottest month of the year with the mean daily maximum temperature at 41°C (106.9°F). The heat in May and the early part of June prior to the onset of the South-West monsoon is tiring.

* Mr. John Martin Casey kept records of temperature and rainfall in his sisal plantation at Nildungri from 1927 to 1963. His daughters have presented records to the Gazetters Section for our use.

The onset of the monsoon by about mid-June brings some relief. In between spells of rain the weather becomes hot and oppressive due to the high moisture in the air. In September, due to breaks in the monsoon which are not uncommon the day temperatures increase slightly and this increase continues in October, but the nights become progressively cooler from October. From about the middle of November the day temperatures also begin to drop rapidly and December is usually the coldest month with the mean daily maximum temperature at 26.9°C (80.5°F) and the mean daily minimum temperature at 12.1°C (53.8°F). Cold waves sometimes affect the district in association with the passage of Western disturbances across Northern India in the cold season when the minimum temperature may go down to 4° or 5°C (40°F).

The highest maximum temperature recorded at Sambalpur was 47.2°C (117°F) on 1948 May, 22. The lowest minimum temperature was 4.4°C (40°F) on 1902 December, 5 and 1954 January, 26.

The temperature records show that the highest temperature in May and early June hovers between 114°F. and 117°F. It is highest at Sambalpur on account of radiation from the rocks and sand of the bed of the Mahanadi. The construction of the Hirakud Reservoir covering over 300 Sq. miles has made little difference to summer heat. The highest temperature continues to shoot up to 117°F. The only difference it has made is to increase the humidity in the proximity of the lake, making the neighbouring villages suffocating. This is felt particularly at Hirakud, Burla and Belpahar.

III. Humidity

The relative humidities are high during the South-West monsoon season being generally over 75 per cent. After the monsoon season humidity decreases and during the winter season, the air is fairly dry. The driest part of the year is the summer season when the relative humidities are rather low, the afternoon humidities being generally about 25 to 30 per cent.

IV. Cloudiness

Sky is heavily clouded to overcast in the monsoon season. In the latter half of summer and the post-monsoon months the clouding is moderate. In the rest of the year, sky is generally clear or lightly clouded.

V. Winds

Wind is light to moderate generally, with some increase in force in late summer and the South-West monsoon season. In the post-monsoon and winter months, wind is mainly from directions between North and East. In March wind is variable in directions. By April winds from the West and South-West become more common and these predominate during the period May to September.

VI. Special weather phenomena.

During the monsoon season, depressions from the Bay of Bengal cross the east coast of India and move in some westernly direction. These cause widespread heavy rain and strong winds. Occasionally storms from the Bay of Bengal in October may also affect the district. Thunderstorms occur throughout the year, their frequency being least in November and December and highest in the monsoon season. Occasional dust-storms and dust-raising winds occur in the summer months.

Appendices IV, V and VI give the temperature and humidity mean wind speed and the frequency of special weather phenomena respectively for Sambalpur.

The radiation from the rock and the sand keeps the temperature high throughout the night. A night drive from Sambalpur town to any of the forest areas such as Mundher or Meghapal gives almost the sensation of going to hill stations.

APPENDIX I

A Day alone in the wild *

(This is the experience of three days put into one)

May 1932 and April 1933, Sambalpur district in Orissa

I left Chamunda alone on foot at 4-30 A. M. having slept the night in the forest bungalow. I took a rifle for protection, but the object was not to shoot. In the dim light preceding dawn I could see enough of the fire line which had been cleared and was meant to stop forest fire spreading. Soon there was enough light for me to see things clearly. Cocks started crowing all-round me. I felt as if I was in a chicken run. Cocks came out, saw me, and hurried back to safety. From a distance of about 15 yards a tiger crossing the fire line, stopped, looked at me, and decided that I was no meal. It walked slowly into the deeper forest. Sunrise was hidden through the trees. But its rays falling on tops of trees in new leaf was enchanting. I came to a clearing of about two acres. The sun had come up about 10°. I stood at the edge of the clearing. A hen came out with her brood, saw me, and went back. A leopard who is always late to seek shelter, came into the open, looked intently at me and decided that this monster was not worth trying. Man with his height looks like a monster to all animals, except perhaps to elephant and to monkeys who perhaps know that he is only a relative. I watched sun shine on fresh Kendu¹ leaves in the bushes and on Sal² in flower on top of the canopy against the clear blue sky. It looked glorious. Heaven for an artist. I stood enraptured, for how long I do not know.

I saw nothing on my way back to Chamunda. I had a wash followed by breakfast of shredded wheat in milk and Gur, a quarter boiled egg, bread, butter and Jam, ending with coffee. It was enough to send me back to bed again to sleep. I got up hungry at 9 A. M. had a bath in cold water. Then a meal of whole wheat Chapati with chicken curry. By 11 A. M. I was ready to start again in Khaki breeches, canvas shoes, and a Khaki shooting shirt consisting of straps and pockets. I filled one pocket with toffee, one pocket with cartridges, hung my 375 Manlicher on my back, carried a flask of cold water in my hand and started prepared for the day. A light flask of water was enough as Amla fruits which I plucked on the way were enough to quench thirst. The sun was hot. I walked through

* From the auto-biography of Shri Nilamani Senapati, published in the Paurusha (Oriya Monthly)—Vol. 2, No. 8

¹ Kendu is a shrub as well as a tree. The shrub produces large leaves in spring which are in great demand for wrapping tobacco for making leaf-cigarette.

² Sal is a tall stout forest tree. In spring it produces masses of golden flowers on its top branches which set off brilliantly against the clear blue sky. The seed drops with wings circling in the air like an electric fan.

shaded paths, until there was no path, enjoying bird songs coming from top of the canopy of trees. I jumped down into a ravine and walking along it came to a water hole¹. I climbed the bank and sat astride on the fork of a tree. It was a shady tree. I was saved from the direct sun. About 1 P. M. a tigress came with 3 cubs. They played about in the water like children splashing water in a shallow lake. They stayed for over half an hour and slowly walked away. Immediately came a peacock with its long tail and splashed water on himself. I do not know why a peacock would follow a tiger to water. Nothing happened till sunset when many birds, a hyena, a pair of jackals, a rabbit, a fox and a Kutra (barking deer) came for drink. Then came a number of long tailed monkeys, had their drink and sat on the trees. They saw me but took no notice of the intrusion. As it became darker, came a large number of pigs, tuskers, mother pigs, suckling pigs and non-descript pigs. They wallowed in the pool and must have made it filthy. Breaking the sound of wallowing pigs came the loud whooping of a monkey like the sound of a bulb horn. Immediately the pigs scattered without a grunt and vanished. The monkey warned them that enemy was about. I heard a fierce struggle on the opposite bank of the water-hole. A pig was caught by a tiger and dragged into the forest. Sound came of pulling at flesh. While the tiger was busy at dinner I slipped down the tree and stole away as quietly and as quickly as possible and coming up the ravine nearly started running. There is no reckoning what a tigress with her cubs would do.

A night alone in the wild

Early spring. About the end of February. Sambalpur district - Basiapara, 20 miles from Sambalpur. I was sitting over a cow killed by a tiger. The kill was 20 yards in the open, tied to a bush. I sat on the Machan at 4 P. M. As darkness enveloped the jungle and distant sounds died down, I was left alone to my thoughts—only disturbed occasionally by the call of a lone bird or the barking of a near Kutra which probably saw a tiger. A jackal came and pulled at the carcass. Suddenly it ran away. The tiger was there but not on the kill. I strained my eyes and ears to no effect. If I could hear my breathing, the tiger could probably hear it too and became aware of my presence. The tiger must have been somewhere near, as the jackal never came back. But a hyena came about 11 P.M. I disturbed it by flashing my torch on it and it left. After that the carcass was left untouched and I was left alone. The distant bell of a Sambar showed that the forest was alive. About midnight a bison came and ate leaves from my tree. I could almost touch it. I dozed off and dreamt that a tiger was sitting under my

¹ Water-hole is a pool of water in a dry forest area. As there is no water within a long distance, animals must come to water-holes for a drink. Different animals have different times. They do not clash.

Machan which broke and I was falling. Next morning I saw pug marks right under my Machan. Fortunately the tiger did not try to come up the tree. Or did it? My snoring or nightmare must have scared it.

Sitting alone, the stillness of the night in the forest can be unnerving. I enjoyed it. Thoughts were of creation, struggle for existence, the universe, of eternity, of infinity, of the tiny span of the life of man, of evolution, etc. The night was unending. Thoughts also came back to more mundane matters like my bank balance, my family and what provision I had made, in the event of the tiger getting me. Reality of living came back to me when about 4-30 A. M. the jungle came to life. Dew started dropping from leaf to leaf and birds fluttered their wings on their perches. I also came to life. My thoughts came back to the immediate present. Cocks crowed from far and near. I made my love call, by cupping the palm of my hands. People came and I came down from my Machan. Pug-marks showed that the tiger had come from behind and was right under the Machan.

I have spent over a hundred nights alone in the wild. A disturbing feature was the mosquitoes for which I kept the body covered and had a net for the face and neck. For the hands I had ample supply of mosquito cream.

Life in the wild on a tree was not always enjoyable. It had its dangers and discomforts.

Sitting on a tree in the forest whether on a fork of the tree or on a Machan can sometimes, but very exceptionally, expose one to snakes. I was sitting on a Machan on a bamboo bush, I found a green snake crawling up. It went on to the bar in front of me. Then it stretched across to a culm. I had my knife ready. With a sharp stroke I cut it in two. Both parts dropped on the ground. I cannot say what happened thereafter. The tail part must have been dead. The head part must have crawled away to live or to die I cannot tell.

A major discomfort can be ants, the large red variety of which can give you quite a sting. The forest folk take good care before they tie Machan, to select a tree with no ants.

Sand-flies in day time and mosquitoes at night are an eternal nuisance. A net tied round the head can protect the eyes from sand-flies and the face and neck from gnats. But it interferes with the aiming of the gun. The hunter has to choose between the two.

Some times sudden storms cause major disturbance. The day I was on a bamboo bush. I was sitting for tiger. A storm came at 1 A. M. and pushed the whole bush down. My Machan which was 12 feet high came down to 4 feet. The tiger came at 4 A. M., saw me and walked away. It was a strange bamboo bush in his experience. I could not shoot because there were many impediments to the manipulation of the rifle.

APPENDIX
Normals and extremes

Station	No. of years of data	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
1	2	3	4	5	6	7	8	9	10
Sambalpur	.. 50 a	16.3	26.9	18.5	15.0	25.1	238.3	498.3	494.5
	b	1.0	2.3	1.5	1.5	2.2	10.4	19.3	19.0
Bargarh	.. 50 a	15.5	25.1	17.5	18.3	25.1	224.0	430.8	421.6
	b	1.1	2.0	1.5	1.5	2.1	10.3	17.5	16.4
Padampur	.. 48 a	13.7	23.4	19.3	23.4	29.0	192.3	360.9	370.8
	b	0.7	1.7	1.7	2.0	1.9	9.8	15.8	15.7
Jharsuguda	.. 31 a	12.2	28.5	17.3	12.5	31.7	225.0	532.9	435.
	b	0.7	2.0	1.3	1.4	2.5	10.0	20.4	17.9
Dhama	.. 31 a	11.9	24.6	12.2	14.5	30.5	220.5	537.5	477.8
	b	0.8	2.1	1.4	1.2	2.1	9.5	19.3	18.7
Ambabhona	.. 32 a	15.2	23.3	18.5	15.0	21.8	202.4	527.8	461.5
	b	1.1	1.7	1.7	1.2	1.8	9.6	19.9	17.9
Bijepur	.. 31 a	9.4	17.0	12.5	16.5	23.6	183.6	399.5	376.9
	b	0.5	1.4	1.3	1.3	1.8	8.5	16.9	14.9
Deogarh	.. 49 a	17.5	28.5	17.5	23.9	54.4	241.8	462.8	412.0
	b	1.0	1.8	1.2	1.7	3.8	11.0	19.0	18.0
Rampur	.. 49 a	16.8	23.4	14.7	19.1	37.3	240.0	476.0	427.2
	b	0.9	1.7	1.4	1.4	2.8	10.4	19.5	18.5
Sambalpur district	.. a	14.3	24.4	16.4	17.6	30.9	218.7	469.6	430.9
	b	0.9	1.9	1.4	1.5	2.3	9.9	18.6	17.5

(a) Normal rainfall

(b) Average number of rainy days

* Based on all available data

**Years given

II of Rainfall

Sept.	Oct.	Nov.	Dec.	Annual	Highest annual rainfall as per cent of normal and year*	Lowest annual rainfall as per cent of normal and year**	Heaviest rainfall in 24 hours	
							Amount	Date
11	12	13	14	15	16	17	18	19
227.1	57.9	12.7	3.8	1,634.4	141(1919)	57(1915)	401.33	1889 July 20
11.4	3.6	0.9	0.4	73.5	..	..	..	..
214.4	46.0	8.4	3.1	1,449.8	146(1929)	65(1923)	249.2	1892 July 22
10.8	3.1	0.8	0.3	67.4	..	..	..	..
214.6	56.6	14.5	2.8	1,321.3	160(1933)	63(1923)	368.3	1939 Sept. 7
10.0	3.4	0.9	0.3	63.9	..	..	..	..
231.4	68.6	19.6	3.3	1,618.3	138(1929)	67(1929)	350.0	1925 June 29
11.9	3.5	1.2	0.4	73.2	..	..	..	..
230.9	56.4	15.2	2.8	1,634.3	129(1939)	52(1921)	266.9	1920 Aug. 26
11.7	3.5	1.0	0.2	71.5	..	..	..	..
223.8	16.2	20.1	2.3	1,576.9	140(1936)	63(1948)	264.2	1937 June 27
10.9	3.0	1.0	0.1	69.9	..	..	..	..
213.6	42.9	15.2	3.3	1,314.0	146(1936)	75(1924)	228.6	1941 Aug. 9
9.9	2.9	1.0	0.3	60.7	..	..	..	..
225.8	107.0	12.9	5.3	1,610.1	131(1903)	61(1923)	330.2	1943 Aug. 1
13.1	5.8	1.2	0.4	78.4	..	..	..	..
236.7	72.4	13.7	5.3	1,582.6	159(1925)	64(1912)	330.2	1950 Aug. 7
12.2	4.1	1.0	0.3	74.2	..	..	..	..
224.3	61.6	14.7	3.6	1,527.0	128(1943)	74(1922)	..	..
11.3	3.7	1.0	0.3	70.3	..	..	..	..

in mm.

(days with 2.5 mm. or more)

up to 1950

in brackets.

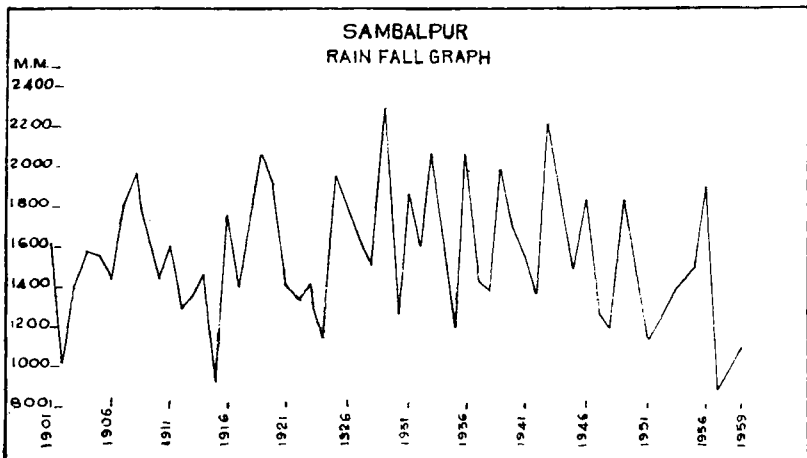
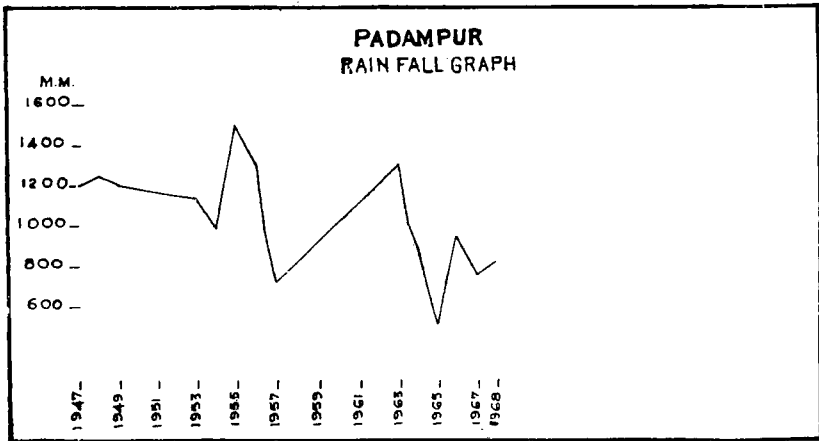
APPENDIX III

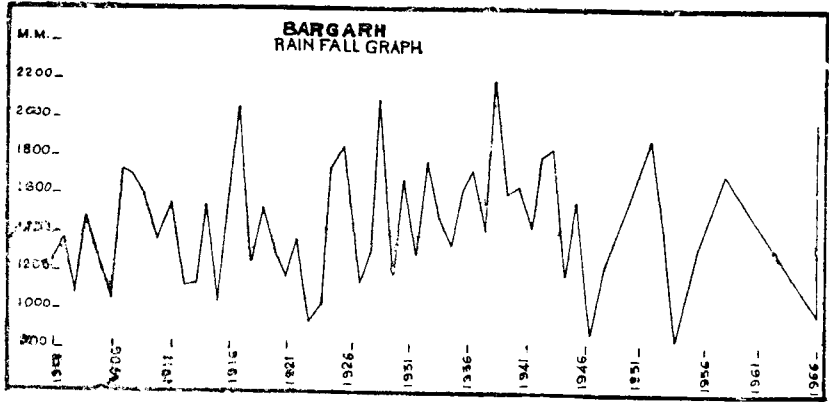
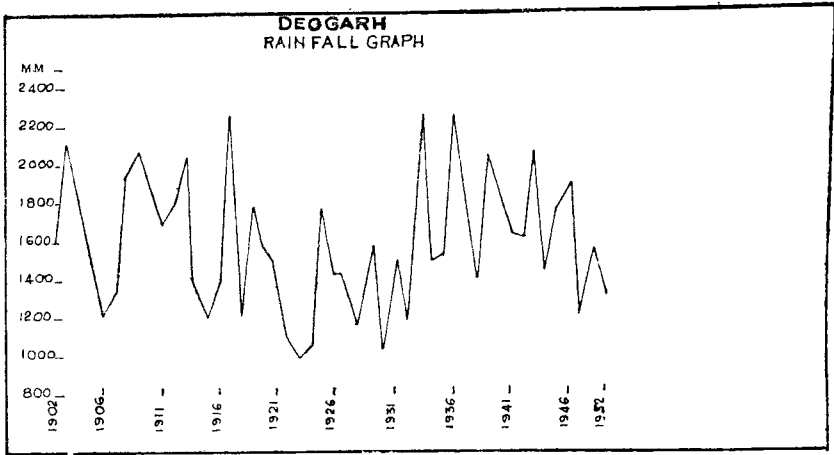
Frequency of Annual Rainfall in the District

(Data 1901—1950)

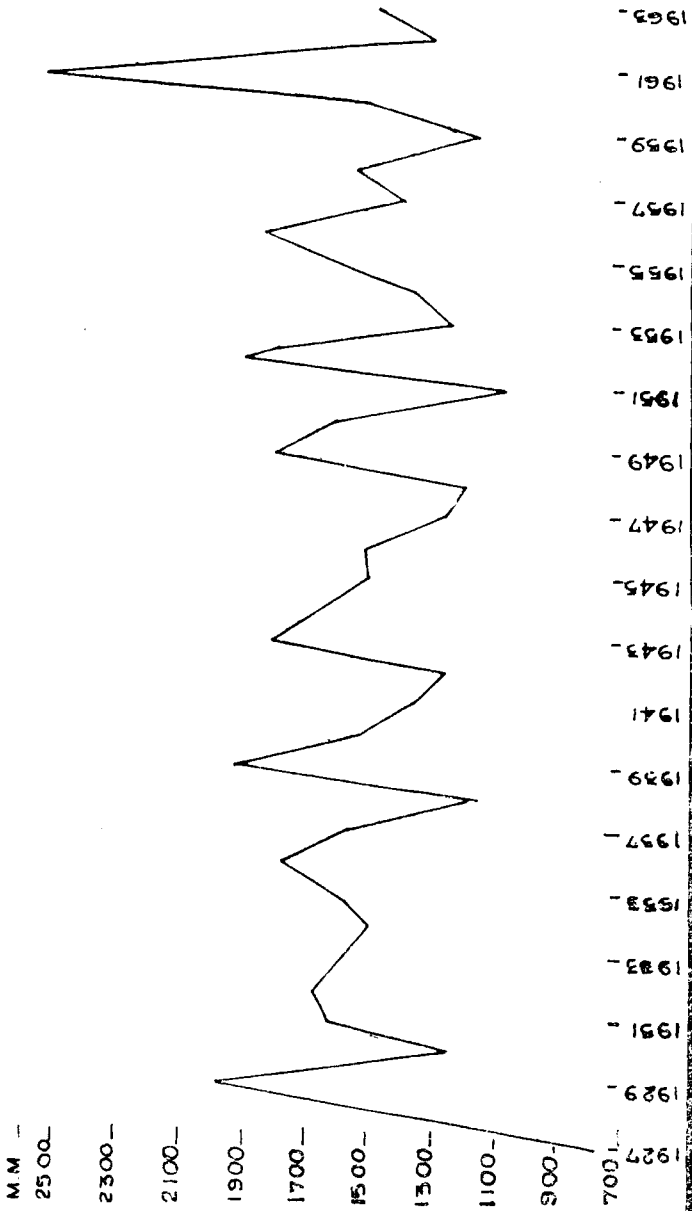
Range in mm.	No. of years	Range in mm.	No. of years
1101—1200	..	1601—1700	6
1201—1300	..	1701—1800	4
1301—1400	..	1801—1900	6
1401—1500	..	1901—2000	3
1501—1600

RAINFALL GRAPHS





**NILDUNGRI
RAINFALL GRAPH**



APPENDIX IV
Normals of Temperature and Relative Humidity (Sambalpur)

Month	Mean Daily maximum temperature	Mean Daily minimum temperature	Highest Maximum ever recorded	Lowest Minimum ever recorded	Relative Humidity	
	OC	OC	OC Date	OC Date	%	%
January	27.7	12.8	33.9 1889 Jan. 30	4.4 1954 Jan. 26	72	44
February	30.2	15.1	37.8 1896 Feb. 28	5.6 1950 Feb. 13	66	39
March	35.4	19.2	43.3 1888 Mar. 23	11.1 1954 Mar. 8	52	30
April	39.4	23.8	45.6 1942 Apr. 30	14.4 1905 Apr. 2	49	25
May	41.6	27.4	72.2 1948 May 22	20.6 1951 May 3	49	28
June	36.5	26.9	46.7 1955 June 6	19.4 1903 June 28	67	59
July	30.7	25.1	40.6 1902 July 1	18.3 1910 July 1	85	85
August	30.4	24.9	35.0 1954 Aug. 2	21.1 1956 Aug. 9	85	83
September	31.5	24.9	36.1 1930 Sept. 30	20.6 1921 Sept. 29	82	78
October	31.5	21.9	36.1 1920 Oct. 17	12.8 1921 Oct. 31	77	66
November	28.9	16.3	33.9 1946 Nov. 13	7.8 1926 Nov. 30	73	56
December	26.9	12.1	32.2 1902 Dec. 19	4.4 1902 Dec. 5	74	49
Annual	32.6	20.9			69	53

* Hours I. S. T.

APPENDIX V

Mean wind speed in Km./Hr.

SAMBALPUR

January	February	March	April	May	June	July
3.4	3.9	4.2	4.8	5.8	6.8	6.8

August	September	October	November	December	Annual
6.1	4.7	3.7	3.4	3.1	4.7

APPENDIX VI
Special Weather Phenomena
SAMBALPUR

Mean No. of days with	January	February	March	April	May	June
Thunder ..	2.2	3.0	4.4	4.9	7.9	15.1
Hail ..	0.	0.1	0.1	0.2	0.	0.
Duststorm	0.	0.	0.	0.4	0.6	0.7
Squall ..	0.4	0.	0.4	0.3	0.9	0.3
Fog ..	0.2	0.	0.4	0.	0.	0.

	July	August	September	October	November	December	Annual
	15.2	14.7	16.4	5.1	0.2	0.2	89.3
	0.	0.	0.	0.	0.	0.	0.6
	0.	0.	0.	0.	0.	0.	1.7
	0.1	0.	0.	0.	0.	0.	2.4
	0.	0.	0.	0.1	0.	0.	0.9