DISTRICT GAZETTEER OF CHAMPARAN.

CHAPTER I—GENERAL.

INTRODUCTORY.

Origin of Name.

In Vishnu and certain other Puranas frequent references have been made of Champak-aranya (the forest of *Champa* trees) stretching along the Salgrami or Narayani river, which is another name of the Gandak. The area was the abode of the Hindu ascetics, removed from the wordly ambitions. There are a number of places in the district which commemorate many a great Hindu *rishis* of the epics.

It is now said that the name Champaran is a degenerate form of Champak-aranya, a name which, as stated above, dates back to the time when the district was a tract of the forest of *Champa* trees (*Michelia champaca*) and was the abode of solitary ascetics.

Location, Boundaries and Area.

The district of Champaran, which forms the extreme north-western portion of the Tirhut Division and of the State of Bihar, is situated between 26°-16′ and 27°-31′ north latitude, and between 83°-50′ and 85°-18′ east longitude. In Edward *Thornton's Gazetteer,* Vol. I (London, Wm. H. Allen and Co. 1854) the district is mentioned to be situated between 26°-16′—27°-30′ latitude and 83°-55′—85°-55—85°-21′ longitude. According to the census of 1951, the district extends over an area of 3,525 square miles and has a population of 25,15,343 (1951).

The district is bounded on the north and north-east by Nepal; on the south-east and south by the district of Muzaffarpur; on the south-west by Saran; and on the north-west by the Gorakhpur district of Uttar Pradesh. To the north and north-east the boundary marches with the Nepalese *zilas* of Parsa and Bara; and here the frontier, where not naturally formed by rivers, is marked by ditches and masonry pillars, and for a considerable distance runs along the crest of the Sumeswar range. On the north-east the Uria, and on the south-east the Lal-Bakeya and Baghmati constitute natural boundaries and on the west, the district is separated from Gorakhpur and Saran by the present channel and an old bed of the Gandak.

Thornton's Gazetteer mentions "Champaran district is bounded on the north by Nepal State; east by Muzaffarpur district; south by Muzaffarpur and Saran districts; and west by Gorakhpur district, N. W. P. and by Nepal State". The boundaries given by Thornton do not appear to be quite correct now because of administrative changes.

It will be of interest to mention that the district of Champaran, even when it was a part of Sarkar Saran, had seemingly a much larger area under it than what it has at present. In the old correspondence from one letter no. 21, Saran, dated the 14th February 1842, from the Judge to G. D. Wilkins, Joint Magistrate of Champaran, it appears that there were eight thanas in the district and that the total area of all of them together was 4,139 square miles. This, however, was questioned by the Judge as the total area of the district was shown at 4,048 square miles in a statement. Another letter from Calcutta, dated the 18th January, 1842, from the Secretary of same Department to the Judge, Saran mentions about the statistics of area and population of Saran and Champaran. It was mentioned that the area of Saran Civil District was 7,918 square miles of which 3,870 was the area of Saran Magistracy. The Magistracy of Saran consisted of eleven thanas and three Munsifs and that of Champaran of eight thanas and three Munsifs. The Magistrate of Saran computed the area by multiplying medium length by medium breadth and Joint Magistrate of Champaran by multiplying extreme length by extreme breadth. The population of Saran was calculated by multiplying the number of houses by five and half and the result was about 170 persons per square mile while Champaran had returned about 110 persons per square mile, the figure being based on the reports of *Patwaries and Gomastahs.*

A table of statistics is attached with the letter which runs as follows :—

Comparative Statement of Munsif and Thanas, Saran Civil District.

From Judge's revised Supplementary Table no. 5.			From revised list of Magistrate no. 3.		
Munsifs.	Area.	Population.	Thanas.	Area.	Population.
1	2	3	4	5	6
			Saran Magistracy.		
Chuprah ..	54	2,66,584	(1) Chuprah ..	120	1,05,973
			(2) Manjhi ..	220	50,215
			(3) Taujpore ..	280	1,10,396
			TOTAL ..	620	2,66,584

From Judge's revised Supplementary Table no. 5.			From revised list of Magistrate no. 3.		
Munsifs.	Area.	Population.	Thana.	Area.	Population.
1	2	3	4	5	6
Pursah ..	528	2,34,300	(4) Pursah ..	270	68,607
			(5) Kusmer ..	200	57,195
			(6) Tuttehpoor ..	270	76,125
			(7) Goldingganj ..	170	32,373
			TOTAL ..	910	2,34,300
Sewan ..	736	4,22,988	(8) Butterdah ..	270	85,717
			(9) Sewan ..	260	1,47,719
			(10) Daraoly ..	230	79,376
			(11) Barragong Hoosaypore.	230	1,10,176
			TOTAL ..	990	4,22,988
		Champaran Magistracy.			
Champaran or Bettiah.	2,208	4,47,208	(12) Motihari ..	468	63,813
			(13) Bettiah ..	832	98,541
			(14) Kullianpore ..	480	51,885
			(15) Govindgunj ..	294	51,540
			(16) Musowra ..	320	47,506
			(17) Dacca ..	384	62,595
			(18) Burijurea ..	562½	28,907
			(19) Birgah ..	703	42,421
			TOTAL ..	4,043½	4,71,208
	3,526	13,71,080		6,563½	13,71,080

Subdivisions and Thanas.

The district has two subdivisions, namely, Sadar and Bettiah. The former with its headquarters at Motihari, which is also the district headquarters, has an area of 1,528 square miles and a population of 14,43,961 souls, according to the census of 1951. Bettiah subdivision has its headquarters at the town bearing the same name and extends over an area of 1,997 square miles with a population of 10,71,382 souls. The two subdivisional headquarters are also the principal towns of the district, of which Bettiah is more populous than Motihari and is also the chief trading centre of the district.

The whole district is divided into 9 revenue thanas and 25 police-stations. Of the total number of revenue thanas, 6 are in Sadar subdivision and the rest in Bettiah subdivision and that of the total number of police-stations, 13 are in Sadar and 12 in Bettiah. A table is given below showing the name, area and population of each revenue thana and police-station, according to the census of 1951 :—

Name.	Area in square miles.	Population.		
		Persons.	Males.	Females.
1	2	3	4	5
Sadar subdivision—				
Motihari (Revenue thana) ..	287	2,63,997	1,35,606	1,28,391
Motihari (police-station) ..	11	24,489	14,247	10,242
Motihari Mufassil (ditto) ..	211	1,72,567	86,845	85,722
Sugauli (ditto) ..	65	66,941	34,514	32,427
Adapur (Revenue thana) ..	226	2,28,151	1,16,930	1,11,221
Adapur (police-station) ..	111	1,11,469	56,839	54,630
Raxaul (ditto) ..	115	1,16,682	60,091	56,591
Dhaka (Revenue thana) ..	339	3,66,554	1,77,846	1,88,708
Dhaka (police-station ..	139	1,66,010	79,654	86,356
Ghorasahan (ditto) ..	85	85,125	42,005	43,120
Patahi (ditto) ..	115	1,15,419	56,187	59,232
Kesaria (Revenue thana) ..	268	2,39,072	1,17,405	1,21,667
Kesaria (police-station) ..	194	1,68,455	82,352	86,103
Pipra (ditto) ..	74	70,617	35,053	35,564

Name.	Area in square miles.	Population.		
		Persons.	Males.	Females.
1	2	3	4	5
Sadar Subdivision—*concld.*				
Madhubani (Revenue thana and police-station).	125	1,20,764	58,863	61,901
Gobindganj (Revenue thana) ..	283	2,25,423	1,13,395	1,12,028
Gobindganj (police-station) ..	134	1,06,399	53,509	52,890
Hasidih (ditto) ..	149	1,19,024	59,886	59,138
Bettiah subdivision—				
Bettiah (Revenue thana) ..	556	4,88,698	2,49,503	2,39,195
Bettiah (police-station) ..	29	53,827	27,646	26,181
Jogapatti (ditto) ..	86	68,993	35,590	33,403
Majhaulia (ditto) ..	101	92,022	46,744	45,278
Nautan (ditto) ..	160	1,25,980	63,697	62,283
Sikta (ditto) ..	63	65,779	33,261	32,518
Chanpatia (ditto) ..	117	82,097	42,565	39,532
Bagaha (Revenue thana) ..	699	2,61,741	1,34,985	1,26,756
Bagaha (police-station) ..	474	1,47,057	76,448	70,599
Dhanaha (ditto) ..	225	1,14,694	58,537	56,157
Shikarpur (Revenue thana) ..	742	3,20,943	1,62,873	1,58,070
Shikarpur (police-station) ..	315	1,46,105	74,242	71,863
Ramnagar (ditto) ..	258	60,347	30,952	29,395
Mainatanr (ditto) ..	98	43,743	21,294	22,449
Lauriya (ditto) ..	76	70,748	36,885	34,363

The History of the District as an Administrative Unit and the Changes in the Component Parts.

Till 1837 Champaran did not have a separate entity as a district but formed a part of Sirkar Saran for all administrative purposes. In that year, however, the criminal jurisdiction of Champaran was separated and placed under a Joint Magistrate with headquarters at Motihari. This Joint Magistrate was also given the powers of a Deputy Collector for his jurisdiction. This arrangement appears to have continued till 1865-66. In 1866 the revenue jurisdiction of

Champaran was separated and it was given the status of a full-fledged district.

The district has two subdivisions, Bettiah with headquarters at Bettiah and Sadar with headquarters at Motihari. As regards the creation of the subdivision of Bettiah there appears to be some anomaly. Hunter's Statistical Account of Bengal (1875) mentions 1852 as the year of creation of Bettiah subdivision. The old *District Gazetteer of Champaran* (1938) has also mentioned the same year, probably on the basis of Hunter's version. But some of the documents which are in existence do not support the view that the Bettiah subdivision was created in 1852. In 1845 the subdivisional system was introduced for the first time in Lower Bengal for better administration. It appears that the subdivision of Bettiah also came into existence in this connection. But the subdivisional headquarters appears to have been withdrawn later. Letter no. 192, dated the 18th June 1860, from the Commissioner of Patna to Government of Bengal, mentions that by Government Order no. 635, dated the 9th April 1845, the selection of Bettiah as the headquarters of a subdivision bearing the same name was approved much to the chagrin of the Bettiah Rajah and a Deputy Magistrate was stationed there. The opposition, though passive, of Bettiah Rajah continued and by another Government Order in September, 1846, the Deputy Magistrate from Bettiah was recalled to Motihari. The same letter no. 192, dated the 1st June 1860, mentions that subsequently another Deputy Magistrate was appointed at Bettiah for some time but was later transferred to Sherghati (now in Gaya district) and no Subdivisional Magistrate appears to have been deputed to Bettiah till 1862. This letter does not, however, mention as to when another Deputy Magistrate was sent to Bettiah.

A proposal for the creation of a full-fledged subdivision at Bettiah was given by the Joint Magistrate of Champaran in 1860 to the Commissioner of Patna Division. In the concluding lines of his letter, he wrote :

" 10. Formerly there always used to be Deputy Magistrate at Bettiah, but he was removed (to Sherghotty I think) and no one was sent to supply his place.

" There is at present no accommodation at Bettiah. The last Deputy Magistrate's Bungalow was burnt (some say accidentally), but there is the foundation and part of the walls of a house in a very good situation, which would, if completed, make very good Residence and Cutcherry. This was intended to be an Industrial School or something of that sort, but when your immediate predecessor came to Patna the works were stopped. But the Rajah is unwilling to complete it, the Government might hire or buy the land and the house might be finished by the Executive Engineer.

" 11. I enclose a rough map of the district and of the parts which I propose to make the subdivision.

"With reference to the size of the proposed subdivision it is to be remembered that it does not contain probably 2,00,000 of 7,00,000 inhabitants of Champaran.

"12. As to Establishment, the smaller it is, the better. The Amlah would, to a certainty, coalesce with the Rajah's Amlah. I should propose :—

	Rs.
A Mohurrir on	15
A Mohurir on	10
I Chupprassie	5
3 Chupprassies at Rs. 4 each	12
Total	42

"The Joint or Deputy Magistrate could write his own letters and be supplied with stationery from my office."*

The Commissioner of Patna while recommending this proposal for approval of Government discussed the previous history of Bettiah subdivision in his letter of 18th June, 1860, cited above, and observed : "The present position then is not to form a new subdivision but to appoint an officer to a subdivision sanctioned and established in 1845." Meanwhile Government had received several petitions from inhabitants of that part of Champaran complaining of oppressions practised upon them by the farmers of Bettiah Raj. The Collector's proposal was, therefore, sanctioned by Government under Judicial Department letter no. 91A, dated 8th January, 1861, to the address of Commissioner of Patna Division which runs as follows :—

"2. The Lieutenant-Governor has no objection to the immediate establishment of the subdivision of Bettiah as proposed by you. No permanent buildings, however, will be sanctioned until the general question of subdivisions for the Patna Commissionership has been settled. Meanwhile you can depute any available officer to take charge of the subdivision. If no suitable accommodation can be found there, the officer deputed to Bettiah can live in tents, and return to the Sudder station at the commencement of the hot weather. Mr. Lynch is probably available for this service."**

The new Subdivisional Officer, however, could not shift his residence to Bettiah till late in 1862, for a letter of the Commissioner of Patna, dated 12th June, 1862, says :

"There is only one subdivision at present, viz., that of Bettiah and the officer in charge of it does not reside or hold office there

* *Bengal Judicial Department Progs.* nos. 141—148 of January, 1861.
** *Ibid.*

but at the Sudder station of Moteharry 30 miles distant owing to the absence of a Cutcherry or dwelling house at Bettiah."*

Under the new subdivisional arrangements in Patna Division which were already under consideration of Government, two subdivisions, namely, Motihari and Bettiah, were sanctioned for Champaran under Judicial Department letter no. 1608, dated the 2nd March 1863.† The Sudder subdivision continued to be under the Magistrate's charge while Bettiah had its separate Subdivisional Officer. The new arrangements were notified on the 10th June, 1865 (published in *Calcutta Gazette* of 14th June 1865), after receipt of the Report of Boundary Commissioner.

The revenue jurisdiction of Champaran was separated from that of Saran in 1865-66 and the former got the status of a full-fledged district.

The Sudder Subdivision of Motihari appears to have continued to be under the direct charge of the Magistrate of Champaran till 1916 when in accordance with the recommendation of the Decentralisation Commission it was provided with a separate Subdivisional Officer.

TOPOGRAPHY.

Configuration.

In the old *District Gazetteer of Champaran* it has been mentioned : " In shape, Champaran roughly resembles an irregular parallelogram, extending along the eastern bank of the Gandak for 100 miles, and having a breadth of 20 miles at the northern and of 40 miles at the southern extremity. The general aspect of the greater part of the district is very similar to that of the rest of North Bihar, a flat cultivated expanse diversified by numerous large groves of mango trees and intersected by a number of rivers and streams debouching from Nepal. In the south and east the country is almost perfectly level with a very slight declination to the south; and the general character of the scenery is tame and monotonous. Towards the north and north-west the country begins to undulate and the alluvial plain gives place to a broken hilly region known as the Dun or Ramnagar Dun. This consists of a range of low hills, about 20 miles long, north of which the Sumeswar range extends for about 46 miles along the northern frontier. Below these hills extend southwards and eastwards large grassy prairies watered by numerous hill-streams, while in the background tower the Himalayas of Nepal in an imposing arc of eternal snow."

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* *Bengal Judicial Department Progs.* nos. 94—112 of March, 1863.

† *Bihar Appointment Department Progs.* nos. 99—118 of March, 1916.

There have not been substantial changes in recent years to necessitate a change in the above statement excepting that the district has not got now numerous mango groves. Many of the mango-topes were cut down and the fuel used up for domestic purposes and as fuel to the sugar mills whenever there was scarcity of coal which has to be imported into the district.

Natural Divisions.

The district is divided into four distinct tracts. The first consists of the hilly tracts of Sumeswar and Dun ranges. They are to the extreme north of the district at the foot hills of Himalayas. These Dun and Sumeswar hills run with their foot hills some 15 miles into the alluvial plains. It is noticeable that the soil even at the foot of the hills has no rocky formation and wherever water can be impounded, rich growth of crop is possible. The hilly streams, however, play havoc by bringing down huge quantities of sand and destroying cultivable lands. The hills contain large stretches of jungles and forests. In fact with the exception of forests occurring in the Bettiah and Madhuban thanas the entire forest area of the district, which is 359 square miles, occurs on these hilly tracts. The finest timber of these tracts have long since been exploited on account of mismanagement of forest in the hands of the old Bettiah and Ramnagar estates. Since these forests have now vested in the State they are being scientifically maintained.

Next to the hilly area comes the sub-montane tract, known as Terai. This Terai region is supposed to be comparatively unhealthy and consists of mostly prairies and forest lands. The Tharus of the district reside in the scattered clearances of the area. Welfare measures taken by the State to improve the condition of this tract have attained some success.

The Terai region is followed by fertile plain occupying the rest of the district. This plain itself is divided into two well defined tracts by the little Gandak, and have markedly different characteristics. The northern portion of the area which is the third distinct tract of the district is composed of old alluvium and has a considerable area of lowland. It is traversed by a number of streams flowing southwards. The area is admirably suited for the cultivation of rice, but is unfit for the cultivation of *rabi* crops. The southern portion of the tract is composed of recent alluvium deposited during the oscillations of the Gandak while it shifted westward to its present channel. The area could be described as the fourth distinct tract and is characterised by stretches of upland varied in places by large marshy depressions known as *chaurs*. The soil is generally lighter and grows millets, pulses, cereals and oilseeds.

A remarkable physical feature of the Champaran district is a chain of 43 lakes in number running through the centre of the district. These lakes, of which the largest are at Lalsaraiya, Sugaon,

Turkaulia, Motihari, Pipra, Siraha, Nawada and Tetaria, extend over an area of 139 square miles, and evidently mark an old bed of the Great Gandak. Their depth varies from 3 to 20 feet and the water, which is considered very unhealthy, never dries up. They contain a variety of fish but rather difficult to catch. It is said there are mostly deep bores in the lakes where fish conceal themselves whenever net is put in. These lakes are usually not inundated by the spill-water of the rivers.

There are also a number of swamps and marshes scattered over the district, of which one of the most remarkable is the one known as Bahas along the borders of *tappas* Bahas and Balthar. This is a genuine bog during the greater part of the year, and even in the hot weather the prudent way farer cautiously feels his way with a stick or bamboo across the treacherous ground.

There was a severe earthquake in 1934, a description of which will be found in the chapter Agriculture and Irrigation. This earthquake raised the level of some *chaurs* and as a result portions of a few *chaurs,* which used to hold water perennially, have now become fit for cultivation. In recent years there has also been an attempt to drain off water of some *chaurs* to make them fit for cultivation.

Hills and Plains.

In the old *District Gazetteer of Champaran* (1938) it has been mentioned "To the extreme north the Dun and Sumeswar hills extend over an area of about 364 square miles. The Sumeswar hills form a part of a long range, which, under different names, runs in practical continuity along the whole length of Nepal, the only breaks in the chain being caused by rivers seeking an outlet. It is the lowest and outermost of all the Himalayan ranges, immediately overlooking the plains of Hindustan; and at its base lies the swampy feverish Terai. The hills of this range are mainly composed of imperfectly compacted sand-stone, in which are imbedded rocks and pebbles of the same formation. Owing to this ill-formed sand-stone, the hills have been worn by the action of rainfall into a series of steep ravines and almost inaccessible summits; and bare steep crags rise from the midst of the luxuriant vegetation with which many of its slopes are clothed.

The average height of the range in this district is 1,500 feet, but the hills vary in altitude from a few hundred feet to 2,884 feet above sea level at Fort Sumeswar, which commands a superb view of the Himalayas. This peak overlooks the Mauri valley in Nepal and in the background stretches the main range of the Himalayas, hill succeeding hill and peak rising above peak until they culminate in the vast snowy range to the north. The great peaks of Dhaulagiri (26,826), Gosainthan (26,305), and Gourishankar are clearly visible; and the view is said to be, for extent, one of the finest obtainable

from any place on the frontier line in British India.* The ascent lies along the Sumeswar pass up the bed of the Juri Pani stream amid romantic scenery; this pass was commanded by a hill fort during the Nepal War of 1814-15. About 200 feet below the summit a bungalow has been erected, as it was once hoped that the place might develop into a sanatorium for North Bihar. For this it is in many ways well adapted, as the temperature does not exceed 80 in the hot weather and there is a supply of pure water; but the place has the reputation of being unhealthy, except from December to May. At the eastern extremity of the range, where the Kudi river pierces it, is situated the Bhikhna Thori pass through which a British force successfully marched into Nepal in 1815; and the other principal passes are the Kapan and Harha also leading to Deoghat in that State."

"The only other hills in the district are the Dun hills, a range of low hills which extends for about 20 miles in a south-easterly direction from the north-west corner of the district, and has an average breadth of 4 to 5 miles. Between this and the Sumeswar range lies what is known as the Dun Valley, an elevated table land inhabited by aboriginal Tharus."**

The above statement still holds good.

Barring the hills of the north and the area skirting them, the entire district is occupied by the rich and fertile plain. The entire plain area is divided into two well defined northern and southern tracts by the river Little Gandak, each distinguishable from the other in the principal characteristics. The northern tract is composed of the old alluvium, whereas the southern is composed of recent alluvium. The plains of the district has also a number of lakes and marshes, a description of which has already been given above.

River System.

"The general line of drainage is first from north to south, and then from north-west to south-west, the latter being the predominant course of the rivers. To the west the Gandak flows along the whole length of the district except for a small strip of land, forming the Dhanaha police-station, which lies to the west of it adjoining Gorakhpur. To the north-east the Uria forms part of the boundary, while to the south-east the district is bounded throughout its length by the Lal Bakeya and Baghmati rivers. Besides these boundary rivers, there are a considerable number of rivers and streams of which the most important is the Little Gandak or Sikrahna. The whole of the country north of this river is watered by a number of tributaries flowing almost due south from Nepal or the Sumeswar

* Now the Union of India.

** The Tharus are no longer recognised as aboriginals. They are now classed as the people of Backward Class. The Tharus have been discussed elsewhere.

range; to the south there are only two considerable streams, both sluggish and with tortuous channels, in which the water remains almost stagnant except during the rains."*

The yearly rainfall of the district ranges from 50 to 60 inches. The nature of the country, as stated above, is partly plain and partly hilly. The average slope of the plain area varies from 4 to 5 feet and that of the hilly area, locally called Terai, varies from 6 to 15 feet per mile. The maximum precipitation in 24 hours ranges from 10 to 15 inches which causes the rivers and streams in this district to come in spate very suddenly, causing devastation and submersion of large tracts of arable land.

The Great Gandak.

The Gandak or Great Gandak is also known as Narayani or Salgrami owing to the presence in its bed a large number of black stone pebbles with a white bend round its middle which are venerated by the Hindus as *Narayan* or *Salgram*. Although there is no clear indication of its distant past, but it is generally believed that the Burhi Gandak was its original course and after centuries it has moved westward to its present course. This river has also been identified with the Kondochates of the Greek geographers and (according to Lassen, is the Sadanira or everflowing river of the epics.

The Gandak rises in the mountain basin of Nepal, which has been called, from time immemorial, the Sapt Gandaki or the country of the seven Gandaks, from the seven main streams which unite to form this river. Its catchment area up to Indo-Nepal border is 14,612 square miles. After passing through Deoghat hills, 30 miles north of the territory of the Indian Union, the united stream flows southwards in a succession of rapids and pools until it reaches the Sumeswar range near Tomaspur. Here the descent is very rapid and its course lies through a narrow gorge between high cliffs crowned with trees. The Gandak finally leaves the hills through a pass in the sand-stone range to the west of the Sumeswar hills, at Tribeni, where it is joined by the Panchnad and Sonaha, the name Tribeni being suggested by the confluence of the three streams.

It then flows in a south easterly direction separating the district from Gorakhpur up to Tengraghat, from whence up to Satterghat it forms the boundary between Saran and Champaran, and from thence up to Sonepur, where it outfalls into the Ganga, it forms the boundary between Muzaffarpur and Saran. A number of streams fall into it during its course through Champaran, such as Rohua, Manaur, and Bhabsa, a description of which will be found later. Several minor streams which rise in the south of the tract, known as Ramnagar Dun, pour their combined waters into the Gandak at Rajwatia near Bagaha.

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* *Champaran District Gazetteer* (1938).

At first a snow-fed torrent, the Gandak becomes much wider and its stream more equable in velocity after debouching into the plains at Tribeni; and boats come up thus far and take away cargoes of timber. Navigation, however, is difficult owing to the narrow and tortuous course of the river during the hot and cold season, and the impetuosity of its current during the rains; large boats rarely go beyond the shoals and rapids near Bagaha, but smaller crafts ply as far as Lehra Ghat in Nepal. South of the Bagaha it becomes a widespreading river, with sandy tracts being formed one year to be swept away the next. It is on record that the main stream was once diverted for over a mile in consequence of the obstruction caused by a boat laden with rice being sunk in its channel. In the rains the stream attains a breadth of two to three miles and even in the hot and cold weather it is a quarter of a mile broad. After its entry in the territory of the Indian Union, the Gandak first flows over a rocky bed between high banks bordered with forest, but it soon acquires the character of a deltaic river, its bed being raised considerably above the level of the surrounding country. The south of the district is consequently liable to inundation from the river overflowing its banks, but is now protected from its once disastrous floods by an embankment extending from near Bagaha to the southern extremity of Champaran.

It is unique among Bihar rivers as it has been deprived of all spill area for a distance of 100 miles from its outfall by the construction of marginal embankments on its either banks now maintained by the Government. On the Saran side the embankment is continuous and has closed up the off-takes of all the spill channels, viz., the Gandaki, the Dhanai, etc., which used to irrigate and to build up the northern part of Saran district. On the Champaran and Muzaffarpur side the embankment has been breached several times and again restored. In Champaran itself the embankment has been breached at several places and retired lines have been constructed to encircle these gaps. Any gap caused by the breach of embankment is quickly closed by constructing a retired line or by restoring the embankment itself.

Along the left bank of Gandak there originally existed from Ratwal up to the southern border of Champaran an embankment known as Champaran Embankment. This was the gift of the local authorities and is now known as Gandak embankment. This embankment was breached at places in course of time and at present its total length, including the breached portions, comes to 83.5 miles. The bank was breached at Bathna, Majharia and Huseni. At Bathna the gap was about two miles and the spill through this gap used to go about two miles east and flow back into the main stream through the Ojhwalla Nala and the sluice provided in the embankment near Mangalpur. The Majharia gap occurred in the 48th mile and extended over three and a half miles. A very small percentage of the spill used to pass through this gap and combine with the

Reghua spill in the low *chaur* areas under Gobindganj and Kesariya police-stations. The Huseni gap was about two and a half miles and its spill water used to flow south of Kesariya through several *chaurs* and ultimately meet the Reghua which is called Baya after its confluence with the Samohti. These gaps no longer exist and whenever any fresh gap occurs that is put in order immediately by the Construction Division of the Irrigation Department.

As stated above, there are a number of tributaries to the Gandak. A brief description of the important streams meeting the Gandak in Champaran is given below.

The main tributaries of the Gandak are the Bhabsa Nadi, the Harha Nadi and the Bara Haraha.

The Bhabsa Nadi rises in the low hills, ten miles south of Tribeni, and after a circuitous route in the hills, where it is joined by many minor streams, flows in the south-westerly direction and crosses Tribeni canal at Amahat in the 14th mile, from whence it flows in the south-easterly direction and finally forms a confluence with the Gandak at Pathkauli.

The Harha Nadi is a combined stream of several minor streams, namely, the Jhegersi (which is called Baghi further down), the Jhakauri, the Kosi, the Garghai, the Gobrahi, etc., all rising in the hills. They join one another after crossing the Ramnagar-Santpur Road and the Tribeni canal. The combination of the Garghai and the Gobrahi is called Harha Nadi, which is later joined by the Jhegersi, the Jharkauri and the Kosi at Pipra Dharauli, from whence the Harha flows in the south-easterly direction crosses the Sugauli-Bagaha railway line at Pokharbhinda through a bridge (5′ × 40′) and finally falls into the Gandak at Rajwatia about three miles south-east of Bagaha.

The Bara Harha is a high level spill channel of the Gandak itself, which, after its off-take near the village Bherihari, is fed by the river Tengrahi and also receives water from the Bargaon branch distributary at Bisambharpur, and, after leading an extremely tortuous course of about 43 miles, again falls into the Gandak at Chaumukha. At several places cross bunds are put on this river either for irrigation or for fishing purposes which are not completely removed before the flood season. Five miles above its outfall it follows the course of a dead streamlet of the river Gandak and inundates the surrounding country badly along with the spill water of the Gandak.

It is interesting to mention that the Gandak has also an abandoned channel known as the Dhanauti, which originally was its spill channel with the off-take at Bairia. The Dhanauti ceased to flow, as its off-take was silted up for a few miles, and is now an extremely sluggish drainage channel, full of loops in which drainage

water practically stagnates till it falls into the Sikrahna at Pakridayal. The existence of several *Mans* or lakes in the vicinity of the Dhanauti provides a good ground for the belief that during the course of westerly swing of the Great Gandak from its old course the Dhanauti used to function as an important channel.

An investigation was made for the improvement of the Dhanauti by reducing certain amount of Sikrahna spill into it through Khairwa bridge west of Motihari. It was, however, found that the scheme was not feasible owing to the insufficient fall in the bed, the length of Sikrahna being 45 miles against the tortuous length of the Dhanauti of 98 miles. The attempt was made with a view to improve the hygienic condition of the area falling on the banks of the Dhanauti, which was reported to be very unhealthy. It was also reported that a tract of the country to the west of Motihari was sparsely populated on account of this. However, the area is no longer reported to be unhealthy, although it is still sparsely populated.

It may also be of some interest to mention here about the towns situated at the banks of the Gandak. There may be said to be two townships so situated, namely, Tribeni and Bagaha, although the former is not reckoned as a town in the census of 1951. Tribeni is the headworks of a canal bearing the same name and its scenery at the headworks is fascinating. Bagaha is an important growing township and is also reckoned as such in the census of 1951 with a population of 5,820. Bagaha controls a large turnover of timber trade due to its proximity to the Terai and being close to the forests of Champaran district. It is situated in the north-western extremity of the district and was formerly connected with the Gorakhpur district by a bridge at Chhitaunighat. The bridge collapsed in 1924 and has not been replaced since. A temporary pontoon bridge is fixed up by the Bagaha Sugar Mill every year now for the transport of sugarcane to the mill.

The Little Gandak or Sikrahna.

In the district of Champaran the Little Gandak is the largest river next to the Gandak. Earlier it was believed to take its rise in the western extremity of the Sumeswar range and has been mentioned as such in the old District Gazetteer of 1938. But actually it rises from the Chautarwa *chaur,* which, in its turn, is fed by a number of hilly streams such as Manguraha, Sakti, Haraha, etc. It is rather a continuation of the river Manguraha, which gets a perennial supply of the sub-soil water percolating from its bed.

The Little Gandak flows through the centre of the district from north-west to south-east till it enters the Muzaffarpur district at Semra village. In the northern portion of its course it is known as the Sikrahna and in the southern portion as the Burhi Gandak. It has frequently changed its course, its oscillation from side to side being facilitated by its banks being composed of sandy friable soil.

During the first portion of its course, until it turns, southwards at Lakhaura, north of Motihari, it is joined by a number of hill-streams which make it an impetuous torrent in the rains, when it rises with great rapidity and sometimes overflows its banks causing serious inundation. From the records of the different years it appears that the flood slope varies from 1.05 feet to 1.27 feet per mile up to Lalbegiaghat, from where up to the district boundary, a distance of 48 miles, the slope is only 5.2 inches per mile. A table is given as Appendix 'D' of this chapter which indicates the maximum high level flood discharge for different years. It is navigable for a portion of its course towards the south by boats of small burden. The minimum width of the river between banks is 260 feet and the maximum is 975 feet, the mean being 533 feet. The low water mean depth is 4.87 feet but the least depth is 2.2 feet, whereas the greatest depth is 18.10 feet.

The catchment area of the river, which is partly hilly and partly plain, falls in Nepal as well as in Champaran. The catchment area in Nepal up to Indo-Nepal border is 961 square miles, and 211 square miles in Champaran. Most of the tributaries of the Sikrahna are hill torrents, a description of which is given below, and they all have sudden floods. When there is simultaneous rainfall in the catchment area of all the tributaries, the Sikrahna also goes in flood. In order to take precautionary measures and to know the nature of food in Burhi Gandak telegrams of heavy rainfall above 3 inches at Bhainsalotan (Tribeni), Ramnagar, Bettiah, Raxaul, Kathmandu and Motihari are sent to the Superintending Engineer, North Bihar Circle at Muzaffarpur.

The bank erosion in the Sikrahna is like that of other rivers flowing through the alluvial soil. It is eroding one bank and silting up the other, the tendency being more apparent where a loop is forming. The inner side of the loop is silted up and the outer side is eroded until the loop attains almost a circular shape. The river is eroding the right bank up stream approaches of the Chainpatia and Sugauli bridges.

During its course through the Champaran district the Sikrahna is fed by a number of hill torrents, namely, the Masan, the Belor, the Pandai, the Uria, the Tilaway, the Teur and the Kouhara. A brief description of each of them is given below.

The Masan at its place of origin is known as the Harha. It takes its rise in the Sumeswar range, close to Fort Sumeswar, and flows in the southern direction until it turns to the east near Barbiro. In its upper reaches it is joined by some tributaries, namely, the Saktiani Khola, the Dhair Khola, the Khudi river and the Kapan river. The Masan joins the Sikrahna at Basantpur after crossing the Raxaul-Bagaha section of the North Eastern Railway embankment through a bridge having eight vents of 60 feet each. It is famous for its turbulance, causing heavy erosion along its banks, and, when

in flood, it brings in sand to the fields on its banks and deprives them of their fertility. The influence of this system exists from the western extremity of the Sumeswar range up to 80° 30′ east longitude of this range. The Masan alone is reported to be responsible for almost 30 per cent of Sikrahna discharge.

The Belor is a hilly stream formed by the unification of four hilly torrents, namely, the Ramrekha, the Belor, the Dhongai and the Harbora. It meets Sikrahna at Matiriaghat after passing through a railway bridge of seven vents of 40 feet each of the Narkatiaganj-Bagaha railway section. It is liable to come in spate very suddenly, causing inundation in the area it passes through.

The Pandai takes its rise in the Nepal territory north of Sumeswar range and enters into the district of Champaran through a pass between Sumeswar range and Churiaghat at Bhikhna Thori, from whence it flows in the southern direction and after crossing the Bagaha-Narkatiaganj railway line west of Gokhula railway station, it is joined at Tirmohanighat by another hill stream, the Kartaha, which is also called Maniari. The combined channel flows southwards and meets Sikrahna at Tulaghat. It is joined by several rivulets arising from the Sumeswar range before it is joined by the Maniari. It is also famous for its swift current and is reported to have damaged the Thori Bazar close to Bhikhna Thori railway station.

The Uria flows due south from Nepal, separates the district from Nepal for 12 miles and then flows southwards through the district for 14 miles and falls into the Sikrahna near Piparpantighat. Before its fall into the Sikrahna it is joined by the Sikta, the Kangali and the Gadh. It at times brings down heavy discharge of water.

The Tilway, which is a hilly stream, rises in Nepal, enters the district four miles west of Raxaul railway station and flowing southwards up to Ramgarhwa it takes south-easterly turn after crossing the Sugauli-Raxaul railway line. In its lower reaches it is joined by the Sariswa, the Bangari and the Pasaha streams and falls into the Sikrahna at Ajgarwa, which is two miles west of Barnawaghat.

The Tiur is the last important tributary of the Sikrahna, which crosses the railway line between Chauradano and Ghorasahan railway stations and carries a considerable discharge. It falls into the Sikrahna at about a mile east of Barnawaghat. A table is given as Appendix 'D' of this chapter which shows the maximum flood level discharge of different rivers. It has a canal of the same name, which will be described in the chapter "Agriculture and Irrigation".

The Kinhara is not any stream but a drainage channel, being the continuation of the Jharahi, for the Bettiah area. It falls into the Sikrahna near Gudderghat. It also works as a back spill channel of the Sikrahna when it is in flood and inundates the Bettiah area.

It may be mentioned here that the Sikrahna has a continuous chain of old and abandoned channels, namely, Chatnaha, Kachua Nala or Bakeya Nala, Hardia Nala and Babua Nala or Puraini Dhar, the last named is said to be once the course of the Baghmati. The earthquake of 1934 upheaved the bed of these channels. Now they are neither effective as spill channels nor as drainage channels and the result is the submersion of large area under four to five feet of water during the rains. However, occasionally they collect the drainage of Dhaka, Patahi, Nawada and Madhuban area and eventually pass on to Muzaffarpur district. There was also a live and vigorous spill channel of the Sikrahna at village Singhasani which was called Singhasani Nala. In 1938 it was observed that this spill channel was being gradually invigorated with a definite tendency of the river to divert through it on account of the gradual silting up of four of the nine vents of 80 feet each of the Sikrahna bridge number five at Sugauli. This had resulted in the formation of a shoal in front of the vents, which not only obstructed the flood flow but contracted the water section by yearly deposits of silt so much so that in 1938 only 36 per cent of the total discharge crossing the railway embankment between Sugauli and Ramgarhwa stations could pass through the main Sikrahna bridge. But now this Singhasani Nala, is a dead channel. No shoal formation at the Sugauli bridge takes place and whatever was earlier formed has been washed away by the river itself. The river now flows through its natural channel. However, it has been noticed that the river is now forming shoal at Chainpatia railway bridge and is reported to have already silted up three vents of 100 feet each there. It is feared that if no action is taken to remove the silt the river may form a diversion channel.

Earlier there were three embankments on the Sikrahna. The first was Piparpanti-Singhasani bund along the left bank from about Singhasani up to Sugauli-Ramgarwa railway embankment to protect the left bank area. The embankment is now totally ineffective and has been allowed to remain so. The second embankment was Thikaha-Barkagaon bund opposite to Madhubanighat to check the left bank spill damaging Pakridayal area. It has been breached at several places and has not been restored. The third was Manpura bund opposite to Narhar-Pakrighat. This has also been breached at several places and has not been restored. A portion of the river has now been provided with embankments on both sides right from the south-eastern border of the district up to the outfall of Dhanauti on the right side and that on the left side up to Sijua Nala. The total length of embankment in Champaran district on the right side is about 41 miles and that on the left side about 31 miles. In fact these embankments are a continuation of the embankments that start from the Khagaria railway station in the Monghyr district. There is also a proposal to put embankments on both banks of the river in the remaining portion in Champaran.

It may also be of interest to note that there are three towns at the bank of the Sikrahna, namely, Chainpatia Bazar, Sugauli and Mehsi but the last named is not recorded as town in the census of 1951. Chainpura Bazar is an important grain market in north-west Champaran and according to the census of 1951 has a population of 5,100. Sugauli is an important railway junction of the North-Eastern Railway for the branch line of Raxaul and Nepal and a sugar mill is also situated there. It has a population of 9,106 souls, according to the census of 1951. Mehsi is a very old town and had an indigo factory in the past. It has now several button factories. The river Sikrahna brings a huge quantity of oyster shells and the shells are utilised for making buttons.

Lal Bakeya.

The river Lal Bakeya is a hilly stream and takes its rise in the foot-hills of Nepal. It forms the eastern boundary between Champaran and Muzaffarpur and meets the Great Baghmati at Khori Pakar. It occasionally comes in high flood and sometimes causes damage to the down stream apron of the weir and threatens the North-Eastern Railway bridge. Its right bank is protected by a marginal embankment extending up to Nepal border, but the left bank spill water extends up to Bairagnia where it is joined by the spill of Baghmati and the joint spill inundates several villages in the district of Champaran as well as of Muzaffarpur. At Goabari, about one mile south of the Nepal border, the headworks of Dhaka canal is situated on this river, an account of which will be found in the chapter "Agriculture and Irrigation".

Baghmati.

The river Baghmati rises in the inner valleys in Nepal hills near Kathmandu and is a snow fed river. It enters into the territory of the Indian Union near village Rasulpur. Very little is known about the catchment area of the river in Nepal, but it is definite that the catchment area is very steep there as the river comes in spate very suddenly with short duration like torrential rivers, the current being sometimes 7 miles an hour in its upper reaches during heavy freshets. The river runs low during the cold season and also when no rain has fallen, but after a few days' rain its spill water combined with the spill water of Lal Bakeya inundates some portions of Champaran as well as of Muzaffarpur. In the Indian Union the nature of the catchment is fairly plain. The river after forming the boundary of the district of Champaran from Khori Pakar to Suga Pipar enters in the Muzaffarpur district. In this portion of its course the river is navigable by boats of 15 to 18 tons burden as far as Maniarighat. Its principal tributary is the Lal Bakeya which joins it at Khori Pakarghat. On account of many reasons the river has changed its course several times. It being a hilly stream, carries an enormous amount of silt in suspension and as is usual with such rivers, the major portion of the silt gets deposited on the banks forming a ridge

close to the river, which consequently restrict the spill discharge and call upon the reduced channel section to cope with this heavy discharge. Due to this and other natural causes as well as due to obstructions created by the human agency such as construction of roads, embankments, etc., and also because of the nature of the soil along its banks being very light and friable, the river has changed its course several times.

Lalbegi.

Besides the rivers already mentioned above, the only other river of some importance is the Lalbegi which flows into the Gandak to the north of Gobindganj.

Minor Streams.

There are several other minor streams or rivulets flowing in the district which join with one or the other big rivers of the district already mentioned above. These rivulets are so minor in importance that they hardly require any separate mention.

Lakes and Tanks.

The *District Gazetteers of Champaran,* published by both L. S. S. O'Malley in 1907 and R. E. Swanzy in 1938, have the following to indicate the importance of lakes and marshes in the district :—

"A remarkable physical feature of Champaran is a chain of lakes, 43 in number, running through the centre of the district. These lakes, of which the largest one at Lalsaraiya, Sugaon, Turkaulia, Motihari, Pipra, Siraha, Nawada and Tetaria, extend over an area of 139 square miles, and evidently mark an old bed of the Great Gandak. Their depth varies from 3 to 20 feet, and the water, which is considered very unhealthy, never entirely dries up. They contain a number of fish; and indigo factories are built on the banks of the greater number of them.

There are also a number of swamps and marshes scattered over the district, of which one of the most remarkable is the one known as Bahas along the borders of *tappas* Bahas and Balthar. This is a genuine bog during the greater part of the year, and even in the hot weather the prudent wayfarer cautiously feels his way with a stick or bamboo across the treacherous ground. This unpromising marsh, however, produces fine crops of rice, the seed being sown broadcast from canoes."

The above statement still holds good, excepting the fact that there are no longer any indigo factories existing anywhere in the district. There are schemes to clear up and dig deeper some of the lakes and marshes for hygienic fish culturing and irrigational purposes. No tanks are being excavated now.

Underground Water Resources.

Champaran has got sufficient supply of underground water which is evident from the fact that the drinking water for urban areas is supplied by tapping water from underground resources by boring deep wells and not from rivers or lakes.

GEOLOGY.

"The Dun and Sumeswar hills in the extreme north which are a continuation of the Siwalik range are formed of ill-compacted sand-stone, scored by the bare stony beds of the water-courses down which the streams rush with considerable force in the rains. Probably these Himalayan foot-hills were originally anti-clinal, the southern half of the anti-cline having disappeared, as there are no fossils in the strata. On the lower slopes of the hills the gravel beds are covered with forest in which *sal* predominates. In the lower ground at the foot of the hills which is called the Terai the ground is more marshy and high grass replaces the forest. The remainder of the district is an alluvial plain, a large portion of which has been formed by the Great Gandak, the river which now forms the south-west boundary of the district but which formerly flowed through the centre. The whole of the tract between the old course of the river and the present channel has been subject to fluvial action within comparatively recent times, and the soil is the older alluvion which is a characteristic feature of the Gangetic plain. There are beds of *kankar* in parts of the district and saltpetre is found almost everywhere."*

Our knowledge of geological formation of the district may be supplemented by a note dated the 12th March, 1959, from the Department of Geology, Patna University, which runs as follows :—

"The greater part of the district is covered by alluvium deposited by the numerous tributaries of the Ganga. The alluvium together with silt and sand fills up a great depression which forms a hidden trough all along the plains of the Ganga from the west to the east in northern India. This trough came into existence during the elevation of the Himalaya Mountain by the sagging of the frontal position of the Peninsula when the advancing mountain waves of strata pressed against the latter. It is presumed that the bottom of this trough which is deeper towards the north is covered by the Nummulitics—a lower Tertiary formation and other lower Tertiary deposits as it must have been filled by a sea. It is likely to contain also oil-bearing strata.

The northern fringe of the district is marked by the Sumeswar Range which is a continuation of the Siwalik Range of the western Himalaya. This range is largely made up of sand-stones and conglomerate or grit beds of Middle and Upper Tertiary age. There is a lower range of hills known as the Dun Hills separated from the

* *District Gazetter of Champaran* (1938).

former by a *dun*, known as the Ramnagar *dun*. The strata of the Sumeswar Range and of the Dun range of hills are thrust against the younger deposits further south by a series of faults which are known in Indian Geology as the main boundary fault. The bulk of the strata of the Sumeswar Range probably correspond to the Nahans of the Punjab Himalaya."

A proper soil survey of the district has not yet been done which can help in specifying nature, origin and distribution of parent rock material from which the soil has been derived. The soils are generally loam, yet in different parts soils are found which may be very loose sands, very hard clay or even reddish loam. Clay soils are found in limited areas near Gobindganj and Kesariya. The soils on the average show 0.05 per cent of nitrogen, 0.007 P_2 05, 0.02 per cent K 20 and 6.0–8.8 PH, the maximum nitrogen being 0.086 per cent and the minimum being 0.04 per cent.

The sub-soil in the alluvial plain has sandy deposit in various depths at different places of the district. Therefore, though masonry buildings of one or two storeys can safely be constructed with ordinary foundation, but heavy structures, such as bridges over rivers, are difficult to construct.

The note from the Department of Geology, Patna University, adds regarding the soil formation of the district that " The soils of the foot-hill zone are primary immature soils containing a good proportion of the undecomposed mineral grains. The slopes of gravel and shingle along the foot of the hills covered with thick forests of *sal* are known as *bhaban*. Many parts of the district are characterised by saline and alkaline efflorescence known locally as *reh* or *kallar*. In North Bihar particularly saltpetre is termed by the action of nitrifying bacteria excreta of cattle in the soil on a widespread scale ".

*Earthquake.

An earthquake is defined as a vibration caused by the passage, through the earth, of elastic waves set up by a sudden disturbance of the crust. Earthquakes are of two types, viz., volcanic and tectonic, the latter being more destructive than the former and affects a wide area. All the Indian earthquakes are of tectonic origin. The North Bihar Earthquake of 1934 which affected Champaran so severely, probably ranks equally with any recorded earthquake in history, both in intensity and in real damage.

Severe earthquakes are caused by a sudden fracture of a portion of the earth crust or by relative movement along some old fault place. The faults are of two main types, namely, normal or tensional fault and reversed or thrust fault. A normal fault may arise when

* Based on a study of the *Preliminary Report on the North Bihar Earthquake of the 15th January* 1934 by J. A. Dunn, J. B. Auden and A. M. N. Ghosh.

tension within a portion of the crust exceeds the elastic limits of a rock; the crust along one side of the fault sinks, relatively to the other side, as a result of gravity. Reversed faults arise where the crust is under horizontal compression; rocks above the fault are pushed bodily over those below or the underlying rocks are thrust under those above the fault. Under a normal fault the vertical displacement may vary from less than an inch to several thousands of feet, but the horizontal displacement is usually small. Under a reversed fault the horizontal displacement in some cases can be measured in tens of miles, but the vertical displacement may be comparatively small. Along the foot of Himalaya a series of reversed faults parallel to the trend of the mountains, separating the older rocks from the younger and from the area now covered by the Indo-Gangetic alluvium, is present.

There are two hypothesis, that is, overloading and underloading of Gangetic plains and both of them postulate a movement of the earth's crust over North Bihar in a north-south direction and the transfer of materials one way or the other. Any disturbing factor in the equilibrium of the crust in this zone may precipitate an earthquake.

It is known from the geodetic work of the Survey of India that a region of great underload exists in North Bihar, corresponding to a deficit of 5,000 feet of rock of density 2.67. Motihari lies near the centre of maximum underload. This underload arises from the abnormally low densities in the crust and is partly to be accounted for by the low density of the alluvium of the Ganges valley. The area of underload is flanked to north and south by the regions of overload in the Himalaya and in the Peninsular India. Such variations in loading must cause great stress differences, and it is remarkable that the Zone of maximum destruction in the North Bihar Earthquake of 1934 corresponded approximately to that of the area of greatest underload.

It has been stressed that the border of the Gangetic alluvium along the Himalaya is a seismic region and earthquakes could be expected along this belt in future also. But the timing of severe earthquakes, as one could expect by the earthquakes of 1833 and 1934, is impossible to predict.

The isoseismal map of the Bihar Earthquake of 1934 also indicates that Champaran district is one of the places in North Bihar liable to severe earthquakes. Although only a small part of the district, namely, the eastern portion of Dhaka thana, falls under the epicentral tract, but probably the whole of Motihari, Gobindganj, Kesariya, Madhuban, Sugauli and a portion of Ghorasahan thanas fall within the slump belt. This slump belt extends up to Purnea through a stretch of land some 10 to 20 miles in width. Besides, the northern most isoseismal line passes through Raxaul, Bettiah and other parts of the district west of Motihari.

The report of Messrs. Dunn, Auden and Ghosh put forward certain recommendations, based on their observations, regarding the reconstruction of buildings. They advised that in North Bihar heavy buildings should not be constructed until the dry season of 1934-35 was well advanced, since the alluvial soil was liable to subside irregularly for some months, even in places which exhibited no visible danger signs. The buildings should not be constructed near depressions like lakes, rivers, etc. Buildings should be given strong foundations and proper bracing. They should be of sound materials, one storeyed and as light at the top as possible. In the belt of maximum intensity use of steel or timber framed structures was recommended. Masonry arched bridges and culverts should be avoided and screw pile bridges adopted wherever possible. Buildings of irregular shape with wings, protruding verandahs, porches, etc., should be avoided.

Rebuilding of Government headquarters at Motihari presented a special problem. The old town lay on the banks of the lakes and the fissuring and subsidence of the soil had been extreme. Only a few islands of apparently sound soil could be found and the real stability of these areas was a matter of grave doubt. After an enquiry by the Chief Engineer it was found that Government buildings could not be constructed at Motihari and hence a piece of high land at Lautaha at a distance of 3½ miles, relatively free from fissures, was selected to construct Government buildings. It is the present site where all the Government buildings are now concentrated.

Since the engineering knowledge has advanced during recent years, it is not an unusual sight to find big buildings being constructed even by the side of depressions.

A detailed description of damages caused in the district of Champaran by the earthquake of 1934 has been given elsewhere.

VEGETATION.

In the last District Gazetteer it was observed "Botanically Champaran may be divided into several distinct areas. To the north are the Sumeswar and Dun ranges covered with forest and scrub wood, and next comes a narrow, more or less sloping gravelly sub-montane tract covered, except along river beds, with forest, the constituent species of which are those that occur on the lower slopes of the mountains themselves. In existing river beds only a few tough flexible bushes occur; along abandoned shingly river courses the jungle is open and park-like, and the species are those characteristic of a drier climate than obtains in the forest along side. The sub-montane forest is succeeded by a belt of swampy land of varying width, covered with long reedy grasses. Further out into the plain the ground, if so high as to be free from inundation, is in waste tracts usually covered with open jungle of a bushy character."

"Nearly the whole of the rest of the district is under cultivation, and is bare or diversified with bamboos, palms, and orchards of mangoes, or less often groves of other trees. The tracts liable to inundation are mainly confined to the banks of the larger rivers, and are there often covered with a jungle of reeds and bushes, largely tarmarisk, with a few trees. To the south, however, the river courses widen considerably in proportion to their strems, and their beds contain little or no vegetation. The powerful current in the rains sweeps everything away; the shingly or sandy banks are at other seasons too dry to admit of much growth. But old river beds, marshes, lakes and such streams as are stagnant, or nearly so except after heavy rains, have a mass of vegetation while even small rivers with a gentle stream abound with water plants.

"The belt of forest along the northern border of the district contains *sal* (Shorea robusta), *sisu* (Dalbergia sissoo) and *tun* (Cedrela toona), the red cotton tree (Bombax malabaricum) and *khair* (Acacia catechu) are also common. Bamboos thrive in the moist Terai tract, *sabai* grass (Ischoemum angustifolium) and the *narkat* reed (Amphadonax falcata) are also valuable products and extensive thickets of tamarisk line the Gandak river. In the south cultivation is closer, and the crops leave room for little besides weeds, grasses and sedges, chiefly species of Panicum and Cyperus, though on patches of waste land thickets of *sisu* very rapidly appear. The sluggish streams and lakes are filled with water weeds, the sides being often fringed by reedy grasses, bulrushes and tamarisk. Near villages, small shrubberies may be found containing mango, *sisu, Eugenia jambolana,* various species of Ficus and occasional tamarind, and a few other semi-spontaneous and more or less useful species. Both the palmyra (*Borassus flabellifer*) and date palm (*Phoenix sylvestris*) occur planted and at times self-sown but neither in great abundance."

There are many kinds of mushrooms. Scores of them are of fungus nature. There are also mosses of different families, particularly two, the family of Bryacacedoe (the feather mosses) and Phasaceoe (earth mosses). A more detailed description of vegetation will be found under the sub-head 'Forests'.

FORESTS.

History.

Only about 50 years back the forest area in the district as stated in the old District Gazetteer of 1907 was 427 square miles. The forest area has been stated to be about 392 square miles in the District Gazetteer of 1938, and now the area is reported to be 359 square miles. From the detached mound of the village Lauriya an extensive view over the well-wooded country on every side could be had 50 years ago, but now one can have such a view only from Gaunaha, a distance of 20 miles north of Lauriya and that too only towards the northern side.

This indicates the extent of denudation which the forests of Champaran has suffered during the last half a century. During this period the forests were mostly under the management of the Ex-Ramnagar Raj and the Ex-Bettiah Raj. Major portion of the forests of these two estates fell in the unsurveyed tract and even *raiyati* settlements over wellwooded and unsurveyed forests were made by the Ex-Ramnagar Raj indiscriminately, particularly after 1946 when the proposal for the abolition of Zamindari was being considered. With the increase of the demand of land for sugarcane cultivation a great destruction of the forests occurred. Mismanagement of forests in the hands of the two ex-estates of Ramnagar and Bettiah has also been one of the reasons for the denudation of forests. A description of the forests under the erstwhile estates is given below.

Ex-Bettiah Estate Forest.—A scheme for the management of forests under the Ex-Bettiah Raj was prepared as early as in 1903 by Mr. H. H. Haines, I.F.S. However, this was not adhered to and more trees of *sals* were felled than prescribed. The entire *khair* area was worked out within five years and no tree was available for several years for the manufacture of *kath* (catechu). The following extract from Mr. Sabharwal's working plan of 1931-32 to 1945-46 (paragraph 25) is given to show the extent of felling.

"The average annual number of trees felled between 1914-15 and 1918-19 was 3,201 and between 1919-20 to 1929-30, 4,343, while for four years during the latter period the number of trees felled annually exceeded even 6,000 against 1,174 prescribed by Mr. Hains."

Mr. Sabharwal also cautioned against the over exploitation of the forests, especially to retain sound *sal* trees of five and over in girth. This also was not adhered to and the Forest Officer of the Ex-Bettiah Estate in 1950-51 fixed the main felling of *sal* trees of 5 feet and over in girth to 2,000 without safeguarding future yield and improving the ground stock which resulted in felling all available *sal* trees of 5 feet and over in girth and created large blanks.

On the basis of the preliminary report of the Working Plans Officer, Northern Circle, the annual yield of *sal* trees for the Ex-Bettiah Estate forest was fixed at 1,600 trees.

Ramnagar Estate Forest.—This was never put to any selective felling of trees on scientific basis. The forests were leased out to many European Companies for many years, of which Messrs. Dearr & Co., enjoyed the longest term of lease, that is, from 1890 to 1922 and again from 1937 for a period of five years. Under the former lease this Company had an agreement to mark off for felling 5,000 *sal* trees of $4\frac{1}{2}$ feet and over in girth annually. This was too high and the forest was over exploited and that also only in easily accessible areas. When the first lease expired in 1922 the then proprietress of the estate Rani Chatra Kumari Devi did not lease it out till 1935,

which resulted into the recuperation and development of the forests. Even during this period some destruction to the forest was caused on account of a civil suit in the family itself between the Rani and Ram Raja. But when in 1936 the estate passed into the hands of the latter, the forest was again leased out in 1937 to Messrs. Dearr & Co., for five years.

There had been a suit between the Raja and his sons for asserting control over money yielding forests, which resulted into indiscriminate destruction of the forest. But in 1942 an understanding took place between the parties and the forests west of Gobardhana were given to exploit only dry trees and drift and waif wood.

In 1943 the Nepal Timber Co. was given a contract which started work on the border of Ramnagar and Bettiah estate forests in the Bhabsa river. This company worked till 1947.

With a view to exploit as much money from forests as possible and to clear forests of the plains for settling with tenants on payment of *salami*, a heavy felling was resorted to by the Ex-Ramnagar Raj after 1946, when the Bihar Private Forests Act was being enacted.

The mismanagement of forests, as stated above, in the private hands led the Government of Bihar to create North Bihar Forest Division with effect from the 15th of May, 1950, to take over the forests of all the districts north of the Ganga by the application of Bihar Private Forests Act (Act IX of 1948) with a view to manage them scientifically.

The Ex-Ramnagar estate forest was first taken over by the Government under the Bihar Private Forests Act on the 9th of October, 1950, which later with the application of the Land Reforms Act (Act XXX of 1950) vested in the State of Bihar and the Indian Forests Act was applied to them under the notifications nos. C|P.F.-6036|52—86-R., E|P.F.-6036|52—87-R., C|P.F.-6036|52—88-R., dated the 6th January 1953, and C|P.F.|10184|53—344-R., dated the 19th January 1954.

A patch of the Ex-Bettiah estate forest falling in the Bettiah revenue thana was taken over under the Bihar Private Forests Act, vide notification no. C|PF-1030|51—178-R., dated the 16th January 1952. The rest of the Ex-Bettiah Raj forests were under the Court of Wards and were being managed by the Board of Revenue, Bihar, prior to the 24th December 1953 when it was transferred to the Forest Department, Bihar, under the Bihar Private Forests Act. Soon after the vesting of the Bettiah estate in the State of Bihar, the Indian Forest Act was applied to all these forests, vide notification no. 1904-R., dated the 27th May 1955, and since then all the forests in the district of Champaran became State-owned.

A patch of good forests of the Ex-Hathua estate on the banks of Sikrahna in Madhuban police-station was subjected to the Indian

Forest Act, vide notification no. C|F-17070|54–3439-R., dated the 12th August 1954, after the vesting of the estate in the State.

Since the forests of the district have come under the management of the Government they are being worked in a planned manner on a scientific basis. Out of three trees of exploitable girth at a place only one is marked out for felling. The number of *sal* trees for felling annually for the Ex-Ramnagar estate and Ex-Bettiah estate forests has been fixed at 2,000 and 1,600, respectively. Cultural operation has been prescribed for regeneration and their establishment and growth.

The felling of miscellaneous and *semal* trees is regulated on the basis of a sustained yield from year to year keeping in view the object of building up the forest capital with improved growth and quality. The annual felling of *khair* trees has been fixed at 500 of 3 feet and over in girth. The cane forest is worked in a cyclical order of four years, the time being considered sufficient for the good growth of cane.

A statement of revenue and expenditure of the Ex-Bettiah and Ex-Ramnagar estate forests is given at the end of the chapter which gives some idea of forest yield in the private hands and in the hands of the Government.

Situation.

The main forest of the district lies between 27°-10′ to 27°-31′ north latitude and 83°-50′ to 84°-41′ longitude and is bounded on the north, north-east and east by Nepal, on the south by a long stretch of cultivation and on the north-west by the river Gandak, separating it from Nepal and the districts of Deoria and Gorakhpur in Uttar Pradesh.

A rich forest growth occurred on the islands formed by the usual alluvium and diluvium actions of the river Gandak which still exists and is a subject of changing configuration due to the actions of the river.

Configuration.

Barring aside the forests of Bettiah and Madhuban thanas, the entire Forest area falls on the Sumeswar and Dun ranges, an account of which has already been given under the sub-head ' Hills '.

The forest falling in the Bettiah thana is well known as Udaipur Forest. This occurs on a more or less flat ground in the form of a crescent moon bordering a lake known as Sareya Mon, encircling the land of Majharia village more or less in the form of an island. A small patch of forests exists on the other side of the lake in the village Majharia and along its border. The Sareya Mon is connected with a river, called Haraha, which forms a part of the western boundary of Udaipur forest. The Haraha is not an aggressive river and as

there is not much of undulation on the forest floor, the configuration of this forest land is comparatively stable.

The forest in Madhuban thana is on the banks of the Sikrahna river and hence its configuration is unstable.

River System.

The drainage system of the main Ex-Bettiah and Ex-Ramnagar estate forests may be divided into four parts on the basis of their respective catchment area. The drainage system of the Ex-Bettiah estate forest consists of the Great Gandak system and the Haraha Masan river system, while that of the Ex-Ramnagar estate forest consists of the Pandai river system and the Dhoram river system. A description of all the river systems has already been given under the sub-head 'The Rivers'.

Types of Forest.

The forest may be classified into the following types :—

(1) Valley *Sal* Forest.
(2) Hill *Sal* Forest.
(3) Dhup or Pine (Pinus longifolia) Forest.
(4) Miscellaneous Forest.
(5) Riverain Forest.
(6) Cane Forest.
(7) Grassy Blanks.
(8) Swamps.
(9) Bamboo Forest.
(10) Jhaw (Tamarix) Forest.

Valley Sal.—This type occurs in the valleys of Manore, Kaila, Sonha, Bhapsa, Haraha, Masan, Raghia, Dwardah and Pandai.

Very good *sal* occurs in Kaila, Manore and Sonha valleys where the quality is up to Q : I, i.e., matured trees are of 110 ft. and over in height. The Q : II *sal* (i.e., trees with mature height from 90 ft. to under 110 ft.) is also seen in flat ridges of the Dun Hills where the depth of soil is sufficient and enough of moisture is available. The quality of *sal* drops, with the elevation and due to biotic factor. In the Ex-Ramnagar estate forest biotic factor is more marked than elsewhere. From Gobardhana eastward the quality of valley *sal* is comparatively poorer than those occurring in the valleys from Raghia westward up to Gardi. The human pressure with excessive grazing on the portion of the valley *sal* forest from Gobardhana eastward is the cause of drop in the quality.

The common associates of *sal* in the valley type are—

Top Storey—Lannea grandis (*jhingan*); Terminelia tomentosa (*asan*); Terminelia belerica (*bahera*); Adina cordifolia (*karam*); Albizzia procera (safed *siris*); Lager stroemia

parviflora (*asidh*); Salmalia malabaricum (*simal*); Anogeissus latifolia (*banjhi*); Ficus religiosa (*peepal*); Dalbergia latifolia (*satsal*).

Middle Storey—Carea arborea (*kumbhi*), Mitragyna parvifolia (*tikul*); Garuga pinnata (*kenkar*); Eugenia Jambolena (*jamun*); Terminelia chebula (*harra*); Eugenia operculata (*bodra*); Steriosperumum suaviolens (*pandar*); Gmelina aroborea (*jamhar*).

Under Storey—Dillenia pentagyna (*aghai*); Millusa velutina (*kariota*); Malltus philippinensis (*rohini*); Casearia tomentosa (*beri*); Holarrhena antidysenterica (*dudhkoraiya*); Casearia graviolens (*beri*); Syplocos racemosa (*lodh*); Bauhinia malabarica (*sahul*); Bauhinia variegata (*kachnar*); Litsaea sebifera (*piroj*); Emblica officinalis (*awla*).

Ground Cover—Clerodendron infortunatum (*litbhant*); Glausend excavata (*agayhar*); Leea crispa (*gorar*); Indigofera pulchela (*bilhul*); Flemingia spp. (*galphulli*); Randia domentorum (*manna*); Thespesia lampas (*bankapas*); Litsea polyantha (*motwa*); Litsaea chinensis; Grewia helicterifolia (*banbhunja*); Asparsgus racemosa (*satawar*); Flacourtia ramonchii (*katahi*); Strobilanthes spp.

A striking feature in the valley *sal* area round the village Gardi in the west and to the north of Manguraha is the occurrence of phoenix humilis (*khajur*) in abundance.

Amongst the grasses the important ones are Heteropogan contortus (*choranth*); Saccharum munja (*munj*); Thysanolia agrostis (*phul jhar*); the last one occurs along sheltered *nalas,* particularly perennial ones.

The common climbers are Bauhinia vahlii (*mohulan*); Butea flora (*mahai*); Vitis repanda (*panilat*); Acacia pennata (*arar*); Smilax spp. (*ram datwan*); Caesalpinia digyna (*hainsa kant,* also known as *tiary* fruit trees); Pipal longum (*peipar*).

Hill Sal.—This type of *sal* forest occurs throughout the hilly regions. These hills are rugged with ravines having deep gorges and jutting out spurs in all directions. The quality of *sal,* in consequence, is poor, stunted, malformed and stag-headed which are commonly met with in this type of forest. The quality of *sal* varies from Q : IV to Q : V, i.e., matured trees attain heights up to 70 feet.

These forests are not of so much of importance for direct yield of timber but for their indirect effect of protection against soil erosion and soil desiccation and, therefore, may be treated as protection forests.

The different storeys of this forest are not so marked as it is of poor quality. The associates of *sal* in this type are the following :—

Buchanania lanzon (*piyar*); Dillenia aurea (*mandar*), Terminelia tomentosa (*asan*); Anogeissus latifolia (*banjhi*); Semecarpus anacardium (*bhelwa*); Terminelia chebula (*harra*); Gardenia turgida (*banian*); Randia dumetorum (*manna*); Randia uliginosa (*pirar*); Emblica officinalis (*awla*); Symlocos racemosa (*lodh*); Steriospermum suaviolens (*pandar*); Holarrahena antidysenterica (*dudh koraiya*); Wendlandia tinctoria (*tilai*).

Among the shrubs are Clausena pentaphylla (*rowena*); Grewia helicterifolia (*banbhunja*); Indigofera pulchella (*bilhul*); Flacourtia ramonchi (*katahi*); Milletia recemosa, (*gorax ganj*); Nyctanthes arbertrists (*samsihar*); Phoenix acaulis and poneuix hulimis (*khajur*), which occurs in this type of forest. The most important grasses are Eulaliposis binata (*sabai*) and Heteropogan contortus (*suara* or *chorantha*).

Dhup or Pine Forests.—There is a small isolated patch of Chirpine (Pinus longifolia) forest, locally known as *Dhup,* above the village Raghia between the Kapan Nala in the west and Pakhna Nala in the east between the altitude of 1,000 feet to 1,700 feet. The natural occurrence of Chirpine at this altitude is unique as it is generally found at the altitudes of 4,000 feet to 5,000 feet on the Himalayas. A Chirpine tree of 5 feet 4 inches in girth and 120 feet in height was measured and recorded by the Working Plans Officer, Northern Circle, Bihar. The existence of natural regeneration in the area speaks of the pine making the area its habitat.

The Chirpine occurs with *sal,* Buchannia lanzon (*piyar*); Lager stroemia parviflora (*asidh*); Bauhinia purpuria (*koinara*); and Semecarpus anacardium (*bhelwa*).

Tall spear grass (Hateropogon contortus), *Sabai* (Eulaliopsis binata) and Kathain grass occur in this locality.

Miscellaneous Forests.—This occurs in Madanpur range on the eastern side and the contiguous north-western portion of Gonauli range with narrow miscellaneous belts of such forest along Mirdangwa, Singha, Dwardah, Ganguli, Chhegrahawa and Daini *nalas.* The soil in these localities is subjected to inundation during rains.

This type of forest also occurs to the east of the Pandai river up to the extreme Nepal border. This part of forest has become miscellaneous as a result of biotic factor. The forest has been over exploited by selective felling of *sal,* heavily grazed and burnt year after year and a retrogression has been brought about to a miscellaneous type of forest that exists now.

The common species of the miscellaneous forests are the following :—

Adina cordifolia (*karam*); Terminelia tomentosa (*asan*); Lannea grandis (*jhingan*); Lagerstraemia parviflora (*asidh*); Terminelia

belerica (*bahera*); Anogeissus latifolia (*banjhi*); Garuga pinnata (*kenakar*); Steriospermum suaviolens (*pandar*); Gareya arboria (*kumbhi*); Eugenia jambolena (*jamun*); Engenea operculate (*bodera*); Mitragyna parvifolia (*tikul*); Salmalia malabaricum (*semal*); Albizzia procera (*harre*); Trewia nudiflora (*bhilor*); Mallotus philippinansis (*rohini*); Bridelia retusa (*khujhi*); Bauhinia malabarica (*sahul*); Randia uliginosa (*piar*); Cassia fistulla (*amaltash*); Cassearia tomentosa (*beri*); Erhetia loevis (*datrang*); Terminelia chebula (*harra*); Cordia myxa (*lasorha*); Kydia calycina (*patai*); Albizzia lebbek (*kala siris*); Dalbergia latifolia (*salsal*); Salix tetrosperma (*baisa*, only in Madanpur range); Ficus glomerata (*gular*); Aegle marmelos (*bel*).

Shrubs are the same as found in the valley type *sal* forest. Phoenix species are absent and Carissa spinarum (*kanoda*) occurs at places.

The Udaipur forest along Sareya-Mon contains a special type of miscellaneous forest. Along the border of the lake a gregarious crop of Eugenia jambolena (*jamun*) occurs with occasional Ficus tomentosa (*barun*). In the lake patchy growth of Barringtonia acutangula (*izzar*) which grows from its bottom, is found. On the flat surface towards the south and between the banks of the Sareya-Mon and of Haraha river a gregareouis crop of Putranjiva rox-burghii (*patjug*) occurs. The other species that are found are the following :—

Adina cordifolia (*karama*); Alstonia scholaris (*chatwan*); Streblus asper (*shihora*); Mallotus philippinanis (*rohini*); Erhetia laevis (*datrang*); Aegle marmelos (*bel*); *Ghor karanja*; Pongamia glabra (*karanj*); Milusa velutina (*domsal*); Flacourtia ramonchi (*katahi semal*); *Khair* and *Sissoo*.

Semal Forest.—Occurrence of *semal* (Salmalia malaborica) is conspicuous in Madanpur range, although sporadically it is found all over the district of Champaran plains. This is marked in fresh alluvial deposits, which have attained a little maturity. It is conspicuous in the patch of forest in Majharia island of Udaipur forest where its natural regeneration is found. The associates of *semal* are commonly *sissoo* and *khair*.

Riverain forest.—This type of forest mainly occurs along the Great Gandak on its eastern bank in areas subjected to inundation, along the bank of Sikrahna in Pipraiman and Vimalpur of Madhuban thana and along the Pandai and Dhoram *nalas*. Typical riverain succession is noticeable along the bank of the Great Gandak in Madanpur range. The grass is the first colonising species, the most important ones are Saccharum munja (*munj*); Saccharum spontaneum, S. Naranga (*narkat*); Typha elephantina (elephant grass, *pater*). These grasses are followed in succession by Acacia catechu (*khair*) and Dalbergia sissoo (*sisham*); and Salmolia malabaricum (*semal*). In the next stage a typical miscellaneous forest of Dalbergia

sissoo (*Sisham*); Salmalia malabericum (*semal*); Adina cordifolia (*karam*); Albizzia procera (safed *siris*); Engenia jambolena (*jamun*) are found.

Cane Forest.—Cane (Calamus tenuis) occurs in damp areas in patches along almost all the *nalas* of Madanpur range, such as Bohua, Baljora, Chamania, Pathlawa, etc., and in a small patch in Bisahia *nala* near Hathimalkhanta in Gonauli range. It also occurs in damp areas in Udaipur forest towards its southern portion. The tree species in the area are *jamun* (Engenia jambolena); *semal* (Salmolia malaberica); *khair* (Acacia catechu); *rohini* (Mallotus philippinansis); *satsal* (Dalbergia latifolia); *vilore* (Trewia audiflora).

Grassy Blanks.—Vast stretches of grassy blanks occur in the bed of the Great Gandak and in the old abandoned sites of cultivation and habitation near the villages, Gonauli and Kotraha.

The common grasses are Saccharum munja (*munj*); Saccharum spontaneum (*kans*); Typha elephantina (*pater* or *hugla*); Davi pharagmitis karta (*narkat*) which occur in *nalas* where water accumulates and also in Sareya-Mon.

Swamps.—A typical swampy area occurs along the Rahua *nala* in Madanpur range. It is a low level marsh almost devoid of drainage. The area is recorded to be 860 acres in extent and is in the process of natural reclamation. The species naturally occurring there are Salix tetrosperma (*bainsa*); Bischofia javanica (*arang*); Eugenia jambolena (*jamun*); Barringtonia acutangula (*izzar*); Dalbergia sissoo (*sisham*); Acacia catechu (*khair*); and Salmalia malabarica (*semal*).

Various water plants exist in the lake Sareya-Mon of botanical interest submerged in deep water.

Bamboo Forest.—Bamboosa arundinacea is found along upper reaches of Saktihari, Harra in Naurangia block of Ex-Ramnagar estate forest and near Nardebi Asthan of Ex-Bettiah estate forest at the site where, according to a legendary, the fort of Allha Ruddal, a chieftain, existed. The bamboo is of thorny variety and is not of much use.

Jhaw (*Tamarix Forest*).—Jhaw (Tamarix) occurs along the banks of Gandak and is found in pure patches to the south of Narshai island and Rajhawa, Jajhi and Mangalpur *Retas*.

FAUNA.

The wild animals available in the forests of the district are tiger, leopard, panther (Panthera pardus), black-bear (Ursus torquatus), wild dog, wild pig, barking deer (Mutiacus muntjak), *nilgai*, wild buffaloes (Babalus bubalis), black-buck, wild cows and oxen, monkeys (both red and black faced), wolf (Cannis pallipes), hyaena (Hyaena hyaena), four-horned antepole, wild-goats, *sambhar* (Rusa unicolor), chittal (Axis axis), bison (Bibos ganrus), hog-deer, wild cat.

The rhino (Rhinoceros unicornis) also makes stray appearances in the forests of Madanpur range from the neighbouring Nepal State. A solitary rhino is often met with in Rampur Madanpur Forest, Balgangwa forest and the Hathimalkhanta forest.

The specimens that are fast disappearing are hyaena, black-buck, four-horned deer, wild-goats and elephant (Elephas maximus). The last rhinoceros in Champaran district was heard of about a decade back.

The jungle abounds in various kinds of moths, caterpillars and butterflies.

AVI-FAUNA.

It would appear from the previous description that Champaran has forest as well as fields, hills as well as marshes and is situated on the border of the Indo-Gangetic and Himalayan regions. Its avi-fauna is varied and interesting but so little work has been done on this district that the bird population has to be inferred from the systematic list given in the Darbhanga Gazetteer. The birds mentioned in Champaran's own systematic list are those birds which have been definitely recorded from the district and from its size it is apparent that only a small part of the bird population has been recorded.

The most interesting birds of Champaran are the amazonian species of the three-toed quails and two of the migrant waders. Normally in the bird world, in India or elsewhere, the males are bigger and more gorgeously plumaged. The smaller and inconspicuous female accepts suit, sits on the clutch of eggs and hatches it. Since it has not to fight for territory or to win a mate, its smaller size and duller colouring is not a handicap while on the nest the inconspicuousness of the female has a protective function. It cannot be spotted and attacked by enemies easily and, therefore, the nest is not discovered nor destroyed.

With the amazonian species all this is reversed. The female is bigger, more gorgeously plumaged; it fights for its territory and for its mate, is polyandrous and does not sit on the nest. The males do that.

The bustard-quail (Turnix suscitator), the button quail (Turnix tanki), and the little button quail (Turnix sylvatica) are the three amazonian species resident in India. These are all three-toed quails and three-toed quails with similar habits are also found in Australia and Africa. Apart from them the only other amazonian species in the world are the red-necked and grey phalaropes, two waders which are winter visitors to Champaran and other districts of North Bihar and are called *tuhi* in Hindi. These two waders breed near the Arctic Circle and so the pugnacious females are not seen by us nor do we see them in their breeding plumage.

All the three-toed quails are found all over India, except the Punjab and Rajputana. In Champaran especially near Bettiah, the bustard-quail is rather common and prominent. It is called *gulu* in Hindi (the little button quail is called *lawa* and the button quail *burra lawa*) and is an almost tailless ground bird of the size of a sparrow but more roundish and plump. In the bush it seems a darky and heavily barred bird with a slight whitish apology for a crest over the black spotted head. The chin, throat, neck and breast are velvet black and strikes one's attention if the bird raises itself. That is rare, for the bird is a great sulker. The smaller male is duller than the hen and has white chin and black and buff banded breast. The three-toed quails can be distinguished from the quails, especially in the hand, by their having only three toes, the hind toe being missing.

The dominant females of the bustard quails abhor all domestic duties and responsibilities and are the dominant partners of the short-lived mating. They lay the eggs but do not sit over the nest. They leave the incubation and rearing of the youngs to the males. The females parcel out the territory too and use gorgeous plumage for both intimidating rival females and for courting the males. The fights for territory begin as symbolic demonstrations, with much aggressive gesturing and posturing. These birds have not much song, but whatever capacity for making noise during courtship there is, is largely among the females.

The small bush or heavy grass in cultivated fields or the undergrowth of light forest which these birds tenant resounds during the territorial display with loud drumming and booming sounds. That is the voice, song, call as you please, of these bird amazons. They first drum *drr-rr-r-r-r-r-r* and then bellow out from puffed breasts and throats *boom-boom-boom*. These bird amazons are polyandrous. They fight over a male but as soon as they are mated and the eggs are laid—in a shallow hollow on the ground, protected by a bush or grass—they leave the males to brood. The nests are often tunnelled through a dense tuff of *siki* or *munj* grass and the clutch of three to four eggs laid at the back, the brooding male going and coming through the hole in the grass.

The hens having laid the eggs wander in search of new territory and new males. Sometimes a few hens will be together for a short while in the undecided period after a mating, but soon the grass widows, with renewed interest in mating, will start fighting. So desperate is the fight that it is possible to walk up and catch two fighting hens. The bird-trappers of Champaran and Darbhanga know of this pugnacity of the hens and catch them with the aid of decoy females, mind it, not of males.

The avi-fauna of Champaran is also remarkable for the fact that the Nepal Kaleej pheasant (Lophura leucomelana) and the pin-tailed

green pigeon (Sphenocercus apicaudus) come down to the thousand-foot contour along with the chirpine on the Siwalik hills around Ramnagar Dun.

Champaran is rich in green pigeons as are many other parts of Bihar. There are five types of green pigeons and the closely allied purple wood pigeon (Columba punicea) which are difficult to tell apart without close observation. The ashy-headed green pigeon (Treron pompadora) differs from the true green pigeon (Treron phoenicoptera) in having its whole nape and crown grey. The orange-breasted green pigeon (Treron bicincta) is at once recognised by its orange breast and chestnut under-tail coverts. The imperial green pigeon (Ducula aenea) is bigger than the others and is purple-grey everywhere except the wings, tail and back which are a deeper metallic green than the yellow-green of the other green pigeons. The purple wood pigeon is smaller than the ordinary green pigeon and is purple instead of green or olive. The pin-tailed green pigeon is distinct from all others because of its long pointed tail.

The most beautiful bird of Champaran is the Nepal Kaleej pheasant. It is the only pheasant found in Bihar; a large ground bird, quite like a fowl. It frequents moister jungle than the jungle fowl but both birds are often flushed from the same place in beats. It is easily distinguishable from the jungle fowl because of its long black hairy crest which trails like a plume behind its head. The kaleej does not have a fleshy comb as crest for the males as the red jungle fowl has, but has a patch of bare and skin on the sides of its face. The male has upper plumage black glossed with blue and its wings and fowl-like tail are dark brown glossed with green. Its black crest is glossed with purple blue and the entire bird gives an impression of undertone of colour seeping through the predominant top coat. A flushed bird disappearing quickly behind a bush has the effect of shot silk. The female has crest and upper plumage reddish brown and black middle-tail feathers.

Of the common birds the brown flycatcher (Muscicapa poonensis) is a small brown bird with its breast and throat mottled. It is a quiet bird more frequently found in the wooded and broken country in the north-west of the district. The grey shrike (Lanius excubitor) is about the same size as the *myna,* french grey in colour with a black stripe above the eye. It is the commonest of the shrikes which are called butcher birds because of their habit of impaling their victims, lizards and small rats, on thorns in the bush as if storing in a larder. The green willow warbler (phylloscopus trochiloides) is a tiny bird, olive green in colour with a yellow supercilium and two white wing-bars. It is a cheerful bird and a good songster.

The black-headed *myna* (Sturnus pagodarum) is like the common *myna* but grey instead of brown. It has a prominent black head and crest, the long crest lying flat on the neck like a pigtail. It is darker in colour than the bank *myna* which has no crest. The grey-headed

myna (Sturnus malabaricus) is the only *myna* which is purely arboreal in habits, while the bank *myna* is the least used to trees. The grey-headed *myna* is lighter in colour than the common *myna* and is redder than the bank or black-headed *myna*. It has a grey head and has a blue bill (with yellow tip) while all the other *mynas* have full yellow bills. The jungle *myna* (Acridotheres fuscus) can be distinguished from the common *myna* by its darker colour, absence of bare skin behind the eyes and the presence of a tuft of erect hair above the nostrils. That gives it a singularly moustached appearance. The pied *myna* (Sturna contra) is almost as common as the common *myna* but is distinct from all other *mynas* because of its pied plumage—jet black touched off by white wingbars and white sides of face.

The tree pipit (Anthus trivialis) is a tiny bird close to the larks, sandy brown with numerous black streaks. It is fond of fields and is quite numerous in flocks in winter.

The white-eye (Zosterops palpeberosa) is a minute bird, smaller than the sparrow, greenish yellow in colour with prominent white rings round the eyes which give it the appearance of wearing spectacles. Arboreal in habits, it goes about in small flocks in the mango orchards and forests. The northern green barbet (Megalaima zeylanica) is bigger than the crimson-breasted barbet and as big as the *myna*. It is rich green in colour and has brown head, neck and breast. The crimson-breasted barbet has crimson forehead and breast. The barn owl (Tyto alba) is slightly smaller than the grass owl. It is reddish brown with silky white underpart, and has a white longish heart-shaped face. Both the owls screech in the same manner.

The white-backed vulture (Pseudogyps bengalensis) is easily distinguished from the black vulture (Sarcogyps calvus) because the former has a bare fleshy-looking neck. The long-billed vulture (Gyps indicus) is similar to the white-backed but a long bill and a brown back. The griffon (Gyps fulvus) has white down on the neck and the crown and is distinguished from the black vulture because of its colour, fulvous and not black. The scavenger vulture (Nephron percnopterus) is dirty-looking white bird with black edges to its wing and vultures.

The Waders.

The marshes and river banks of Champaran are famous for their ducks and waders. The ducks have been described in detail in the Muzaffarpur Gazetteer, here the waders are discussed.

The waders have all long legs and long bills, but some have web-footed legs such as the avocet and the flamingo. Others are lobe-footed such as the coot. The broadest division of the waders is among those who perch and those who do not.

They perching waders are the storks, herons, ibises and spoon-bills and can be easily distinguished from each other by the following key.

The spoonbills have spoon-shaped beaks. The ibises have long slender beaks, gently curved downward throughout (the avocet is the only Indian bird whose beak curves upwards). The herons and storks have straight beaks (except the painted stork whose beak is curved only towards the tip) but they are not hard to tell apart. The two outer front toes of the herons are only webbed at the base; the herons have grooved beaks but not the storks. All the front toes of the storks are joined by a web at the base.

The non-perching waders are the flamingoes, cranes, rails, plovers, snipes, courses, pratincoles and jacanas. Flamingoes are large and extremely long of neck and leg, with short, thick, downwardly bent bills and webbed feet. The cranes are also large and lanky, but have straight rather slight bills, and no web between the toes, except a small one between the two outer. The rails are of moderate or small size, very slab-sided, short-winged and tailed toe, with no web at all between the toes.

The shore-birds—plovers and snipes—are medium-sized or small birds with but few points in common, the chief being that the mouth does not run further back than the forehead, which gives them a very characteristic expression. The plovers have short pigeon-like bills and big heads and big eyes. The snipes and their allies have smaller heads and eyes, and bills always longer than a pigeon's and often very long indeed. The coursers and pratincoles are much like plovers, except for the mouth going further back than the forehead. The jacanas have long thin toes with enormously long, nearly straight claws.

Among the storks the adjutant (Leptoptilos dubius) and the lesser adjutant (Leptotilos javanicus) are at once marked off by their naked necks, to say nothing of their size. Of the other storks, which all have feathered necks, the black-necked stork (Xenorhynchos asiaticus) is much the biggest, being over four feet long, whereas the others except the adjutant and the lesser adjutant are well under this length. The painted stork (Ibis leuocephalus) has its bill gently curved downwards towards the tip, all of the others having straight beaks. The white necked stork (Dissoura episcopus) has a black body and white neck and when walking about does look like a clergy-man. The black body is the result of a curious forked tail of dark colour, barely exceeding the under tail-coverts in length. All the other storks have ordinary tails. The openbill (Anastomus oscitans) is distinguished by its short beak and grey or white colour combined the bill is only about six inches long, while the other storks have one or eight inches or more, except the white-necked, which is a dark-coloured bird.

The white and black storks (Ciconia ciconia and Ciconia nigra) both are winter visitors and have no peculiarities about their necks, tails or bills; they are medium-sized as storks go, being about a yard and a half long with eight-inch bills.

Of the ibises the white (Threskiornis aethiopical) is at once distinguished by its colour. The black (Pseudibis papillosa) and the glossy (Plegadis falcinellus) are both dark birds but the tail of the first is longer than its bill. In the case of glossy ibis the tail is markedly shorter than the bill. The spoonbill (Platales leucordia) is an ibis with a beak nearly straight and flattened, with a wide rounded expansion at the tip, which gives the spoon-like appearance.

The herons can be split into three groups : typical herons, all very big birds never all white or all grey, nor pied; egrets either all white, all grey or pied; and bitterns, smaller birds.

Of the typical herons, the grey heron (Ardea cinerea) is always distinctly grey, while the purple heron (Ardea purpurea) shows much admixture of cinnamon or fawn.

Of the egrets, the large or white egret (Egretta alba) is the biggest while the intermediate and little egrets (Egretta intermedia and Egretta garzetta) are smaller types. The cattle egret (Ardeola ibis) is recognised by its short bill. The pond heron (Ardeola gravi) is always pied and is stouter in build than the other egrets.

Of the bitterns, the common or European bittern (Botaurus stellaris) is distinguished by its large size; it is well over two feet long, none of the other bitterns being as much as two feet. But this is a migrant. The little bitterns (two species) are remarkably small, being fifteen inches or less in length. The little green bittern (Butorides striatus) and the dwarf or yellow bittern (Ixobrychus sinesis) are distinguished from each other by their respective green and yellow colours. The chestnut bittern (Ixobrychus cinnamomeus) and the black bittern (Dupetor fluvicollis) are so prominently chestnut and black that they cannot be mistaken for any other bittern. The night heron (Nycticorax nycticorax) is grey above and white below with green-black cap and back. From the black cap dangles a long white hairy crest. It is the most burly looking bird among the bitterns and can be seen any evening flying out to ponds and fields with frequent calling of *wak wak*.

Of the cranes the *sarus* (Grus antigone) is the only resident species and is distinguished by its great size, well over four feet, and grey colour. The common crane (Grus grus) is of medium size, measuring between three and four feet and varies from light to dark grey. The demoiselle crane (Anthropoides virgo) is the smallest being less than a yard long and bears fine curled hanging plume on each of the head behind the eye. The Siberian or great white crane (Grus leucogeranus) has been recorded only from Darbhanga and is a rare bird as large as the *sarus* but lacking the read on the head which the *sarus* has.

Snipes are shore birds having large eyes set very far back, over the orifices of the ear in fact the back and crown heavily marked

with black. The woodcock (Scolopax rusticola) is much bigger than the other snipes being fourteen inches long, while the others never more than barely exceed a foot. The wood snipe (Gallinago menericola) is a foot long and dark in plumage with very short wings. It has not been reported from anywhere else in Bihar except Champaran. The fantail and pintail snipes (Gallinago gallinago and Gallinago stenura) are medium size snipes while the jack snipe (Lymnocryptes minimus) is the smallest.

The most valuable and rather rare bird of Champaran is the kaleej pheasant and deserves very strict protection.

Among the common birds mention may be made of the water voles, the king fishers, the dippers, the swallows, the martins, the swifts, the wagtails, the debacniks, the must beeths, the goat moths, the puss moths, the way flys, the leaf cutter bees, the doves. Besides there are a varieties of passerine birds like the crows, the babblers, the bulbuls, the shrikes, the fly catchers (particularly the famous paradise fly catcher), the finches, the sun birds, etc., and among the non-passerine are wood peckers, the barbets and cuckoos, etc. There are also a vast variety of parrots in jungles.

The number of migrant wader and ducks varies a great deal from year to year.

Shooting Facilities.

As the Ex-Bettiah and Ex-Ramnagar estate forests had the reputation of being among the best forests in Bihar for purposes of shooting which attracted reputed and rich *shikaries* in the past and were favourite spot for Governor's shooting, it appears interesting to mention about shooting here.

On account of heavy poaching and clearing of forest in the accessible areas many games have become almost extinct in certain cases, e.g., the famous black duck of the Ex-Bettiah estate forest and also the game bird *lassar* have almost become extinct.

Since the vesting of the forests in the State the number of games shot annually has considerably decreased. No shooting permit has been issued since 1956-57 in the Ex-Bettiah estate forest. Creation of game sanctuaries has been proposed under the instruction of the Indian Board for Wild Life and restriction to shoot tiger to a limit of 10 in one's life time has been imposed. Elephants and rhinoceros are completely protected against shooting. Besides, shooting has been restricted to a fixed number of games in each shooting block in a year. Each shooting block is given a rest for fifteen days after shooting.

There is also the usual imposition of close-permit for shooting. But in spite of these restrictions it is felt that there has been a large scale butchering of wild animals and game birds. This is due

to a number of factors. There has been a large scale granting of gun licenses to men who have no sportsman's spirit. Some years back it was a common sight that a number of does would be killed and that also during close season with impunity.

The worst offenders unfortunately are the Government officials and their friends. Shooting in the night with spot-light is no sport and this used to be very common before. Strict implementation of the game laws has not been possible and protection of wild life depends to a large extent on co-operation from the public. Forest zones at Bettiah subdivision had certain specimens which are fast disappearing. Some of them have been mentioned elsewhere.

It may be mentioned that since there are vast agricultural fields and thickly populated villages in the centre of many of the forests in Champaran, much of the spirit of a sanctuary could not be given a practical shape, a sanctuary being certain carefully demarcated forest areas where killing or capturing or trapping of wild birds and animals are strictly prohibited. Nevertheless, the Jattashankar forest area of about 30 square miles in Ex-Bettiah Raj forest, extending from Gonauli north of Tribeni Canal to Jattashankar temple on the bank of Gandak, could be well utilised for making a national park, if not a game sanctuary. It is not necessary to make a comparison of relative features of Jattashankar block with the area in Hazaribagh district that has been converted into a national park. But the close proximity of Jattashankar area to the Tarai of Nepal is an unbeatable feature. There is no doubt that we could even have rhinoceros and wild elephant in this area, if converted into a national park. A game sanctuary already exists in Champaran at Udaipur forest. It was formed in 1952 with an area of $8\frac{1}{2}$ square miles or 1121.95 acres. There is a rest house, viz., Udaipur Forest Rest House, located by the side of Sareyamon lake, a beautiful spot for picnic purposes.

Apart from the once fairly rich wild life population which is fast declining we have the water swamps in this district. No other district in the State of Bihar has so many large lakes or lagoons. Most of these lakes once attracted large flocks of migratory wild ducks and geese in cold weather. Various kinds of teals were common. But there has been a decline of bird population as well. Apart from ducks and geese there used to be large flocks of green pigeon in the season. Jungle fowl, pea fowl and imperial pheasant have also become scarce.

In keeping with the general policy followed all over India, the State of Bihar is also working on the recommendations of the Indian Board for Wild Life. The State Board for Wild Life was constituted, vide Revenue Department Resolution no. 4699-R., dated the 3rd|5th December 1953. The Board meets from time to time. Although it is in its infancy, but is expected to be useful. A wild life week in the first week of October is observed to emphasise the

necessity of the preservation of wild life through publicity and propaganda.

Regarding statutory laws it is being felt that the Wild Birds and Animals Protection Act, 1912, no longer gives the adequate legal protection that the urgency of the situation demands. Provisions of the Indian Forest Act, 1927, do not always give sufficient protection. It may be necessary to have an Act sometime later which would provide for a machinery to execute the provision of an increased punishment for offenders against game rules all over the State quickly and effectively. The West Bengal Government have drafted a new Bill with similar purposes.

Poaching has also been a problem. There has been no game association which could be made responsible for seeing that game laws are strictly followed by the members within their respective jurisdictions.

It is a happy sign that some fall in the number of animals shot annually has been recorded in recent years in Champaran jungles.

The following official figures are quoted to indicate the trend of shooting in Champaran jungles :—

Name of the game.	1954-55.	1955-56.	1956-57.
Sambhar	10	9	2
Nilgai	13	12	1
Spotted deer	18	13	3
Barking deer	18	12	2
Leopard	3	..	Nil
Tiger	3	5	3
Bear	4	Nil	Nil

It is, however, needless to say that the official figures must have missed many animals shot by authorised persons.

Fish.

Among the bigger ones river contains *rohu* (Labco rohita); *naini, buali, moi, katla, tengra, sauri, bami* (Mastacembelus armatus) and *bansari* and among smaller ones *rewa* (Chirrhina reba), *bachwa* (Eutropiichthys vacha), *chepua, pothia, kana* (Xenentodon concila), *derwa* (Danio dangila), *suia* (Gadusia chapra), *jolkapur, patta, garai* (Ophicephalus gachua), *bulla, tengra* and *jhinga* are found.

In lakes most of the above fishes are found and in addition *kewai* (Anabas lestudeneus), *mangur* (Charias batrachus), *senghi* (Heteropnaeustes fossilis), and several coloured fishes are also found.

Gharial or alligator, sunb-nosed *mugar* or crocodile, *kenkara* or crab and *kachhua* or tortoise are common in both Gandaks.

Mahseer fish that was once quite plenty near Bhainsalotan is becoming rare.

Reptiles.

The reptiles that are generally found here are pythons, cobra (*Naia naia*), king cobra (Hymadryad), *karait, dhamin, ghorkarait, dommoha, sugwa, dhonrh, paniadarad, machhgiddhi, sankhar, harhara* and inguana.

Among aquatic specimens mention may be made of crocodiles, alligators, sybet cat, water cat (Otters), and *sons*. Crocodiles are now becoming rarer and so are inguana. The reason is that there has been an indiscriminate slaughter of crocodiles and inguanas for their skins which have a high market value.

Climate and Rainfall.

Champaran has a damp, moist and rather enervating climate although it is much cooler than the neighbouring districts of Bihar. At one time Champaran had the reputation of having the worst climate in Bihar and the area in the northern portion of the district in the neighbourhood of Ramnagar, Bagaha and Shikarpur police-stations was taken to be the worst in the district. But with the opening of National Extension and Community Development Blocks the condition of portions of the northern portion of the district has improved. The cold weather starts early and it is generally possible to dispense with fans after the first week of October. The hot weather begins about the end of March. The rainy season has a high incidence of fever.

Climatic Divisions and their Duration.

L. S. S. O'Malley discusses the duration of the seasons in his District Gazetteer of Champaran published in 1907 in the following manner : " Except in these notoriously unhealthy tracts (Tarai near Ramnagar, Bagaha and Shikarpur) the climate is comparatively pleasant and cool throughout the year. From November to March it is low and bracing, especially at night, but cloudy skies and cold-weather showers are more frequent than in districts further removed from the hills; light fogs occur occasionally in the day time. The hot weather begins in the middle of March and is at its height in May, a hot, dry month, when westerly winds prevail; but compared with other districts, the temperature is not excessive. In the rainy season the climate is damper and cooler than in the adjoining districts, but the nights are hot and disagreeable, except when there is an east wind to temper the atmosphere. In October the steamy heat begins to be less oppressive, and in November the cold weather is ushered in by a chilly north wind blowing from the hills..... ".

In fact with the clearance of forests the climatic conditions have also changed accordingly and the differences in feeling in various seasons have become more marked.

Temperature and Humidity.

It was anticipated by L. S. S. O'Malley that " ..... Owing to the progress made in clearing the forests and the extension of cultivation in the north of the district, the rainfall is decreasing, while the extremes of temperature are becoming more marked and the mean temperature is rising ". This conclusion he came probably due to the figures mentioned in the Final Report on Survey and Settlement Operations published in 1900. There is a statement showing comparative maximum and minimum figures for the years 1874 and 1896. In 1874 the maximum and minimum average temperatures recorded were 83.5 and 69.2, respectively, as against 91.25 and 58.58 for the year 1898. The Report puts in, " Assuming that in both years the methods of observation were proper, is a remarkable fact that for every month, the maximum temperatures of 1898 were higher than those of 1874, while the minimum were lower, and the range of variation therefore very much greater. This seems to be a marked phenomenon of recent years ". In the next Report on Revisional Survey and Settlement Operations published in 1922, this phenomenon is indicated to a very marked degree. The following statement has been quoted from the same source to " show that the range variation has been maintained " :—

Year.	Maximum.	Minimum.
1903	107	39
1904	103	39
1905	102	32
1906	105	39
1907	105	33
1908	107	36
1909	103	35
1910	103	44
1911	103	43

The figures for all the years showing both maximum and minimum temperatures are either far higher or much lower than the figures for both 1874 and 1896.

After 1912 observations at Motihari were suspended for some years.

Following is the statement showing the temperature chart from 1940 to 1955 :—

Motihari Meteorological Station.	Annual temperature.			Annual humidity (%).	
	Highest maximum.	Lowest minimum.	Mean- ½ (max. + min.).	8-30 A.M.	5-30 P. M.
1	2	3	4	5	6
1940	107	41	76.5	77	58
1941	106	43	77.3	79	60
1942	108	41	77.2	81	60
1943	105	40	76.2	82	60
1944	105	41	75.5	80	60
1945	NA	38	NA	79	59
1946	104	40	76.7	81	61
1947	NA	44	NA	77	64
1948	105	42	NA	75	66
1949	101	41	75.7	75	69
1950	105	37	75.4	72	65
1951	109	41	77.4	70	64
1952	104	43	77.1	76	72
1953	109	41	77.3	74	68
1954	NA	NA	NA	NA	NA
1955	NA	NA	NA	NA	NA

Vide Bihar Statistical Hand-Book, 1953. pp. 8—13.
Vide Bihar Statistical Hand-Book, 1955, pp. 14—15.

The mean average of 76° has been maintained but the maximum temperature shows a more rise than the previous decades and the minimum temperature curiously enough shows a rising tendency. But the variation between the two is becoming more and more marked than past decades.

Rainfall.

The rainfall in Champaran is reported to be heavier than in any other district in Tirhut, and is specially heavy in the submontane

tract, partly owing to the heavy showers which fall when cyclonic storms break up on reaching the hills and partly because the monsoon current is stronger towards the west over the districts just under the hills.

In normal years, the monsoon breaks in June when there is 9.17 inches of rain. The heaviest rainfall occurs in the months of July and August, varying from 15.66 inches in the former to 13.30 inches in the latter. The rainfall then decreases to 10.41 inches in September. The annual rainfall varies greatly and the variation ranged between 39.89 inches and 75.41 inches during the decades 1924—1933 to 1934—1943. The average rainfall of the district in the former decade was 53.796 inches, while it was 56.38 in the latter as against the normal rainfall of 53.16 inches.

In 1938 the average rainfall of the district rose as high as 75.41 inches and 21.05 inches rainfall occurred in the month of June alone. The minimum rainfall was recorded in the year 1932, when it was only 39.89 inches.

From the study of rainfall records from 1924 to 1950 it appears that there was no scarcity of rain excepting in 1932, 1943, 1945 where there were 39.89, 41.08 and 42.57 inches rainfall, respectively. In the remaining years variation from the normal of 2 to 3 inches on either side was recorded. The rainfall statistics for 1950 onwards are given below :—

I

Statement showing the average rainfall in inches in Champaran from 1936-37 to 1955-56.

Year.	Average rainfall in inches.
1936-37	72.26
1937-38	56.57
1938-39	72.11
1939-40	47.27
1940-41	50.34
1941-42	57.32
1942-43	44.25
1943-44	47.22
1944-45	49.28
1945-46	43.06
1946-47	59.62
1947-48	52.49

Year.	Average rainfall in inches.
1948-49	55.38
1949-50	55.92
1950-51	48.35
1951-52	51.56
1952-53	60.78
1953-54	59.38
1954-55	51.41
1955-56	62.31

The average normal annual rainfall has been 56.18 inches.*

It is apparent from the above statement that monsoon is extremely moody in nature and fluctuates almost every year. In 1936-37 the rainfall reached the maximum figure of 72.26 inches thus exceeding the normal figure by 16.8 inches which is not a negligible fact. But the very next year there is a downfall in the figure and a little over the normal rainfall occurs. It again goes up to the year before last figure in 1938-39. The year 1939-40 must have been a very trying period for the farmer because the rainfall was far below the normal. The lowest figure of 43.06 was reached in 1945-46. The period covering from 1939-40 to 1945-46 excepting the year 1941-42 when the rainfall was 57.32; the figures show a continuous low rainfall which naturally hard hit the economy of the district. From 1951-52 onwards the rainfall records a satisfactory trend.

A fuller discussion on rainfall and its importance has been made elsewhere in the Agriculture and Irrigation Chapter.

* *The Bihar Statistical Hand-Book*, 1953, pp. 14—15 and *Bihar Statistical Hand-Book*, 1955, pp. 16—17.

II

Statement showing monthly rainfall in inches in Champaran from 1950-51 *to* 1955-56.

	Year.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.
	1	2	3	4	5	6	7	8	9	10	11	12	13
A	1950-51 ..	1.24	0.11	3.52	14.55	8.53	14.68	4.74	0.07	Nil	0.15	0.64	0.12
B	1951-52 ..	0.27	0.02	0.42	7.72	18.14	13.46	3.74	0.34	0.37	Nil	0.12	0.29
C	1952-53 ..	1.91	1.94	3.23	11.73	11.67	16.10	11.40	0.52	0.10	Nil	2.05	0.13
D	1953-54 ..	0.95	0.72	1.74	13.52	23.60	8.17	9.57	0.63	0.12	0.03	0.26	0.07
	1954-55 ..	0.02	Nil	2.65	7.08	20.27	15.60	4.31	0.97	Nil	0.04	0.28	0.19
	1955-56 ..	0.05	0.52	1.41	10.09	22.82	10.77	13.66	0.66	Nil	Nil	0.71	1.62
E	Normal rainfall of the district.	0.49	0.68	2.47	9.17	15.66	13.30	10.41	2.37	0.28	0.18	0.47	0.70

A. Vide Bihar Statistical Hand-Book, 1951, pp. 8-9.
B. Ditto ditto 1952, p. 10.
C. Ditto ditto 1953, p. 16.
D. Ditto ditto 1955, pp. 18-19.
E. Ditto ditto 1955, p. 20.

Even considered against the normal rainfall figures, it is apparent that the district suffers from uneven distribution of rainfall. While the highest rainfall considered normal is 15.66 inches, in the month of July, the corresponding figures for the same month in the years from 1950-51 to 1955-56 show remarkable variations either going up too much or far below the normal figure. The months of August and September also suffer from the same vagary. In short, the rainfall in the district is quite unreliable and even when the total rainfall in a year seems to be satisfactory, an uneven distribution of it often spoils th crops—thus causing widespread distress in the district.

APPENDIX A.

Statement showing the Revenue and Expenditure during the Management of the State Forest Department.

Year.	Total revenue in rupees.	Total expenditure in rupees.	Surplus or deficit in rupees.	Remarks.
1	2	3	4	5
1950-51	Nil	47,726	(—)47,726	Figures obtained from Draft Working Plans.
1951-52	2,466	63,794	(—)61,328	
1952-53	18,013	65,512	(—)47,499	
1953-54	93,861	82,589	(+)11,272	
1954-55	1,73,266	1,82,894	(+)30,372	
1955-56	2,05,682	1,51,275	(+)54,407	
1956-57	4,96,957	1,74,961	(+)3,21,996	

APPENDIX B.

Statement showing the Revenue and Expenditure of Ex-Bettiah Estate Forest during the period of the Bettiah Estate.

Year.	Total revenue in rupees.	Total expenditure in rupees.	Surplus or deficit in rupees.	Remarks.
1	2	3	4	5
1941-42	21,965	Not known	..	Figures obtained from Draft Working Plans.
1942-43	Nil	Ditto		
1943-44	22,316	Ditto	..	
1944-45	1,34,044	Ditto	..	
1945-46	48,355	Ditto	..	
1946-47	1,94,652	Ditto	..	
1947-48	1,30,084	Ditto	..	
1948-49	2,53,066	Ditto	..	
1949-50	2,38,144	Ditto	..	
1950-51	1,61,101	Ditto	..	
1951-52	82,745	Ditto	..	
1952-53	34,200	Ditto	..	
1953-54	27,500	Ditto	..	

APPENDIX C.

Statement showing the Revenue and Expenditure of Ex-Ramnagar Forest during the Management of the Estate.

English equivalent date.	Total income in rupees.	Total expenditure in rupees.	Profit in rupees.	Remarks.
1	2	3	4	5
1st October 1936 to 30th September 1937.	14,400	5,256	11,143	Figures obtained from the Draft Working Plans.
1st October 1937 to 30th September 1938.	14,074	7,884	6,189	
1st October 1938 to 30th September 1939.	76,411	6,588	69,823	
1st October 1939 to 30th September 1940.	33,463	8,585	24,879	
6th September 1940 to 5th September 1941.	84,016	7,317	76,699	
6th September 1941 to 27th September 1942.	35,659	4,142	31,517	
28th September 1942 to 14th September 1943.	1,15,963	12,764	1,03,199	
15th September 1943 to 3rd September 1944.	51,775	15,756	22,926	
4th September 1944 to 21st September 1945.	94,045	12,314	65,922	

APPENDIX D.

Statement of high flood levels of different rivers at their various sites in Champaran district.

Serial no.	Name of river.	Name of gauge.	Maximum high flood level on record.	High flood level.								
				1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.	1942.
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Sikrahna ..	Sugauli bridge no. 5	..	..	226.25	225.25	222.33	223.66	223.00	223.75	223.50	222.25
2	Ditto ..	Railway bridge at Chainpatia.	..	248.60	247.00	250.60	244.00	249.00	244.00	249.75	247.00	..
3	Ditto ..	Bairatpur outfall at Konhar	..	..	..	..	..	..	..	..	..	..
4	Masan ..	Bridge no. 4 between Harinagar and Bhairoganj.	..	..	..	..	..	..	..	..	..	..
5	Tribeni ..	Bhainsalotan	..	362.92	364.82	362.42	359.32	361.22	357.22	358.92	360.42	357.92
6	Tiur ..	Above Tiur headworks ..	..	238.50	298.80	238.00	296.50	241.70	232.90	232.80	237.40	237.00
7	Tilawe ..	Siswa railway crossing ..	..	..	..	..	..	..	..	..	..	..
8	Bougri ..	Narkadei railway crossing	..	..	..	..	..	..	..	..	..	..
9	Lalbakoya ..	At Dhaka headworks ..	..	104.50	106.20	..	104.10	106.00	103.00	105.20	104.20	102.00

Serial no.	Name of river.	Name of gauge.	Maximum high flood level on record.	High flood level.									
				1943.	1944.	1945.	1946.	1947.	1948.	1949.	1950.	1951.	1952.
1	2	3	4	14	15	16	17	18	19	20	21	22	23
1	Sikrahna ..	Sugauli bridge no. 5	..	221.83	222.90	222.50	224.50	223.50	223.25	223.58	223.67	..	223.90
2	Ditto ..	Railway bridge at Chainpatia.	..	..	..	..	..	..	..	244.75	245.50	246.60	248.00
3	Ditto ..	Bairatpur outfall at Konhar.	..	..	..	..	..	..	..	..	..	..	..
4	Masan ..	Bridge no. 4 between Harinagar and Bhairoganj.	..	..	..	..	..	..	..	..	..	..	..
5	Tribeni ..	Bhainsalotan ..	..	357.82	357.62	361.02	360.22	361.82	360.12	362.12	367.20	360.50	360.60
6	Tiur ..	Above Tiur headworks.	..	238.80	238.50	236.50	238.00	240.80	236.90	235.60	236.10	238.10	238.40
7	Tilawe ..	Siswa railway crossing.	..	..	..	..	...	..	...	..	..	..	..
8	Bougri ..	Narkadei railway crossing.	..	..	..	..	...	..	...	...	..	..	..
9	Lalbakeya	At Dhaka headworks	..	102.20	102.60	102.30	104.30	104.50	101.00	103.00	104.00	103.00	104.00

Serial no.	Name of river.	Name of gauge.	Maximum high flood level on record.	High flood level.						Remarks.
				1953.	1954.	1955.	1956.	1957.	1958.	
1	2	3	4	24	25	26	27	28	29	30
1	Sikrahna ..	Sugauli bridge no. 5	..	223.80	224.50	224.50	226.3	222.75	223.00	Levels are connected with railway datum G.T.S. Value—Railway datum—1.48.
2	Ditto ..	Railway bridge at Chainpatia.	..	247.75	..	247.30	248.81	242.39	242.56	Levels are connected with railway datum. G. T. S. Value—Railway datum—1.82.
3	Ditto ..	Bairatpur outfall at Konhar.	..	217.73	..	..	..	..	..	..
4	Masan ..	Bridge no. 4 between Harinagar and Bhairoganj.	..	316.00	..	..	..	..	..	Levels connected to railway datum.
5	Tribeni ..	Bhainsalotan ..	..	360.50	368.40	365.20	359.40	362.60	360.20	Levels connected to G. T. Bench mark.
6	Tiur ..	Above Tiur headworks.	..	237.78	242.50	237.50	230.33	229.33	232.23	
7	Tilawe ..	Siswa railway crossing.	..	253.06	..	..	..	..	..	By observing the flood mark level connected with railway datum.
8	Bougri ..	Narkadei railway crossing.	..	249.40	..	..	..	..	..	Ditto ditto.
9	Lalbakeya	At Dhaka headworks	..	105.00	106.00	231.57	230.67	230.02	230.42	Levels are not G. T. S. but assumed zero of gauge 93.00.