Chapter 1

THE AGRO-ECOLOGICAL SETTING OF NORTH BIHAR

The area of North Bihar extended from the districts of Champaran and Saran in the west to Purnea in the east, the northern part forming the frontier with Nepal and the south was separated from the rest of Bihar by the river Ganges. (See Map No. 1)

North Bihar had unique geographical features different from the rest of Bihar and Bengal. In this chapter, first, the attempt will be to bring out the physical features of North Bihar in its undisturbed state (i.e., before the British intervention in the agrarian economy). Second, the ways and means by which the inhabitants of this region responded or adjusted to this particular geographical setting would be outlined.

1. Rivers of North Bihar

The general feature of the greater part of North Bihar was that it was a flat cultivated expanse intersected by a number of rivers and streams debouching from the Nepal hills and following a long tortuous route before falling into the Ganges.

The rivers of this region can be grouped under three heads, viz., (a) those that are snow-fed rivers and bring their waters across the Himalayas and are perennial, e.g., the Gogra (or Ghagra), the Great Gandak or Narayani, the Bagmati, the Kamla and the Kosi; (b) torrential rivers which bring a large volume of water during monsoon but dwindle down into small streams during summer and cold months, e.g., the Sikrana or Burhi Gandak, the Lalbakeya, the Lakhandeyi, the Purani Dhar, the Adhwara-Marha - Rato group of rivers, the
Darbhanga Bagmati, the Balan, the Tiljuga and the Tilawe; (c) 'dead rivers' or old beds which did not run through the year but served as 'indifferent' country drainage channels during monsoon, e.g., the Dhanauti, the Baya, the chain of rivers comprising of the Danda, Furdo, Kedane, and Nun, the Jamuari, the Beti, the Balan, the Sursar Dhar, the Haiyaha Dhar, the Bochaha Dhar, the dead courses of Kosi (four in number), the Kali Kosi and the Saura. (See Map No. 2 for some of the rivers)

The rivers of group (a) were mostly great 'land-builders' and in their process of land-building, oscillated from east to west and back in the range of hundreds of miles. (See Map No. 2 for the different courses of the Kosi) P.C. Ghosh described the oscillation of these rivers in the following words:

Very little is known about the oscillation of Gogra in this Province. But the popular belief is that Burhi Gandak was once the bed of the Great Gandak and as the latter moved westwards, it adopted and left in turn the Kedane-Nun group of rivers and the Baya respectively until it reached its present course - where its further westward movement was checked by the construction of a marginal embankments on its both banks. The existence of large 'Mans' or lakes in the Bettiah sub-division of Champaran district also confirms the belief of previous existence of a big river along the lakes. The Bagmati ... has been oscillating westwards in successive stages from Darbhanga-Bagmati to its present channel, where its further westward movement has been checked by the training works of the railway bridge and the embankment itself. In coming to its present site, the Bagmati adopted and left as its channel the Marha-Rato group, the Adhwara-Sikao group, the Lakhandeyi and the Purani dhar and built up the land to a great extent in its northern part. The Kamala ... is still continuing its westward move and has come up to its present course flowing close to Rajnagar, Madhubani, etc. and there is evidence that it had once moved eastwards from the old Kamla (Baldewa dhar), then flowing west of Jainagar and through Gausa ghat ... With regard to Kosi, there are records and evidence that it oscillates from the border of Purnea district to the border of the Darbhanga district.

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2 Ibid., pp. iv-v.
The whole of North Bihar from Saran up to Purnea may be considered as a "huge inland delta as all the principal rivers emerging from the mountainous region debouch in the plains and eventually flow into the Ganges". The process of delta building towards the Ganges was going on for thousands of years and "almost the whole of it was built up by the principal rivers bringing from across the Himalayas the stock of building materials or detritus".

Saran district was formed by the delta of the rivers Gogra and the Gandak. From the Gandak, several 'spill channels', viz., the Jharahi, the Daha, and the Gandaki used to flow through this district and ultimately fall either into the Gogra or the Ganges. The tract of country from the east of the Gandak up to the west of Saura - a tributary of old Kosi, formed a big delta, built up by the river Sikrana with its tributaries, the Masan, the Balore, the Pandai, the Uria, the Gadh, the Tilawe, etc., in the Champaran district; by the Bagmati, the Purani dhar, the Lakhandeyi, the Adhwar Marha-Rato group, and the Darbhanga-Bagmati in the Muzaffarpur district; by the Kamla, the Kareh, the Jiwachh, the Balan, and the Tiljuga in Darbhanga district; by the westerly diverted channels of the Kosi through the Mahuli, the Dhemra, the Beti, and the Gajna in North Bhagalpur; by the Kamla, the Kareh, the Bagmati (old course), and later from Chauthem by the Ghaghri - the main course of the Kosi, in North Monghyr; by the old Kosi channels, the Kali Kosi and the Saura in the Purnea district.

The rivers of North Bihar conserved themselves in the deltaic region, i.e., created a permanent channel for themselves and, in the process, built up the unique land formation very similar to a delta. As to how the rivers conserved themselves, it is best to quote S.C.

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3 Ibid., p. iii.
4 Ibid., p. iv.
5 The above account is taken from Ghosh, op.cit., pp. iii-iv.
Mazumdar, the Chief Engineer of Bengal in 1942, who did an extensive study of the rivers in Bengal:

... Even if left to nature, rivers must carry certain portion of silt during floods, being picked up along with the surface run-offs from their catchment basins. Indeed, in the economy of nature, it is necessary, as without the silt neither could the delta be formed and raised, nor the land fertilised by natural manure. If left to nature, rivers coming down the hill slopes and flowing through non-deltaic region have usually got sufficient gradient and velocity to be able to transport the normal silt charge; while flowing through the deltaic region with flatter gradient and velocity usually not sufficient to carry the silt burden it is necessary in the economy of nature that the rivers should spill over their banks during floods and after depositing the silt thereon, the silt free spilled water should flow down these channels during the subsidiary stages of the floods and maintain them in good condition.... Spill area no doubt rises gradually but along with it, the river bed and the flood level also rise and the relative position is not materially altered except at long intervals, perhaps centuries, when the river unable to spill, bursts through the high banks and diverts her course to perform similar deltaic building functions in the adjacent areas and so on.

The most marked and unique characteristics of the river system in North Bihar was that the rivers flowed on ridges elevated above the surrounding country, and each pair of rivers thus enclosed a shallow depression, consisting of a series of chaurs (depression liable to flooding) or low lands, leading into one another. When the local rainfall first filled these chaurs, the surplus water passed off from one to another, until its flow was checked by some high ground. Having no other course to take, this drainage water broke into one of the nearest rivers at a point where the banks were low, after the level of the river had somewhat subsided. This way the rivers, although running upon comparatively high ground, became ultimately the receptacles of the drainage of the country, or rather the channels by which it was conveyed into the Ganges.⁷

⁷ L.S.S. O'Malley, Muzaffarpur District Gazetteer, 1907 [Muzaffarpur DG, 1907], p. 3.
2. Lakes and Marshes

Another very unique feature of the landscape of North Bihar was the series of lakes (or chaurs as they were locally known) found throughout the region, which were again the result of the oscillations of the rivers. Champaran had the largest number (43) of them running through the middle of the district. They cannot be characterised as lakes in the strict meaning of the term, as these dried up by the end of October or November to allow the sowing of rabi crops. But some of these chaurs could not dry up completely even by the end of the cold season. The total area under these chaurs in this district was 139 square miles. In the Saran district also, there were a number of chaurs, the most important being the Hardia chaur which extended from Sonpur along the Gandak embankment for 20 miles, with an average breadth of 2 to 5 miles and depth varying from 4 to 13 feet. In Muzaffarpur district also, there were a number of chaurs. But there was no body of water in North Bhagalpur, of sufficient size and depth, to be called a lake. Shallow marshes were numerous, occurring principally in the Madhipura sub-division on either side of the river Loran. In Darbhanga, a series of chaurs and shallow depressions were found, especially in the south-east corner of the district where all the lines of the drainage, north of the Gandak, converged.

In North Monghyr, marshes abounded, several hundreds being enumerated in the Pharkiya Pargana (Gogri thana) alone. The District Gazetteer of Monghyr reported, "their formation is generally peculiar. The banks ... [were] high and abrupt ...They [were] filled

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8 L.S.S. O'Malley, Champaran District Gazetteer, 1932 (Revised) [Champaran DG, 1932], p. 8.
10 J. Byrne, Bhagalpur District Gazetteer, 1911 [Bhagalpur DG, 1911], p. 10.
annually by the floods of the Ganges or its Himalayan affluents." Further to the west, there was a chain of marshes all along the north-east of the Begusarai sub-division, of which the most important was the Kabar Tal. This was a large shallow lake extending over an area of 7 square miles, a portion of which was always under water, but the remainder dried up in time for sowing of rice broadcast in the month of May, the crop being reaped in November.

There were no lakes in the strict sense of the term, in Purnea district, but there were numerous marshes, especially towards the south-east. They never became entirely dry, but were reduced towards the end of the dry seasons to much narrower limits. As the Purnea Gazetteer states, "the most remarkable (lakes) form a long chain extending, though not continuously, from Gondwara to Malda." They resembled a line of broken narrow channels winding among low lands and could have been a former bed of some great river.

All these lakes and marshes were situated on the old beds of some great rivers and together, along with the rivers and drainage channels, formed a complex drainage network of the region. Each of these was interconnected, and some of the rivers had their origin in these lakes, e.g., the river Sikrana or Burhi Gandak. They received all the flood spill of the rivers and retained water long enough to irrigate the lands near them in case of early cessation of rains. They were also home to a variety of fishes, which was an important constituent of the food of the people in North Bihar, like in Bengal. But unlike chauras, marshes were never cultivated, as the latter even when they dried up were full of wild grasses. Marshes in Monghyr and Purnea districts were locally known as tals. As will be discussed later in this chapter, these

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13 Ibid., p. 10.
chahurs, in their undisturbed state, were never a source of unhealthiness in the region. Chahurs, marshes and lakes are different categories of water bodies, which can be broadly characterised as wetlands. The word chaur was used locally for lowlands as well as lakes, while the term used for marshes was tal.

3. Rivers and Diaras

Another example of land formation by the action of the rivers in North Bihar was diaras or chars. The District Gazetteer of Saran describes their formation in the following words:

Some backwater or curve of the river bed sets up an eddy in the current, which thereupon becomes sufficiently stationary to deposit a portion of the sand which it holds in solution. The level of the diara, which is so far nothing but a heap of sand, then gradually rises as the water lying stagnant spreads a thin layer of clay and silt over the sand; and this deposit of silt deepens at every high flood, until at last the diara rises above flood level. The soil of such a diara is extremely fertile and grows magnificent crops; but if its growth is arrested by the rivers altering its course, so that the flood water does not cover it during the second stage of its formation, it remains sandy and barren.

Some diara lands were the most fertile, producing the bhadoi crop before the river rose and good rabi crops in the cold weather. Other diaras could be all sand, and the good field of one year could be destroyed by the deposit of sand the next.

Diaras were found throughout the course of the Ganges through North Bihar. Some diaras were as big as 17 square miles, like Arazi Bhawanandpur in the Begusarai thana in North Monghyr. A number of villages were situated in these diaras. In fact, the largest village in Saran district, Shitab Diara, was situated in a diara of the same name, and measured

\[^{15}\] Saran DG, 1908, p. 4.
16 ½ square miles. There were three other diara villages of more than 7 square miles in the same district.16

4. Gradient and Soil

North Bihar was almost a level plain with hardly any elevations other than that of the rivers. The slope was from north to south for the first 50 miles or so, and then from north-west to south-east; and this was the direction of almost all the rivers. But the gradient was almost imperceptible to the naked eye. For the first 50 miles from the northern boundary, it was no more than 10 feet per mile; thereafter, it flattened rapidly, and near the Ganges, where all the rivers converged, the slope was no more than 1-2 feet per mile. The plain of North Bihar was disturbed in places only by shallow depressions and the elevated riverbanks.17

The alluvium formation occupied the greater part of North Bihar. Much of it was clearly composed of deposits from the rivers, whether by annual overflow or in consequence of periodical changes in the channel. The older alluvium was found in places near old beds of the rivers and where the inundation did not reach. Here a stiff clay or Kankar was observed, very unlike the ordinary silt as freshly deposited. New alluvium was found near the present channel of the rivers and this area was subject to annual inundation. The precise relation between the two formations was not determined and their extent not demarcated.

There are other classification of soil which were found in North Bihar, viz., (1) heavy clay called Karail; (2) clay called Kariya, Kewal; (3) clayey loam called dhusi kewal or

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17 Ghosh, op.cit., p. iv.
phulank; (4) loam called dhus, dusri, doras, or balmut; (5) sandy loam called balsumbhi and (6) sand or bal.

The clay soil was classified as follows: (a) the Kacchua Kewal was the typical clay soil of chaur or low lands, which remained too long and too deep in water to allow paddy cultivation. The soil, however, was good for all sorts of rabi crops. Its colour was black. (b) Karail or Karari was black, tenacious rich soil, also found in the chaur, which grew only rabi crops. (c) Dhusri or dusri kewal was a little lighter than Kacchua kewal and grew both paddy and winter crops. (d) Gorki was an extremely stiff soil suitable neither for paddy nor wheat or barley, and grew only arhar, gram, kulthi, etc. It had a mixed white and red colour.

The usual loamy soil was dusri, or dusri or dhus, a light rich soil suitable for crops. A sandy soil was known as balsumi or balsumbhri. It was not a rich soil, but grew both bhadoi and rabi crops. Dhus, balmut or doras were soils found in diaras, containing three-fourth of sand and one-fourth of clay, and which grew only inferior rabi crops. Alkaline soils were known as nonchhal or usar, when impregnated with salt-petre (Potassium nitrate); as reh, when impregnated with sodium carbonate; and as Kharwa, when apparently containing sodium sulphate.¹⁸

5. Rainfall

North Bihar had ample amount of rainfall, more than in the rest of Bihar. The amount of rainfall varied from district to district, but it was more than 45 inches per annum in all the recording stations in the region. As a rule, monsoon started in mid-June, and a significant amount of rain fell between June and October. This influenced the cropping pattern as will be explained later.

¹⁸ The above account of soil is compiled from Purnea DG, 1911, p. 84; Monghyr DG, 1909, p. 94; Champaran DG, 1932, p. 54.
The rainfall was heaviest in the sub-montane 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 district just under the hills".\textsuperscript{19}

It was also seen that rainfall decreased as one moved from east to west, Purnea recording the highest annual average of 52.5 inches,\textsuperscript{20} and Saran the lowest of 45.05\textsuperscript{21} inches. Champaran was an exception to this rule as its annual average of 51.88\textsuperscript{22} inches was high because a large part of its area was in the sub-montane and terai tract where, as has been mentioned above, the rainfall was the heaviest.

This annual average for each district varied from year to year. But what was more important, from the viewpoint of agricultural operations, was the variation of rainfall for each month. As will be discussed later, rainfall greatly influenced the cropping pattern and agricultural operations in North Bihar.

6. Agriculture in North Bihar

In North Bihar, like in other parts of the Bengal Presidency, the crops grown were usually classified in three great divisions - aghani, bhadoi and rabi. The aghani crop consisting of the 'great winter rice' was sown in June and cut in the month of Aghan/Agrahan (November/December) and was overall the most important crop in North Bihar, except for some exceptions. The bhadoi crops reaped in the month of Bhado (August/September) consisted of 60 days (sathi) rice, marua and various millets, Indian corn and indigo. The rabi crops, which were so called because it was harvested in the spring (rabi) included such cold weather crops as wheat, barley, oats, pulses and poppy.

\textsuperscript{19} Champanar DG, 1932, p. 54.
\textsuperscript{20} Purnea DG, 1911, p. 18.
\textsuperscript{21} Saran DG, 1908, p. 15.
\textsuperscript{22} Champanar DG, 1932, p. 13.
The *aghani* rice was initially sown broadcast after the commencement of rains in June on lands selected for seed nurseries, which had been ploughed three or four times. After four or six weeks when the young plants were a foot high, they were transplanted. The rice was then left to mature with the aid of water till towards the end of September. The land was then drained off and fields allowed drying for 15 days. The partition between fields was cut and water drained from one field to another until it reached some drainage channel or wetland. At the end of 15 days, the lands were again flooded.

It was this practice of draining the fields known as *nigar* that made the rainfall or, failing that, irrigation essential for a successful harvest. These late rains (or *hathiya* rains) were "the most important in the year as not only were they required to bring winter rice to maturity but also to provide moisture for the sowing of the rabi crop".\(^{23}\)

The second cropping season was the *bhadoi* in which the sowing operations were carried out in June/July; the harvesting season was August/September. This was also known as the early autumn crop and was grown in some areas of North Bihar. The *sathi* rice was sown broadcast and it did not require much care.

The third cropping season was the *rabi*, which was sown after the *hathiya* rains (21st October to 3rd November). If the rains failed, then irrigation was done through wells. The harvesting was done between the last week of February to the middle of April. It was sown on lands from which a crop of early rice had been taken, and often wheat was sown with barley or gram, mustard or linseed.

\(^{23}\) *Muzaffarpur DG*, 1907, p. 55.
7. Floods and Agriculture

As has been mentioned earlier, North Bihar was an "inland delta", and thus particularly liable to floods. Perhaps one could say that floods were inevitable in North Bihar. The Bihari peasant, instead of trying to alter this natural event, had tried to adjust his agriculture and lifestyle to floods. This is evident from the agricultural practices prevalent in North Bihar.

North Bihar had monsoon from June to October and this, coupled with the increased volume of water brought by the rivers because of the melting of snow during the summers, was responsible for floods during the monsoon months. Bhadoi crops were particularly susceptible to damage from floods in August-September when it needed a dry period to ripen the grains. The aghani rice could withstand partial and temporary inundation during this period, provided the floods did not come in a rush and lands did not remain submerged for a long time. It was only in the chaurs and marshes that lands remained under water for a long time. In such areas, a special variety of rice was grown. The plants of this rice crop grew in height with the rise in the level of water. This kind of rice was sown broadcast from canoes and did not require any great care. Although this was a very coarse variety of rice, it had a great value in times of distress for the weaker sections of the population. In fact, there were around 80 varieties of rice in North Bihar.24

The transplanted long maturing, high-yielding, winter-cut rice was cultivated where river floods did not interrupt its growth, yet where the water supply was expected to allow maturing through October for the final ripening in November/December. Cultivation and maturing took up to six months. It was always transplanted, except in a few exceptional cases. From June/July, when the seed nurseries were prepared, to November/December when

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24 Purnea DG, 1911, p. 45.
harvesting was done, *aghani* crop needed a comparatively short period of dry weather. It was only in the end of September when the water was drained off from the fields and during the period before the harvesting that any abnormal fall in rain or late floods could damage the *aghani* rice. Apart from these two periods, floods of abnormal height and duration could also damage the *aghani* rice. It must be noted, however, that floods of unprecedented height and duration were a phenomenon experienced only after the colonial intervention in flood control had been initiated.  

Good *rabi* crops were also grown in low lying lands (*chaurs*) which were enriched by the rich silt deposited by the flood waters. The *rabi* crops were sown when the water was drained off back to the rivers. But good *rabi* crops were not grown on lands where *aghani* was grown. It was sown on lands where *aghani* could not be sown, e.g., the *chaurs*. These *chaurs* dried up by the end of October, and *rabi* was sown in and around the *chaurs*.

The time of sowing of *rabi* was regulated by two circumstances - the heavy rains of the *hathiya nakshatra* (*nakshatra* is a fortnight in a month in the Hindu calendar) in the end of September to the beginning of October, and the approaching cold season. If it was sown too late, the plant would not be strong enough to withstand the cold; if it was sown too early, the heavy rains could drown the seed and the sprouting crop, and so necessitate re-sowing. The cultivators were thus anxious to sow as soon as the heavy rains ceased. A sufficient supply of moisture was essential at this time in order to enable the seeds to take root, and later on some rain or artificial irrigation was also necessary to prevent the crop from withering and to mature the ripening grain. Accordingly, *rabi* was grown in lands which already had given a *bhadoi* crop, and not on *aghani* growing lands, as *rabi* was sown before the *aghani* crop was harvested.
(only inferior quality of rabi was grown in lands which already had produced an aghani crop).

Secondly, some rabi crops, like wheat, tobacco, chillies etc. needed regular waterings; so rabi was grown wherever there was a source of artificial irrigation - in most cases wells. For example, it was observed that rabi crops were grown in large scale in the southern thanas of Muzaffarpur district - Hajipur, Mahua, Paro and Muzaffarpur - because wells were suited in this tract and in none of these thanas the proportion of irrigated area supplied by wells fell below 78 per cent.26

Bhadoi crops being susceptible to excessive moisture were always grown on high lands. In case of bhadoi crops, good rains was a must in June and July for ploughing and preparing of nurseries, but a dry period was always necessary towards the end of August and the beginning of September to ripen the grains, and another dry period was necessary at the time of harvesting. Because of the above mentioned conditions required for the bhadoi crops, it was grown on relatively high grounds, and its cultivation was prevalent more in the southern portions of North Bihar where rainfall was lesser than in the northern parts. Bhadoi rice (or autumn-cut rice) was grown in tracts which saw frequent interruption from river floods after July, and where no other crops could be sown till the end of the monsoon (September/October).

From the above account of the agricultural practices of the North Bihari peasants, it becomes very evident that they had adjusted their agriculture very well to floods and other adverse natural conditions. The very fact that the agricultural lands were so intensively cultivated year after year (the percentage of fallow land was very low), and the high density of

26 Muzaffarpur DG, 1907, pp. 50-51.
population of North Bihar, shows how a supposedly disadvantageous natural condition could be turned into one's advantage without meddling too much with 'nature'.

Another example of the adjustment to natural conditions was the agricultural practices in diaras. The diaras, because of their vicinity to the rivers, were particularly prone to floods. In fact, they owed their formation and, subsequently, fertility to floods. In these lands aghani crops could never be grown, first because of its complete inundation from July to September and, second, because the soil in these lands were not retentive of moisture. But bhadoi and rabi crops were grown extensively in diaras.

If the rivers rose late then the diaras produced a good bhadoi crop, and if it rose early, then a good rabi crop was produced. So, in whichever situation, the diara lands gave at least one good crop. Also, because of its vicinity to rivers, irrigation could be done easily.27

8. River Basins and Agriculture

A noted geographer, Arthur Geddes, makes a very interesting geographical division. Geddes divides North Bihar into the Gandak cone, the Gandak-Kosi inter-cone, the Kosi cone, the Kosi-Mahananda inter-cone and the Ganga meander belt. (See Map No. 3) These tracts delineated by the river pattern in each were recognised by him as the basis of the cropping pattern, both as to crop specialisation and seasonal rhythms. This difference in crops and seasonal cropping was due to the dispersal of the distributory water on the two great cones of the Kosi and the Gandak in contrast to the gathering of waters on the vast inter-cones.28

MAP No. 3  
TRACTS OF THE BIHARIA PLAINS

The Kosi cone was the most symmetrical but was still in the process of deposition. The Gandak cone, slightly incised by a 15 kilometre flood plain, had two different types of soils: the recent, still calcareous from its lower Himalayan catchment of limestone, and the major, older surface from which many centuries of leaching had washed down the lime to the lower horizon. It also had a stable and fixed spill pattern. Between the two cones of varied soils was the great, gently declining Gandak-Kosi inter-cone. At the foot of the inter-cone decline was the annually inundated flats- inundated by the Gandak and the Ganga- a belt nearly 80 kilometres wide from the Ganga spill-hollows northward and over 200 kilometres long between the fringes of the Kosi-Gandak cones. Inundation and the shifting of the meanders rendered this tract precarious for road or railway making and dangerous for town building.29

The clayey inter-cones held water longest and so induced the cultivators to sow the longest maturing and most valuable staple crop, the winter-cut or aghani rice. The drawback was that by the end of the harvest, the soil dried out too much for a good second crop. The cones induced local preference for a two-crop year, with crops cut in spring and autumn. In the inter-cones, though additional spring crops usually covered some 20 per cent of the gross cropped area, these were mainly of oilseeds and other low value crops. On the other hand, the cones contained minor spill-hollows, which encouraged local aghani rice. Within major crop tracts, one can see and interpret a pattern in which minor crops recur. Also, this general pattern was variously adapted within each village area.30

So the predominance of winter over autumn-cut rice corresponded with the core tracts of winter rice: the inter-cones along the north and south margins of the Ganga meander-belt

29 Ibid., pp.160-61.
30 Ibid., pp.157-59.
and its northern spill-hollows (Darbhanga and Muzaffarpur districts). In the transitional zone, where the inter-cones met the cones, the autumn-cut rice was found alongside other autumn-cut crops, including maize and a little eleusine (or red) millet. Spring crops like wheat and barley was predominant in the lower Gandak cone (e.g., Saran district).

Set against the greater weight and value of the aghani rice, compared to the other predominating crops in Bihar, was the risk of its failure in the event of the failure of the monsoon; in fact it was a famine risk. If the soil retained some moisture, dry spring crop could follow, but they were of low value. Conversely, the autumn plus spring crops, though of lesser-combined value, they faced a lesser risk of complete crop failure. During the Bihar famine of 1897 ten per cent of the rural folk, almost all of them from inter-conal, aghani rice growing districts had to receive famine relief.\(^31\)

8.1. Kosi-Mahananda Inter-cone and Kosi Cone - Purnea District

Half the district of Purnea owed its physical characteristic to the steady westerly movement of the river Kosi. As regards the quality of soil, it may be divided into two main portions of equal size. To the east of the line running from the point where the river Panar entered the district to the town of Purnea, and then trending southwards and eastwards through Saifgunj to Manihari, the land was composed of rich loamy soil of alluvial deposit. To the west of this line, the country, which seemed to have been formerly of the same nature, was thickly overlaid in 1872 with sand deposited by the Kosi in the course of its westward movement. The former tract was peculiarly rich in rivers and natural canals. Large marshes also existed which did not dry up at any period of the year. Rice was almost the only staple of cultivation, except towards the north,

in the Kishangunj sub-division, where jute occupied a considerable area. In the western division, the most noticeable feature was the extent of area not under cultivation, which spread out from the vicinity of the town of Purnea, chiefly north and west, in the form of radiating stretches of land, opening out occasionally into fine, grassy, prairie like plains. Along the Ganges there was little vegetation; but the newly formed Kosi chars, or sand-banks, were covered with dense and high jungle of coarse grass. Villages were rare here than in the east of the district.\textsuperscript{32}

One of the most marked characteristics of the district was the great grassy plains, or ramnas, that surrounded the town of Purnea, and extended nearly to the northern and western frontiers. These expanses of country were used during the rains as pasture grounds, and formed valuable properties. During the cold and dry seasons, from the end of October to the middle of June, they were left as open commons. But with the first showers of the rains, however, the owners took a greater interest in their property. They set up bamboo in each field which was a sign that occupation had been resumed, and that all cattle found trespassing would be sent to the nearest pound. This was also to be regarded as a notification that the land was to let. The goallas or cowherds soon came forward, and as the floods rose in the outlying parganas along the Kosi chars, the Ganges diaras, and the lowlands of Gondwara, Kadba, Badaur and Surjyapur, the demand increased. After October, they no longer afforded sufficient sustenance for the large herds, and the goallas drove off their cattle to Nepal, or the lowlands of pargana Dharampur, and along the Ganges.\textsuperscript{33}

The grazing ground usually went with the village land. The large plateau from Matiyari to Purnea, about 40 miles in length and 6 miles in breadth, was practically all grazing ground. The area of the district was about 5218 square miles; and of this area, pasturage lands were entered as covering 900 square miles.34

The population was most dense in the rich alluvial plains extending from the Kankai to the Nagar rivers, which was watered by the Mahananda and its affluents; the highest average found in Kishengunj. The tract next in order was the police circle of Araria, watered by the Panar and Ratua. The eastern and the east-central police circles of Kaliagunj, Balrampur and Kadba were also well peopled, while the central thanas of Purnea and Amur-Kasba showed a higher average than that common to the whole district. The population diminished both to the south and west, along the banks of the Ganges and Kosi, due to the devastating overflow of these rivers. Along the Kosi the population grew more and sparse from north to south.35

As was the trend throughout North Bihar, the cones supported a double cropping while the inter-cones had a predominance of aghani rice; it was also true in Purnea district. The result was that the tracts especially affected from the failure of inundation and rainfall and which had the worst kind of distress in 1874, were thanas Kasba Amur, Balrampur, and Kadba. The tracts affected above average by failure of rain, which had the secondary degree of distress, were thanas Bahadurganj, Krishanganj, Purnea and one-third of Araria. On the other hand, the parts near the Kosi and Ganges, like Dharampur pargana had excellent crops.36 So it becomes pretty evident that the tracts suffering the most from drought conditions were predominantly aghani

34 Ibid., pp.235-36.
rice growing in the vicinity of the Mahananda, and the tracts falling within the spill area of the Kosi, or the Kosi cone, suffered less.

8.2. The Shifting Kosi Cone

The area devastated by the wandering of the Kosi had a completely different agro-ecological setting than the rest of North Bihar because of the unique characteristic of the Kosi. During the period when the Kosi flowed through any area, it led to complete devastation of the area and no crops could be grown. Even the trees were uprooted or completely filled up by the sand of the Kosi. But after the recession of the Kosi to the adjoining low-lying area the area used to be brought under cultivation with a little labour. This recovered area became fit for growing jute, tobacco, and also paddy and *makai* (maize). The old beds of the Kosi were filled up and the whole area became totally immune from floods. In this section we would cite the agricultural conditions in two regions, only as an illustration, which were settled after the Kosi had receded from there. These areas were reclaimed and the agriculture in this area was unique. The figures cited in this section is representative only of the years in which the survey was conducted, but this would give a fair idea of the agricultural practices in this tract.

While describing the material condition of some 40 villages in *thana* Dhamdaha in the Sadr subdivision and 14 villages in *thana* Raniganj in the Araria subdivision of Purnea district (along the western boundary of the district), which were being freshly surveyed and settled in 1923-26 after the Kosi had receded from the area (see Map No. 1), the Settlement Officer stated:\(^{37}\):

On the whole the material condition of the *raiyats* is fairly satisfactory and the area is practically free from the likelihood of famine. There has been no year in which the *bhadoi, aghani and rabi* crops have all failed. Labour is plentiful and wages are fair. The general run of the *raiyats* cannot, however, be said to be prosperous and few of them are free from debt.

In the 346 villages lying in seven different *thanas* falling in one compact block running along the district boundary of Bhagalpur and Purnea, which were surveyed and settled between 1926-31, it was reported that\(^\text{38}\):

Regarding the productive capacity of the soil the general impression of the people of the area is that all lands affected by the Kosi river have productive capacity of a temporary character. After the deposit of the new silts by the river the land becomes very productive but in course of time it deteriorates. The general productive capacity of the soil is said to last 20 to 30 years.

The total number of holdings dealt with in the settlement operation (between 1923 and 1926) was 11,735, the average acreage per holding was 4.9 and the average size of the plot was 1.24 acres. Plots in this area were fairly big. Plots and average size of the holdings could have been bigger but for the several homestead lands of *ryots* and the landless class.

### Table 1.1

<table>
<thead>
<tr>
<th>Thana</th>
<th>Total area dealt with statistically (in acres)</th>
<th>Percentage of net cropped to total area</th>
<th>Percentage of the net cropped area under-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bhadai</td>
</tr>
<tr>
<td>Dhamdaha and</td>
<td>48,016</td>
<td>79</td>
<td>65</td>
</tr>
<tr>
<td>Raniganj</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


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The figure for the *aghani* crops is not, however, normal, as there was little paddy in the year of survey on account of a failure of monsoon. In almost all the villages the *bhadai makai* was either followed by *aghani* rice or *rabi*. On particularly good lands and in years of reasonable rainfall, some lands could grow *bhadai* jute and *aghani* rice. The *Bhadai* crop including the early (*jethua* *makai* was a very important crop in the area—about 65 per cent of the net cropped area coming under it, a figure nearly double that for the rest of the Purnea district. This was due to the villages being absolutely immune from floods.\(^39\)

The uncultivated area consisted of current fallow, 804 acres, other culturable land, 6,064 acres, unculturable 3,297 acres. Of the culturable area 4,188 acres represented the reformed bed of the Kosi which were used for grazing. The area under thatching grass was 1,718 acres. House sites covered 727 acres of the area classed as unculturable. The total area under food crops was 46,934 acres, which was 75 per cent of the total cropped area, viz., 62,622 acres and 123 per cent of the net-cropped area, viz., 37,852.\(^40\)

Table 1.2

<table>
<thead>
<tr>
<th>Thanas</th>
<th>Percentage to net cropped area of total area under-</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rice</td>
<td>Wheat</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dhamdaha and Raniganj</td>
<td>13.18</td>
<td>10.88</td>
</tr>
</tbody>
</table>

Source: *SSR, Kosi Diara*, 1927, p.20.

The area under *bhadai* rice was 1,236 acres and that under *aghani* 3,990 acres. But this was not a normal state of things. Of all the *bhadai* crops that under *bhadai* rice was very less compared to maize or jute. The area under wheat (4,120), barley (2,281), *makai*  

\(^39\) *SSR, Kosi Diara*, 1927, p.20.  
\(^40\) *Ibid.*
(19,316), marua(2,597). Arhar was quite popular and other foodgrains included Kalai, kurthi, meth, bora and peas.  

Table 1.3

<table>
<thead>
<tr>
<th>Thanass</th>
<th>Percentage to net cropped area of total area under-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oil-seeds</td>
</tr>
<tr>
<td>Dhamdaha and</td>
<td>37.31</td>
</tr>
<tr>
<td>Raniganj</td>
<td></td>
</tr>
</tbody>
</table>


The total area under non-food crops was 15,688 acres, which was 25 percent of the total cropped area and 41 percent of the net-cropped area. In a normal year the percentage under food crops would have been very much larger. Mustard was a favourite crop and of the other oil-seeds castor was more widely grown than linseed or til (sesamum).

8.3. Kosi-Gandak Inter-cone

8.3.1. Bhagalpur District (North)

The northern division of the Bhagalpur district (north of the river Ganges) formed a continuation of the great alluvial plains of Tirhut (Muzaffarpur and Darbhanga districts before they became different districts). It was abundantly supplied with river communication, and a large part was subjected to annual inundation by the flooding of many rivers whose source was in the southern range of the Himalayas, as well as by the overflow of the Ganges over its left bank. These northern rivers were inter-connected by numerous channels of considerable width and depth, called dhars, so that, except in years of unusually scanty rainfall, the region was

41 Ibid., p.21.
well supplied with means of irrigation. There was very little high land, the only elevated tracts being narrow ridges of land on the banks of the larger rivers. From these ridges the land sloped gradually away from the river, often meeting a similar incline from some other river; and marshes or chain of marshes, frequently of great extent, were thus formed. 42

The north-eastern paragnas which, at the beginning of the 19th Century, constituted one of the most fertile portions of the sub-Terai rice tract, and supported the great grain market of Nathpur, had been by 1872 completely devastated by changes in the course of the Kosi. The whole country had been laid under a deep layer of sand, which destroyed the productive power of the soil. At the same time, the fear of the further movement of the river had driven back cultivation, and a high grass jungle, the home of tigers, buffaloes and a few rhinoceros, took up its place. 43

Rice was the most important crop of Bhagalpur and undoubtedly the largest. There were some half-dozen varieties of rice sown in the district, which were distinguished from one another only by the relative fineness or coarseness of the grain. The soil occupied by rice was low-lying wetlands. Long-stemmed rice was grown in north Bhagalpur over extensive tracts, which were flooded during the rains, but the best of the species, called desariya, was a coarse red grain. These low-lands were usually sown with spring and early autumn crops. Among cereals crops, wheat had a prominent place, and was very largely produced in paragna Chhai, on the north bank of the Ganges. 44

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43 Ibid., p.23.
44 Ibid., p.117.
As has been mentioned earlier the thanas of the district falling within the spill area of the Kosi, or the Kosi cone, had a higher percentage of land under the *bhadai* and *rabi* crops than under the *aghani* rice. On the other hand, the tract on the left bank of the river Tiljuga and the central thanas of the district had a higher proportion of lands under the *aghani* rice. The former tract suffered less than the latter from the famine of 1874. Sir Richard Temple's Minute dated 19 February 1874 gives us some understanding about the famine of 1874 in the region and also about the agro-ecology of the region.45

The Collector ... assures me that in those parts of the district...which are situated on the basin of the river Kusi (Kosi), there is no reason to fear any serious distress; and on the north bank of the Ganges the crops are excellent...Otherwise the prospect of widespread and protracted suffering is restricted to the tract which lies on the eastern or left bank of the Tiljuga, which tract extends eastwards till it approaches the spill or the basin of the Kusi, and on the west adjoins the Madhubani and Darbhanga Sub-division of Tirhut. This tract includes the *thanas* of Supul, Bangaon, Pratapganj, in the Supul Sub-division; and the *thana* of Madahpura, in the Madahpura Sub-division... The cause of the distress here is the same as in North Eastern Tirhut—namely, the loss of the principal rice crop, which failed from insufficiency of rain on a hard soil, peculiarly needing abundant moisture... There is reason to believe that for several months the distress would be severe.

8.3.2. Monghyr (North)

The northern portion of the Monghyr district was a flat, alluvial plain, very little raised above the ordinary level of the Ganges, and always liable to the inundations when the river came down in floods. The Ganges, in the rains spread over the low lands of *pargana* Pharkiya to a distance of twenty miles from its ordinary bed. The region was traversed from the north-west to south-east by the little Gandak. It was very fertile and supported, from the beginning, a large population.46

A very marked characteristic of the northern division of the district was the numerous marshes, several hundreds being enumerated in the single *pargana* of Pharkiya. Their formation was generally peculiar, the banks, which were covered with wild roses and lantana bush, being high and abrupt, which showed that they owed their origin to the diversion of great rivers. They were filled annually by the spill of the Ganges or Burhi Gandak, and during the rains were home to snub-nosed crocodiles and a great variety of fishes. All along the north of the district there were a chain of marshes, the principal of which was the Kabar *Tal*. Rice was sown on the edges of the shallow marshes.\(^{47}\)

The principal pasture grounds were found in *pargana* Pharkiya, and comprised all the alluvial lands periodically inundated by the Ganges, Gandak and Tiljuga, and which lay so low that the season of sowing even a spring crop passed before the water receded. The largest tract was between the Burhi Gandak and Tiljuga, due north of Monghyr town. An area of about 12 miles north and south and 20 miles east and west, or about 200 square miles, was so deeply flooded that not more than half the land was ever cultivated, and hardly any land was sufficiently high for village sites. This tract formed the pasture for the later cold weather of spring and hot season, and was covered chiefly by a very rank pod grass and the pampas (prairie or grassland), together with the more succulent kinds, such as the *dub*. The cattle grazed here from January till the rising waters forced them to retire in June. The newly formed banks bordering on the Ganges also afforded pasturage during the dry season. The cattle were excluded from those areas, which were cultivated, until after the *rabi* crop was cut in April.\(^{48}\)


\(^{48}\) *Ibid.*, p.34.
The most densely populated parts of northern sub-division of the district were the police divisions of Begu Sarai or Baliya and Tegra, in which the population in 1872 was 671 and 717 to the square mile respectively.\textsuperscript{49}

In north Monghyr little rice was grown, except to the extreme north around Bakhtiarpur, and on the Kabar Tal to the north-east. In this subdivision (Begusarai) out of the total area of 492,160 acres, the uncultivated area was 52,800 acres, under rice 13,000 acres, under \textit{bhadai} or \textit{rabi} or both 327,000 acres, and other than food crops 99,360 acres.\textsuperscript{50}

In arriving at the areas under the various crops in Monghyr, a difficulty as to the accuracy arose, due to the fact that, with the exception of rice, few of the crops were grown singly. As many as five or six species were grown mixed together in the same field, for example, wheat or barley with linseed, mustard, gram, \textit{Khesari} (a pulse, \textit{Lathyrus sativus}), \textit{masuri} (a pulse, \textit{Ervum lens}) and safflower. This system was better suited to the inundated lands than any other. Although \textit{bhadai} crop was grown all over the \textit{diaras} and other inundated lands subjected to the spill of the Ganges, the sowing was little more than a speculation, as the floods usually came before the crop was ripe.\textsuperscript{51}

Wheat was most cultivated in the Begusarai Sub-division, and was exported from the large trade centre of Khagaria to Calcutta. Half the Begusarai Sub-division was under wheat, and at least half of the produce was exported.\textsuperscript{52}

\textsuperscript{49} Ibid., p.49.
\textsuperscript{50} Ibid., p.83.
\textsuperscript{51} Ibid., p.105.
\textsuperscript{52} Ibid., p.143.
From the above account it becomes clear that north Monghyr could not suffer from drought as much as it principally depended on cold weather crops. Sir Richard Temple's minute of the 1874 famine in Monghyr further makes this clear. He wrote "the only part of the north (Monghyr) in which distress seemed imminent... was the tract around Bakhtiarpur, in the north-east corner of the district, touching Tirhut and the Supaul subdivision of Bhagalpur, in which rice is largely produced, and had failed."^53

So, except for the north-eastern corner which shared the characteristics of the Supaul subdivision, North Monghyr can be grouped under the category of 'Ganga Meander Belt'. (The Ganga Meander Belt was the region situated on the foot of the inter-cone decline, and annually inundated by the Ganga and the Gandak).

8.3.3. Tirhut (Muzaffarpur and Darbhanga Districts)

Tirhut district until 1874 comprised of Darbhanga and Muzaffarpur districts. In fact, both shared similar characteristics; a major portion of both, the central and northern subdivisions, can be characterised as inter-conal tracts, while the southern subdivisions, Tajpur and Hajipur respectively, fell under the 'Ganga Meander Belt'. (See Map Nos. 1 and 3)

Tirhut was a great rice-producing district, specially the central subdivisions. The crop statistics given by W.W. Hunter clearly proves this fact. The Headquarters (H.Q.) subdivisions of Muzaffarpur and Darbhanga have figures of about 63 per cent of the net-cropped area under rice. The northern subdivisions of Sitamarhi and Madhubani also show a high figure for rice, 59 per cent and 73 per cent respectively. The southern subdivisions of Hajipur and Tajpur

^53 Ibid., p.131.
show the lowest percentages under rice, 26 and 25 respectively. The figures for rabi and bhadai are high for Hajipur (52% and 40%) and Tajpur (53% and 45%) subdivisions; while it is low for the central and northern subdivisions- Muzaffarpur H.Q. (29% and 27%), Darbhanga H.Q. (28% and 29%), Sitamarhi (26% and 32%), Madhubani (17% and 21%).

But these figures are slightly confusing, as statistics for rice are not given separately for aghani and bhadai, while it is not clear whether the figures for bhadai crops included bhadai rice also. O'Malley mentions in the Muzaffarpur Gazeteer of 1907 that only about 14 per cent was under early or bhadai paddy. The proportion of bhadai rice was lowest in the southern thanas varying from 4 per cent in Muzaffarpur to 1 per cent in Paro and the largest in the northern thanas, even up to 29.29 per cent in Katra. In the southern tract of the district bhadai and rabi crops of a superior kind dominated, whereas aghani rice and common rabi were grown in the north. Maize, a superior bhadai crop, did not cover more than 5 per cent of the net-cropped in any of the northern thanas, whereas in none of the southern thanas did it cover less than 13 per cent. Pupri (2%) returned the smallest and Hajipur with 21 per cent returned the largest under maize.

8.4. Gandak Cone

8.4.1. Saran District

Saran district, was bounded on the whole of the north-east by the river Gandak, on the south-west by the river Gogra and on the south by the Ganges. It suffered annually from the floods of the Gandak till the erection of the embankment along its entire course. But the floods from the Gogra damaged the standing crop, as the zamindary embankments were not kept in good order.

and especially after the construction of the Railway embankment across the drainage line, as I shall discuss later.

The peculiarity of Saran was that its bangar or rice producing area was found in patches all over the district instead of being confined mainly to one tract as in Muzaffarpur, Champaran and Darbhanga. The interests of Saran was more equally spread over the three great harvests of the year than was the case in either Muzaffarpur or Champaran, in which large tracts were almost entirely dependent on the aghani rice crop. This fact rendered a kindly, and well distributed rainfall especially necessary for Saran, but on the other hand as the district was not dependent on a single crop, it showed greater powers of resistance than its neighbours did to the effects of a partial drought.\textsuperscript{56}

The agricultural advance of Saran under the British rule had been more in the direction of improvement than of extension of cultivation and its fertile soil and favourable situation made it a very highly cultivated tract even in the earliest days. 77.25 per cent of Saran was cultivated and 22.75 per cent uncultivated in the beginning of the 20\textsuperscript{th} century. The nominal uncultivated area in Saran was larger than in Muzaffarpur and Darbhanga, but this area was not available for cultivation, due to the large diara tract included in this category in Saran. The uncultivated area in the Ganges, Gogra and Gandak diaras amounted to 65,263 acres.\textsuperscript{57} In fact, between the Settlement operations in 1893-1901 to 1915-21 there was an increase of 4.5 per cent under the head 'cultivated', most of this increase was achieved at the expense of grazing lands. More importantly, the number of plots increased from 4,831,923 to 5,881,338, an increase of 17.8 per cent. Consequently, the average size of the plot decreased from 0.35 acre to 0.28 acre.\textsuperscript{58}

\begin{thebibliography}{99}

\bibitem{56} SSR, Saran, 1902, p.9.
\bibitem{57} Ibid., pp.102-104.
\bibitem{58} SSR (Revision), Saran, 1923, pp.42-43.
\end{thebibliography}
The most noticeable feature in Saran was the very large area under *rabi* crops, the large area twice-cropped, and a comparatively high percentage of the net-cropped area which was irrigated. The *aghani* area was considerably less in proportion than in other districts, except North Monghyr. The area under *bhadai* was proportionately less than in Champaran, but greater than in other district. As regards *rabi* crops, Saran was on the top. The twice-cropped area was considerably less than that of Muzaffarpur and Champaran, but on the other hand the irrigated area was more than seven times as extensive. This was because Saran grew better and more valuable *rabi* and *bhadai* crops than the other two districts.\(^{59}\)

The Saran Survey and Settlement Report of 1902 describes in some detail the cropping pattern in the district and also the susceptibility of different *thanas* to drought. It states thus\(^ {60}\):

In five out of ten *thanas*, viz., Mirganj, Gopalganj, Mashrakh, Parsa and Sonpur, *bhadai* occupies over 40 per cent and *rabi* over 55 per cent of the net-cropped area: and of these *thanas* it may be safely said that they are, as a whole, practically secure from famine... The Siwan subdivision, on the other hand, with its comparatively large area under *aghani* crops and small area under *rabi*, should be the first to suffer in case of a failure of rains. At the same time famine could never be severe for more than few months, unless the *rabi* crops failed also... In the remaining *thanas*, Manjhi and Chapra, the area under *bhadai* and *aghani* crops are equally distributed, while the percentage under *rabi* crops is considerably above the district average. And in these *thanas*, too, a severe famine is an impossibility.

But these figures were not of much value in Saran. As has already been mentioned, a very striking feature of the district was the presence, in nearly all parts of it, of large low-lying tracts of land in which only *aghani* rice could be grown. If the *aghani* crops failed, such tracts were bound to suffer severely, even though the highlands surrounding it might have secured a good *bhadai* and *rabi* harvest. Nearly one-fifth of the district was to a large extent dependent in its prosperity on the *aghani* harvest and it was this area which suffered most severely in a year

\(^{59}\) SSR, Saran, 1902, p.111.
\(^{60}\) Ibid., p.112.
when conditions similar to the years of famine, for example in 1873 and 1896, prevailed. Every thana except Sonpur contained a considerable proportion of this area.61

It has already been well established from the above discussion that Saran had reached a stage, in the beginning of the 20th century, at which it could no longer support an increase in its population in moderate comfort from the produce of the soil. The Survey and Settlement Report of 1902 reported, "the signs are that Saran is meeting this strain on its resources, not by a further subdivision of holdings and a consequent reduction in the standard of comfort, but by emigration... The census figures and the conduct of the people in the last famine (1896-97) show that they would rather emigrate than submit to a reduction of their standard of comfort or to further subdivision of their holdings."62 Even the Settlement Report (Revision) of 1923 stated, "extensive emigration and ravages of plague and other epidemics have largely eased off the pressure of population."63

Anand Yang has also discussed in detail the practice of emigration in Saran from the late eighteenth century to neighbouring district as agricultural labourers, and to the cities of Calcutta and Dhaka as factory workers.64 The Settlement Report of Kosi Diara of 1927 also mentions that after the recession of the Kosi the lands were being settled with outsiders, mostly from the districts of Saran and Muzaffarpur.65

**Champaran District**

Champaran district was unique due to the fact that its western and southern part fell under the conal tract, while the eastern and northern tracts was characterised as inter-conal. Champaran district is divided into two clearly defined tracts by the river Burhi Gandak, the north-eastern

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61 Ibid., pp.112-13.
63 SSR (Revision), Saran, 1923, p.50.
65 SSR, Kosi Diara, 1927, p.8.
portion being low paddy land unfit for the cultivation of indigo or important rabi crops, while the south-western portion contained much larger proportion of upland. In the northern tract, the soil mainly hard clay, locally called bangar, required irrigation, and was well suited for rice cultivation. If winter rice was grown only one crop was obtained, but the soil, which grew autumn rice, also furnished a spring crop of oilseeds or pulses. The soil next in importance found in the northern tracts was called babhani, a thin loam of light colour. It was seldom sown with rice and its chief products were maize, barley, gram, other pulses and oil-seeds.66

While the northern tract was a great paddy producing area, the southern tract, on the other hand, was characterised by a predominance of upland or bhith, in contrast to paddy lands, which are called dhanahar. It was, however, frequently varied by stretches of bangar, notably in thanas Gobindganj and Kesaria, where the frequency of large tracts of marshy lands or chaurs suitable for paddy was a striking physical feature. The upland, which was the predominant soil in this area, was composed of fine light sand and clay. So the northern area was a paddy-producing tract, while the southern grew millet, pulses, cereals and oilseeds. Indigo cultivation, too, was almost entirely confined to the southern tract.67

From the above account it becomes clear that the northern tract, though very rich and fertile, was, in the absence of artificial irrigation, mostly dependent for its crops on a seasonable monsoon and fell within the grip of famine on its failure. During the famine of 1896-97, the rice producing area of Ramnagar and Dhaka were the first to succumb to its effects, and the last to recover. Thana Adapur, an equally prominent rice producing area, but for which artificial irrigation was obtained by drawing upon the hill streams, remained unaffected. The southern tract, on the other hand, was comparatively safe owing to the variety

66 SSR, Champaran, 1900, pp.5-6.
67 Ibid., pp.6-7.
of its crops. But even in this tract, in the absence of irrigation, there was widespread failure when the season was unfavourable.\(^\text{68}\)

The most noticeable points with regard to the crop statistics of Champaran was the very large area under *bhadai* (46 per cent), the somewhat small area under *aghani* (38 per cent), the large area under *rabi* (55 per cent) and the large area twice-cropped (39 per cent). But much of the *rabi* area was covered with gram, *khesari* and other cheap crops which, only the poor ate. The large area under *bhadai* can be explained by the fact that Champaran, being much exposed to inundation, grew much of its paddy as an autumn crop. The difference in the percentages of the two subdivisions is also noticeable. Bettiah, with much of its area north of the river Burhi Gandak (or Sikrana), had 42 per cent under *bhadai*, while Sadar, with much of its area south of Sikrana, showed 49 per cent. Under winter crops, Bettiah had 43 per cent, while Sadar had only 35 per cent; but under *rabi*, Sadar had 57 per cent, against Bettiah's 53 per cent, and the twice cropped area in the Sadar was consequently greater than in Bettiah.\(^\text{69}\)

9. Artificial Irrigation in North Bihar

Artificial irrigation was practiced on a very small scale in North Bihar because abundant rainfall and the overflow of rivers provided sufficient moisture to the lands.

Whatever means of irrigation existed, was found in the northern part of North Bihar. In this region, the river channels were narrower and irrigation was done by putting *bandhs* across the rivers. These were temporary structures and were erected every year when the irrigation was most needed. Earthen dams were put up across the rivers and, water distributed through

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channels, which were locally known as pynes (or pains), specially constructed, or through some old channels of the rivers. When all the lands were irrigated the bandh was demolished, and another bandh built lower down the river to irrigate the lands in the lower reaches of the river. This way in some 10 to 15 days all the lands commanded by the rivers or streams were irrigated. This method was not prevalent in the central and southern parts of North Bihar because the river channels became broader and it became difficult to build bandh across them.  

Although this method of irrigation was very 'primitive' and inexpensive, the management practices associated with their working were well developed. The major cooperation expected of co-users was in the area of operations and maintenance (of the bandhs and pynes), in allocation (of water) and conflict resolution. These were recurrent tasks. Nirmal Sengupta argues that in sufficiently old irrigation systems, due to the process of evolution and selection, systematic cooperation of users was a more likely event than not. He shows it for tank irrigation in south India and ahar irrigation in south Bihar. 

In the southern part of North Bihar, not much artificial irrigation was witnessed except for well irrigation in some pockets. Here, unlike in the north, irrigation was reserved only for non-food crops, like tobacco, oilseeds, etc. In some parts, there was a prejudice against well irrigation, as it was believed that land once artificially irrigated must always be irrigated. This belief was to a certain extent well founded, for "in some soils prevailing in the south, irrigation

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70 Champaran DG, 1907, p. 56; Muzaffarpur DG, 1907, p. 51.  
formed a crust below the surface, which impaired the fertility of land, unless irrigation was continued every year.\textsuperscript{72}

Well irrigation was practiced the most in the Saran district, except on tracts bordering on the river Gandak. In the greater part of the district well irrigation was feasible owing to the fact that subsoil water was found very near the surface. The crops, which benefited from well irrigation, were those of the \textit{rabi} and spring harvest.\textsuperscript{73} The northern \textit{thanas} of Saran showed remarkable figures for net-cropped area as irrigated- Darauli (33 per cent), Manjhi (28 per cent), Mirganj (23 per cent), Chapra and Siwan (around 15 per cent), Basantpur (10 per cent). The Survey and Settlement Report of Saran reported that for the extension of irrigation in the northern thanas\textsuperscript{74}:

\ldots Mr. A. Tyler, late Sub Deputy Opium Agent at Siwan is mainly responsible. During the 30 years, he held that position 3,500 masonry wells were built and about 800 repaired in this area from advances made by the Opium Department. Further in the Hathwa (\textit{zamindary} estate) area, Mirganj and a portion of Gopalganj, the (Hathwa) Raj has...constructed 1,226 masonry wells in the last 28 years.

In the \textit{thanas} bordering on the river Gandak, viz., Gopalganj, Mashrakh, Parsa and Sonpur the percentage of area irrigated were very small. In Sonpur little irrigation was needed nine years out of ten. Of the other \textit{thanas} the same was true to a certain extent but the main reason for the low percentage was the belief of the peasants that soil was unsuitable for irrigation. A similar belief also prevailed throughout Champaran.\textsuperscript{75}

There was a further increase under the irrigated area in Saran due to excavation of a large number of wells and tanks mostly at the expense of the Hathwa \textit{Raj} and the District

\begin{itemize}
\item\textsuperscript{72} \textit{Darbhanga DG}, 1907, p. 51.
\item\textsuperscript{73} \textit{Saran DG}, 1907, pp.58-59.
\item\textsuperscript{74} \textit{SSR, Saran}, 1903, pp.113-14.
\item\textsuperscript{75} \textit{Ibid.}, p.114.
\end{itemize}
The number of wells recorded in the course of the revision operations (1915-1921) was 58,739 against 30,432 of the previous settlement (1893-1901). 76

10. Rivers, Floods and Irrigation

Although annual rainfall in North Bihar was enough for agriculture, there was also the benefit of the muddy waters from the rivers during monsoon. Agriculture in North Bihar was possible without the silt-laden waters from the rivers. But, as will be discussed later in this chapter, the river spill not only improved the fertility of the soil but also helped in combating malaria.

William Willcocks 77 in his lectures on the irrigation in Bengal had contended that "overflow irrigation" was practised since the ancient times. The distinguishing feature of this irrigation was that 78:

1. the 'canals' were broad and shallow carrying the crest waters of the river floods, rich in fine clay, and free from coarse sand;
2. the 'canals' were long and continuous and fairly parallel to each other, and at right distance from each other for purpose of irrigation;
3. irrigation was performed by cuts in the banks of the 'canals', which were closed when the flood was over. These artificial cuts were called Kanwas in Bhagalpur in the 19th century.

Willcocks argued that the drainage channels, or the 'dead' rivers, which took the excess waters of the rivers during the monsoon, were nothing but canals originally constructed by the ancient rulers for the purpose of irrigation. He further writes 79:

76 SSR (Revision), Saran, 1923, p.43.
78 Ibid., p. 5.
79 Ibid., pp. 11-12.
... the ordinary irrigation canals carry nothing but river water from start to finish, but the overflow canals of Bengal worked under different conditions. The irrigation of the country was done principally by rainfall and the river water was used to manure the rainfall, and kill the mosquitoes or deprive them of their malignity. Such canals were real canals at their heads carrying nothing but river water; while at their tails they were practically drains carrying little but rain water which had drained through the fields.

Willcocks saw the 'overflow canals' not merely as a source of water but recognized its importance as a fertilizing agent.\(^\text{80}\)

...if your rice fields have been irrigated by rain water alone, they are weak and cry for irrigation in October with excessive and costly supplies of poor river water....If however you have irrigated your fields with rain and river water mixed together in the early months of monsoon when the river water is rich and full of mud, you so strengthen the plants of rice that they resist the hard condition of an early failure of the monsoon in a way rice irrigated by rain water alone has no knowledge of. *River water in the early months of the floods is gold.*

C. Addams Williams, Chief Engineer in the Bengal Irrigation Department at that time, challenged Willcocks' contention that several of the distributaries in the Ganges delta were originally canals lined out and dug parallel to each other. He believed that the so-called 'overflow canals' were natural streams showing deltaic meanders, which showed that they were the work of natural factors.\(^\text{81}\) But, according to Willcocks, these "overflow canals" were originally dug straight as a matter of course, but later their winding course was nature's handiwork. They were built wide and shallow to carry the beneficial muddy surface waters of the rivers and avoid the harmful sandy waters of the beds.\(^\text{82}\)

Although the above description of "overflow irrigation" was limited only to the western and central Bengal, the alignments of the rivers and drainage channels in North Bihar indicates

\(^{80}\) *Ibid,* p.32 (emphasis mine).

\(^{81}\) Note by C. Addams Williams, on the Lectures of Sir William Willcocks, on Irrigation in Bengal Together with a reply by Sir William Willcocks, Calcutta, 1931, pp.4-6.

\(^{82}\) Willcocks, *op. cit.*, pp. 16-17.
that the same system was prevailing in the latter. The very fact that the peasants of North Bihar resorted to cutting of river, road and railway embankments, even at the risk of being prosecuted by the colonial government, suggests the importance of the muddy river water for agriculture. Another fact, which might suggest the same conclusion, was the demand of the Saran peasants from 1880 onwards to open the sluice gates in the Gandak embankment for the purpose of irrigation. This suggests that annual inundations were an inherent and vital part of the agriculture of North Bihar. The reliance on river silt could also explain the absence of use of manures in the region, a fact ridiculed by British commentators.

The importance of silt in other river valleys has also been recognized, especially for rice cultivation. Joseph Needham contended that it was only through the constant renewal of the soil by silt that intensive cropping was carried on in the Yangtze valley in China, without recourse to mineral fertilizers.

Silt consisted of sand particles (of different sizes) and mud (mostly organic matter). Different rivers had had different percentage of sand and mud, for example, the Kosi silt (predominating in heavier sand particles) was not considered fertilizing and put the lands temporarily out of cultivation. The silt of other rivers of North Bihar was considered to increase fertility of the land. The heaviest sand particles settled on the riverbed, while the mud got carried off far away and settled in the inter-cones. A balanced mixture of sand and mud was spread over the conal tracts.

83 A detailed discussion on this is made in Chapters 4 and 5 of this study.
84 A detailed description of Saran Canals is given in chapter 2.
Arthur Geddes has made some analysis of the difference between the silt content in the Kosi and other rivers. He argues that the major factor in the violent movements of the Kosi was the heavy load of sand it carried from the gorge together with the size and shape of its constituents. While the sand of the Arun averaged only 0.14 mm and that of Tamur 0.23 mm, that of the greatest of the three tributaries, the Sun-Kosi measured 0.3 mm (Arun, Tamur and Sun were the tributaries of the Kosi). The sands of the Kosi were composed of grains of differing shape and colour with sharp edges. While some fragments were of irregular form, others were in thin flakes, which were uplifted and thrown forward. On the other river cones, the grains of equal or greater weight being of compact shape were less readily uplifted and tended to interlock and consolidate, and in time chemical consolidation followed. The much greater discharge of the Son-Kosi relative to the combined Arun and Tamur largely explained the predominance of the Son-Kosi’s sands unloaded over the Kosi cone and its unstable river regime. 86

The contrast between the valleys of the Kosi and Gandak was also very striking. The banks of the Kosi were steep, partly covered with scrub or secondary woodland and with patches of temporary dry cultivation on the slopes. Some 15-45 metres above the December river level was a stony terrace, devoid of cultivation or hamlets. Habitations in the lower valley were few and scattered. On the other hand, the crests and spurs above the middle Gandak the hamlets were thickly aligned and their inhabitants had constructed terraced rice fields all down the slopes to the monsoon flood limit to which they descended to plough, irrigate and harvest. So, the slopes of the Gandak valley, being gentler and the soil being thicker and the land less rocky, favoured cultivation. In the Kosi valley, on the contrary, cultivation was more difficult

86 Geddes, op. cit., p.164.
and terracing of the rocky slopes too arduous or impossible. Factors of erosion along the Son-Kosi were initially greater and were made worse by temporary, sporadic clearings for cultivation, which led to rapid denudation and landslides so increasing the Son-Kosi’s load.⁸⁷

So, the finer soils and the relative stability on the Gandak cone can therefore be partly explained by the gentler slope and terracing in the Gandak’s Himalayan longitudinal valley. Conversely, the instability on the Kosi cone was partly due to the steep slope that hastened soil erosion in the Son-Kosi’s longitudinal valley.

As has been written earlier, irrigation from rains alone would have caused malaria. Willcocks explains how "overflow irrigation" could combat malaria in the following words⁸⁸:

The floods in the rivers begin with the same monsoon rainfall which prepares the soil for sowing or planting of rice. And as the rains advance, the dry and barren plains become damp first, and then, over extensive surfaces, covered with water, and the mosquito larvae begin to be bred in millions. It is just then that the muddy waters of the rivers come down with millions of eggs of the finest carp first, later of inferior fish, and finally of shrimps. In the old days of "overflow irrigation", the rivers had low banks, while all the canals taking water from the rivers, met the floods open to the floods (sic), without any banks across their heads, and the eggs floated down the canals, entering the subsidiary channels and the rice fields full of rain water and the tanks (sic). They soon became young fish ... and they at once fell on the larvae of the mosquito and lived on them. Guided by the banks of the water courses and canals, the eggs went everywhere, and soon all the canals, water courses, fields and tanks became full of fish and wherever the mosquito larvae there were their enemies the fish (sic). This was the 'overflow irrigation' of Bengal, which combated malaria, provided an abundant harvest of fish, enriched the soil and made congestion of the rivers impossible.

⁸⁷ Ibid., pp.166-67.
⁸⁸ Willcocks, op.cit., pp. 59-60 (emphasis mine).