THE 'COLONISED RIVERS' OF NORTH BIHAR: COLONIAL INTERVENTION IN IRRIGATION AND FLOOD CONTROL, 1880-1940

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Certificate

Certified that the dissertation entitled **The 'Colonised Rivers' of North Bihar: Colonial Intervention in Irrigation and Flood Control, 1880-1940**, submitted by **Praveen Singh** in partial fulfilment of the **Master of Philosophy** degree of this University. This is an original work and has not been submitted for any other degree to this or any other University to the best of our knowledge.

We recommend that this dissertation be placed before the examiners for evaluation.

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to
maa and papa

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Praveen Singh

LIST OF MAPS

MAP No. 1


ADMINISTRATIVE DIVISIONS
NORTH BIHAR-(1910A.D.)
N
W
E
S
8 0 8 16 24 32 40 48
KMS
PROVINCES
NEPAL
BENGAL
CHAMPARAN
RAMNAGAR
BAGHA KHAS
SHIKARPUR
LAURIA
ADAPUR
KOTWA
OBETTIAH
MOTIHARI
DHAKA
GOBINDGANJ
GOPALGANJ
MIRGANJ
MADHUBAN
KESARIYA
SHEOHAR
SITAMARHI
BELSAND
PUPRI
SARAN
SIWAN
BASANTPUR
MASHRAK
PARO
MUZAFFARPUR
KATRA
MUZAFFARPUR
PARSA
LALGANJ
MAHUWA
CHHAPRA
SONPUR
HAJIPUR
SHAHABAD
GANGA R.
DARBHANGA
KHAJAULI
BENIPATI
MADHUBANI
PHULPARAS
RAHERA
DARBHANGA
WARISNAGAR
SAMASTIPUR
DALSINGH SARAI
NORTH MONGHYR
TEGHRA
BEGUSARAI
GOGRI
MONGHYR
PATNA
BHAGALPUR
SUPAUL
BANGAON
MADHEPURA
BHAGALPUR
PRATAPGANJ
NORTH
FORBESGANJ
ARARIA
RANIGANJ
KISHENGANJ
PURNEA
PURNEA
DAMDAHA
KADWA
KORHA
KATIHAR
GOPALPUR
KASBA AMUR
BAHADURGANJ
ISLAMPUR
KISHANGANJ
BIHPUR
SANTAL PARGANAS
LEGEND-
International Boundary
Boundary-Province
Boundary-Sub-division
River
Distt. Headquarters
Sub-Division Headquarters
Thana
Distt Boundary

INTRODUCTION

As the sub-title of this dissertation suggests, this study is about the British government's attempt to control the rivers in North Bihar (Bihar north of the Ganges) for the purpose of irrigation and flood management.

Although modern irrigation engineering was born and developed in India, it was very much a product of European colonial technological project. The term 'colonised Rivers' is used in a certain context, which will become clear in the subsequent pages of this dissertation. But briefly, it is used to describe the Colonial State's attempt to curtail the freedom, and disturb the ideal natural conditions of the rivers. This was done by constructing permanent concrete *weirs* across the rivers and diverting a portion of the water supply into artificially created waterways called canals or, by confining their flow within certain limits with the help of embankments. This kind of intervention affected both the agro-ecological setting as well as a large section of the population dependent on agriculture.

The term 'Colonised Rivers' is also used in the more conventional sense of the term. Although rivers were used as trade routes even in pre-colonial times, the commercial exploitation of river water for the purpose of agriculture was started in a big way in the colonial period. River water

was valued in terms of money (e.g. water rates in canal, embankment cess, etc.) or the revenue it could generate. As will be discussed later in this dissertation, the motive of the colonial state in meddling with the rivers was, to increase, both quantitatively and qualitatively, agricultural production of India so that the colonial structures could be maintained.

The period under consideration is between 1880 and 1940. The year 1880 has been taken as the beginning of this study because, first, it was around this period that North Bihar became the focus of great activity in canal construction. Madhuban (or Teur) canal was started in 1879, while the Saran canals became operational in 1880. It was also during the last quarter of the nineteenth century that some of the older systems of *pynes* (or irrigation channels) were rehabilitated by the European planters and District Boards. Second, it was around the 1880s that the evil effects of the colonial flood policies had started showing up and these policies were being questioned even in official circles. But it was also observed that Colonial intervention increased during this period. The construction of Railways and Roads during this period further worsened the flood problem.

This study ends in 1940 because the Tribeni canals and Dhaka canals became operational from 1914 and 1908 respectively, and their working over a certain period has to be observed to judge their utility. Secondly, there was a break in the colonial flood policy in the 1940s,

especially after the earthquake in North Bihar in 1934. With the formation of the Tirhut Waterways Division in 1941, the flood problem in North Bihar was taken up as a comprehensive whole, while earlier the intervention was very localized with no co-ordination between different districts.

Survey of the Existing Literature

Till recently the study of irrigation in general, was a neglected subject. Works on this area were rare and invariably undertaken mainly with a view to assisting the current policy formulation. D.R.Gadgil's book[1] was, for instance, basically a technical cost-benefit analysis primarily oriented towards policy formation and refining of project appraisal techniques.

Similarly, nationalist historian R.C.Dutt's[2] concerns on irrigation were limited to a critique of the diversion of enormous investment to the railways rather than to the construction of irrigation canals. He believed that while canals would contribute to stability of agriculture, railways,

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[1] D.R. Gadgil, *Economic Effects of Irrigation: Report of a Survey of the Direct and Indirect Effects of the Godavari and Pravara Canals,* Poona, 1948

[2] R.C. Dutt, *The Economic History of India in the Victorian Age, 1837-1901* (3rd edition), London, 1908.

transporting imported British goods to the remotest corners of India cheaply and quickly, would hasten the ruin of the surviving Indian industries. He also showed how the economic returns on investment in irrigation were much higher than those in the railways. For all his brilliant arguments, it seems that Dutt had an inherent faith in the modern irrigation engineering as a precondition for India's agricultural development.

The real break in the study of this subject came in the 1970s with Elizabeth Whitcombe's book.[3] Although discussions on irrigation in the United Provinces constitutes only a section of the book, Whitcombe has questioned the role of artificial irrigation in the security of agriculture which had long been regarded almost as a truism. She argued that the way canals had been constructed often adversely affected the local peasant economy through: increase in the production of cash crops, decline in food availability, marginalisation of wells, over exploitation of lands, decrease in pasturage and consequently decrease in cattle population, etc. Whitcombe also shows the ecological problems related to canal irrigation - seasonal flooding and increase in *reh* (salt efflorescence) infected lands, creation of swamps which resulted in recurrence of malarial outbreak.

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[3] Elizabeth Whitcombe, *Agrarian Conditions in Northern India, vol.1, The United Provinces Under British Rule, 1860-1900*, Berkeley, 1972.

Ian Stone, in a more exhaustive study[4] on the other hand, built up a productivity efficiency model and placed the peasant in it. His study is also on the United Provinces. He argued that the problems created by irrigation were incidental to the larger designs of improved productivity, market regulated demands and a peasantry tuned to increase his gains.

But most of Stone's most detailed research has focussed upon the particularly buoyant districts of Meerut and Muzaffarnagar, whereas coverage of the more stagnant districts of the central and lower doab is limited.

Imran Ali's[5] concerns about canal irrigation were very different. His main argument was that although agriculture in canal colonies in West Punjab (now in Pakistan) showed an impressive process of growth if measured with such indices as cultivated area, output marketed and trade, it failed to convert to capitalist agriculture. This was because of the colonial policy which reimposed the traditional social structure which was dominated by rentier and absentee landlords.

Alis major concern in this book was to analyse the social, demographic and economic engineering done through the colonisation

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[4] Ian Stone, *Canal Irrigation in British India: Perspectives on Technological Change in a Peasant Economy*, Cambridge, 1984.

[5] Imran Ali, *Punjab Under Imperialism, 1885-1947,* Delhi, 1988.

scheme. The more important issue of the impact of canal irrigation on the agro-ecology of Western Punjab was totally neglected.

One basic and important aspect of irrigation which the above mentioned studies missed was a proper and sympathetic description of the traditional irrigation system and techniques of management. The reason for this might be that the euro-centric orientation of modern engineering and capitalist development has been a stumbling factor even for a proper understanding of traditional technologies and sciences.

Nirmal Sengupta[6] provides us with a close examination of traditional irrigation practices and its management in South Bihar. Sengupta gives a proper description of the *ahar-pyne* system of irrigation which made possible the best out of a very unfavourable natural condition of that region. Sengupta also examines the social organisation and the system of produce rent which were, according to him, linked with a proper working of the irrigation system.

Objectives of the Study

The aim of this study is to look into the traditional methods of irrigation and agriculture, the colonial intervention in irrigation and flood

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[6] Nirmal Sengupta, "The Indigenous Irrigation Organisation in South Bihar," *IESHR*, vol.17, no.2, 1980.

control, and the consequent changes in the ecology of that region. The proposed area of study is North Bihar, i.e, Bihar north of the Ganges (see Map 1).

Also the study attempts to deepen our understanding of how man has been affected by his natural environment through time, and conversely, and perhaps more importantly, how he has affected that environment and will what results. Further, the attempt is to fill a gap in the existing literature as there has been no work on floods or flood management and irrigation in North Bihar for the colonial period. This work has been divided into three main chapters. The first chapter of this dissertation would consist of a detailed geographical study of North Bihar. A detailed survey of the (a) river system of the region, (b) water table, (c) rainfall, (d) climate, (e) gradient of the region, and (6) types of soils need to be made to understand the traditional agricultural practices as also to critically examine the British intervention in irrigation and flood control.

A survey of floods and the peasants response to such floods will be analysed. It has to be seen whether the peasants considered floods as a menace or had adjusted their lives and agricultural practices to it.

An attempt will also be made to find out the traditional irrigation practices through *chaurs*, *pynes* and "overflow irrigation" from rivers. A sympathetic description of traditional agricultural practices and

techniques, agricultural cycles, varieties of crops grown etc., in short the 'science' behind traditional agriculture in North Bihar, is also attempted.

The general theme of this dissertation is to show the impact of colonial intervention on the 'agro-ecology' of North Bihar. The term 'undisturbed' has been used to describe the pre-colonial 'agro-ecology' of North Bihar. It does not mean that there was no human intervention in pre-colonial times. But, as will be shown in subsequent chapters, the quality of intervention was different - whereas in the pre-colonial times the emphasis was more on adjusting one's life and agricultural practice to suit the natural conditions, in the colonial period the attempt was directed towards changing the natural setting itself. It was also witnessed that the changes occurring in the natural setting of North Bihar during the colonial period was at a very fast pace. This is evident from the extension of cultivation in areas which were earlier not under tillage.

The second chapter consists of a discussion of the various aspects of the British intervention in canal construction. First, a discussion will be made on the planning and construction of these canals and the various engineering problems associated with them. Second, an attempt is made to analyse the motives behind the construction of these canals. A brief discussion on famines in Champaran district, which was the centre of great canal construction is included. It will also be shown as to how the

introduction of canals was intended to help in the extension of cultivation. Third, I have attempted to show the destruction of the traditional means of irrigation and, in some areas, their rehabilitation in a different form. A comparison of the working of these two systems of irrigation is also made.

In the third chapter is examined the various aspects of colonial intervention in flood control. To begin with, there is a discussion on how the natural actions of the rivers to conserve themselves in the deltaic region was tampered with by the construction of embankments.

There is also a discussion on the role of embankments in increasing the flood level, changing the nature of floods, and cutting off of the fertilizing silt brought by the rivers. It has been shown that embankments, even as a temporary solution to control floods, proved unsuccessful. In the next section, the discussion centres around the role of embankments, in the tampering with, and subsequent destruction of, the drainage network of North Bihar.

An analysis of the role of the Railways and Roads in obstructing the drainage of the region and in worsening the already grim flood situation is also given.

Finally, an attempt is made to analyse the politics behind the construction of embankments. Whose interests was the Government trying

to protect through its flood control policy? It is also attempted to find out the peasants response to and outlook on embankments.

Chapter I

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.

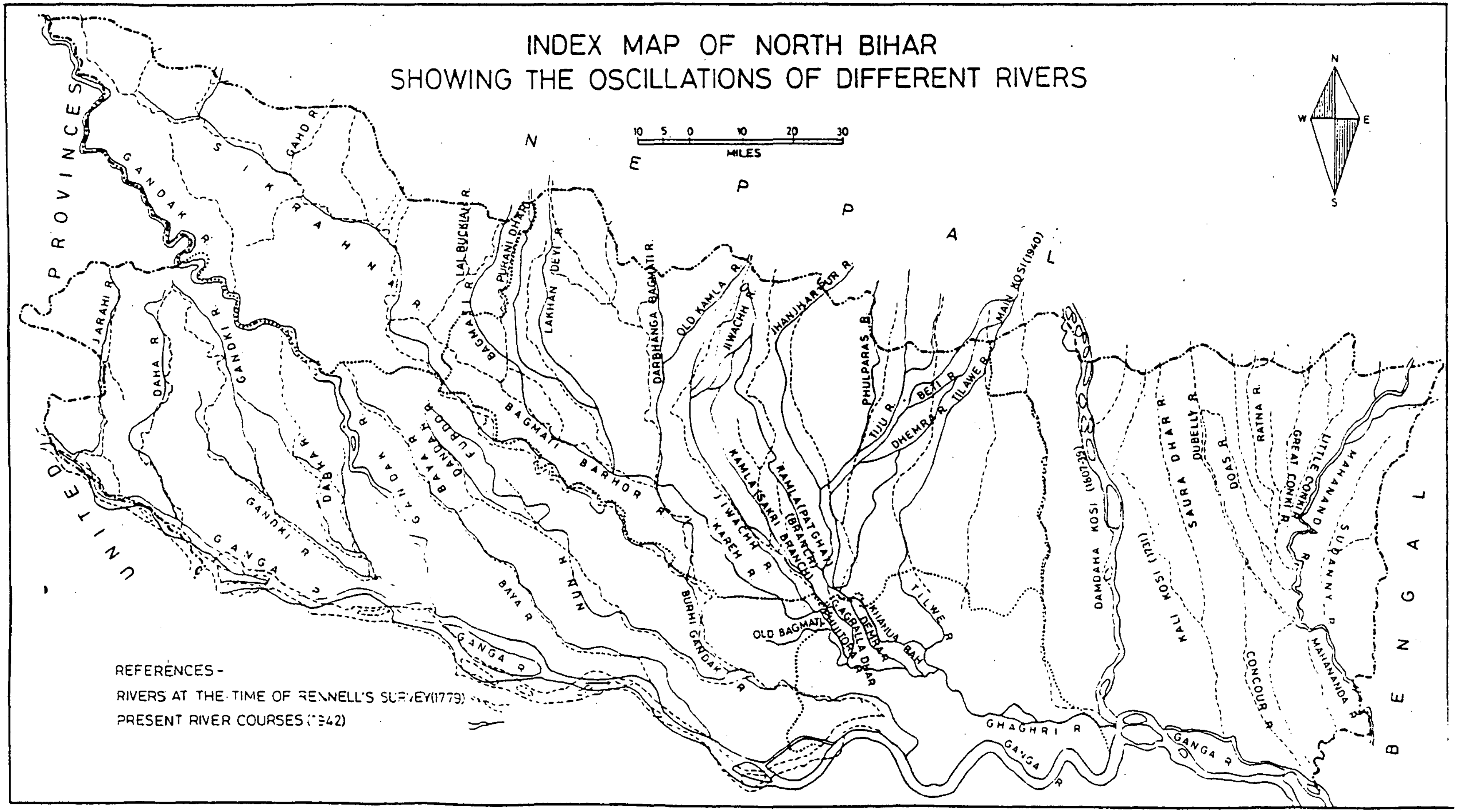
North Bihar had unique geographical features different from the rest of Bihar and Bengal. In this chapter first attempt will be to bring out the physical features of North Bihar in its undisturbed state (i.e., before the British intervention in the agrarian economy). Secondly, the ways and means by which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

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, the Great Gandak or Narayani, the Bagmati, the Kamla and the Kosi; (b) torrential rivers

MAP No. 2


INDEX MAP OF NORTH BIHAR
SHOWING THE OSCILLATIONS OF DIFFERENT RIVERS
10 5 0 10 20 30
MILES
N
E
W
S
N E P A L
UNITED PROVINCES
BENGAL
GANDAK R.
SIKRAHNA R.
GAHD R.
LALBUCKIA R.
PUHANI DHAR
DEVI R.
LAKHAN
BAGMATI R.
DARBHANGA BAGMATI R.
OLD KAMLA R.
JIWACHH R.
JHANJHARPUR R.
PHULPARAS R.
MAIN KOSI (1940)
JARAHI R.
DAHA R.
GANDKI R.
DABHAR R.
GANDAK R.
BAYA R.
FURDO R.
DANDA R.
BAGMATI
BARHOR R.
TIJU R.
BETI R.
DHEMRA R.
TILAWE R.
KAMLA ISAKRI BRANCH
KAMLA (PATGHAT BRANCH)
JIWACHH R.
KAREH R.
GANDKI R.
GANGA
NUN R.
BURHI GANDAK R.
OLD BAGMATI
AGRALLA DHAR
DEMRA R.
KHIRHUA R.
TILWE R.
DAMDAHA KOSI (1807-39)
KALI KOSI (1731)
SAURA DHAR R.
DUBELLY R.
DOAS R.
RATNA R.
GREAT CONKI R.
LITTLE CONKI R.
MAHANANDA R.
SUDANNY R.
MAHANANDA
CONCOUR R.
GANGA R.
GHAGHRI R.
GANGA R.
REFERENCES -
RIVERS AT THE TIME OF RENNELL'S SURVEY (1779)
PRESENT RIVER COURSES (1942)

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 Bava, 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.[1]

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). P.C. Ghosh describes the oscillation of these rivers in the following words:[2]

> 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.

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1 P.C. Ghosh, *A Comprehensive Treatise on North Bihar Flood Problems*, Patna, 1942 [*Ghosh*] p. iv.

2 *Ibid.*, pp. iv-v.

> 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.

The whole of North Bihar from Saran upto 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".[3] 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".[4]

Saran was formed by the delta of the Gogra and the Gandak. From the Gandak, several 'spill channels', viz., the Jharahi, the Daha, and the

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3 *Ibid.*, p. iii.

4 *Ibid.*, p. iv.

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 upto 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 Adhwara – Marha-Rato group, and the Darbhanga-Bagmati in the Muzaffarpur district; by the Kamla, the Karch, 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 Karch, 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.[5]

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 Mr S.C. Mazumdar, the Chief

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5 The above account is taken from Ghosh, *op.cit.*, pp. iii-iv.

Engineer of Bengal in 1942, who did an extensive study of the river problems in North Bengal:[6]

> ... 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* or low lands, leading into one another. These were first filled by the local rainfall, when the surplus water passed off from one another, until its flow was checked by some

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6 S.C. Mazumdar, *Rivers of the Bengal Delta*, Calcutta, 1942 [*Mazumdar*], pp. 6-7.

high ground. Having no other course to take, it 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]

Lakes and Marshes

Another very unique feature of the landscape of North Bihar was the series of *chaurs* (or lakes) 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. The total area under these *chaurs* in this district was 139 square miles.[8] 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 feets.[9] In Muzaffarpur district also, there were a number of *chaurs*. But there was no body of water in North

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7 L.S.S. O'Malley, *Muzaffarpur District Gazetteer*, 1907 [*Muzaffarpur DG*], p. 3.

8 L.S.S. O'Malley, *Champaran District Gazetteer*, 1932 (Revised) [*Champaran DG*], p. 8.

9 L.S.S. O'Malley, *Saran District Gazetteer*, 1908 [*Saran DG*], p. 10.

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.[10] 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.[11]

In North Monghyr, marshes abounded, several hundreds being enumerated in the Pharkiya Pargana (Gogri thana) alone. The District Gazetteer of Monghyr reports that "their formation is (was) generally peculiar. The banks ... are (were) high and abrupt ... They are (were) filled annually by the floods of the Ganges or its Himalayan affluents".[12] 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.[13]

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10 J. Byrne, *Bhagalpur District Gazetteer,* 1911 [*Bhagalpur DG*], p. 10.

11 L.S.S. O'Malley, *Darbhanga District Gazetteer*, 1909 [*Darbhanga DG*], p. 3.

12 L.S.S. O'Malley, *Monghyr District Gazetteer*, 1909 [*Monghyr DG*], p. 9.

13 *Ibid.*, p. 10.

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 form a long chain extending, though not continuously, from Gondwara to Malda".[14] 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 *chaurs* 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 were interconnected, and some of the rivers had their origin in these *chaurs*. 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. As will be discussed later in this chapter, these *chaurs*, in their undisturbed state, were never a source of unhealthiness in the region.

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14 L.S.S. O'Malley, *Purnea District Gazetteer,* 1911 [*Purnea DG*], p. 12.

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:[15]

> 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* might be all sand, and the good field of one year was destroyed by the deposit of sand the next.

Diara lands 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.

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15 *Saran DG, op.cit.*, p. 4.

Gradient and Soil

North Bihar is 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 is almost imperceptible to the naked eye. For the first 50 miles from the northern boundary, it is no more than 10 feet per mile; thereafter, it flattens rapidly, and near the Ganges, where all the rivers converge, the slope is no more than 1-2 feet per mile. The plains of North Bihar was disturbed in places only by shallow depressions and the elevated river banks.[16]

The alluvium formation occupies the greater part of North Bihar. Much of it was clearly composed of deposits from the present 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 of *Kankar* and often ochre, 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 precisely determined and their extent not demarcated.

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16 Ghosh, *Op.cit.*, p. iv.

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 *phulank*; (4) loam called *dhus, dhusri, 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 *chaurs* or low lands, which remained too long and too deep 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 *chaurs*, which grew only *rabi* crops. (c) *Dhusri* or *dhusri 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 *bhusri*, or *dhusri* 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.[17]

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 cropping pattern as will be explained later.

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".[18]

It was also seen that rainfall decreased as one moved from east to west, Purnea recording the highest annual average of 72.5 inches,[19] and Saran the lowest of 45.05[20] inches. Champaran was an exception to this

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17 The above account of soil is compiled from *Purnea DG*, p. 84; *Monghyr DG*, p. 94; *Champaran DG*, p. 54.

18 *Champaran DG*, p. 54.

19 *Purnea DG*, p. 18.

20 *Saran DG*, p. 15.

rule as its annual average of 51.88[21] inches was high because a large part of its area was in the sub-montane and tarai 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 view point 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.

Agriculture in North Bihar

In North Bihar, like in other parts of Bengal, 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* (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*, Indian corn, indigo and various millets. 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.

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21 *Champaran DG*, 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 to dry for 15 days and at the end of that time, they 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".[22]

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

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22 *Muzaffarpur DG*, p. 55.

which a crop of early rice had been taken, and often wheat was sown with barley, or gram, mustard or linseed.

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 life style 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.[23]

Aghani rice was invariably grown in low lands, because it needed a lot of moisture and took a very long time to mature. It was always transplanted, except in a few exceptional cases. From June/July, when the seed nurseries were prepared, to November/December when 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 the period before the harvesting that any abnormal fall in rain or late floods could damage the aghani rice. But apart from these two periods, floods of abnormal height and duration could damage even the *aghani* rice. In passing, one could mention that floods of unprecedented height and duration was a phenomenon experienced only after the colonial intervention in flood control.[24]

Good *rabi* crops were also grown in low lying lands 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

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23 *Purnea DG*, p. 45.

24 The change in the nature of floods in North Bihar in the 19th century is discussed in chapter 3.

sown on lands where even *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* asterism (*nakshatra*) in the end of September/October or beginning of November, and the approaching cold season. If it was sown too late, the plant could 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 resowing. 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.[25]

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.

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 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

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25 *Muzaffarpur DG*, pp. 50-51.

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.[26]

Artificial Irrigation in North Bihar

Artificial irrigation was practised on a very small scale in North Bihar because sufficient moisture was provided by abundant rainfall and the overflow of rivers in the monsoon.

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 bunding the rivers. These were temporary structures and were erected every year when the irrigation was most needed. The rivers were bunded by means of earthen dams and, water distributed through channels, which were locally known as *pynes* (or

26 *Monghyr DG*, p. 85.

pains), specially constructed, or through some old channels of the rivers. When all the lands were irrigated the bund was demolished, and the river again bunded lower down 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 bund them.[27]

Although this method of irrigation was very 'primitive' and inexpensive, the management practices associated with their working was well developed. The major cooperation expected of co-users was in the area of operations and maintenance, in allocation and conflict resolution. These were recurrent tasks. Nirmal Sengupta[28] 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,

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27 *Champaran DG*, p.56; *Muzaffarpur DG*, p. 51.

28 Nirmal Sengupta, *Managing Common Property, Irrigation in India and Philippines*, New Delhi, 1991.

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 formed a crust below the surface, which impaired the fertility of land, unless irritation was continued every year".[29]

Well irrigation was practised 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 benefitted from well irrigation were those of the rabi and spring harvest.[30]

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 flood waters; but, as will be discussed later in this chapter, if dependent altogether on rainfall, it could impoverish the soil and could produce malaria though it could not combat it.

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29 *Darbhanga DG*, p. 51.

30 *Saran DG*, pp. 58-59.

William Willcocks[31] 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 :

(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.[32]

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[33]:

> 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.

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31 William Willocks, *Ancient System of Irrigation in Bengal and its Application to Modern Problems*, New Delhi, 1930 (Revised 1984).

32 *Ibid.*, p. 5.

33 *Ibid.*, pp. 11-12.

These "overflow canals" were, according to Willcocks, 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.[34]

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 that the same system was prevailing in the latter. That Willcocks mentions the term "Kanwa" might also suggest that he was aware of the prevalence of this system in North Bihar, albeit, in a slightly different form. 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.[35] Apart from the above mentioned facts the fish culture, which was an important constituent of "overflow irrigation" was also prevalent in North Bihar. As has been written earlier, irrigation from rains alone would have caused malaria. Willcocks explains how "overflow irrigation" could combat malaria in the following words:[36]

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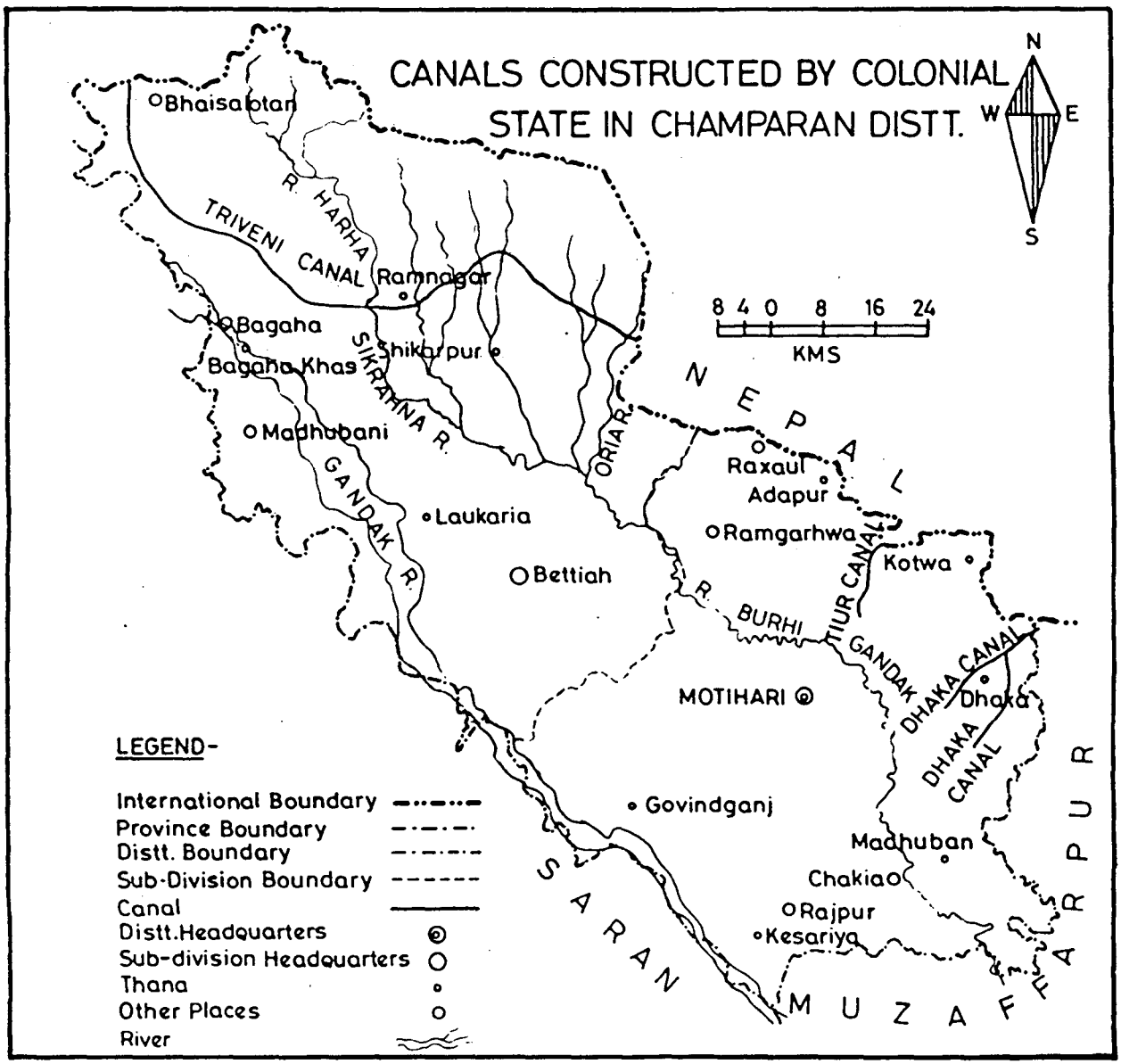
34 *Ibid.*, pp. 16-17.

35 A detailed description of Saran Canals is given in chapter 2.

36 Willcocks, *op.cit.*, pp. 59-60.

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 crap 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**.

MAP No. 3


CANALS CONSTRUCTED BY COLONIAL STATE IN CHAMPARAN DISTT.
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KMS
Bhaisalotan
R. HARHA
TRIVENI CANAL
Ramnagar
Bagaha
Bagaha Khas
Shikarpur
SIKRAHNA R.
Madhubani
GANDAK R.
ORIAR
Laukaria
Bettiah
NEPAL
Raxaul
Adapur
Ramgarhwa
Kotwa
R. BURHI GANDAK
TIUR CANAL
DHAKA CANAL
Dhaka
DHAKA CANAL
MOTIHARI
Govindganj
Madhuban
Chakia
Rajpur
Kesariya
SARAN
MUZAFFARPUR
LEGEND-
International Boundary
Province Boundary
Distt. Boundary
Sub-Division Boundary
Canal
Distt.Headquarters
Sub-division Headquarters
Thana
Other Places
River

Chapter 2

THE COLONIAL INTERVENTION - IRRIGATION

The colonial intervention in an important aspect of agriculture, viz., irrigation had started in the beginning of 19th century. The success of irrigation projects in North India in increasing the agricultural output of that region led to their extension in other parts of India. By the end of the century, India had one of the most impressive networks of irrigation canals. Most of the major rivers having a reliable supply of water were 'tamed' and their water distributed over vast territories which had no natural supply of water other than rainfall.

North Bihar, in the last quarter of the 19th century, was the focus of great activity in canal construction. Madhuban canal (or Teur canal) was built in 1879, while Tribeni canal and Dhaka canal were conceived in the last decade of the 19th century, but became operational in 1914 and 1908 respectively. Teur canal and Dhaka canal were smaller projects. All these three canals were in the Champaran district. The Saran canals, in the Saran district, was built in 1880.

After the famine of 1873-74, supposed to have been caused by the failure of rains, numerous irrigation works were proposed for the protection of the tract north of the river Sikrana (or Burhi Gandak) against famine. This proposal contemplated the construction of a *weir* across the

Gandak at Butsura, above which a high level canal was to take off, running eastwards, along an alignment roughly parallel to the Nepal frontier as far as the Kamala river. A second branch was to follow the course of the Gandak on its east bank. A third main branch was to run southwards through Muzaffarpur and Hajipur. In this scheme, facilities for navigation was a prominent feature. This scheme also included the construction of small canals taking off from five streams called Hurha, Ramrekha, Bulour, Pandye and Maniari.[1] But these small works were left out of consideration after the construction of the Tribeni canal.

In the eastern portion of the Champaran district, "the proposals of 1873-74 embraced the construction of irrigation channels from the Gad and Telari, Pussa, Teur, Bakiya and Lal Bakiya".[2] Two of the streams - Teur and Lal Bakiya - were made use of till 1908.

The original Gandak project was set aside owing to engineering problems connected with a *weir* across the Gandak. With the failure of the rice crop in 1896 and widespread disasters, the question of irrigation in north Champaran was again brought to the notice of the Government. A new project on a smaller scale was proposed. This canal "will extend as far eastwards as *Ooriah Nala*, and is constructed at as high a level as possible, so as to command the country as far to the north as is

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[1] G.C. Maconchy, *Report on Protective Irrigation Works in Bengal*, Calcutta, 1902, p. 3.

[2] *Ibid.*, p. 4.

practicable".[3] The *weir* was situated high up the Gandak at Tribeni Ghat instead of at Butsura "so that the north-west corner of Champaran, the Ramnagar district (sic)"[4] also came under its command. The construction of this canal started in 1900 and it became operational in 1914 (see Map No. 3).

Tribeni Canal Project - Planning and Construction

The revised Gandak project of 1897, known as the Tribeni Canal project, was also not without its problems. It was from the very beginning besotted with engineering problems and faulty planning which led to inordinate delays, and increasing costs, in its construction. The engineering problems of this project also caused great expenses in maintenance of the canal in later stages.

In fact, doubts about the project's viability were sounded even before the construction began. W.A. Inglis, Chief Engineer, P.W.D. pointed out that "the canal to be useful must be thoroughly well made, and if it so, it will be costly".[5]

In 1899, the Bengal Government submitted a project for the construction of the Tribeni Canal as a protective work at an estimated cost

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3 *Ibid.*, p. 3.

4 *Ibid.*

5 W.A. Inglis, *The Canals and Flood Banks of Bengal,* Calcutta, 1909, p. 138.

of Rs. 37,91,789. The canal was to irrigate annually 114,000 acres in the district of Champaran. It was estimated that "ten years after the completion the canal would yield a net revenue of Rs. 188,500, equivalent to a return of 3.9 per cent on the sum at charge of nearly 5 per cent on the total capital outlay".[6] One reason for such a small allocation for the works in the first estimate was the existence, just below the proposed site of the headworks of the canal, "of a permanent boulder bar which obviated the necessity of an expensive *weir* across the river".[7] This site was selected by the Chief Engineer of Bengal who was considered to be "an extremely able officer. Later, it was also inspected by the Inspector General of Irrigation, who was also Secretary to the Government of India, P.W.D., and the project was sanctioned by the Secretary of State in March, 1901".[8] Both, the Chief Engineer and the Inspector General felt at that time that "a better site for the headworks could not have been selected".[9]

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[6] *Selections from the Records of the Governments of Bengal and Bihar and Orissa containing papers from October 1904 to September 1915 relating to the Tribeni Canal Project in the Champaran District* [Selections (Tribeni Canal)], Calcutta, 1919, Vol. II, p. 131.

[7] *Ibid.*

[8] *Ibid.*, p. 132.

[9] *Ibid.*

But the initial euphoria over the project died down when three revisions of the estimate were made in twelve years,[10] and the prospect of an early opening of the canals looked grim.

The imperfections of design and under-estimation of the costs were brought to the notice of those involved in the project in 1907 when the river deserted the site of the head regulator, which was then approaching completion. It became obvious that the project of 1899 was submitted in an incomplete state as regards river surveys, and there was an inexplicable hurry on the part of the Inspector General of Irrigation and the Local Government to rush through the project. When later the survey of the river was completed, it became obvious that "the bed level of the river had been retrogressing from many past centuries, and that the site on which such perfect reliance was placed was quite unsuitable".[11] The extra expenses required to correct this mistake amounted to more than Rs. 2 lakhs excluding the working expenses. It seems surprising that the project was sanctioned and construction started without a proper survey of the previous conditions of the river being done.

Many alterations had to be made in the designs of some other works of the Tribeni canal in the interest of safety and efficiency. Floods did

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[10] The third revised estimate was made in 1911, which amounted to Rs. 78,49,661, an increase of nearly 200 per cent from the first estimate. *Ibid.*, pp. 169-71.

[11] *Ibid.*, p. 139.

unprecedented damage to a portion of the canal which was opened in 1910, thus, further delaying the opening of the canals. The damage from floods was largely due to "the inadequate protection afforded to the canal works, to not allowing the ordinary margins of safety, matters which experienced Superintending and Chief Engineers would have seen to before sanctioning plans".[12]

The need for all alterations had their origin in "an imperfect original project based on inadequate experience of requirements on the part of the local officers".[13] One reason for the inexperience of the Irrigation Officers of Bengal might have been that irrigation works were at a standstill for almost 25 years in Bengal[14] and these officers had no means of acquiring useful experience in the preparation of irrigation project estimates, or of their execution. In other provinces, where there had been a fairly steady progress in the execution of new canals, "it had been the practice to give most members of the establishment experience of construction. Senior officers who had not had this experience were rejected as not suitable for construction charges".[15]

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[12] *Ibid.*, p. 133.

[13] *Ibid.*, p. 139.

[14] The last big Irrigation Project in Bengal was the Sone Canal which was completed in 1876. Smaller projects like Teur and Saran canals hardly gave any experience.

[15] *Selections (Tribeni Canals)*, Vol. II, p. 141.

In Burma, where three irrigation canals, very similar to the Tribeni canals, were executed, "the principal members of the establishment were selected Irrigation Officers from Punjab, United Provinces and Bengal".[16] But in the case of the Tribeni canal project, this practice was not followed, and instead, inexperienced officers of Bengal were given charge of the affairs. This was done as any move to follow the superior practice followed elsewhere "would have been bitterly resented, and would have met with the utmost opposition"[17] from the Bengal officers.

But apart from the inexperience of local officers, the role of two Chief Engineers needs special attention. One of them, who held that post for two years, never inspected the canals, and it was in his tenure that the local government sanctioned contracts to two European contractors vastly in excess of their powers, which later proved to be a grievous and costly mistake. Another Chief Engineer, who held that post for four years, visited the canals on only four occasions but failed to observe that the river was deserting the head regulator, and he did not report this occurrence when the desertion was complete.[18]

As mentioned in the above paragraph, the decision to employ European contractors led to enhanced rates and slow progress of work. In

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[16] *Ibid.*, p. 144.

[17] *Ibid.*, p. 142.

[18] *Ibid.*

the case of the Tribeni canal, construction in "an unhealthy and inaccessible tract led to difficulties in procuring an adequate labour force".[19] The European contractors resorted to sub-letting to their Indian counterparts. In this case, the European contractors "proved to be far less satisfactory than the petty Indian ones, and after the failure of the former, the latter had to be re-employed to finish the work".[20] This resulted in waste of time and money. In fact, the third revised estimate was made only to fulfil the claims for compensation, which amounted to Rs. 3 lakhs, made by the European contractors.[21]

The problem on the Tribeni canal was not limited to only during the construction period. The project was beset with constant problem of upkeep due to the damage caused by floods.

Tribeni Canal and Floods

As has been shown in the first chapter, the sub-Himalayan tract of the country, north of the river Sikrana, where the Tribeni canal was built, sloped down in an North-South direction from the Himalayan foothills to the plains of the district of Champaran and was intersected by

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[19] *Ibid.*, p. 139.

[20] *Ibid.*, p. 140.

[21] *Ibid.*, p. 170. The only instance in Burma Canals project where a delay of two years occurred was also because of the employment of European contractors for the head works of the Mon Canal. Ironically, this decision was made by the officers of Bengal. *Ibid.*, p. 144.

innumerable hill streams which ran down the watershed of the country in a south-easterly direction and drained the hill floods off into the plains down below and thence into greater rivers beyond[22] (see Map No. 3).

The alignment of the Tribeni canal was in such a way that it crossed "the watershed and (hill) streams at right angles in a manner ... unknown and unprecedented in either ancient or modern schools of engineering".[23] The implications of faulty alignment will be discussed later in this chapter.

Another unique feature of the Tribeni canal was that it was a high level canal, the canal embankment in some places being as high as 10 feet. This was done so as to irrigate larger areas to the north of the canal. In 1910, some local residents of that region contended that "the canal has in fact never yet flowed with water at any irrigation season, nor has it irrigated any ... lands, nor can the canal ever irrigate any .... lands situated to the north"[24] of the canal because of the slope of the country from the foothills to the plains.

In fact, the canal was dug without a proper survey being done of the area through which it passed. Provisions were made to construct waterways in the canal only for larger streams and rivers, by means of

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[22] See Chapter 1.

[23] *Selections (Tribeni Canal)*, Vol. 1, p. 228.

[24] *Ibid.*, p. 229.

'*aqueducts*' and '*syphons*', but they were not enough. The smaller streams and *nalas* were diverted into the larger ones by means of drainage channels. This artificial reorganisation of the drainage network created a lot of problems for lands lying near the canal and its distributaries; "it dislocated the natural drainage of the said tract and has [had] rendered it liable to incalculable damage to floods".[25]

The proprietors of some concerns and '*Ticcadars*' whose lands were between the 13th and 34th miles of the Tribeni canal in the Bettiah sub-division, submitted a memorandum in December, 1910, to the Government complaining about damage done to their lands by the floods caused by canal embankments.

For example, "the Argana river which used formerly to flow into the stream Bhabsa which connected with the Gandak near Rampur, was diverted into the stream Jhikri which in turn was diverted from the Bhabsa into the river Doodhaura which ran into the river Harha",[26] thus adding more to the already swollen waters of the Harha during the rains. In their natural and original course, the Argana and Jhikri discharged into the Gandak through the Bhabsa and "did not in the least contribute to floods as they now do in their dislocated courses".[27] The memoralist

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[25] *Ibid.*, p. 228.

[26] *Ibid.*, p. 226.

[27] *Ibid.*

contended that as a result of this "no less than 100 acres of valuable cultivated lands have been buried in sand and rendered absolutely and irreclaimably useless".[28]

In response to this allegation, the Executive Engineer contended that the spread of sand over the said tract[29]

> cannot be put down as a result of the canal passing over it ... as it is not a new thing for the Jhikeri to bring down sand and change its course .... It is an undisputed fact that sand has spread over some fields but certainly not over so large an area as 100 acres. Moreover this land even has not been "rendered absolutely and irreclaimably useless". There was a very fine crop of melons raised over a great portion of it this hot weather.

The memoralist listed nine similar complaints regarding the problems created by the artificial man made floods. Even if we assume that these charges were exaggerated as regards the area of land damaged, the fact remains that the Tribeni canal helped in dislocating and disturbing the existing agriculture of that time. A 'good crop of water melons' could not be a good substitute for even an average crop of rice.

Apart from insufficient waterways in the canal, the failure of the '*aqueducts*' and '*syphons*' to withstand the floods was also responsible for the damage done to lands and canal property. The damage to the Bakuli

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[28] *Ibid.*, p. 227.

[29] *Selections (Tribeni Canal)*, Vol. II, p. 109.

aqueduct over the Kochil river and to the Masan *syphon* in the floods of 1910, when the canals were first opened, can be attributed "to imperfections of design due to inadequate study of local conditions, and to the sacrifice of efficiency in attempts at economy".[30] The above mentioned waterways were the most seriously damaged ones. There were other damages to the canal. For example, at Naraingarh *aqueduct*, "the outfall channel silted badly and obstructed the free flow of the floods in the Jhikri which cut badly into the East, and finally on 18th September breached into the canal".[31] The north bank of the canal was breached at the 9th, 12th, 15th, 16th, 17th, 22nd, 28th, 34th and 36th mile points of the canal because of the silting up of the existing waterways which led to rise in the water level (5 to 7 feet in some places) on the north side of the canal bank.

Apart from causing damage to the canals, the failure of the *aqueducts* and *syphons* to drain off all the flood waters, also caused damage to nearby lands. For example, the construction of Masan *syphon* on the 34th mile of the canal to carry canal water over the Masan river proved to be a failure as the Masan "bursting through all engineering devices, wrecked the *syphons*, tore away the canal embankments and pouring into the Ramrekha rushed upon the Ramrekha *aqueduct*".[32] The

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[30] *Ibid.*, p. 133.

[31] *Selections (Tribeni Canal)*, Vol. 1, p. 236.

[32] *Ibid.*, p. 267.

floods caused by this submerged all villages and their cultivation "in a devastating and appalling manner, such as had **never been known before the river was tampered with**, covering vast areas in sand and destroying them all for cultivating purposes".[33]

In fact, one of the main causes of the excess in the estimate for the construction of Tribeni canal was the repairs that had to be undertaken in some works of the canals which were damaged by the floods of 1910; the approximate amount spent due to this being Rs. 13,00,000.[34] This goes on to show that the cost of maintenance of the Tribeni canal was very high.

The damages caused by floods continued even after 1910. After the 1912 flood season, cracks had appeared in the Chota Bhabsa, Maniari and Pandai *syphons*.[35] Again, after the flood season of 1913, the walls of some of the *aqueducts* and *syphons* were scoured and silt got deposited in the vents.[36]

The drainage works in the original plans and designs of the canal were not enough and there were many instances of damage to lands because of this. A case in point is the Bhora nala at the 45th mile of the Tribeni canal. No provision was made to pass the flood waters of this nala,

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[33] *Ibid.*, p. 268 (emphasis mine).

[34] *Selections (Tribeni Canal)*, Vol. II, p. 133.

[35] *Ibid.*, pp. 168-69.

[36] *Ibid.*, pp. 210-13 and 218.

except to build a cross channel one mile long on the north of the canal passing eastwards through the Sikti *nala* into the Gumpti *aqueduct*. This was found unsuitable by the Superintending Engineer, Gandak Circle, who in August 1918, reported that "the Bhora always broke into its old bed and covered the country with sand besides leaving a considerable area undrained. To remedy the above defects, it is proposed to construct a crossing".[37]

To prevent damage to these waterways, *weirs* or training bandhs were provided "to prevent the slope of the nala from steepening and to help in keeping the vents of the aqueducts clear".[38]

In many cases damage to the waterways occurred because of faulty designs of their approach and insufficient passage to allow the flood discharge to pass. For example, the Khunti *syphon*, which was damaged in flood, was originally provided with 68 sq. feet of waterway, but later it was rebuilt in 1917 with a total waterway having been increased to 590 sq. feet. The cost of this new work amounted to Rs. 1,60,312.[39]

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[37] Proceedings of Public Works Department, Irrigation Branch [PWD(I)], Government of Bihar and Orissa, File No. XVC/1 of November 1918, p. 11.

[38] *Ibid.*, p. 12.

[39] Proc. PWD(I), May 1917, Vol. IV, pp. 10-11.

The problems related to floods damages in the canal remained even as late as 1932. The Champaran District Gazetteer reports:[40]

> The canal, cutting as it does across the numerous streams which flow from the Nepal hills south ... is an ambitious project, which has been subject to considerable expense in upkeep. In several floods the main canal has been breached in several places which has resulted in stopping irrigation until the breaches were repaired at considerable cost. In some places silting up at the head works has rendered it very difficult to obtain a sufficient head of water during the season when irrigation is most needed; in other years irrigation has been difficult owing to the cutting up of the main canal and distributories. Owing to these difficulties, the canal has not entirely succeeded in replacing the older system of irrigation by bunding the mountain streams.

The Saran Canals

The Saran canals, in the northern part of the Saran district, was also an outcome of the great scheme for irrigation by canals taking off on both sides of a *weir* at Butsura. In 1876, a modified scheme was prepared by Mr T. Martin, Superintending Engineer, Gandak Circle, for throwing a perennial supply into the principal nalas (or streams) of the Saran district. The proposal was:[41]

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[40] *Champaran DG*, p. 55.

[41] Maconchy, *op.cit.*, p. 92.

> to admit a supply from the Gandak at Siswa into the old Gandaki nala through a sluice, and thus to carry the supply along the inside of the Gandak embankments, supplying the various nalas which traverse the district ... and the Government of India offered a loan on the understanding that 4 1/2 per cent interest on the capital should be guaranteed by those affected by the undertaking.

The scheme was completed in 1880. The supply was drawn from two bye-channels of the Gandak, the Takraha *Sota* and the Rupan chak *Sota*. From the former of these "there was a head cut, 6 1/2 miles long, sluiced at the entrance and falling into the Daha *nala*. Four other sluices with connecting cuts, admit water from the Rupan chak *Sota* to the Daha, Gandaki, Dhanai and Gangari *nalas*. A regulator below the Daha forces a supply into the Rupan chak *Sota*, when its entrance is dry, through the Daha sluice. There is also a regulator at Sadowa".[42]

This scheme did not prove a success. The area irrigated had been very small, and difficulties had arisen with regard to the renewal of the guarantee and, failing that, the system under which the canal could be worked.

The canals were closed in 1894-95 and 1895-96, they were then again opened for two years, only to be closed in 1898-99. It was opened at irregular intervals at the request of the Manager of the Hathua Raj and of certain Indigo Concerns. In the year 1915, it was contemplated by the Government to abandon the canals entirely. "At that time the Manager of

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[42] *Ibid.*

the Maniara and Sadowa Concerns agreed to pay Rs. 500 a year each to cover the maintenance expenses of the canals and it was therefore decided by the Government to retain the canals as Government works".[43] After some time, the Managers refused to pay the money. In 1942, Ghosh reported that "these canals are [were] not working now and are [were] altogether abandoned due to the river receding far away"[44] from the sluices and regulators.

The scheme failed, according to W.A. Inglis, Chief Engineer of Bengal, because "the water was of much less value for Indigo, whether for cultivation or manufacture, than has [had] been anticipated. Distribution was difficult and in many years there is [was] little or no demand for water either for *Kharif* or *rabi* crops".[45] Also, the command area of these canals was very imperfect "as the only distributing channels are [were] the natural drainages of the district".[46]

The weakest point of the scheme was in the method of drawing the supply from the bye-channels of the Gandak, instead of the river itself, and "changes in the course of the main stream of the Gandak have cut-off the

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[43] Ghosh, *op.cit.*, p. 16.

[44] *Ibid.*, p. 17.

[45] Inglis, *op.cit.*, p. 92.

[46] Maconchy, *op.cit.*, p. 92.

supply of the sluices, while ... the channels leading from the *sota* to the sluices silt[ed] if used in the flood season".[47]

Another problem in these canals was that the supply could only be maintained by a system of dams and channels at the entrances, which, in some cases, "caused injury to lands above and, in others, deprived the guarantors below of their share (of water). At critical periods, it was hardly possible for the supply from the *sota*, as this involved the erection of temporary dams which could only be carried out when the flow from the main river had fallen below a certain volume".[48]

As has been discussed in the first chapter, irrigation was hardly needed in this part of the district because of the annual inundation, the retentive nature of the soil, and existence of innumerable water courses in the district. This system was disturbed by the erection of a continuous line of embankment on the Gandak, in the Saran district. In return for this supposedly 'protective' measure, the cultivators had to pay an embankment cess, even though the natural supply of water and fertilizing silt was cut off. "It was to remedy this state of affairs that the Saran canals were constructed" and the cultivators had to pay water rates for irrigation from these canals, over and above the embankment cess.

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[47] Inglis, *op.cit.*, p. 92.

[48] *Ibid.*, pp. 92-93.

Madhuban (Teur) Canal

The work was undertaken by the Irrigation Department in 1876 in pursuance of a project devised by Mr Hewitt, the then Collector of Champaran, for irrigating the land in Duho Suho tuppa in Champaran (see Map No. 3). The expenditure incurred in the canal was Rs. 72,926. The zamindar of Madhuban, who had undertaken to pay the cost of the undertaking, contributed Rs. 61,997; Rs. 4,408 was contributed by other zamindars who were benefitted by the work, and the balance, Rs. 6,881 was paid by the Government.[49]

The work was completed in 1879 and the first watering given in 1880, about 5000 acres being irrigated out of the total estimated irrigable areas of 17,424 acres.[50] The distribution of the water remained in the hands of the Madhuban zamindar, but difficulties were foreseen in connection with the retention of the management of the canal. "The difficulties were that the arrangement would lead to rack-renting and the zamindar could not legally collect water rates under the Irrigation Act".[51] This conclusion was arrived at because of the fact that "rent has [had] been enhanced from Rs. 17,344 in 1850 to Rs. 86,157 (in 1876)... on the strength

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[49] Maconchy, *op.cit.*, p. 23.

[50] *Ibid.*

[51] *Selections of Papers Relating to the Teur (Madhuban) Canal in Champaran from 1880 to 1893 [Selections (Teur canal)]*, p. 13.

of temporary irrigation works, alleged to have been constructed by the zamindar".[52]

Irrigation from temporary works (*pynes* and *bunds*) existed even at the time of settlement of the *tuppa* in 1850. But the colonial state did not interfere through its civil courts to stop any further enhancement of rents which the zamindars applied for.

The Government wanted to charge water rates from the Teur canal because it was turning out to be a profitable venture, even though the irrigated area never exceeded 5000 acres. There were difficulties in the zamindar charging water rates unless the Government declared "under section 6 of Act III (B.C) of 1896, that the water of the Teur is required for a canal",[53] which could not be done so long as the canal remained the property of a private person, in this case the Madhuban zamindar. The second difficulty was that "the *raiyats*, conceiving their enhanced rent to give them a claim on the zamindar to free irrigation, are not disposed to willingly pay for water, and the Act can certainly not be applied so as to make them do so compulsorily".[54]

There was no other way left for the Government but to refund the money advanced by the zamindars and take over the canal itself, which it

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[52] *Ibid.*, p. 6.

[53] *Ibid.*

[54] *Ibid.*

did in 1886. On the question of water rates, W.A. Inglis, Superintending Engineer, recommended that water rates be charged on the canal proper. For the lands which were earlier irrigated by the Raj *pynes*, and where rents were enhanced by the zamindar, Inglis suggested that "the zamindar should continue to get such rents as may have been awarded to him from the villages which are irrigable from the *pyne*, and that he should be bound in return to continue to maintain a supply of water in the *pyne*, which he can do by **purchasing it from the Government**".[55]

Thus, while the colonial state did not want to interfere in the zamindar's relations with the *ryots* except in the former's favour (a case in point is the government's inaction in stopping any attempts by the zamindar to enhance rents), on the issue of irrigation the State ended up constraining the absolute power of the zamindar. The losing of control over irrigation (one of the most important aspects of Indian agriculture) by the zamindar was one of the most significant impacts of colonial rule in India. The traditional practice of managing irrigation works, of which the zamindar was the central character, was replaced by the colonial bureaucracy.

"It appears that long before the canal (Madhuban) was made, irrigation was effected by temporary bunds across the Teur and another

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[55] *Ibid.*, p. 11 (emphasis mine).

river"[56] and water was distributed in fields through a network of *pynes*, which was also used for canal irrigation.

Dhaka Canal

Another canal of the same class as Madhuban canal was built in the western part of Champaran in Dhaka thana (see Map No. 3). This was the Dhaka canal which derived its supply from the Lal Bakiya river. The work was "sanctioned in August 1900 ... at an estimated cost of Rs. 2.93,145 for all charges". The canal became operational in 1908 and by 1942 "irrigation of about 16,000 to 20,000 acres was carried on yearly".[57]

Before the construction of the Dhaka canal, a certain amount of irrigation was effected during the *rabi* and hot weather season from the Lal Bakiya nadi "by making a cross bund just below the frontier. The water being led off through a *pyne* on the right bank and thence dropped into roadside cuttings and drainages and lifted from these into the field".[58]

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[56] Inglis, *op.cit.*, p. 137.

[57] Ghosh, *op.cit.*, p. 29.

[58] Maconchy, *op.cit.*, p. 30.

Pynes Versus Canals

One reason cited by the British officials for the introduction of big irrigation projects in Champaran was the allegedly "almost total absence of artificial irrigation because of which any shortfall or variation in rainfall caused widespread distress".[59]

But as has been discussed in chapter one, a great deal of irrigation in the region north of the Sikrana was done by bunding the rivers that issued from the Nepal hills, the water being generally distributed by means of *pynes*.

The most noteworthy system of pynes was laid down by the Sathi concern in Bettiah. In 1907, there were nearly 150 miles of distributaries running through the property. The rivers drawn from were the Pandai, Maniari, Kataha and Ramrekha. The proprietors of the concern gave their own *ryots* the use of water and also allowed the same privileges to the cultivators of other villages after their own tenants had been supplied. Any surplus water was run into village tanks for the benefit of the villagers and their cattle. It was estimated, in 1906-07, that about 20,000 acres were irrigated from this source.[60]

Another instance of the satisfactory working of *pyne* irrigation was in the north-western corner of Champaran. It was dug as a famine relief

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[59] *Survey and Settlement Report (SR) of Champaran*, 1899, p. 107.

[60] *Champaran DG*, p. 56.

work in 1897, and since then was under the charge of Mr Sealy, the District Engineer. It received its supply from the river Masan. It irrigated an area exceeding 10,000 acres, in a strip of land about 15 miles long, and 3-4 miles in width. The necessary silt clearance and minor repairs were done entirely at the cost of the cultivators who paid a cess on the area irrigated. Mr Sealy made a yearly budget of his requirements and divided it proportionally among the cultivators who paid the money to the Collector. This system worked without any trouble.[61]

Apart from the above mentioned cases, there were other instances of zamindars and planters running a system of *pynes* in other parts of Champaran, especially the north-western corner. But not much has been written in the official records about the existence of *pynes* in the estates of the Indian zamindars. But to argue that the Champaran zamindars had not maintained a system of *pynes* would be wrong as even the British observers agreed that "many of these bunds and *pynes* are [were] **relics of the old system of irrigation** which was carried on before the Tribeni canal was built"[62].

However, the question remains that if at all this system of irrigation worked so well, then why did famine occur in these areas? In the 19th

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[61] *Indian Irrigation Commission, 1901-1903, Minutes of Evidence (Bengal)*, pp. 45-48.

[62] *Champaran DG*, p.34 (emphasis mine).

century, there was a decline in the indigenous system of irrigation. Nirmal Sengupta writing on the indigenous system of irrigation in South Bihar suggests that their decline was because of the change from the *baoli* system of rent to *nagdi* system. According to him, this change removed any kind of incentive which a zamindar had for improving and maintaining *ahars* and *pynes*.[63] This might have been true for Champaran also, where the total cash rental in 1899 was Rs. 31,07,897, and the produce rental was only Rs. 3,80,112.[64]

Some other measures of the colonial state also helped in the disappearance of the older system of irrigation. One was the British obsession of building masonry *weirs* across the same rivers from which water was taken for irrigation by constructing earthen bunds, in earlier period. The case of Teur and Lal Bakiya rivers are two such instances. One reason for doing this has already been discussed in the section on the Teur canals.

The keenness of the British engineers to build *weirs* and canals also shows their obsession towards, and inherent faith in, 'permanent' structures (like *weirs*, canals, sluices, regulators, etc,). At the same time, they looked down upon any kind of 'temporary' structures (like earthen

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[63] Nirmal Sengupta, 'The Indigenous Irrigation Organisation in South Bihar', *Indian Economic and Social History Review*, Vol. XVII, No. 2, pp. 178-80.

[64] *Champaran DG*, p. 94.

bunds, pynes etc.) built by the cultivators to tap the river water whenever the need arose.

The only problem in the older system of irrigation was that the earthen bund was washed away every year by the river floods and had to be built again, but not with much costs, as repairs were done by community labour. But the 'permanent' irrigation works constructed by the colonial state were not immune from floods. This is evident from the Tribeni canals (as has been discussed earlier), and the Dhaka canal where "Lal Bakeya occasionally comes (came) in very high floods which sometimes caused damage to the down-stream apron of the *weir*".[65]

Another problem which cropped up was the silting of the headworks and the canals and distributories, which was bound to happen after some time as the rivers, in the upper reaches of their course, carried large quantities of sand. All these led to a high cost of maintenance on these canals.

Even the Indian Irrigation Commission accepted the advantages of small temporary works in North Bihar, especially in the years of deficient rainfall. The Report notes:[66]

> The excellent results obtained by Mr Sealy (in Masan *pynes*) and Mr king (in Darbhanga), and by the Managers of other estates and factories, show how much can be done by active

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[65] Ghosh, *op.cit.*, p. 29.

[66] *Indian Irrigation Commission Report,* Delhi, 1903, p. 168.

> and energetic officers of long experience, to utilize the available water supply in seasons of drought by temporary and comparatively inexpensive expedient, adapted to the exigencies of the moment .... A manager of a private estate has a much freer hand in undertaking measures for the benefit of his tenants than can be given to a public works officer .... In seasons of drought prompt measures could be taken for throwing earthen dams across the principal streams at the earliest possible moment, and for diverting the water in the network of channels already existing, connecting or closing these channels where necessary.

In the northern parts of Champaran, where the Tribeni canal was built, the closing of the older system of irrigation was because of the Government notifying the area under section 76 of the Embankment Act and Section 40 of the Irrigation Act, under which construction of bunds was prohibited as it could interfere with the working of the canals. It was mainly in the area north of the canal, mostly in the Ramnagar Raj villages, that the irrigation authorities tried to put a stop to the bunding of the rivers. On the south of the canal, "bunds are [were] objected to only when they are [were] likely to interrupt the drainage of the country, or to cause damage to the distributing channels of the canal, or to **interfere with the irrigation from such channels**".[67]

The canal authorities believed that the cultivators would soon apply for canal water when "the benefits of an assured supply of water for

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[67] *Selections (Tribeni canal)*, Vol. I, p. 261 (emphasis mine).

irrigation are brought home to the *raiyat* by seeing the effects of absolute failure of the hill-streams on the local system of irrigation".[68]

The memoralist, whose memorial has been mentioned earlier in this chapter, completely denied this and argued that:[69]

> this assertion is true only of some of the said streams and that a very large number of the said streams are perennial and do not fail even in a dry year while the closing by the canal authorities of the supply from the streams north of the canal must inevitably occasion a regular annual famine in the population north of the canal whose lands the canals cannot possibly irrigate.

Another complaint of the memoralists was that it was "inequitable that the state shall impose upon a populace, which exists by agricultural toil and whose means are of the scantiest, an increased water rate ... and thus cruelly increase the burden of their life."[70] To this, the Secretary, Irrigation Department of bengal, replied that "it was optional with the cultivators to irrigate their lands from the canals at the rates specified, and they are not deprived of the supply in the streams which cross the canal".[71]

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[68] *Selections (Tribeni Canal)*, Vol. II, p. 106.

[69] *Ibid.*, Vol. I, p. 266.

[70] *Ibid.*, p. 229.

[71] *Ibid.*, p. 261.

In fact, with the canal authorities prohibiting the construction of bandhs, and also diverting and dislocating the said streams, the cultivators had no other option left but to apply for canal water; the other option was to do without irrigation. So no cultivator would have voluntarily accepted canal irrigation, however, assured "at Rs. 4 an acre if he might sufficiently water his lands in his own way at Rs. 1-3 an acre as he has [had] done..."[72] since olden times.

Famines in North Bihar

One most common concern of the Government officials in North Bihar was with the famines which visited the region regularly in 1865-66, 1873-74, 1889 and 1896-97. The parts in which the "effects of drought have [had] been the most serious is [was] a tract extending along the border of Nepal, from the Gandak to the Kosi river, 250 miles by 50 miles".[73] This region's susceptibility to famines was cited by one and all for it urgently needing artificial irrigation.

It was after the famine of 1874 that the first scheme of irrigation for North Bihar was put forward. But for some unknown reasons, this project was shelved, "although the necessity of irrigation ... was pointed out by

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[72] *Ibid.*, p. 266.

[73] *Report of the Indian Famine Commission [Famine Commission]*, Delhi, 1880, p. 153.

successive commissions and collectors of the district".[74] The Famine Commission of 1880 suggested that "the preparation of a carefully considered irrigation schemes from the Gandak, which could be taken up any time if thought desirable, is therefore, in our opinion expedient".[75]

An analysis of famines and the agricultural conditions in the region is necessary to find out whether it was the lack of any means of artificial irrigation which was responsible for the recurring famines, or was it because of some other reasons. The analysis would be limited to only the Champaran district where three irrigation projects were constructed in the last quarter of the 19th century.

I will briefly digress into a discussion of the general agricultural conditions of Champaran.

The average size of the holdings in the district was 5 acres, almost double of any district in North Bihar. For the two sub-divisions of the district - Bettiah and Sadar - the same figures were 6 acres and 4 acres respectively. Similarly, the average plot in Champaran was 0.74 acre, it was 1 acre in Bettiah and 0.57 acre in Sadar. The Survey and Settlement Report of Champaran states: "This clearly indicates that, except in a small

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[74] Maconchy, *op.cit.*, p. 25.

[75] *Famine Commission*, 1880, p. 153.

tract in the south, there was an entire absence of that agricultural pressure which leads to a diminution in the size of all land units".[76]

Considering the low population on land, the rent rates in Champaran were also very low. Taking all classes of *raiyats* together, the rent rate of Champaran was Rs. 1-13-9 per acre in 1899, or lower than that in Muzaffarpur, Ghazipur, Gaya and Banaras by 100 per cent or over.[77]

The area under rice was more in Champaran than in Muzaffarpur, Gorakhpur and Gaya. The proportion under other food crops, including pulses, was less than that in other districts. The high percentage of non-food crops in Champaran compared to other districts also explained its susceptibility to famines. These facts also show that the pressure of population on land was slight.

As shown in the first chapter, annual rainfall in Champaran exceeded 50 inches annually, which was more than sufficient for agriculture. With such an abundant rainfall, it seems surprising as to why famine occurred in Champaran.

One reason cited by many officials was the uneven distribution of rainfall which harmed the crops. On the rainfall in Champaran, G.C. Maconchy writes:[78]

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[76] *S.R. (Champaran)*, p. 99.

[77] *Ibid.*, p. 131.

[78] Maconchy, *op.cit.*, p. 26 (emphasis mine).

> In the last quarter of the 19th century, rainfall during September to October was in six years, that is 1873, 1877, 1880, 1883 and 1893, less than 2.5 inches, so that all the rice crops except in very low grounds or where it was irrigated by streams and tanks, **must have failed**, and in three other years, that is, 1875, 1878 and 1892, there was no rain in October, and in September less than 6 inches, so that over a considerable area the **rice crop must have been a poor one**. In 1876 and 1882, the rainfall in June or July was less than 10 inches, and could not have therefore been sufficient for the *aghani* crop, and in 1897, the rice sowings were greatly delayed, as upto 27th July. It does appear that a full rice crop could have been obtained from this tract only, on an average, one year in two without irrigation.

But at the same time, it should be noted that Champaran "was able in ordinary years to export about 450,000 maunds of food grains valued at about 10 lakhs of rupees, notwithstanding the great increase in population within the last quarter of the 19th century.[79] So it was only in years of extremely deficient rainfall, that is, in 1865, 1873, 1889 and 1896, that widespread distress occurred.

Even in Champaran, two main areas were always worse than the remainder - the first, corresponding roughly to the Dhaka thana, and the second, was a large tract of 430 sq. miles to the north-west of Bettiah of which Ramnagar was the centre, and which included the *thanas* of Bagaha and Shikarpur. It was alleged that these areas were susceptible to famines because of their dependence on a single crop, i.e., *aghani* rice,

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[79] *S.R. (Champaran)*, p. 170.

unlike the western thanas of Champaran. The Settlement Report of 1899 notes:[80]

> The importance of this contrast lies in the fact that it is well known that Shikarpur is the area in the district most liable to famine, while Adapur (in the west) is the least affected. Shikarpur, with its dependence on the *aghani* harvest, feels at once the least failure of rainfall and has no *rabi* crops of any value to look forward to, to help it tide through the year following a short *aghani* harvest; whereas in Adapur, a rich *bhadai* crop is reaped at the beginning of September, so that, even if the *hathiya* rains fail, it is no great matter while there is always the prospect of a good *rabi* crop on the high *bhadai* land later on. In the recent times, Shikarpur was the thana first and most seriously affected.... Adapur, on the other hand, was only comparatively slightly affected.

In short, it was the overdependence on rainfall (which was uneven in distribution) and on a single crop (*aghani* rice) which were responsible for famines.

Another significant reason for frequent famines and distress was the unequal distribution of land among different social classes. It was the labouring class who were most exposed to distress. Landholding agriculturists would have been affected only to a very small degree.

The wages of labour had not risen in this district in unison with the rise in prices, either as a normal condition or during years of famine. On wages, the Settlement Report reports:[81]

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[80] *Ibid.*, p. 110.

[81] *Ibid.* p. 162.

> All things considered, average wage of an adult male *cooly* (labour) now may be taken as a little over two-and-half annas, as against two-and-one-fourth annas twenty years ago, a rise of about 11 or 12 per cent. The mean price of the food grains available for comparison (common rice,wheat, barley and gram) has risen from 23 1/5th seer during the four years 1870-73 to 17 2/5th seer (to the rupee) during the five years 1891-95, i.e., by 30.6 per cent.

Field labourers were, however, mostly paid in kind, and in this light, the scale of wages had risen in proportion to the rise in prices in so far as the rate of their grain allowances remained uniform.

The Settlement Report also calculated the cost of living in the district. For a family of six people, the cost of living was Rs. 77/- a year. In the same way, a subsistence holding (a holding sufficient to support an average family in fair comfort) was calculated to be 4 acres (in Bettiah sub-division, it was 5 acres, and in the Sadar, where crops were more varied and secure, at 3.5 acres), allowing for a portion to be left uncultivated.[82]

The occurrence of famine in the district might be explained by the fact that 44 per cent of the holdings were under 2 acres, much below the subsistence holding.[83]

In the Settlement Report, the population of the district was apportioned in the following way:[84]

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[82] *Ibid.*, p. 165.

[83] *Ibid.*, p. 168.

[84] *Ibid.*, p. 170.

1. Pure cultivators	-	57 per cent
2. Pure cultivators with other professions	-	7 per cent
3. Cultivating labourers	-	21 per cent
4. Landless labourers	-	9 per cent
5. Miscellaneous	-	6 per cent
Total population		100 per cent

So, Champaran, with more than 50 per cent of its population dependent, for living, on their own labour, wholly or partially (44 per cent with holdings below 2 acres and 9 per cent landless labourers), was easily susceptible to famine from even a small variation in the rainfall.

Amartya Sen contributes to our understanding of famines by explaining why these groups so suffered.[85] He attributes famines to 'failure of exchange entitlements'. Entitlement means right through ownership. 'The set of all the alternative bundles of commodities' that a person can acquire in exchange of what he owns is called the 'exchange entitlement' of what he owns. The failure of this exchange entitlement explains why a person's income abruptly diminished during famines. For

[85] A.K. Sen, *Poverty and Famines*, Delhi, 1982

example, the bundle of goods that the labour of an agricultural labour would buy during a famine was much less than during normal times. The sudden rise in commodity prices sharply diminished the size of this bundle.

B.M. Bhatia, on the other hand, stressed the role of the compulsions of India's international economy.[86] A striking feature of India's international economy at the time was the inability of India to pay for the increasing imports of British goods by her own industrial goods because of the fast decline of India's industrial production. India was thus obliged to send away on increasing quantity of food grains. The consequent pressure on the grain supply in the domestic market inevitably pushed up grain prices. The rising prices tempted peasants to part with their usual stores of grain. This severely hit the numerous community of marginal peasants, who even in normal years, had to buy food for a considerable part of the year.

Bhatia's argument seems to be correct if seen in the light of Bengal grain trade. The exports of grains from Bengal as reported by the 1880 Famine Commission was:[87]

in 1864-65 - 695,341 tons,

in 1865-66 - 336,211 tons,

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[86] B.M. Bhatia, *Famines in India, 1860-1965: A study in Some Aspects of Economic History of India*, Delhi, 2nd Edition, 1967, Chapters 1 and 2.

[87] *Famine Commission*, 1880, p. 118.

in 1866-67 - 222,659 tons, and

in 1872-73 - 526,000 tons.

Sir G. Campbell, the Lt. Governor, suggested that "the export of rice to foreign countries from Indian dominion might be stopped.... If there was a general failure (of crops) in Bengal, all that (the rest of) India and Burma could supply would go but a little way to fill up the vacuum".[88] He further suggests that "even if it be decided not to interfere with the great export of rice from British Burma, still the Government of India might very reasonably and fairly consider the expediency of interposing to prevent exportation of food from Bengal".[89]

The Viceroy wrote to the Secretary of State that "the deficiency in Bengal and Bihar could be met without importation from abroad or Burma, that the rise in prices that has occurred and must increase would of itself attract rice from Burma and Calcutta, and that to prohibit exports would have the effect of artificially reducing prices at the beginning of a season of scarcity, and would **shake the confidence of the mercantile classes**"[90].

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[88] *Ibid.*, p. 116.

[89] *Ibid.*, p. 117.

[90] *Ibid.*, (emphasis mine).

The Lt. Governor, again replied, quoting a story told by the Magistrate of Bhagalpur that cartmen were especially willing to carry Government grain to the north of the district, because they expected to get return loads of grain to bring back from thence. He wrote that "it seemed unnatural that while private traders were exporting grain, we should be importing it to the same locality"[91] to distribute it in relief works. He was apprehensive about the imports and arrangements to import on the part of the Government might be keeping down the prices, further leading to more exports.

The Viceroy, Lord Northbrook, put a final verdict on this question by not stopping the exports of food grains. He believed that an export trade in food grains was a great advantage to a country like Bengal, since it ensured the production, in ordinary years, of more food than was required for the consumption of the people. Any measure that would diminish the export trade would readily divert the trade from one channel to another. If the ordinary customers of Indian grains were not supplied during famine years, then there might be a possibility that they take recourse to other markets.[92]

Another interesting fact about the famines in Bengal was that between the first famine recorded in British official records in 1769-70 and

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[91] *Ibid.*

[92] *Ibid.*, p. 118.

the next famine in 1865-66, there was an interval of 87 years when there was not a single famine. Here again Bhatia's argument gains ground. But apart from the question of India's position in the international economy, there must have been some other causes for the increased frequency of occurrence of famines in North Bihar. Was it because of the decay which occurred in the indigenous system of irrigation? Or was it because of the construction of embankments which interfered with the system of 'overflow irrigation' practiced in this part of Bengal?

Extension of Cultivation

One very strong motive of the Britishers for the introduction of the Tribeni canal might have been the extension of cultivation in, and create conditions for the migration to, Champaran to help ease the increasing population congestion in other more populated areas of North Bihar. The Settlement Report of Champaran opines:[93]

> Allowing for the relative infertility of the cultivable area, I should say, there is still room for the district to augment its population by 12 per cent or, say 2 lakhs of souls, without causing the least inconvenience to its present inhabitants, but to attract the surplus population to Champaran, the northern part of which is liable to famine owing to precarious rainfall and is still very unhealthy, requires special measures which, I believe, are on a fair road to fulfillment. The Tribeni canal, if constructed, will place a very large area in the northern tract in a position secure from calamities of season. The

[93] *S.R. (Champaran)*, p. 105.

> country requires opening out, and the contemplated railways from Bettiah to Bagaha, and from Bairagnia to the same place, via Ramnagar, if constructed, are sure to give agricultural development a marked impetus.

Here I would briefly digress to give details of cultivation and population statistics of Champaran district. In 1899, out of the total area of 2,079,815 acres, 1,447,668 acres or 70 per cent was cultivated.[94] But these figures did not take account of the extended hills and jungles which would have considerably increased the percentage of uncultivated area. The same figures for Gaya and Shahabad was 69 per cent, and 60 per cent respectively.[95] But Champaran had more room for agricultural development. Much of the waste in Gaya and Shahabad was uncultivable hills and jungles. In Champaran, on the other hand, it was land lying unoccupied, and poor but cultivable. The sub-divisional percentage varied considerably from the district one. In Bettiah sub-division, the cultivated area was only 62.3 per cent and would have been much less if the jungle tract was taken into account; but in Sadar sub-division, it was as high as 77.74 per cent. Adapur, Dhaka and Madhuban recorded more than 80 per cent of area under tillage.[96] So, it was in the northern tract, where the

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[94] *Ibid.*, p. 99.

[95] *Ibid.*, p. 100.

[96] *Ibid.*, p. 101.

Tribeni canal was built, that the great field for extension of cultivation existed.

Density of population also followed the same trend. Adapur, Dhaka and Madhuban (in the western part) showed the highest - around 800 people per sq. mile. The two northern thanas of Bagaha and Shikarpur recorded below 300 persons per sq. mile.[97]

In Champaran, the area not under cultivation was 30.9 per cent of the total - in Sadar, 22 per cent and in Bettiah, even excluding the uninhabited jungle, it was 38 per cent. Of this, the area available for cultivation, excluding current fallow, was 115,511 acres, i.e., 18.5 per cent, in Bettiah it was 24 per cent; and in Sadar 12 per cent.[98]

Of the total area of the district, old fallow covered 12 per cent. It was largest in Bagaha and Shikarpur, viz., 20 per cent and 15 per cent, and lowest in Dhaka, Madhuban and Adapur, viz. 4.5 per cent.[99]

Land under current fallow (not included in uncultivated area) also showed a high percentage of 2.4, as compared to other districts of North Bihar (Bettiah sub-division showed 2.8 per cent, while for Sadar sub-division, it was 1.9 per cent).[100]

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[97] *Ibid.*

[98] *Ibid.*, p. 104.

[99] *Ibid.*, p. 105.

[100] *Ibid.*, p. 106.

From the above account, it becomes very clear that the British found in Champaran a great opportunity for extension of cultivation. Apart from the apparent reason of giving the district protection from famine, the introduction of Tribeni canal had other obvious motives. It was a measure to help "relieve the great pressure of population on the soil in North Bihar",[101] where the future prospect of agriculture was looking grim in the face of increasing population. The Tribeni canal, along with the proposed railway extension, was conceived to give a fillip to agricultural development.

Conclusion: Viability of Canals

Almost all the official records on Champaran have commented on the unhealthiness of the terai region in the Bagaha and Shikarpur thanas. The Champaran gazetteer reports on the occurrence of fever:[102]

> The greatest mortality is caused by fever which upto 1907 had never been known to cause a death rate of less than 17 per mille (?) since the introduction of the present system of mortuary returns. The average death rate from fever for the past five years (1926-30) is 17.82 per mille (?). It should be noted that these statistics for fever include influenza and other diseases with feverish symptoms, but by far the greatest number of fevers recorded are malarial. There are various types of malaria but most of them are of the benign type which yields to quinine.

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[101] *Ibid.*, p. 104.

[102] *Champaran DG*, p. 51.

If the sub-montane tract of Champaran was an ideal ground for the breeding of malarial mosquitoes, then that region needed better drainage. But the Britishers were doing just the opposite of what was needed; they were creating more waterways which disturbed and obstructed the drainage of the countryside. It can be argued that the canals might have worsened the situation.

At the time when the Britishers were busy constructing irrigation canals in India, in Europe, the engineers and agricultural experts were trying to drain marshy lands to bring them under tillage as also to make them free from malaria. In Italy, for example, the agricultural experts had found a novel method of fertilization of land and mitigation of malaria in the most uncultivable and unhealthy areas.[103]

Edward Buck had tried the same method successfully in some areas, for example, in and around Kanpur, and argued for the adoption of this technique elsewhere. But Buck admitted that there was no means by which the terai could be rehabilitated by the same methods, and he was of the opinion that experts should be sent to Italy to be comprehensively trained for this purpose.[104]

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[103] Edward Buck, *Report on the control and utilisation of rains and drainage for the fertilization of land and mitigation of malaria* (year and place not mentioned), pp. 1-4.

[104] *Ibid.*, pp. 10-21.

So, it can be concluded that in the geographical setting of North Champaran, the temporary and small irrigation structures like earthen bunds and *pynes* were better suited, than large permanent ones like masonry *weirs*, canals, syphons etc.

On the question of famines in North Bihar, it was the creation or result of the colonial rule which created certain institutional structures. The absence of any famine for a long time in North Bihar shows that the peasant economy there was characterised by 'affluent subsistence'.[105]

Apart from the obvious motive of giving protection to a region, the more important motives for introduction of irrigation schemes by the colonial state were to avoid the loss of revenue remitted during famines, and the high cost of relief measures adopted during famines. Another important motive would be to help increase the production of foodgrains so as to maintain the balance of payment position of India through increased food grain exports.

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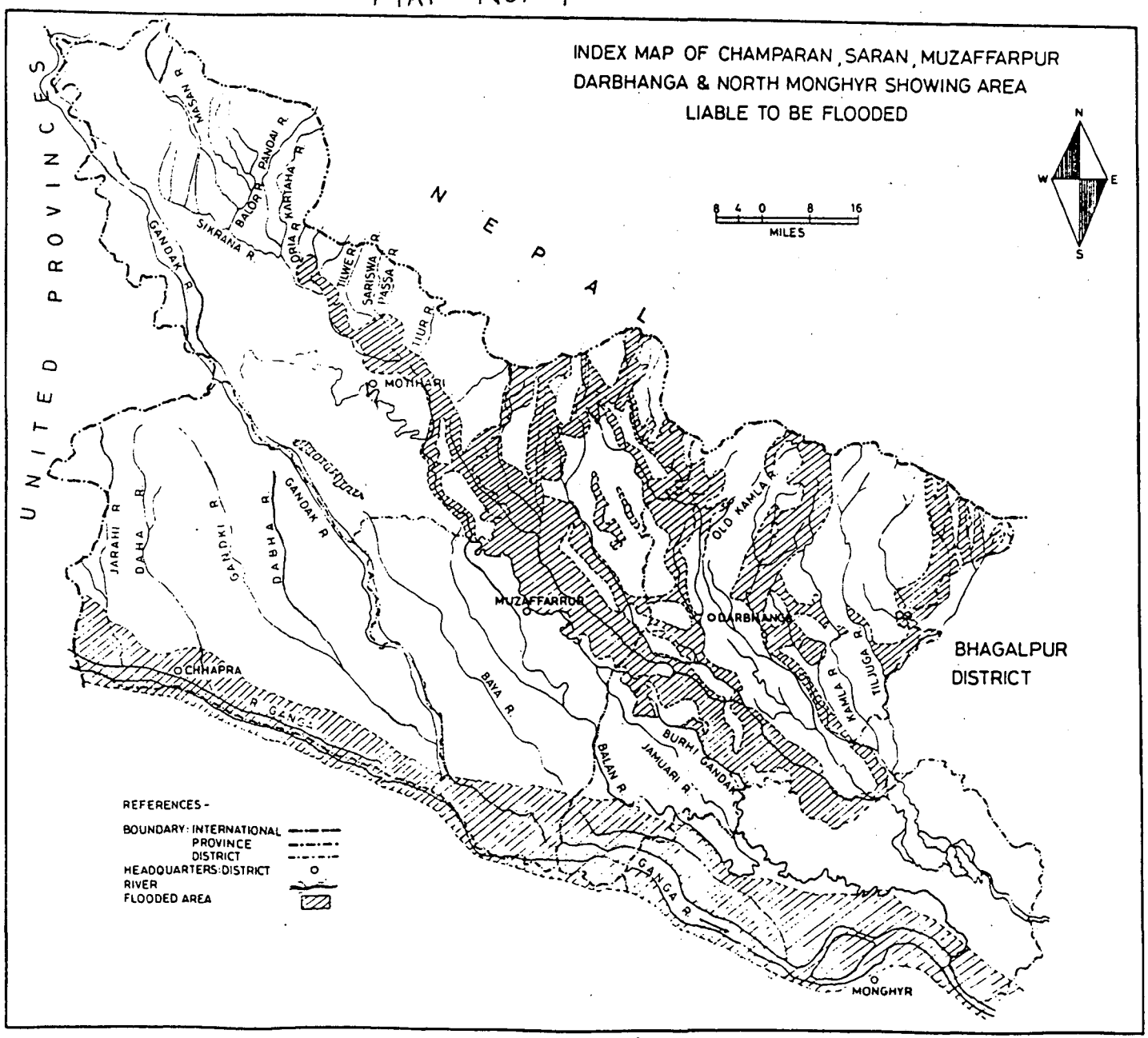
[105] The phrase 'affluent subsistence' is used by Tapan Raychoudhuri. He has thus defined the concept: "an economy geared to production for purposes of consumption rather than exchange, but having high levels of output and consumption attained with relative ease and rather small inputs of labour, permitting a fair measure ofslack which could be taken in as and when the economy responded to market incentives. In areas characterised by such abundance of food supply... inadequacy of food and clothing was unlikely to have been the lot of large numbers, whatever the pattern of income distribution. The possibility of such shortages affecting the sections of the population cannot, however, be precluded for less fortunate regions...." in Tapan Raychoudhuri, 'Historical Roots of Mass Poverty in South Asia: A Hypothesis', *Economic and Political Weekly,* May 4, 1985.

MAP NO. 4


INDEX MAP OF CHAMPARAN, SARAN, MUZAFFARPUR
DARBHANGA & NORTH MONGHYR SHOWING AREA
LIABLE TO BE FLOODED
N
W
E
S
8 4 0 8 16
MILES
UNITED PROVINCES
NEPAL
MASAN R
GANDAK R
SIKRANA R
BALOR R
PANDAI R
KARTAHA R
TIUWE R
SARISWA R
HASSA R
IIUR R
MOTIHARI
JARAHI R
DAHA R
GANDAK R
DABHA R
MUZAFFARPUR
DARBHANGA
OLD KAMLA R
KAMLA R
TILUGA R
BHAGALPUR DISTRICT
CHHAPRA
GANGA R
BAYA R
BALAN R
JAMUARI R
BURHI GANDAK
MONGHYR
REFERENCES -
BOUNDARY: INTERNATIONAL
PROVINCE
DISTRICT
HEADQUARTERS: DISTRICT
RIVER
FLOODED AREA

Chapter 3

THE COLONIAL INTERVENTION - FLOOD CONTROL

One major pre-occupation of the colonial state in North Bihar was to control floods which occurred annually during the monsoons. "In the earliest correspondence of the district during the British era, there are (were) clear indications that floods constituted one of the greatest obstacles with which the administration had to contend with".[1]

North Bihar was subject to floods in almost every year (see Map No. 4). But never was any attempt made by earlier rulers to control it. "During the period of Muhammadan supremacy, neither canals ... nor embankments were erected to prevent the havoc caused by the overflow of rivers ...".[2]

In this chapter, I would be looking at the responses of the colonial state towards the problem of floods in North Bihar in the period 1880-1940. The year 1880 has been taken up as the beginning of this study as it was around this period that the evil effects of the colonial flood policies had started cropping up and these policies were being questioned. This study ends in 1930 because of a break in the colonial flood policy,

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[1] *Muzaffarpur DG*, p. 64.

[2] *Ibid.*, p. 69 (emphasis mine).

especially after the earthquake in North Bihar in 1934. With the formation of the Tirhut Waterways Division in 1941, the flood problem in North Bihar was taken up as a comprehensive whole, while earlier the intervention was very localised with no coordination between different districts.

Floods in North Bihar

The whole of North Bihar from Saran upto Purnea may be considered as a "huge inland delta as all the principal rivers emerging from the mountainous regions debouch in the plains and eventually flow into the Ganges".[3] 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".[4] The perennial rivers were mostly land builders and "in the process of land building oscillated from east to west like the pendulum of a clock in the range of hundreds of miles".[5]

The ideal natural condition under which rivers act and conserve themselves in the deltaic region has already been described in chapter 1. But unfortunately, in the past, this natural working of the rivers had been

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[3] Ghosh, *op.cit.*, p. iii.

[4] *Ibid.*, p. iv.

[5] *Ibid.*

tampered with, with 'devastating' results. Mr Mazumdar contends that "the works carried out [by the colonial state] ... have [had] not only caused deterioration in the river channels making their maintenance more and more difficult but have [had] also made the very problem of protection against flood damages, which they were intended to solve, more and more acute".[6] After the colonial intervention in flood control, the very nature of floods changed.

The Britishers essentially saw flood as a menace which destroyed crops and houses. During the early years of British rule, the reaction to floods was one of panic and construction of embankments was considered to be the only solution available to them.

Embankments

Erection of embankments along rivers in North Bihar was started by the colonial state on a large scale from the beginning of the 19th century. Initially, it began with the restoration and extension of old dilapidated zamindary embankments, and construction of others to protect important colonial establishments. In the first few years, there was an indiscriminate construction of embankments on very 'unscientific' lines and the rivers invariably breached them in a lot of places. During this period whenever a flood problem arose, "the answer was, 'let us build a bandh'.

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[6] Mazumdar, *op.cit.*, p. 17.

And famine relief work, which frequently comprised the erection of bandhs, was in no small measure responsible for the present trouble".[7] Along with the construction of public embankments, many private marginal embankments were also constructed by European planters, indigo factories and big zamindars. In the initial stages, the embankments did give some temporary respite from annual floods, but in the long run, it proved to be a worse evil and also changed the nature of the floods. As the deterioration these embankments caused to the river channels and the drainage system, in public health and productivity of the soil took years to manifest itself, it was universally accepted, at least till the end of the 19th century, as the most effective protection against floods. It was only in the last quarter of the 19th century that the negative impact of embankments was being felt and its role in controlling flood was being critically examined.

Embankments and Increased Flood Level

As has been shown earlier, in the economy of nature, the silt brought by the rivers was intended to be carried with the flood spill so that it could raise and fertilize the land and reduce the silt content in the river channel to what its velocity would transport. Confinement of the flood within the narrow river channel by means of embankments disturbed this

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[7] Ghosh, p. ii.

arrangement and a portion of the silt, in excess of what the river could transport, deposited in its bed. This caused higher and higher flood levels to carry the same volume of flood, necessitating higher and stronger embankments.

For example, the raising of the flood plane due to the closing of the natural spill channel by the railways approach embankment to Inchcape bridge (at Manjhi in Saran district) aggravated the spilling of the Gogra flood from Guthni on the left bank. The depth of inundation in the Saran district was "about two feet more in 1938 than in 1936 though the H.F.L. (Highest Flood Level) recorded at the Inchcape bridge was one foot lower in 1938 than in 1936".[8]

Similar cases where flood levels increased in height year after year because of the obstruction caused to drainage by the embankments are many. A case in point is the floods of 1904 in Begusarai in North Monghyr district. While comparing the floods in 1894 and 1904, G.C. Maconchy, Superintending Engineer, South-Western Circle, shows that "in spite of the lesser flood (in 1904, as compared to 1894), the damage and depth of flooding have increased. This increase must be attributed to the Railways (embankment)".[9]

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[8] *Ibid.*, p. 4.

[9] *Selections from the Records of the Bengal Government, Railway Department; Papers from 1896 to 1905 Regarding Insufficient Waterways on the Tirhoot State Railways [Selections (Railways)]*, p. 64.

Floods in 'Protected' Areas

Apart from increasing the flood levels, embankments, even as a temporary expedient, were hardly a sufficiently effective protection against floods as it was impossible to avoid breaches in earthen embankments. The destructive effects of a concentrated discharge through breaches in embankments was more serious than gradual inundation, especially as the flood level of the river, relative to the land, gradually rose as a result of embankments. The sudden rush of flood water coming out of the breaches completely destroyed the standing crops and swept away the houses.

For example, in the floods in Gandak in August 1903, the breaches caused in the main Gandak embankment near the Parsa thana "entirely destroyed 12,114 bighas of *bhadoi* and 5,500 bighas of *dhan* and damaged 1,112 houses".[10]

Apart from the areas near the breached embankment, other areas which suffered badly from floods were the *diara* lands and lands lying between the outer and the main embankments. In the floods of August 1903 in the Gandak, in the Barauli thana of Gopalganj sub-division, "much greater damage has [had] been done by the floods between the *churki* or outer bund and the main bund ... and this protected area is [was] not

[10] File No. 4 F/5 of 1903, Public Works Department, Irrigation Branch [PWD(I)], Bengal, January 1904, p. 2.

commonly subjected to floods".[11] Apart from the damage to crops and houses, "the flood has [had] also carried away the stores of grains in the houses, as there was **no time to save them**".[12] The worst affected was the unprotected *diara* "lying between the Gandak and the bund .... The whole of this strip was flooded and the entire population with their cattle had to take refuge on the bund or inside it".[13] It is another matter that the people in these *diara* lands were accustomed to floods and had adjusted their agriculture to floods. But after the construction of embankments, these lands experienced floods of greater intensity, duration and depth because all the flood water of the rivers was confined within the limited area between the embankments. This sometimes delayed the sowing of, or even destroyed, the rabi crops, for them the most valuable crops.

One very unique feature of the colonial intervention in flood control during the 19th century was a lack of coordination between districts. Although the rivers flowed through more than one district, the action taken to control floods was taken at the district level. For example, embankments erected along the river in one district caused greater floods in the unprotected parts of other district. A case in point is the inundation

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[11] *Ibid.*, p. 1.

[12] *Ibid.*, (emphasis mine).

[13] *Ibid.*

in the Darbhanga district in September, 1879. The Bazitpur embankment on the left bank of the Ganges was "completely outflanked by the inundation waters which entered through the breaches in the old embankment, in the Monghyr district, also by overtopping the small bunds on the left bank of the Byah river".[14] These inundations 'damaged, and in some places entirely destroyed, the crops over 20 to 25 square miles of country in [Darbhanga] district alone...".[15]

Throughout the 19th century, the engineers of the Public Works Department repaired, strengthened and tried to find a better alignment for the embankments in order to make them safe from any kind of damage from floods. A very simple and readymade expedient for any damage to embankments was either to strengthen them and increase their height or to construct a retired line (of embankment) around the parts of the embankment which were breached or overtopped in the previous flood season. In a letter to the Secretary, Government of Bengal, the Commissioner of Patna Division, while reporting the floods of August, 1903 in Muzaffarpur, Saran, and Champaran, writes that "most of the damage would have been avoided if the Gandak embankments had been strong enough to withstand the sudden and great rise in the river. The collectors

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[14] Inglis, *op.cit.*, p. 350.

[15] *Ibid.*, p. 351.

point[ed] out that the embankments need[ed] to be strengthened and raised in places".[16]

Raising the height of the embankment, reported W.A. Inglis, necessarily led to the "raising of the beds of the river embanked, and thus in compelling the heightening of the embankments until a point is [was] reached when all life within the protected area lies in imminent danger of complete annihilation".[17]

The engineers' dependence on embankment, was so complete that as late as in 1924, when in the month of September breaches occurred in the Champaran embankment due to the encroachment of the river Gandak on its left bank, the only solution they could think of was to repair and remodel an old factory bund, called the Raj bund, which was situated between the breached embankment and the villages of Barharwa and Malahi. Even this embankment was washed away and all "other efforts to protect the river bank by means of spurs and pilling"[18] met with failure in the face of a natural action of the river.

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[16] File No. 4 F/5 of 1903, PWD(I), Bengal of 1904, p. 2.

[17] Inglis, *op.cit.*, p. 376.

[18] Proceedings, PWD(I) for September 1929, Bihar and Orissa, pp. 7-8.

Embankments and Irrigation

Apart from the fact that embankments were not even good enough as a temporary solution to floods and created more complex problems, there were other evil effects. One was the shutting out of the fertilizing silt along with the water which could be used for irrigation.

One prominent case was the Gandak embankment which extended along the whole length of the river in the Saran district. The complete shutting out of the Gandak water had its disadvantages. Formerly, the various streams and water courses which intersected the district received each year a large volume of rich silt laden water which after depositing its silt content ultimately flowed out into the Ganges. P.C. Ghosh in 1942 writes that "this no longer happens and in the year of drought, irrigation is no longer feasible from these sources and the banks of some of the streams have become so unhealthy that no one will live near them".[19]

In fact, it was to remedy this state of affairs that Saran canals were constructed[20] between 1877 and 1880. But after 1890, the canals were opened very irregularly. By the 1830s, the canals were not working at all and were "altogether completely abandoned due to the river receding far away".[21]

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[19] Ghosh, *op.cit.*, p. 15.

[20] A detailed account of the Saran canals has already been given in chapter 2.

[21] Ghosh, p. 16.

One of the reasons for North Bihar being the most populated and productive region in India was the annual depositing of fertilizing silt brought with the river spill. To cut off this spill by means of embankments was to deprive the lands of a natural manure. As with other evil effects of embankments, even the decline in the productivity of the soil would have taken years to manifest.

Embankments and Drainage

Another evil aspect of the embankments was their role in destroying the drainage system of the region. Most of the drainage channels and distributaries of the rivers of North Bihar flowed away from, rather than towards the rivers. There was a complex network of small rivers, drainage channels and *chaurs* distributing the flood spill of the rivers into the countryside, and, finally, relieving the flood water into the major rivers again. Thus, apart from relieving the rivers of its silt load, the drainage channel also helped, by bringing with them small fishes, in destroying the mosquito larvae in its early stages of development, thus, keeping the country healthy.[22]

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[22] A detailed description of the fish culture of Bengal and its role in mitigating malaria is given in chapter 1.

Human interference in the form of embankments contributed in destroying this natural process. A case in point is the closing of the sluice gates of the Saran canals (as has been mentioned earlier). The stoppage of flood water and silt was causing drought like conditions in Saran in 1927. There were demands from the people "to construct sluice gates in the Gandak embankment to let in the Gandak waters for irrigation .... In fact, there were only 32 sluices in the total length of 95 miles of the Saran embankment".[23]

Another case in point is the Baya nadi in Muzaffarpur district which was formerly a spill channel of the river Gandak. When the marginal embankment was constructed along the left bank of the Gandak, a gap was left in the embankment for the Baya "but owing to certain complaints of damage done by the flood of the Gandak, the gap was closed in 1894 and a sluice of 5 vents of (5x4') was constructed there".[24] In 1909, the Collector of Muzaffarpur complained that "the Baya channel has [had] deteriorated owing to the construction of the Baya sluice ....".[25] The series of *chaurs*, situated on the left bank of the Baya, which used to be drained into it and rendered partially fit for cultivation "were no longer effectively

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[23] File No. XVIII CI/1929, PWD(I), Bihar and Orissa, 1929, p.

[24] Ghosh, p. 61.

[25] *Ibid.*, p. 62.

drained and thereby a very large tract of land was thrown out of cultivation".[26]

The irrigation department was not willing to open the Baya nullah sluice and re-excavate the channel as "the government would derive no direct benefit and is under no obligation to keep open these channels ...".[27] But, as one of the contractors for maintaining the Gandak *'taccavi'* embankment the government was responsible for restoring some of the useful river spill that were cut off when the embankment was constructed.

By obstructing and destroying the natural drainage of the country, the embankments delayed the subsidence of the flood. Due to the silting up of the Mehura *nadi* and three other spill channels, viz., Kathhar, Kushihari, and Bijhari, in Saran district, due to the existence of the Saran embankments, "Hardia *chaur* is [was] not drained even upto January and consequently *rabi* crops cannot [could not] be grown over a large tract of the area".[28]

Thus, embanking of the rivers did not allow the draining of the flood water into the spill channels, consequently leading to serious deterioration in their condition and in many cases rendering them even incapable of draining the countryside. Many of these streams, which were originally

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[26] *Ibid.*

[27] File No. VC/1929, PWD(I), Bihar and Orissa, p.

[28] Ghosh, p. 13.

intended by 'nature' to spill over the land they traversed, and keep it in health and plenty by supplying rich silt of the rivers, were converted into stagnant pools of water, providing excellent breeding ground for mosquitoes.

In fact, from the beginning of the 20th century, an opinion was being put forward, even among a section of the engineering class, about the advantages of reactivating and improving the spill channels as a means of mitigating the effect of floods. Of the four methods put forward by Huntingford, Superintending Engineer, in the meeting of the Drainage Survey Joint Committee on 16th Dec, 1916, for dealing with the flood water, the fourth method, i.e., 'tracing out and improving the spill channels', was considered to be the only feasible method because:[29]

> while it will not interfere with the formation of the country in that it will not prevent the spilling of the rivers in high flood, will still dispose off this flood water before it has time to submerge large areas for a considerable time and so destroy crops, also the spilling will be gradual and there will be no danger of the water being held up and then, owing to the breaching of some bund or other, being poured over the countryside in a devastating flood'.

But, apart from the role of the embankments, the practice of bunding the *nalas* for irrigation purposes and putting fishing nets[30] by

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[29] File No. II I-2 of 1917, PWD(I), Bihar and Orissa, p. 25.

[30] "... cross bunds and fishing barriers are placed almost every mile for fishing purposes and this has completely destroyed the entire Baya *nala* as a drainage channel", Ghosh, p. 68.

the people were also responsible for the deterioration of the spill channels and *nalas*. For example, extensive irrigation was practiced during the *Hathia* and *rabi* season by putting temporary cross-bunds in the Jhanjharpur Balan and Phulparas Balan and their tributaries, viz., the Sugarvey, the Soni, etc. in the Darbhanga district. P.C. Ghosh argued that "these cross-bunds should be properly removed before the commencement of the flood season as otherwise change of river courses may take place with disastrous consequences to the local area".[31] But, as has already been discussed in the first chapter, the earlier practice was to remove these bunds before the next flood season.

Chaurs and Drainage

The *chaurs* received all the drainage of the country and were receptacles of the overflow of the rivers. They were interconnected by several drainage channels and finally drained into the rivers by the end of October allowing for *rabi* cultivation in and around the *chaurs*.

As has been shown above, the whole drainage network of North Bihar was tampered with and destroyed by the construction of embankments, roads and railways: the *chaurs* being most affected.

One of the reasons why water remained in some *chaurs* for most part of the year and could not be drained was the silting of the drainage

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[31] Ghosh, p. 90.

channels originating from these *chaurs*. For example, an area of one square mile comprising of Narkatia, Siswania and Bhaluahi *chaurs* in Adapur thana was subjected to overflooding of the Dudhara left bank spill and an area of one-third square mile remained waterlogged even in the month of January as its drainage channel, the Siswania nala, was badly silted up.[32]

Another reason for the waterlogging of large areas for a very long time was the embankments which, although stopped the overflow from the rivers, did not allow any drainage into the rivers. The rain water drained into the *chaurs* and remained there for a long time. For example, the Lebura *chaur*, about one square miles in spread in Lalgunj thana in Muzaffarpur district, was inundated by rain water only and remained water-logged due to deterioration of its drainage channel and due to existence of the Lebura bandh. The area on the south of the Lebura bandh "remains(ed) under stagnation due to erection of a bandh across the Jogia nala at village Khazan Chak and due to absence of any sluiced culvert in the Gandak embankment".[33]

Another case of an embankment obstructing the drainage of the *chaurs* was the Dumardah *chaur* in Dalsingsarai thana in Darbhanga district. This *chaur* was mostly in the north and partly in the south of the

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[32] *Ibid.*, p. 143.

[33] *Ibid.*, p. 158.

railway line between Bazeedpur and Mohiuddinnagar railway stations. It was mainly filled with rain water. At the time of the construction of the railway embankment, a channel called Khanua *baha* was constructed for the drainage of the area. This channel passed through culvert number 4 in the railway line and ended in the Bazeedpur embankment where there was no outlet. The obstruction caused to this channel led to waterlogging of around 4 sq. miles with an average depth of 4 feet even in the cold weather. "The whole area in the north of the railway embankment remain(ed) stagnated throughout the year except in summer and hence no crops can [could] be grown in it".[34]

Apart from the flood embankments, the railway and road embankments also, as has been mentioned earlier, obstructed the drainage of the country, and hence delayed the subsidence of the water level in the *chaurs*. For example, the flood water of Gogra and Gandak collected in the Hardia *chaur* in Dighwara and Sonepur thanas in Saran district gradually herded up against the northern side of the railway embankment, and thus an area of around 50 sq. miles remained waterlogged. This railway embankment sometimes got breached or was cut by the local people.[35]

One of the consequences of the waterlogging of these *chaurs* even after October-November was the delaying in the sowing of the *rabi* crops -

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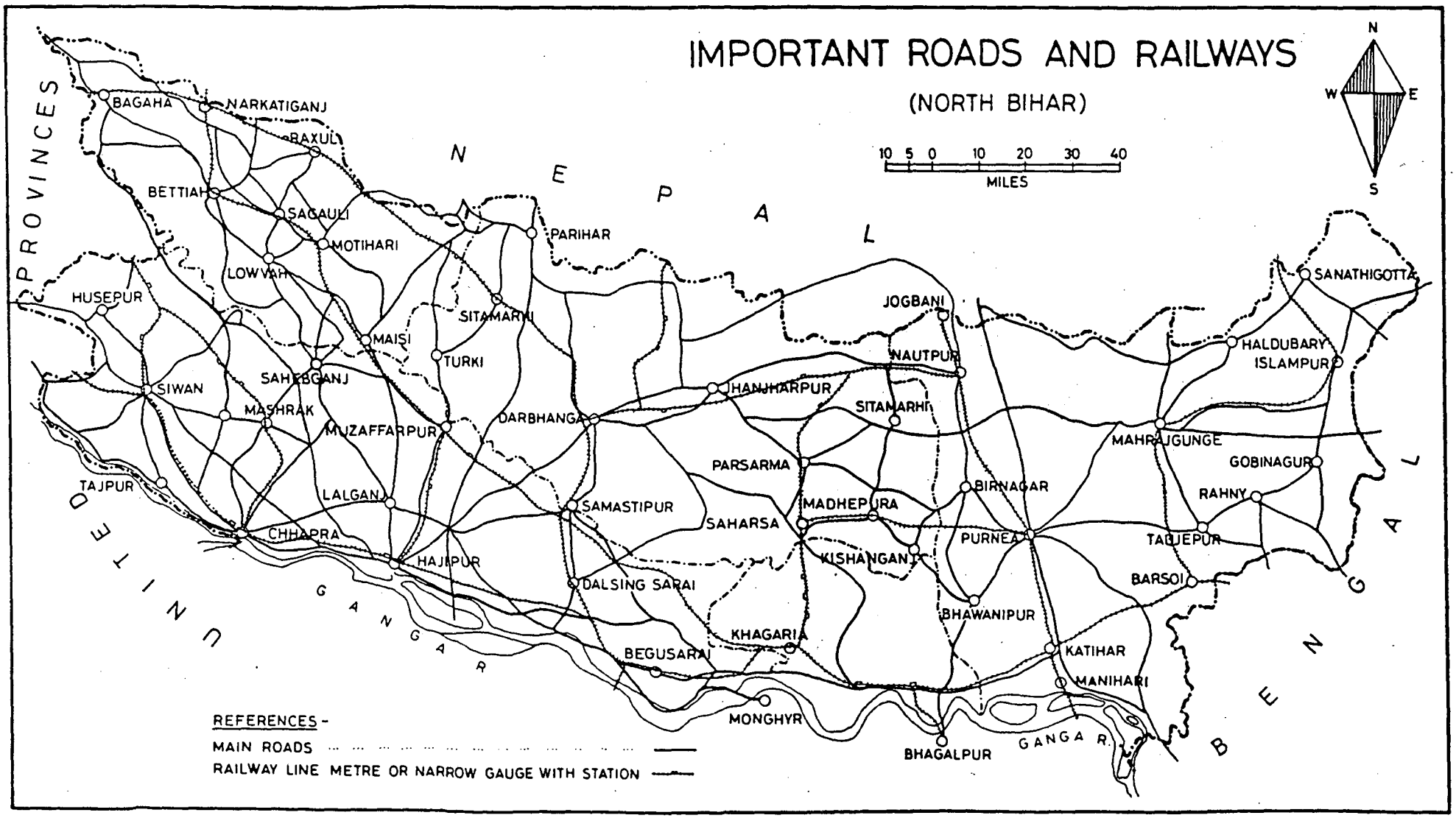
[34] *Ibid.*, p. 162.

[35] Ibid., p. 142.

MAP NO. 5


IMPORTANT ROADS AND RAILWAYS
(NORTH BIHAR)
10 5 0 10 20 30 40
MILES
N
W
E
S
PROVINCES
N E P A L
BAGAHA
NARKATIGANJ
RAXUL
BETTIAH
SAGAULI
MOTIHARI
PARIHAR
LOWVAH
HUSEPUR
SITAMARHI
MAISI
TURKI
SAHEBGANJ
SIWAN
MASHRAK
MUZAFFARPUR
DARBHANGA
JOGBANI
NAUTPUR
HANJHARPUR
SITAMARHI
SANATHIGOTTA
HALDUBARY
ISLAMPUR
MAHRAJGUNGE
GOBINAGUR
RAHNY
TAJPUR
LALGAN
SAMASTIPUR
PARSARMA
SAHARSA
MADHEPURA
BIRNAGAR
CHHAPRA
HAJIPUR
DALSING SARAI
KISHANGANJ
PURNEA
TAJPUR
BARSOI
BHAWANIPUR
KHAGARIA
BEGUSARAI
KATIHAR
MANIHARI
MONGHYR
BHAGALPUR
GANGA R.
GANGA R.
B E N G A L
REFERENCES -
MAIN ROADS
RAILWAY LINE METRE OR NARROW GAUGE WITH STATION

in some cases it could not be sowed at all. This was a big loss to the cultivators because the *chaurs* grew very valuable *rabi* crops.

Railways and Roads and Flood Problem

In the last quarter of the 19th century, there was a large scale construction of railways and roads. It was in this period that the Irrigation Department was trying to control and regularise the construction of any new embankments, and repairs of old ones, which were the worst offenders in obstructing the drainage of the country.

In North Bihar, "Railways and roads with inadequate waterways may be considered as bandhs".[36] The way they were built - without a proper survey of the region through which they crossed, and not taking into account the local opinion - created a lot of problems for the already grave flood situation (see Map No. 5). As we will see in this section, they were the worst offenders in obstructing the drainage of the country.

The alignment of most of these railways and roads "was across the drainage of the country".[37] The obstruction to the "free flow off of floods and spill along the natural drainage line",[38] even if provided with adequate waterways, could not "fail to aggravate the annual floods, and is

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[36] *Ibid.*, p. ii.

[37] *Selections (Railways), op.cit.*, p. 1.

[38] *Ibid.*, p. 11.

therefore likely to do more harm than good".[39] This impounding of water necessarily ensued serious damage to health, agriculture and property.

The most important reason as to why the railways and roads made floods a menace was the inadequate and insufficient waterways provided in them to allow the escape of flood water. The legitimate demand of *raiyats* and planters for providing more waterways was stonewalled against an inept and insensitive class of bureaucrats and engineers for whom following the regimented rules of the technical manuals was more important than to protect the interests of the local people. The administration constantly mentioned that, "... from a purely engineering point of view, and for the safety of the line, it is best to concentrate the discharge of the whole area drained into as few channels as practicable...".[40] The idea was to "avoid minor openings which in floods might at any time assist a bias on the part of the river to change its course, and by being enlarged might do very great injury to the line".[41]

But, by looking at this matter in a purely technical manner, the due considerations of the vested rights of the owners of the property situated on the upper side of the line of embankment and also in its vicinity, in which for long lengths there were no waterways, was overlooked. The

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[39] *Ibid.*, p. 13.

[40] *Ibid.*, p. 10.

[41] *Ibid.*, p. 16.

landholders and inhabitant in these tracts had "prescriptive rights on the land under the condition which had existed for ages",[42] and by cutting off the flood spill from the direction of their natural flow, the Railways and District Boards for their own pecuniary and technical interests, brought in a complete change in the condition of their lands. The results were detrimental to property, agricultural interests and sanitation.

For example, the villages Chotaipatti, Chhatwan, Gokhul, Loma, Belhi, etc. situated on the right bank of the river Jiwachh in thana Darbhanga, were very badly affected by excessive floodings because of "the existence of Tarsarai-Rayam embanked trolley line with insufficient waterways. The existing waterways are [were] very small and practically choked up".[43]

The District Boards were no less responsible for damming up of the river spill. For example, the District Board road No. 11 below Angarghat in Darbhanga district was highly embanked and not provided with any waterway although there were two big bridges in the railway line opposite to this portion of the road. The embanked portion of the road, called the Dakaha *baha bandh*, obstructed a lot of flood spill of the Burhi Gandak which had a tendency to flow towards the west. Flood congestion in the area above the junction with the Bagmati and the Burhi Gandak could

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[42] *Ibid.*, p. 17.

[43] Ghosh, p. 87.

have been "greatly relieved by providing a sluiced culvert of suitable size provided with shutters ...".[44]

In fact, there were instances where the Railways had to pay compensation to those *raiyats* whose lands were damaged by Railway embankments. Compensation had to be paid by the Bengal and North-Western Railway Company "to certain *raiyats* of the Saran district for damage to the crops caused by the construction of an embankment across the Banwari Chuck valley in 1886, which had resulted in loss for growing crops drowned by blocked inundation".[45] The compensation was originally estimated as Rs. 60,000, but later compromised at Rs. 10,000 for distribution to the *raiyats* concerned. Going by the large size of the compensation, one can surmise the great extent of damage to lands.

But, in most cases, the Railways denied the role of embankments in damage caused to lands from floods by contending that the railway embankment obstructed the spill on both sides, thus, not making any overall difference to the flood situation of the area. For example, in response to a council question asked by Babu Lachmi Prasad Sinha at the Meeting of the Bihar and Orissa legislative Council on the 28th November, 1915, "regarding the obstruction of the overflow of water from the left bank

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[44] *Ibid.*, p.81.

[45] *Report of the Administration of Bengal*, Calcutta, 1895-96, pp. 224-25.

of the Gandak river into the Bagmati river, etc., by the construction of the Khagaria Rosera line of the Bengal and North-Western Railway",[46] the Railways contended that the floods could not be attributed to the railway embankments. The Agent of the B&NW Railway argued:[47]

> The Khagaria-Rosera line runs about midway between the Bur-Gandak (sic) River and the various old beds of the Bagmatti (sic) river and therefore if the railway be said to obstruct the overflow of the Bur-Gandak it equally obstructs the overflow from the old Bagmatti. The District Board Road, however, runs between the Bur-Gandak and the railway and it is only when the Bur-Gandak spill tops this road or when the road is breached that any considerable body of water can reach the railway.

Here, the Railways did not mention the fact whether the headings up of the spill waters of Burhi-Gandak by the railway embankment was causing higher floods, than what was earlier caused by the spill of the old Bagmati and Burhi-Gandak together.

In another case, while denying the concerns of some people about the possibility of greater floods which would have occurred by the proposed railway embankment in Khagaria-Katihar line, the Agent of the B & N W Railway argued, on 3rd September, 1895:[48]

> In high floods, the whole country between the Kosi and the Karagola road is under water which is dammed back by the floods of the Ganges, and no greater amount of afflux can be

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[46] File No. XIII-C/8 of January 1915, PWD(I), Bihar and Orissa.

[47] *Ibid.*

[48] *Selections (Railways)*, p. 24.

> caused by the railway bank. On the contrary, the railway bank by shutting out the Ganges floods is likely to tend to reduce the flood level of the country north of the railway.

But the Purnea District Engineer who had more than twenty years of experience of the district, believed that "the Railway bank will **more than take the place of Ganges inundation**, as it must raise the Kosi spill flood level much higher....".[49]

Flood problem also became acute in lands lying between road and railway banks, where, once the water entered, it remained hedged in and delayed the subsidence of floods. While describing the floods in Monghyr district in August 1904, the Collector maintained that the tract that had suffered the most was that between the B & NW Railway line and the Tirhut road, "the water having topped and breached the road in its progress northwards, being stopped by the railway embankment, turned eastwards, and between the road and the railway, which are not far apart, a considerable current set in ...".[50] It was very clear that the railway embankment was responsible for the floods; "it rendered absolute the partial evil caused by the road".[51] The reason for higher floods was because of existence of no waterways in both the bunds.

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[49] *Ibid.*, p. 2 (emphasis mine).

[50] *Ibid.*, p. 58.

[51] *Ibid.*, p. 64.

Both, the Railways and District Boards, tried to avoid the responsibility of constructing bridges and culverts, first, because of huge expenses required, and second, on safety grounds. In fact, there were cases where existing bridges on roads and railways, were filled up to safeguard the bridges against breaching and scouring.

For example, the Tirhut road was, when constructed, provided with bridges to pass the water carried by the various spill channels of the Ganges which it crossed. The waterways provided was, however, insufficient, and "the excessive scour which occurred through the bridges endangered their safety, and consequently the Government in 1888 sanctioned the blocking up of all the bridges".[52] Since then the road formed an obstruction, lying right across the line of the direction of the spill.

It was rather ironical that most of these railways and roads were constructed on the recommendation of the successive famine commissions as measures to protect the areas, through which they passed, from famine. Thus, the Famine Commission of 1880 believed:[53]

> ... it is to the future of the extension of railways that we look as the most complete justification of our belief that the trade of the country may be confidently left to provide for the supply of food in times of scarcity.

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[52] *Ibid.*, p. 62.

[53] *Report of the Indian Famine Commission*, 1880, p. 67.

Politics of Flood Control

As has been mentioned earlier, it no doubt takes years before the evil effects of embankments are actually felt. This very fact made them rather risky expedient as "**vested interests were created** which stood in the way of any bold solution being adopted later on".[54]

Embankments, to begin with, were first constructed by European planters, indigo cultivators and zamindars, especially the first two as indigo was particularly prone to damage by excessive flooding of the land. For example, the Turki Embankment on the right bank of the Bagmati river in Muzaffarpur district was "first constructed in 1810 by the Manager of the Kanti Indigo Factory to safeguard the indigo cultivation of that concern and for more than half a century it continued to be maintained by the factory".[55] In 1875, it was taken over by the Government under the Embankment Act under *Takavi* system, i.e., the cost of its maintenance was recovered from the persons benefitted.

Similarly, a series of embankments along the Gogra and some large streams in Saran district were erected and maintained by the Manjhi Raja, "who kept up these embankments at his own expense".[56] But after the breaking up of this family, these embankments went into disrepair. In

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[54] Mazumdar, *op.cit.*, p. 19 (emphasis mine).

[55] Ghosh, *op.cit.*, p. 47.

[56] Inglis, *op.cit.*, p. 374.

this case the government did not take up any work but allowed the zamindars to repair these embankments if they liked.

Similar is the case with the Gandak or Tirhut Embankment on the northern bank of the Gandak river. "Attention appears to have first drawn to the unprotected state of the southern portion of the district (Muzaffarpur) by the flood of the Gandak in 1801, when the East India Company's saltpetre factory at Singhia near Lalganj was nearly swept away".[57] Accordingly, an embankment was constructed extending from the conference of the river Baya to Harauli, six miles from Hajipur. From then on various repairs and changes in designs were made, when in 1874, "advantage was taken of famine relief operations to remodel, repair and raise it"[58] and the embankment was extended upto Hajipur, a total length of fifty two miles.

Likewise, there were many more private marginal embankments which were indiscriminately constructed along the rivers throughout the 19th century. It was only from the last quarter of the 19th century that efforts were made by the government to regularise the construction of embankments, and take over some private ones to maintain them in proper state, through the passing of various acts. The most prominent of these

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[57] *Muzaffarpur DG*, p. 69.

[58] Inglis, p. 360.

acts was section 76(b) of the Embankment Act II of 1882 through which the government tried to bring the private embankments within its control.

But these acts remained on paper and the Government did nothing to implement it. This is very evident from the fact that the Government notification of July 1891 extending section 76(b) to the tract along the Burhi-Gandak river "had remained a dead letter from the outset and that in spite of the prohibition private embankments had continued year after year to grow up within the prescribed area without question even as long as in 1915".[59]

On the other hand, the Commissioner of Patna Division, Mr Maude, felt that "as long as the Railways and District Boards are, as they inevitably must be, the worst offenders in damming up the natural drainage of the country it was impracticable for the Government to step in and lay down that no one shall make private bunds".[60]

It has to be accepted that private embankments were also doing great harm to the drainage of the country. But the people living in the protected areas had become so used to the embankments that any effort by the Government to withdraw it was fiercely opposed by the people. For example, the Maliks of Majhaul in North Monghyr district, along with their servants were constructing a *retired line* (a retired line was an

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[59] File No. II I-2 of 1917, PWD(I), Bihar and Orissa, p. 31.

[60] *Ibid.*, p. 30.

embankment constructed just behind the main embankment in portions where the latter had breached or was weak) in 1917, in an area which was declared under Section 76(b) of Embankment Act II of 1882, "by raising subscription from the tenant, of villages Barnarpur, Mirzapur, Musurar and Sirsi, without obtaining any permission".[61] In reply to the show cause notice served to them, the maliks contended:[62]

> ... they have not constructed any new bandhs but merely repaired an existing bandh, which under the ruling in the case of Gobardhan Sinha versus the Queen Empress, has been held not punishable even though the repairs take the form of adding to the height of the existing embankment.

This case was later dropped on the advice of the District Engineer of Monghyr, who argued that "the removal of the embankment in question would cause serious damage to a thickly populated and highly cultivated area".[63]

The pressure on the Government by the vested interest groups in the protected area had become so strong that any demand for construction of new embankments was summarily rejected. For example, the memorandum submitted by one Chaya Ram Mahta and others to the

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[61] B. Proceedings of PWD(I), Bihar and Orissa for August 1917, p.7.

[62] *Ibid.*, p. 8.

[63] The decision of the High Court in the above mentioned case was later overruled by the decision of the full bench of the High Court in the case of one Ayodhya Nath Koila. *Ibid.*, p. 8.

Government in 1929, to construct a pucca embankment in a place where an earthen bandh existed some years back, was refused on grounds that "it will interfere with many temporary bandhs above and below, which are erected by the permission of the sub-divisional officer of the Sitamarhi sub-division".[64] Obviously, the Britishers did not want to disturb the existing interest groups of that area. Similarly, another petition in January 1907 for the construction of an embankment by "the residents of the villages of Repura, Shampur, Bhoja, Bishundatpur and certain other villages of Muzaffarpur ... for the protection of their crops and houses from floods"[65] was rejected.

Another supposedly 'bold step' towards controlling floods in a 'scientific' manner by constructing bandhs at a considerable distance from the river bed to enable the flood to be contained safely, was met with opposition from the people. P.C. Ghosh writes:[66]

> There have been many marginal bandhs in North Bihar but they have been badly designed. People naturally do not like to be left between the bandhs and the river and in deference to local inhabitants marginal bandhs have always been constructed as close as possible to the river be (the Tiljuga case is a good example). The result is choking up of the channel, raising of the bed, bursting of the bandh and general havoc.

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[64] File No. X B-6/1929, PWD(I), Bihar and Orissa, p. 5.

[65] File No. II I-2 of 1917, Bihar and Orissa, p.

[66] Ghosh, P. ii (Introduction),

It is another matter that if the embankments had been constructed at a considerable distance from the river a larger area would have come between the river and the bandh, and consequently would have turned swampy and marshy, and thus unfit for cultivation. It would, no doubt, have been safer than other existing bandhs but sooner or later the same problems would have occurred.

It is very clear from the above account that many vested interests had been created within the protected tracts and the Government had to bow to the pressures of these interest groups. But even among them, it was the European planters whose opinions and interests were most valued and respected by the Government. For example, the Turki embankment, which was constructed by the Kanti Indigo Factory, was taken over by the Government, even though there was a difference of opinion regarding the retaining of this embankment at all. The history of this embankment shows that in 1833, 1852, 1860, 1861, 1868 and 1870, the *bund* broke at the village of Turki, and that the repairs were invariably opposed by the Raja of Turki, but in each case the Magistrate or the Commissioner directed that the *bund* should be repaired in deference to the opinions and interests of the proprietors of the Bikanpur and Kanti factories. The Executive Engineer, Gandak circle, and the Superintending Engineer also supported the requests of proprietors of these factories on grounds that "it

(the embankment) had been in existence so long that it would be better to retain it"[67] and carry out the repairs.

Conclusion

If anything can be said with conviction about the colonial experiments in flood control, it is that though the experiments could not stop the floods in North Bihar, at least they were successful in changing the very nature of floods. The various measures adopted by the colonial state made the floods more 'destructive' and 'devastating' because of its (a) sudden invasion of the countryside, (b) excessive depth and duration of inundation, and (c) difficulty in draining of the flood water. The evil effects of floods far outweighed the benefits it conferred upon the land. This was not the case with the pre-colonial times when inundation by the spill of the river was gradual and floods subsided quickly, doing more good than harm.

On the earliest correspondences of the British officers, adjectives such as 'devastating', 'destructive' and 'dangerous' were used to describe floods. But when we look at the agricultural practices and life styles of the inhabitants of North Bihar, it can be said with a fair degree of certainty that they hardly shared the British perception of floods, at least in the 18th and early 19th centuries.

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[67] Inglis, p. 370.

Initially, being accustomed to annual floods, the people of North Bihar used to build their houses on earthen mounds and had adjusted their agricultural practices to suit the flood condition,[68] instead of trying to control floods artificially to suit agriculture which, as the experience of the colonial experiments showed, was a wrong way of dealing with the matter and converted a natural blessing into a calamity. The floods from 1850 onwards were far from being a 'natural calamity' (if at all floods in pre-colonial times is to be characterised as a calamity); it was a man made calamity.

Most of the problems related to floods in North Bihar in the 19th and 20th centuries were due to the "villagers living as in a protected tract, and cultivating the land as it were properly protected".[69] More than a hundred years of staying within a supposedly 'protected' tract, had changed the very attitude and practices of the local inhabitants of North Bihar towards floods. The indigenous population had become so 'bandh minded' that after the Bihar earthquake of 1934, several parties of 'misguided' Congress workers endeavouring to be helpful, "invaded North Bihar and proceeded to construct bandhs across innumerable waterways completely blocking many roads and railway culverts and drainage channels",[70] when

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[68] A detailed description of the indigenous agriculture in pre-colonial times is shown in chapter 1.

[69] *Selections (Railways), op.cit.*, p. 66.

[70] Ghosh, p. i (Foreword).

what was needed at that time was draining of the sub-soil water which had partially inundated considerable areas.

An important feature of the colonial intervention in flood control was the lack of a coordinated effort between different districts, and departments of the Government. The question of floods and bandhs in North Bihar had been a matter of concern to local officers from the very beginning of colonial rule. But every problem had been tackled as "an individual case of purely local interests, districts acting without consulting or informing each other or even in competition with each other".[71] Hundreds of local investigations were made and reports written by District Officers, filed in local offices and forgotten. Along with this, the frequent transfer of officers and want of a definite policy, did not allow any continuity in the flood policy. What was needed was a comprehensive and broad view of the flood problem of North Bihar, and to act without a parochial bias. The first positive step towards this direction was the formation of Joint Embankment Committee of different districts in the 1920s, to discuss the role of embankments. Another positive step was the formation of a permanent Tirhut Waterways Division in 1941.

To conclude, I would quote Mr G.F. Hall, Chief Engineer and Secretary to the Government, Public Works Department in 1941 - "I strongly deprecate the expression 'devastating floods' which has become the

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[71] *Ibid.*, p. i (Introduction).

common phrase for expressing floods causing temporary inconvenience. North Bihar floods are as inevitable as they are essential. Taking the broad view, they are definitely beneficial."[72]

[72] *Ibid.*, p. ii (Foreword).

CONCLUSION

In the first chapter, it has been shown that the river spilled during the monsoon to 'conserve' itself in a deltaic region. Although North Bihar was a flat country, water drained off without any problem through an intricate network of rivers, drainage channels and *chaurs*.

It also becomes evident that floods in pre-colonial North Bihar, instead of being seen as a menace, were an important input for agricultural production - it helped in irrigation, brought fertilizing silt, and helped in combating malaria. The nature of floods was such that inundation was not for long durations or of great height, at least in years of normal rainfall and water drained off from the lands quickly to low lying areas.

Apart from 'overflow irrigation' from rivers, irrigation was also practised by means of bunding the rivers in the northern parts of North Bihar, and by means of wells in some other parts. There was a certain degree of ad-hocism involved in these irrigation technologies as the earthen bunds had to be built every year. But these technologies were culturally so entrenched and their management practices fine tuned, through the ages, to the needs of agriculture that there were no problems associated with their working, at least till the beginning of British rule. In fact, it was the change in the system of rents in kind to that in cash that was responsible for the deterioration of these small irrigation works.

In chapter 1, some of the general features of flood based agriculture practised in pre-colonial North Bihar has also been discussed. This goes on to strengthen the contention that the peasants had adjusted, and developed through the ages, the agriculture in the region to obtain the maximum benefit from floods which were inevitable in North Bihar. No attempt was made to alter the natural actions of the rivers or control the floods.

In Chapter 2, certain important findings on canal irrigation comes out very clearly. First, the construction and planning of the canal projects was not perfect. For example, the alignment of the Tribeni canal was right across the drainage line of the region, and thus proved to be a constant source of danger to the safety of the canal works. It was also observed in 1907 that the river Gandak deserted the site of the head regulator, which was approaching completion. These costly mistakes could have been avoided if proper survey of the previous condition of the river, and the region through which the canal crossed, had been conducted. The technological superiority which the Britishers claimed was not so superior, especially in canal construction.

Second, there were some major problems associated with the working of the Tribeni canals. The faulty alignment of, and the inadequate and insufficient waterways provided on, the Tribeni canals gave rise to abnormal and unprecedented floods in the nearby lands turning them

uncultivable. Floods also damaged canal works, which required huge expenditure on upkeep.

It was not by chance at all, but by the logic of 'benevolent tyranny', that British engineers built these irrigation projects. The colonial state was very keen to take up the controls of the most important input of agriculture, viz., irrigation. This is evident from the case of Teur and Dhaka canals, where earlier there existed a network of irrigation pynes. This keenness was also because of the profitability of selling water. The colonial state, through the passing of various Irrigation Acts, became the sole authority to control and provide the means of irrigation. It was also seen that in northern Champaran the state not only built canals, but in the process destroyed all other means of irrigation, existing since ages, which could have competed with Canal water.

While introducing irrigation works, it was not the interest of the peasants which was supposed to be fulfilled. The Colonial State had other more important reasons. First, only those projects were sanctioned which could be financially remunerative. This aspect of colonial policy is evident in the case of Saran canals which was closed because it did not prove financially successful. Second, canals gave direct protection to the area, by avoidance of the loss of revenue remitted, and the outlay incurred in the costly measure of famine relief. Third, apart from giving certainty to all agricultural operations, Irrigation Works could help in increasing the

outturn per acres of crops, and enabling more commercially valuable crops to be grown. Fourth, Irrigation Works were introduced in areas where there was a great scope for extension of cultivation. All these were tuned to give financial security to the colonial state and increase the foodgrain export from India to maintain the balance of payment situation, which was in a precarious state due to de-industrialisation of Indian industries.

The northern part of Champaran district was a great field for development of agriculture - compared to the rest of North Bihar, as in this districtpopulation was sparse and agricultural land was in plenty. The construction of the Tribeni canal and the extension of railways to the area was intended to give a fillip to agricultural development in the area.

The northern parts of Champaran was also prone to famine, especially in the second half of the 19th century. Apart from the reasons cited in British records - failure of rainfall, social composition of the region (more than 50 percent of the population was dependent for their living on labour), over dependence on a single crop - it was the commercialisation of Indian agriculture which was directly responsible for the occurrence of famines.

Some aspects of the working of the system of pynes during the colonial period has been shown in chapter two. Some of the older system of *pynes* were restored by some Government engineers and managers of Indigo concerns and were worked satisfactorily. This shows that it was not

the short supply of water in the rivers or the temporariness of these small and simple structures, but the breaking up of the traditional social and economic ties, which was responsible for the decline in irrigation from *pynes.*

There is absolutely no doubt about the need for means of artificial irrigation in northern Champaran. But in the geographical context of the region small and temporary means of irrigation were best suited. The Tribeni canal not only proved to be costly, both in construction and maintenance, but also interfered with, and destroyed, the drainage of the region.

In chapter three, it has been shown that the colonial attempt to control floods also proved disastrous. The construction of embankments along the rivers to check the spill of the rivers led to the complete destruction of the ideal natural condition under which the rivers acted in a deltaic region, as well as the ideal state of drainage network of the region.

It has been shown that North Bihar witnessed an increase in flood level every year because the silt brought by the rivers, instead of being spread over the adjoining areas, was deposited in the river bed itself. This involved heavy expenditure on the upkeep of the embankments, as they had to be strengthened and raised regularly. But raising the level of embankment or other repairs were only a means of postponing the

inevitable disaster to a future date. Even as a temporary solution, embankments proved to be a failure as it was impossible to predict and avoid the breaches in them caused by higher floods. The floods caused from the concentrated discharge of river water caused greater damage to the life and property of the people.

The other immediate damage caused by embankments was the shutting out of the silt brought by the river floods which earlier fertilized the lands annually. It also destroyed the 'overflow irrigation' from rivers which was earlier practised by the peasants of North Bihar. There was a constant demand to construct *sluice* gates in the embankments to irrigate the lands from river water.

It has also been shown that embankments were responsible in damaging the drainage network of North Bihar. Drainage channels silted up and turned into stagnant pools of water. Large areas, including the *chaurs*, remained waterlogged even till the month of January, thus delaying and, in some cases, denying the sowing of the *rabi* crop. It also might have caused a deterioration in the health and sanitation of this region.

The Railways and Roads were one of the worst offenders in obstructing the drainage of the country. Their alignment, in most cases, was right across the drainage of the country, thus obstructing the free flow of river spill along the natural drainage line. The inadequate and

insufficient waterways provided in these embankments further aggravated the flood situation of North Bihar. This impounding of water caused serious damage to health, agriculture and property.

It has been shown how the nature of floods changed after the colonial intervention - floods came in a sudden rush, there was an increase in the level and duration of the floods, and longer time was taken for water to be drained.

The attempt to control floods was not made in a very planned or coordinated manner. The various agencies of the government (Railway, Districts Boards, Irrigation Department, etc.) and different districts acted locally and without consulting each other. The result of this was a further worsening of the flood problem. The worst victims were, of course, the peasants whose interests were invariably bypassed over the interests of the various agencies of the colonial state, the European planters and some influential zamindars.

Apart from protecting the property of the colonial government, planters and zamindars from floods, there could have been the revenue considerations of the Government which motivated it to control floods. The damage caused to crops from floods, although did not cause famine, as the next crop was invariably a very good one, it must have caused a loss of revenue for the colonial government. A certainty of agricultural production could have been the motivating factor for the Government to

control floods. This aspect of colonial flood policy needs to be properly investigated.

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GLOSSARY

aghani - crops sown in July and cut in the month of *aghan* (or November/ December).

ahar - a reservoir or tank with embankments on three sides, the fourth side left open to let in drainage and rain water. Irrigation was prevalent in South Bihar.

aqueduct - an artificial channel for supplying water, especially one built of stone or brick and higher than the surrounding land.

bandh or *bund* - any artificial embankment, a dam, dyke, or causeway. "The root is both Sanskrit (*bandh*) and Persian, but the common word, used as it is without aspirate, seems to have come from the latter. The word is common in Persia, e.g. Bendameer" (Hobson-Jobson). In North Bihar *bandh* was also used for flood embankment.

bhadoi - crops sown in June/July and cut in the month of *bhado* (August/ September).

chaur - a low lying area where rain water and river spill was deposited every year. Some of them dried up by November/December to allow for *rabi* cultivation.

churki - outer, e.g., as used in *churki* embankment.

dhar - flow of water or a stream trend. In North Bihar it was used to describe the 'dead' rivers or old beds of rivers.

diara or *char* - a sand-bank or island in the current of the river, deposited by the water. "It was new alluvium land deposited by the great rivers as the floods subsided" (Hobson-Jobson).

hathiya	-	according to Hindu asterism the period from 21st October to 3rd November.
nadi	-	a river.
nala	-	a rivulet or drainage channel.
pyne or *pain*	-	an irrigation channel used to draw water from rivers or dams and distribute it to fields.
rabi	-	crops sown in November/December and harvested in *rabi* (spring, i.e., between last week of February to mid-April).
sluice	-	apparatus, contrivance, for regulating the level of water by controlling the flow into or out of a canal, flood embankment, etc.
sota	-	a spring, fountain, brook, current or source.
syphon	-	bent or curved tube, pipe, etc. so arranged (like an inverted U) that water will flow up through it and then down.
weir	-	wall or barrier across a river to control the flow of water.