Chapter I

Introduction
Introduction

The Kangsabati river basin, the largest in the southwestern part of West Bengal, covers an area of about 9,680 km². The river, with its tributaries, drains Puruliya, Bankura and Medinipur districts of the State in addition to the parts ofSinghbhum district of Bihar. Rightly called the main artery of Medinipur, the Kangsabati flows northwest-southeast through the heart of the district while the Rupnarayan forms boundaries between Medinipur and Hugli-Haora districts in the east and the Subarnarekha separates the police stations of Gopiballavpur and Nayagram from the rest of the district in the west. It is because of the key position occupied by the Kangsabati, it may be called the "sorrow of Medinipur", just as the Damodar till recently was called the "sorrow of Bengal". The river Kangsabati is, however, a sorrow, not just because it causes flood almost every year, specially in its lower catchment area, but also because it subscribes substantially to the causation of droughts in its upper reaches disrupting both life and economy in the basin area. Nevertheless, the river basin with its extensive fertile land presents immense possibility for propping up the agricultural economy. The need to control the river and use its water resources optimally can not be overemphasised.

1.1 Area and Location:

The river Kangsabati originates from the southern slope of the Jabardan hills in the Jhalda police station of Puruliya district, flows through parts ofSinghbhum district of Bihar, the undulating terrain of parts of Bankura and almost level lands of Medinipur, meets the Haldi river near Mahisadal and finally falls into the Bay of Bengal through the Bhagirathi-Hugli river. The basin is bounded by 21°55'N and 23°30'N and 86°50'E and 88°30'E longitudes. The river drains a number of blocks in the Puruliya district, a few blocks of Bankura in the middle part and a large number of blocks
of Medinipur district. The administrative map (Fig. 1.1) shows the blocks included within the basin. The basin is covered by topographical sheets numbering 73I, 73J, and 73N of the Survey of India. The detailed number of topographical sheets covering the area is shown in the administrative index map (Fig. 1.2).

To the north of the upper Kangsabati basin lies the Damodar river basin. The Rupnarayan river basin is situated to the north of the lower Kangsabati basin while the Subarnarekha basin covers a wide area to the south and southwest in the parts of Bihar and Orissa.

The basin is approachable by numerous roadways and railways. Two important railway lines are there, one in the upper part through Puruliya and Balarampur and the other in the lower part. In the lower part, there are three branches from Kharagpur towards the south, west, and east. Three national highways run through different parts of the basin. They are NH-32 in the upper part and NH-6 and NH-41 in the lower part. A number of State highways and district roadways connect an important railway town Kharagpur with Calcutta and other important cities of the country. Transport network is much developed in the lower part of the basin compared to the upper part (Fig. 1.3).

1.2 Early History:

The physical as well as economic scene of the Kangsabati basin was different before the implementation of the Kangsabati project. The upper part of the basin was covered with dense jungles. Jungles existed in the extreme south of the district of Puruliya on the Ajodhya range in Baghmundi and the Dalma range in Balarampur. The difficulties in transport have resulted in some jungles being left on those hills. There were some reserve forests like Jaipur, Mudali, Kalimati, Taralal and Barabhum. About one fifth of the Puruliya district was under jungle. In the blocks of Puruliya, there were no natural lakes. Two big bandhs - Sahib bandh and Ranibundh and similar other small bandhs existed all over the area. These bandhs were extremely useful both for irrigation as
well as for supplying drinking water. More than 52 per cent of the area was under cultivation. All the cultivable wastelands consist of upland of very poor quality. The proportion of rice land to upland was 3:2. The aghani crop was by far the most important crop. The rabi crop on rice land and on gora land was of very little importance. Rotation of crop was practised to a limited extent. The favourite method with the cultivator, however, was to let the land remain fallow for a year or two whenever it showed signs of exhaustion. The only manure widely used was cowdung, ashes, decayed leaves etc. Excepting for some bari lands growing vegetables and akh bandhas growing sugarcane, no upland was irrigated. Irrigation from wells and rivers were negligible. There was no system of irrigation by canals on any extensive scale. The usual method of irrigation was by leading the overflow or surplus water through small channels to the field by cutting the embankments of bandhs. In a few bandhs, culverts and sluicegates were provided to regulate the flow of water. Irrigation disputes and disputes about fishery rights were common. Apart from Puruliya town, Jhalda, Balarampur and Manbazar were important centres of trade chiefly owing to their situation in the midst of lac growing areas. Barabazar was also fairly important. Excepting agriculture, the other sources of income include export of fodder, mahul produces and lac. During 1921, there were 63 factories in the district. Lac was extensively grown on Kul, Kusum, Palas, Babla trees. The average agriculturist in this part has not only enough to eat but, if his income from straw, mahul, lac, jungle and livestock were included, the bulk of the cultivators may be said to be comfortably well-off. The main problem in this upper part was how to cure people of their improvident habits and teach them thrift to divert the money wasted on drinks and luxuary for agricultural improvement and excavation of bandhs etc.

In the middle part of the basin in the district of Bankura, the Kansal (river Kangsabati) drains the police stations of Raipur, Ranibandh and parts of Khatra and Simlapal. Its principal tributary is Bhairabbandki, so called on account of its very tortuous course. The cultivators were completely dependent on monsoon rainfall. Among the irrigation facilities, two canals existed— one the Kulai
Khal in Simlapal thana, the other the Palasbari canal in Ambikanagar. The area irrigated from the former canal was not large and the incomplete Palasbari canal was not useful for irrigation. The irrigation source consisted mainly of bandhs or tanks. Embankments were constructed to retain the water on the bandhs. But, owing to the deposition of silt, the bandhs rapidly filled up, if not constantly reexcavated. A large part of the thanas of Ranibandh and Simlapal were forested. Rice was the most important crop. Aus paddy was grown in higher lands. Pulses and oilseeds, potatoes and vegetables were cultivated for local consumption. Maize was grown in south and west Raipur and in Ambikanagar.

In this part, the number of hired labourers was considerable as the tenure holders require labourers to cultivate their khas lands. Payment for labour was always in kind. Natural manure was fairly extensively used. Silt from tanks and oil cakes were used for sugarcane and potato fields. Bonemeal or chemical manures were not used as they were too expensive. The average cultivator was heavily in debt. He handed over the greater part of his harvest to his 'mahajan' to meet existing obligations. The condition of the artisans were hardly better. The agricultural labours led a hand to mouth existence and had to migrate every year for employment to the rice fields in the lowlands of Hugli and Burdwan.

The lower part of the basin in the district of Medinipur was more or less a flat alluvial formation protected from the ingress of saline water by a very complicated system of protective embankments. The area included within the protective embankments were called 'Madhur Mahal' area (i.e., the area subject to sweet water), while the area mainly lying outside the protective embankments were known as 'Jalpal' (i.e., the area subject to salt water inundation).

In the western part, the existence of extensive Sal jungles grown on laterite soils interspersed by extensive waste lands known as 'dahi' was common. Paddy fields and isolated dwelling houses inhabited by aboriginal or semi-aboriginal people do not form more than 25 per cent of the total area. Several khals were excavated for irrigation purposes. The most important one was the 'Medinipur High Level Canal' which taking off from the Kansai just below the Medinipur town goes east to the Dupnaryan below Kolaghat, a
distance of 60 kms. It was built between 1866 and 1871 partly for navigation and partly for irrigation. For irrigation purpose, it has been provided with a network of distributaries extending as far south as Narayangarh and north to the edge of the Kansai. The Hijli tidal canal extends in two ranges from Geonkhali opposite the junction of Rupnarayan and Hugli rivers 18 kms to Itamogra on the Haldi and from Terapakhia on the south bank of the Haldi, 28 kms to Kalinagar on the Rasulpur.

The Kansai for the first 240 kms or so of its course runs through hilly and undulating country in a deep channel and is unable to discharge flood water. Then, suddenly it enters a practically level plain where there is nothing to check its onrush and it sweeps everything before it. So, in the old days it earned its name of Kasai, the butcher, from the destruction it caused. So, attempts had been made long before the British came to India to erect embankments at various places. The Embankment Act–VI was passed in 1873. The first consequence of embanking a river is the deposition of silt which not only deprive the land of a valuable renovating agency but sooner or later raise the bed of the river above the level of surrounding country which causes severe floods. In the adjoining areas of Hijli, the problem was different. The river Haldi in this part with its affluents is tidal and the waters are almost saline. If left to themselves, the water spreads over a wide area impregnating the soil with salt which prevents the growing of crops. Here also embankments were in existence. According to a committee set up in 1889 to deal with the problem of drainage, the chief cause was the reclamation of Jalpai lands. Formerly, when no obstruction to the flood tide existed, the silt-laden water spread over the Jalpai lands. The salt water passing off the land was comparatively free from silt and entering with a rush into the channels caused a scour. The remedy proposed was the improvement of four existing canals, the dredging of the Rasulpur river and damming it up near its mouth, the construction of a separate outfall channel and the reexcavation and sluicing of several of the subsidiary khals.
The middle and lower parts of the basin in the district of Medinipur were divided into two parts: (i) the basin area and (ii) the upland areas of Binpur-Jhargram and Kharagpur. The former required no irrigation as rainfall was copious. On the other hand, the main problem was to drain out the surplus water. But, in the upland tract rainfall was insufficient and the crops were dependent on irrigation facilities. The sources of irrigation were catchment areas which, when properly embanked, served the purpose of reservoirs. The biggest sources were the 'Karanja' and 'Dhenga' bandhs. About 40 villages used to get irrigation water from them. There were a number of smaller bandhs and a big bandh in mouza Ragunathpur in the Binpur police station. There was only one Government canal constructed for irrigation. The area irrigated from it and its numerous distributaries was 24733.64 hectares. In the alluvial area, paddy lands were never irrigated. The higher lands, on which vegetables were grown, were regularly irrigated from tanks. Wells were not much used.

Thus, studying the early history of the Kangsabati basin, mainly its economic condition in the pre-project stage, it is observed that the district of Medinipur was in a favourable position so far as irrigation and agriculture are concerned. Lack of irrigation facilities hindered the agricultural development in the upper and middle parts of the basin. Agriculture was the main source of income of people throughout the basin, though forest provided secondary sources of income in the upper part of the basin. Scarcity of irrigation water, occurrence of flood and salinity of water were the major problems faced by the people of the basin area.

1.3 Previous Literature:

A number of earth scientists and geomorphologists have worked on the physiography and geomorphology of this part of West Bengal. So, a great deal of information and literatures are available, particularly regarding the physical set-up of the area.

Chakrabarty had studied the evolution of physiography of Bengal. Dunn and Dey (1942), Sengupta (1966), Hunday and Banerjee (1967) and some other geologists had presented the general geology, mineral
resources of parts of the eastern plateau fringe and adjoining plains of southwestern part of West Bengal which are parts of the Kangsabati basin.

Niyogi (1964) had studied the geomorphology of the river Kangsabati on the basis of toposheets. Mukhopadhyya (1972, 1973) interpreted precisely the geomorphic significance of landform units and drainage characteristics mentioning progressive piracy (1980) relating to the evolution of drainage system of the upper Kangsabati basin. Then, Roy and Munshi (1972) had written a paper on the genesis, nature and intensity of erosion on western rimland of the middle Kangsabati basin with reference to the significant erosional types and morphometric variables. Chakrabarty and Ghosh (1974) had contributed an analytical study on longitudinal profiles in fluvial processes citing examples from the Kangsabati valley.

Wasteland mapping reports of Puruliya and Medinipur published by the National Atlas and Thematic Mapping Organisation, supply information regarding wastelands of the upper and lower parts of the basin. Numerous works have been done on the problem of drought and flood. Some of them are worth mentioning. M. Roopali (1979) has studied the rainfall as a conceptual aspect of the drought-prone areas taking the district of Bankura as a case study. Bhattacharya (1979) has worked on drought in dry and moist sub-humid climatic regions. They took the district of Bankura and Medinipur as case studies.

In a joint work, Bagchi and Mukherjee (1980) have carried out a pioneer study on regional geographical problems of parts of southeastern Chotanagpur plateau and adjoining Rarh Bengal. The main findings of their study, mainly on morphology, drainage and flood, give a lot of information regarding the problem of flood. Another paper written by Bagchi (1957) on the Kaliaghai-Baraouka basin also supplies a lot of information regarding the flood problem in the lower part.

Numerous earth scientists have worked on the mineral resources of this part of West Bengal, viz., Ganguly S., Das D.K., Sinha R.N., Sircar N.R., Roy D. and others. The papers of these authors were

It is necessary to mention some relevant works of Banerjee (1979, 1980, 1982) who has made a study on the geomorphic processes related to landform development of the Kangsabati basin. She discussed the soil and surface geometry of the Kangsabati basin and Banerjee and Mukhopadhya (1978) jointly discussed the role of structure, particularly tectonics in the evolution of the Kangsabati valley.

The work of Roy on the landform and land use pattern of the basin needs to be mentioned. She published a number of papers on landscape ecology, land use and related geoeconomic adjustment (1982), the changing crop calendar according to the slope of land (1983), water resource in the integrated development (1984 a), topography and land use pattern—a study in correlation (1984 b) and the impact of catenary association and toposequence on agricultural land use (1984 c).

Some distinctive analysis on analysis on the evaluation of the agricultural land use pattern of the district included in the basin, separately or jointly has been discussed by Das (1968), Das (1973), Sarkar (1973) and others.

1.4 Objectives:

The present study is concerned with a geoeconomic study of the Kangsabati basin with particular reference to water resource utilisation and agriculture. The Kangsabati basin area has a great diversity of landscape with many striking contrasts of landforms. The upper part of the basin is hilly and forested while the lower part is flat and devoid of forest cover. As a result, the soil and water resources are different in different parts. These varied physical conditions have profound influence on land use and economy of the basin. The river's character also depends to a large extent on these physical conditions and the river itself controls the life of the people living in the region drained by it. So, the first objective of the study is to know the physical condition prevailing in the basin.
This region drained by the river Kangsabati and its tributaries, suffers from two climatic hazards: drought and flood almost at regular intervals. Water scarcity is a serious and chronic problem all over the basin while the extreme southeastern part suffers from flood every year which causes damage to crops resulting in abysmal distress to the people living in this part. So, the second objective of the study is to find out the causes of these climatic hazards and to suggest some measures to ameliorate these problems.

The Kangsabati basin drains the most dry and water hungry part of West Bengal where a sizeable section of the people depend on agriculture for their livelihood. The rainfall in this part is not optimum and there is also a great variability of rainfall. So, artificial irrigation is needed in this region. The third objective of the study is to know the water resource conditions—both surface and subsurface—prevailing in the area and to explore the possible new sources of irrigation.

In view of all these factors, i.e., to supply irrigation water to the drought-prone areas and to solve the problem of recurring flood, the Kangsabati project was launched in 1956. The project envisaged to change the economic condition of the area. So, another objective of the study is to find out the changes in the economic condition after implementation of the project and to know how far the project has augmented the growth and development of the area. Whether the water resource condition has improved in the area and how far the project has become successful in checking the flood are other fields of enquiry.

Agriculture is the backbone of the Kangsabati basin's economy. Since a good number of farmers living in this part are poor and agriculture has been an uncertain and inadequate source of income for most of them, a major breakthrough in agricultural development is an important pre-condition for the removal of growing unemployment and poverty. The study of agricultural condition of the basin and of infrastructural facilities of agriculture in detail are other
objectives of the study. This will help to find out the areas backward in agriculture and to suggest measures for their general economic development.

Another objective of the study is to find out the correlation between physical factors and economic variables which will help to identify the factors affecting agriculture mostly over the basin. To divide the basin into different agricultural regions is another objective of the study.

Finally, five sample villages from different parts of the basin have been studied in detail.

1.5 Methodology:

To fulfill the above-mentioned objectives, the researcher has adopted various methods. These are relative relief, dissection index, drainage density, average slope, the long and cross profiles of the basin etc. Hydrographs and Climographs have been prepared for the three meteorological stations which display the climatic conditions prevailing in different parts of the basin.

The isopleth maps showing the average annual rainfall and depth of ground-water table in the summer and the rains help to know the water resource conditions both surface and subsurface. Two graphs are drawn—one to show the amount of actual and computed irrigation from the Kangsabati reservoir in different years and the other to show the inflow and outflow of water of the Kangsabati reservoir.

The working population structure of the basin for the years 1971 and 1981 has been analysed with the help of pie graphs. Then, dominant and distinctive functions have been identified following Nelson's method. The general land use pattern has also been studied with the help of pie graphs.

Agricultural efficiency and land capability index which show the overall agricultural condition of an area clearly, have also been calculated following R.B. Mondal's method. Percentages of different
land use categories to total agricultural area are shown with the help of isopleth maps.

The amount of agricultural credit available per worker, the amount of area irrigated by one deep tube well, shallow tube well etc., percentage of irrigated area under different types of irrigation have been calculated and are shown with the help of isopleth maps. Pie graphs are drawn to show the source-wise agricultural credit, source-wise irrigated area and consumption of fertilizers in terms of N, P, K in different seasons.

To know the cropping pattern prevailing in the region, first the cropping intensity, which is the ratio between gross cropped area and net sown area, has been calculated. The crop combination of different blocks have been found following the methods of Weaver and Dei. S. S. Bhatia's method has been adopted to find out the index of crop concentration and diversification. Percentage share of food crops and non-food crops to the total cropped area and the crop productivity index have also been calculated. All these aspects of crop land use help to identify the backward blocks and the blocks which are prosperous so far as agriculture is concerned.

Lastly, the co-efficient of correlation have been calculated following Pearson's Product-moment correlation method and also Spearman's rank correlation method between a number of physical and economic variables, like relative relief, dissection index etc. on the one hand and percentage of net sown area to total geographical area, percentage of kharif irrigated area etc. on the other. The significance of these co-efficients have been tested with the help of Students 't'. Then, scatter diagrams and residual maps have been prepared to show the correspondence between them. This helps to identify the factors affecting agriculture on which the basin's economy is solely dependent.
The agricultural regions of the basin have been delineated with the help of Principal-component analysis. This has been done mainly with the help of computer.

Detailed field investigation has been carried out by the author. Land use maps of different villages have been prepared on the basis of plot to plot land use survey. Old land use maps have also been prepared with the data collected from Collectorates of respective villages.

References

7. Census of India
District Census Handbook of Bankura (1981)
District Census Handbook of Medinipur (1981)
District Census Handbook of Puruliya (1981)
District Census Handbook of Singhbhum (1981)


27. Wasteland Mapping Reports, Puruliya and Medinipur Districts, National Atlas and Thematic Mapping Organisation (Government of India, Department of Science and Technology).