CHAPTER - I
THE PROBLEM

1.1 INTRODUCTION

Milk is a very important item of food for humans. Even though some of the lagging regions of the world witness more massive investments in automobile industry there remains a marked absence of state investments and infrastructures for production of milk and milk processed products. Yet in ancient civilization milk was recognized as a very useful food and was given the highest priority among all foodstuffs. In ancient Indian system of medicine the milk was regarded as a food that lengthened life.

Godhan or the wealth named cow was sought to be owned for supply of milk to family member. In the Indian epic of the Mahabharata the want of cow determined the alliance of a teacher of weapons against a king who denied him 'godhans' for his children.

Thus it is no wonder that the Mahabharata regarded cow as the best among the quadrupeds. And a cow that gave so much of life – giving strength was eventually worshipped as a sacred animal in India. Even now some people continue this tradition of worshipping the cow and do the frenzied shouting on the Gopastami day 'Gomata ki jay'. The cow was worshiped not only in India, it was equally worshipped in Egypt and Babylonia two thousand years before the birth of Christ. The promised land of the 'Old Testament' was depicted as a country that was surplus in milk and honey.

Some people say that, the soldiers of the Mongol conqueror Genghis Khan had to carry milk in dried from as their ration. It is also said about the Vikings that their sea voyages included cheese. It is also said that the Mayflower that brought the first colonists to America did not bring cattle and so want of milk accounted for high rate of death among the early settlers.

For many centuries in India the households of some big villages and later during the British period in some small towns kept their own cattle for home supply of milk. Foreign rule upto the end of the nineteenth century impoverished and deadened the productive activities. Sincere efforts of the British in the twentieth century and elite oriented national policy under the new republic of 1950 failed to restore the supply of milk for consumption of every Indian mouth.

Table 1.1

Nutrient Contents of Milk *Per 100 grams of Milk*

Protein	4.0 Grams
Fats	4.1 Grams
Lactose	4.8 Grams
Vitamin A	47μ Grams
Calcium	120 mg
Phosphorous	90 mg
Iron	0.2 mg
Sodium	73.0 mg
Potassium	140.0 mg

Table 1.2

Protein Contents of Some Well-Known Food Articles

Food	*Protein per 100 grams of edible portion*
Soya bean	43.2
Fowl	25.9
Ground nut	25.3
Ground Nut Roasted	26.2
Cashew Nut	21.2
Almond	20.8
Lentel (Masur)	25.1
Green Gram (Moog)	24.5
Black Gram	24.0
Bengal gram	20.8
Peas Roasted	22.9
Fowl	25.9
Mutton	18.5
Pork	18.7
Fish	16.6
Eggs	13.5
Wheat	12.1
Rice	6.8

Different kinds of milk, such as cow milk, buffalo milk and goat milk has their own case in respect of nutrients. We here speak only about cow milk which this country has to produce in abundant qualities to nourish its entire people, make them energetic and long-living.

Cow milk has significant quantities of protein, fats, vitamin A and minerals. The following table shows the distribution of some (not all) nutrients per 100 grams of milk, even though estimates of authorities differ substantially.

There is no doubt that plenty of proteins are found in very large number of non-milk food. The following tables show some very important sources of protein, even though all foodstuffs contain some amount of protein. Experts give high priority to protein as a nutrient. Scientists have shown that animals can live for a long period without consuming carbohydrates or fats. But they can hardy live even for short periods without any protein .It is said that protein makes up 15 per cent of a human body. A man needs 60 to 100 grams of protein. But experts also want balancing of food through balanced intake of elements.

Tables 1.3

Costs of milk and Non-milk proteins

Items	Cost of 1 Gram of Protein (Rs.)	Item	Cost of 1 Gram of Protein (Rs.)
Cow Milk	0.31	Green Gram	0.11
Eggs	0.30	Black Gram	0.10
Fish	0.36	Lentil	0.09
Fowl	0.37	Roasted Peas	0.11
Mutton	0.43	Wheat	0.07
Pork	0.37	Rice	0.15
Soya bean	0.20	Bengal Gram	0.07
Banana (Ripe)	0.83	Apple	15.00

Milk protein, however, has three principal advantages over proteins of other foods. Firstly, milk protein becomes multiple as a result of combinations with rich minerals and, therefore, becomes great as food value. Secondly, according to scientists, with combinations of rich minerals and, therefore milk become great as food value. Secondly, according to scientists, of the 23 amino acids found in protein, milk contains all the essential amino acids. Finally, these amino acids in milk protein are greater in amount than in proteins of eggs, meats and beans.

On the basis of the data on the quantity of protein obtained from Gopalan and others and the market prices we obtain in course of our field investigations we prepare a picture of comparative costs of protein from milk and non-milk item. Here we find that milk proteins are cheaper than protein of fish, fowl and mutton.

So far we have sought to show that protein obtained from milk is not only versatile but also less expensive than some important sources of protein such as fish, fowl and mutton. But the great merit of milk is that minerals obtained from milk are of unique quality. Calcium and phosphorous and a little of magnesium make up and nourish the skeletons of animals and humans. The consumption of these minerals is essential for right functioning of the body system of humans. Besides we need some amounts of such minerals as sodium, potassium, iron, chlorine, copper and iodine. They are necessary for various sorts of functioning of the body system of the humans. Experts even insist that not only the intake of these minerals but also the ratio in which they are consumed is important.

The scientists have emphasized that the ratio of calcium and potassium to magnesium and sodium in milk as we find in cow milk approximates the ratio of these minerals in the human system. Calcium and phosphorous are also available from leafy portions of vegetables and fruits. Iron, potassium and iodine are found abundantly in fruits and vegetables. But calcium which is important not only for the building of the skeleton but also for the functioning of muscle including that of heat muscle is found abundantly in milk. Some

scientists' say that calcium content of cow milk is four times more that of human milk.

With these massive benefits consumption of cow milk bestows upon humans, it is but natural that with the growth of incomes of millions of low-income people of the country more and more people will consume more and more of milk. So publicity campaign with the help of mobile teams will contribute to greater consumption of milk at every phase of development in this country. In this process of development the sector of milk and milk based complexes might take a key role.

1.2 INDIA'S MILK EFFORTS

Around the turn of the century, milk was produced privately in the towns and villages by milk men. Non producer bought milk from them for consumption. In the urban areas very small number of families had their own system of production for consumption. With the growth of population in urban areas, consumers had to depend on milk sellers who kept cattle in these areas. As a result, several cattle sheds came into existence in different cities.

The first official move for organized dairying in the country was taken during the pre-independence era when the military dairy creameries were established towards the end of the nineteenth century to meet the demands of the armed forces and their families.

As the requirement of butter and cheese for British troops increased, private entrepreneurs were induced to manufacture table butter at the different towns of the country.

On the basis of the recommendations of the Royal Commission on Agriculture (1928), cooperative milk unions were set up in Lucknow and other places since 1927. In 1943 in a bid to ensure fresh milk to major cities, milk collected from Kaira district was pasteurized and transported by rail for distribution in Bombay. As fresh milk was not sufficient in supply, milk powders were imported for the entire hotel business. During forties milk colonies were set up in metropolitan cities like Bombay, Calcutta and Madras

and Cooperative Dairy Complex was set up with producer's societies in the villages around Anand.

In a bid to improve milch animals the first two five-year plan provided for 'Key Village Scheme', 'Gosadan Scheme' and 'Goshala Development Scheme'. During this time the Amul Dairy has been converted into a large milk processing plant with sufficient infrastructural facilities. Eventually within this period Amul also took the lead in producing milk powder and baby food from buffalo milk.

The third five year plan (1961-66) got separate Dairy Development Departments, fresh milk plants and pilot schemes established in the states. During the period of this plan the production of milk got further boost with the introduction of 'Intensive Cattle Development Programme' (ICDP) with the provision for necessary inputs and services. The fourth plan carried forward this programme with stress on procurement, processing and marketing.

About the same time the first 'Operation Flood' was initiated in July, 1970. In effect Amul model of Dairy was replicated with the village level (1970-81), district level and state level cooperatives. The 'Second Operation Flood' (1981 - 85) was aimed at extending and intensifying the first phase operation flood (1985-1996). World Bank and EEC provided financial and commodity help respectively.

The third phase of the 'Operation Flood'(1985-1996) was strengthened by increased financial help from the World Bank, commodity and case assistance from the EEC and internal resources of the National Dairy Development Board (NDDB). Professionalisation of dairies increased. Embryo Transfer Technology allowed faster multiplication of high yielding superior germplasm in cattle and buffalo to boost up production.

The fourth phase of the 'Operation Flood' operated during the 7th and 8th plan period. As a result of these different phases of the Operation Flood a good amount of infrastructure in the form of animal resource development department offices at the district and block levels and milk collecting and processing cooperatives and marketing centres have been set up.

The results of these efforts are still unsatisfactory. This is despite the fact that milk production increased on average at the rate of 4.75 per cent per annum (from 1970-71 to 1989-90). The rate of growth of milk production was significantly higher in Kerala and Tamilnadu (Patel : 1993). As India is a very big country it is possible that with some efforts the total production may soon be more than other countries.

But in respect of per capita availability of milk India ranks 57th in the world and her rank is lower than that of Pakistan.

Within India the per capita availability is high in Punjab and Haryana.

1.3. THE PROBLEM

With this background of India's milk efforts and their general result the problem we choose for investigation relates to the present state and prospects of milk economy in the North Bengal Division of the state of West Bengal. We shall naturally be led, therefore, also to investigate into the conditions the planners maybe expected to provide for the success of increased production and marketing of milk. The production of milk in this division might be sought to cater to needs of the whole of West Bengal and beyond. In the following section we shall have the occasion to explain why we select the Division of the North Bengal and we expect that this Division has the potential to specialize in milk production for catering to the needs of vaster area.

The investigation will cover the roles of the village milk farmers as well as those of the Government in heightening the milk economy of the region. Especially important is the question of provision of sufficient infrastructures and complementary activities so that milk is produced and processed; and elaborate network of input markets and output markets are set up.

What form and ramifications the infrastructures and complementary activities are expected to take will be understood when we have a full-scale picture of the milk economy vis-à-vis other non-animal husbandry activities. The problem under investigation is, therefore, manifold. It is necessary to understand the present-day productivity of milk production vis-à-vis crops and other commodities.

With a change in the structure of the regional economy, say, with change in structure with growing increase in income and consequent change in demand pattern and/ or with change in processing, storing or use of newer technology or use of unused technologies in these fields, the relative productivity and profitability of milk may change.

Thus the right planning of the milk economy of the region requires knowledge and factual information not only under the existing conditions but also that of future demand and of future multi-dimensional needs to support increased production.

The aspect we have already stressed is that we indeed investigate into the problem of inter-area division of labor on the basis of a plan of producing enough fresh milk and processed milk products within the Division of North Bengal for the remaining Division of West Bengal and beyond. This means that with further growth of income and employment in those divisions there is the possibility of enhanced production of milk and processed milk products and so the task of planning for the network of facilities of purchase of productive services and of marketing finished goods is a part of the problem.

There is no denying that with the successful planning of the setting up of a sound milk economy in the Division of North Bengal income and employment will increase also in this Division. So when we mention change in structure we mean that concept covering both this Division and the Divisions outside that the milk economy of this Division will provide with supplies of finished goods of fresh milk and processed milk products. Both aspects might be covered by finding general income elasticity of demand for milk or milk products.

1.4. EARLIER WORK

To the best of our knowledge and belief, the problem we seek to investigate in this study was not investigated by any investigator or agency. Not only milk economy and its planning in the North Bengal Division was not attempted by anyone before but also such a work must be fusion of

multifarious work done by a number of master economists as well as researchers of various fields.

First we begin with (1) Mishra, S.N & Sharma, R.K., Livestock Development in India, New Delhi 1990, (2) Vaidyanathan, A: Bovine Economy of India, New Delhi 1988, (3) Nair, K.N., White Revolution in India – An Appraisal, New Delhi 1985, (4) George Shanti, Operation Flood, An Appraisal of Current Indian Dairy Policy, Delhi, 1985 (5) Dandekar,V.M., The Cattle Economy of India, New Delhi 1980, (6) Indian Society of Agricultural Economies, Livestock Economy of India, New Delhi 1989.

Apart from these books on the general livestock economy articles have also been published in various journals .We have been seen many. But we mention only a few. (1) Patel, R.K.: Present Statues and Promise of Dairying in India, (2) Khanna, R.S: A Historical Perspective of Dairy Development in India, Indian Dairyman, October, 1989, (3) Singal, S.P. An Overview of Productive and Reproductive Management of Dairy Animals for Higher Production, Indian Dairyman, October, 1994, (4) Gandhi. R.S., Singh. A., Joshi. B.K: Current. Scenario and Future Prospects of Sustainable Animal Production in India, Indian Dairyman, October 1998, (5) Reddy, K.P. Measuring Performance of Dairy Cooperatives, Indian Dairyman, October 1993, (6) Mishra, S.N and Sharma, R.K: Demand for Milk in 2000 A.D., Dairy India, 1992, (7) Saxena, R.: Demand for Milk and Milk Products, Dairy India,1997, (8) Subramanyam, S and Rao, R.N.: Bovine Sector in Agriculturally Prosperous and Backward Regions: A Comparative Study, Indian Journal of Agricultural Economics, July-Sep.,1995, (9) Gandhi, U.P. and Mani, G.: Are Livestock Products Rising in Importance. A Study of the Growth and Behaviour of their Consumption in India, Indian Journal of Agricultural Economics, July – Sept. 1995, (10) Ramesh, B. Trends, Patterns and Effects of Diffusion and Adoption of Cross-breeding of Technology: An Assessment in the Context of Kerala, Indian Journal of Agricultural Economics, July – Sept. 1995, (11) Pandey, U. K.: The Livestock Economy of India: A Profile, Indian Journal of Agricultural Economics, July – Sept.1995.

Some previous studies in respect of demand in general have been of use in the investigation and analysis of our problem (1) Food and Agriculture Organization of the United Nations, 1972 Income Elasticities of Demand for Agricultural Products. (2) Klein L.R: An Introduction to Econometrics, Prentice Hall of India Private Limited, New Delhi, 1969, (3) Wold H. and Jureen, L.: Demand Analysis, J. Wiley and Sons, New York 1953 (4) Mahalanobis, P.C: Note on Studies Relating to Planning for National Development now being conducted at the Indian Statistical Institute in collaboration with the Central Statistical Organization Studies. Relating to Planning for National Development, No 1; Indian Statistical Institute 1954 (5) Roy, J. and Laha, P.G (1960): Preliminary Estimates of Relative Increase in Consumer Demand in Rural and Urban India, Studies in Consumer Behaviour, Indian Statistical Institute, 1960. (6) Roy, J. Chakravarty, I.M. and Laha, R.G. A Study of Concentration Curves as Description of Consumption Pattern, Studies in Consumer Behaviour, Indian Statistical Institute, 1960 (7) Bhattacharyya, N: An Application of the Linear Expenditure System to Consumer Behaviour in India, an unpublished paper of the Indian Statistical Institute. Calcutta, 1966. (8) Sarkar, P.C.: A New Method of Forecasting Demand for Rice in India, Conference Volume of the Indian Econometric Society, 1969. (9) Stone, R et al: Consumers' Expenditure and Behaviour in the United Kingdom, 1920-38, Cambridge 1954 (10) Houthakker H.S: An International Comparison of Household Expenditure Patterns, Commemorating the Centenary of Engel's Law, Econometrica, Vol. 25 (1957).

The core of the references made use of for production function analysis in this work consists of the following (1) Koutsoyiannis, A.: Modern Microeconomics, Macmillan, 1975, (2) Cobb, C.W and Douglass, P.H: A Theory of Production, American Economic Review (Supplement) 1928, (3) Robinson, J. : The Production Function, Economic Journal, 1955, (4) Samuelson, P.A: Foundation of Economic Analysis, 1947, (5) Baumol, W. J.: Economic Theory and Operations Analysis, Prentice Hall of India Private

Limited, 1968 (6) Douglas, P.H.: Are There Laws of Production? American Economic Review, March 1948.

1.5 SUITABILITY OF NORTH BENGAL

On the basis of topography the whole of the North Bengal Division can be divided into three main natural divisions, viz. (1) the hills, (2) upper plains and Dooars and (3) plains. These divisions of physical features can be seen from the map no.1.

The map no.2 describes the rivers of North Bengal Division of West Bengal. In the northern district the slope is from the north - east to south - west. This is confirmed by such rivers as the Teesta, the Jaldhaka the Torsa, the Kaljani and the Raidak all falling into the Brahmaputra thus making up a part of Brahmaputra River system. In the southern districts of the Division the slope is very roughly from the north-east to south-west and the river Atrai, the Ganga as well as on the Brahmaputra, the Mahananda before falling on the Ganga via Murshidabad (outside North Bengal) is joined by the rivers Purnabhaba, Kulik, Tangan and Kalindi.

The map no.3 describes the rainfall zones of all Divisions and the no. 4 illustrates the temperature zones of North Bengal compared to other Divisions of West Bengal All the districts of the Division of North Bengal enjoy much higher rainfall and groundwater is also, in our estimate, much more copiously available in various layers.

The temperature zones of this Division exhibit a wider variety compared to the other Divisions of the state and many other areas of the country. This offers relatively more scope for the rearing of different kinds of breed than in other areas.

The state of agriculture is still now relatively undeveloped and since the region lacks optimal heat for paddy in every part of the year, the region is fit diversion of areas for the building of expansive pastures and intensive culture of special products and crops in the remaining cultivable areas. So the North Bengal Division is ideally suitable for making it an area of specialization of animal husbandry and its complementary agricultural and other activities. We

do not get such rich natural endowments for animal husbandry not only in the rest of the state but also in much of the country.

1.6 THE METHODOLOGY

1.6 (a) SELECTION OF A REPRESENTATIVE AREA

We have elaborated in the preceding section how the natural endowments of the six districts of the North Bengal Division of the state of West Bengal have favoured this Division as an area of specialization for cow husbandry for the whole state. For an individual investigator, however, this is too vast an area for intensive fieldwork. This circumstance makes it imperative to select only one district for intensive collection of data at the farm level.

This naturally leads us to a choice of criteria for selecting a district for this purpose. Naturally the chosen district must represent on average the qualities which make the whole of North Bengal Division an ideal area for specialization in milk production for the whole state of West Bengal. Of the six districts of the North Bengal Division the highest annual rainfall occurs in the district of Jalpaiguri. This is because the highlands of the Upper Dooars cause relatively maximum precipitation from monsoon currents coming both from the Arakan Akyab route, and straight from the Bay of Bengal. In respect of annual rainfall there is a sort of competition between Darjeeling and Koch Bihar. If we average the annual total rainfall of four years from 1995 to 1998 we find that annual rainfall is higher in Koch Bihar (3167.5 millimeters) than in Darjeeling (3087.25). In respect of annual rainfall the order of the six districts of North Bengal is: Jalpaiguri, Darjeeling, Koch Bihar, Uttar Dinajpur, Dakshin Dinajpur and Malda. In respect of heat rank of these districts are as follows: Darjeeling, Jalpaiguri, Koch Bihar, Uttar Dinajpur, Dakshin Dinajpur and Malda. Koch Bihar has one advantage in respect of topography. The area monotonously plain.

In the preceding section we mentioned that one advantage of the North Bengal Division of West Bengal is some cultivable areas can be diverted for the building of high quality pastures. This is because in winter the heat is low

and HYV paddy cannot be grown in this area in contrast to, say, Burdwan and Hughly. It is needless to say such diversion in the interest of high class pastures can be done only in case we set up simultaneously all the necessary infra-structures for a complete milk complex in the area. However, the point is Koch Bihar has in many respects the representative advantages which make the entire North Bengal Division an ideal area for specialization for milk complex for the whole of West Bengal. Some of the areas adjacent to the North Bengal Division have no natural advantages for the building up pastures as heat conditions make such areas suitable for crop and vegetable farming. One example is Dhubri area of Assam. In some adjacent areas of Bihar also the heat conditions do not pose any difficulty for crop, vegetable farming and horticulture. Even though cow and buffalo rearing is traditional occupations there, the area does not offer scope for large-scale diversion to pastures. So well developed milk complex in North Bengal will cater to the needs of quite a few adjacent areas.

The district of Koch Bihar, through watered by good river systems, offers scope for setting up of circular railway for transport of milk products and fresh pasteurized milk to outside areas. Of all the areas of North Bengal Division, Koch Bihar for this reason offers good scope for the building up of the proper transport system.

Despite these very valid reasons for choice of Koch Bihar district for collection of farm level data, there should be no denying the district provides the investigator with certain advantages for the purpose of collection of data. Traveling in Koch Bihar is easy for him, as he has many acquaintances in the district and his present place of work is very near the district.

1.6 (b) THE DATA FRAME

We lay bare in the preceding section our motivation in choosing Koch Bihar as the district, of all the districts of the North Bengal Division, for the purpose of collecting data at the level of operators of enterprises and consumers. Here our task is to choose one, two or three blocks of this district for the same purpose. The district whose administrative head is the District

Magistrate has in all five sub-divisions which each are headed by sub-divisional officer, these five sub-divisions are: (1) Mekliganj (2) Mathabhanga (3) Koch Bihar (4) Tufanganj and (5) Dinhata. The Mekliganj sub-division has two police stations: Haldibari and Mekliganj. The Mathabhanga sub-division has two police stations. Mathabhanga and Sitalkuchi. The Koch Bihar sub-division has one police station. Viz., Koch Bihar Police Station. The Tufanganj sub-division also has one police station only, viz., Tufanganj. The Dinhata sub-division has two police stations: (1) Dinhata and (2) Sitai. Thus Koch Bihar has 8 police stations. Barring Mathabhanga, Koch Bihar, Tufanganj, and Dinhata police stations, the other four police stations are co-terminus respectively with the four blocks. A block is an administrative unit below a sub-division. For each of Mathabhanga, Koch Bihar, Tufanganj and Dinhata there are two blocks. So within Mathahabhanga police station we have two blocks viz., Mathabhanga I and Mathabhanga II. Within Koch Bihar police station the two blocks are Koch Bihar I and Koch Bihar II. Similarly within Tufanganj and Dinhata police stations the two blocks are Tufanganj I, Tufangang II and Dinhata I and Dinhata II respectively. For each of Haldibari, Mekliganj, Sitalkuchi and Sitai, the boundaries of police stations and blocks are the same. Thus we have eight police stations but twelve blocks .As a first step we choose three blocks. The considerations for this choice are two. In the first place, the consumer units and the units of operation should be such as to exhibit maximum possible variation in their behaviour. Secondly, the work and traveling of the investigator should be free from hazards. These two considerations seal the choice to three blocks, viz., Koch Bihar II, Tufanganj I and Tufanganj II.

The level of irrigation in these blocks is found to be low at the time of the survey for this study. Yet before selecting the villages we have collected information of the level of irrigation of each gram panchayat. A gram panchayat is the lowest level of administrative unit. Each of a gram panchayat includes in the district of Koch Bihar a number of mouzas. A gram panchayat is also lowest from of local level democratic institution in the sense that only

elected members sit on the assembly of the gram panchayat and work under the leadership of a Gram Pradhan, At the block level the next level democratic institution in the district is the Panchayat Samity the elected members of which work under a President. The Block Development Officer who is the administrative officer of block executes developmental work in consultation with the President of the Panchayat Samity. In this system we collected irrigation data for different gram panchayats from these local level republics. The level of irrigation in most of these gram Panchayats in each of the three blocks is very low. Of the three villages selected in each of the three blocks, we select just one village from the gram panchayats where the system of irrigation is only slightly better .Two other villages for a block were taken from gram panchayats with very low level of irrigation.

It is necessary to write about our definition of village. We enter a dense settlement of a gram panchayat and fix an arbitrary point. Around this point in a circular area we pick up 20 households who raise both crops and milk. Each of 9 villages defined in these way is given a name by a capital letter such as (A.B.C. ~~D~~ ....I) vide Map No. 5. We have not thus included any family who raises only crops or only milk. What kind of data we collect and important conceptual points find elaboration in the next section.

Apart from the units of operation we study also consumption behaviour. For this purpose we have collected data from covering Koch Bihar town area and other villages covered by the survey. In this combined area we list initially a large number of families with their respective monthly incomes. The families surveyed for family budget studies are divided into a large number of income groups. The details are explained in the seventh chapter of the dissertation.

1.6 (c) CONCEPTUAL FRAMEWORK

The productive activities of a household are divided into sectors. These are pure agricultural productive activities, animal husbandry, non-agricultural productive activities, disposal of household labour. The household schedules used for the purpose of collection of data have been divided into four parts for entering the entries for these four types of productive activities. Besides, the

household schedules have each an initial part for identification of members, sex, education, occupations - primary and secondary, agricultural land holdings, homestead lands and other demographic details.

The division of the productive activities into mutually exclusive enterprises is an important element of the conceptual framework of this study. This division is used in several ways.

One of the uses finds itself in the production function analysis. The lagging rural economies which provide us with the data frame do not have much of non-agricultural productive activities. The production function analysis, therefore, is made for agriculture and animal husbandry. An analysis is also made of whatever data are found for non-agricultural productive activities.

Since, however, resorting to any one method for this purpose may get us bogged down to its pitfalls, we also look for scientific explanation for output variation from farm-size-wise tables of inputs and outputs. Thus the causal relation of inputs and outputs is sought from one sort of crude production schedules. Multiple regression production function is then used to see if the finding through the crude method tallies with what it suggests.

With the availability of inputs only the producers cannot expand production. They must be able to sell as much as they like at a pre-fixed fair price. A community has the option to accomplish this through a variety of alternative means.

In this study we compare the marketing of crops and that of milk by the comparative profitability of the two types of activities of the farmers. In the rural economies which provide the data frame for this study are in a poor shape because there is a thoroughly insufficient understanding, in all levels of thinking, of the true scientific process of development planning. There is massive shortage of complementary activities.

Milk has one advantage. Those who value its qualities will not hesitate to buy. Hence a study of the comparison of profitability of crops and milk on the basis of the existing level of markets has been spurred by the vision that the

setting up of a full-fledged set of complementarities for milk would enhance substantially the margin of relative profitability for milk and has, therefore, entered into the conceptual framework for this study.

A sort of study of relative demand for milk is an essential content of the conceptual framework of the planning of the milk economy of North Bengal Division of West Bengal. In this study of demand we compare the income elasticities of demand for milk and other commodities.

A Leontief type of macro-mathematical model of interdependence is a special feature of the conceptual framework. This will bring to the existing condition or colossal absence of complementary activities and provide the basis for planning in stages of required complementary activities of all sorts.

The required planning pattern, conceptually, may need installing properly conceived institutional framework and reforms of existing institutions.

1.6 (d) TESTING OF HYPOTHESES

Scientific investigations in social sciences begin with one or more tentative hypotheses. In social sciences experiments cannot usually be conducted. Data are collected scientifically to test a particular hypothesis. When the data support particular hypothesis, this hypothesis is accepted. But if the data do not support this hypothesis but support a rival hypothesis then the rival hypothesis is accepted.

An important hypothesis around which this dissertation is being prepared is that the North Bengal Division of the state of west Bengal is ideally suited to develop as a specialized area of dairy complex for the whole state of West Bengal and beyond. We have already hinted at some special endowments of the area which are even rare in the rest of the country as a whole. On the basis of whatever data we collect and analyze in the process, we shall look for an opportunity to give a verdict on the testing of this hypothesis. The thesis that the North Bengal Division of the state of West Bengal holds an exceptional promise as an area of specialization of milk economy is the central thrust of this dissertation.

A second hypothesis to be tested is farmers have a great role both as producers of fresh milk and cooperative producers of processed milk. Data collected would test that whenever opportunities exist the farmers will not fail to produce and sell fresh milk. If the data do not support this hypothesis, such rejection of the hypothesis would support the alternative hypothesis that all these farmers are instinctively inefficient. On the contrary if we can sustain the hypothesis that the farmers are efficient whenever they are given the proper setting, we are entitled to build up the further hypothesis that legal, social and state promoted infrastructures might raise them to the status of cooperative producers of high quality processed modern milk products and ensure their sale throughout the country.

A third hypothesis is that as a result of interdependence of activities a restructuring of agricultural and horticultural activities would boost up both milk farming, crop farming, village industries, service sector like private health care services with provision for service to the village poor who after implementing our type of local level planning would not remain poor. On the contrary they might appear as small industrialists of businessmen. Some test will be devised.

In this process of restructuring, as milk farming and milk processing advances through professional management cooperative processing units, more and more rice lands can be converted into pastures. Data collected might be used to test the hypothesis of this possibility.

1.7 AN OVERVIEW

The second chapter deals with the crude forms of productions for milk and crops. An analysis of production functions is made to have an idea of scope of enlarged production or additional productive undertakings for a possible proportional employment of both males and females. Numerical production schedules of three different size groups of farms provide the subject of analysis for productivity of inputs.

Regression multiple production function are subjects of analysis in the third chapter. The third chapter provides additional support for the second chapter, while the second chapter provides the same for the third.

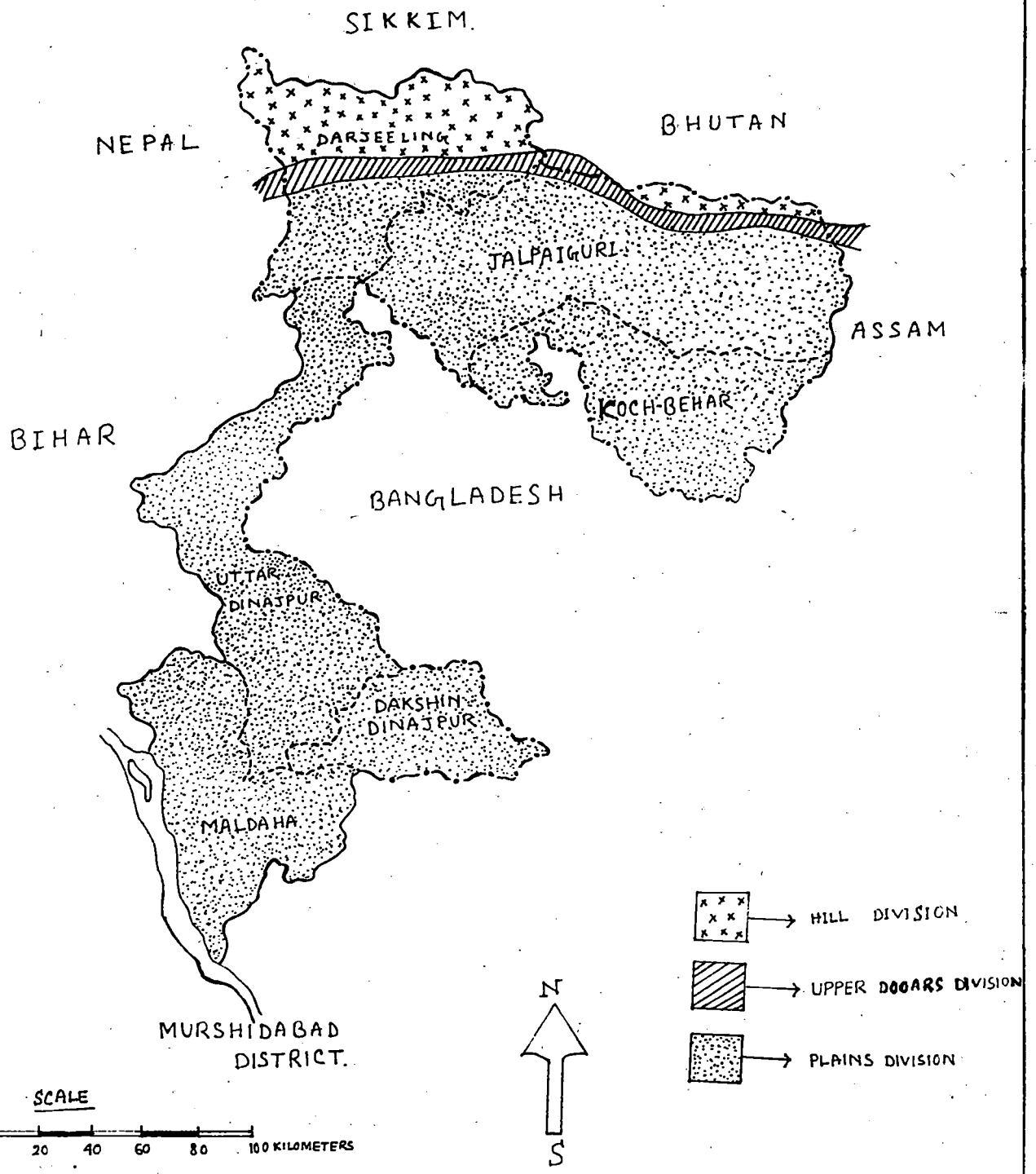
An analysis of the relative profitability of milk is carried out in the fourth chapter. The fifth chapter elaborates existing opportunities of marketing of milk. The sixth chapter is reserved for macro - mathematical models fitted to the data of the best [illegible] of the blocks. They will demonstrate the present backwardness of the rural economies and will merely point to the basic requirement of setting up simultaneously many complementary activities.

The seventh chapter is concerned with the measurement of incomes elasticity of demand for milk and other commodities. This will be helpful in determining the scope of a sound milk complex covering the most areas of Division of North Bengal of the State of West Bengal. Different aspect of the pattern of planning of the milk complexes and required reforms for the Division of North Bengal will be considered in the eighth chapter.

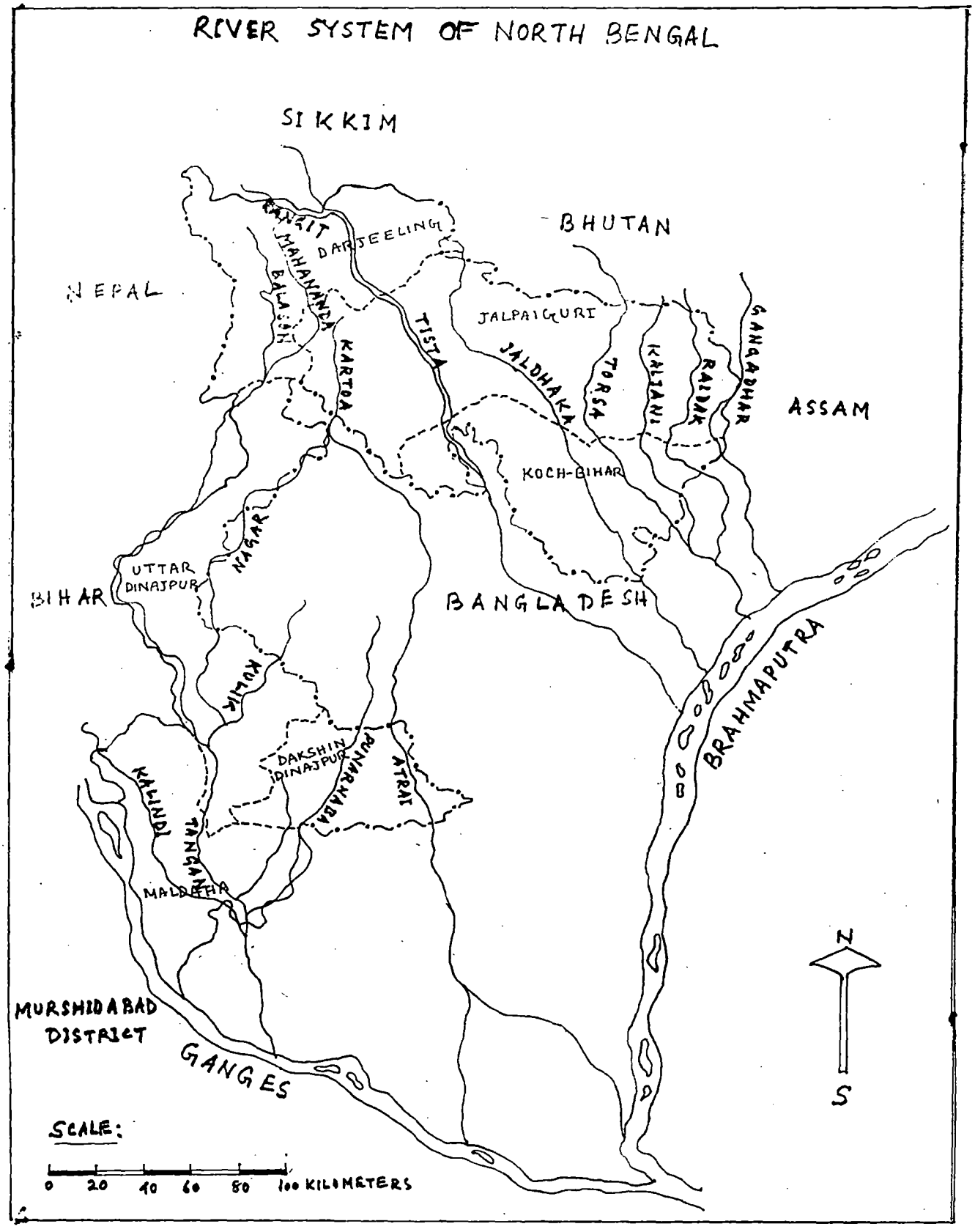
A Summary of the study will be given in the concluding chapter. This chapter will end with a short conclusion.

Map no 1.

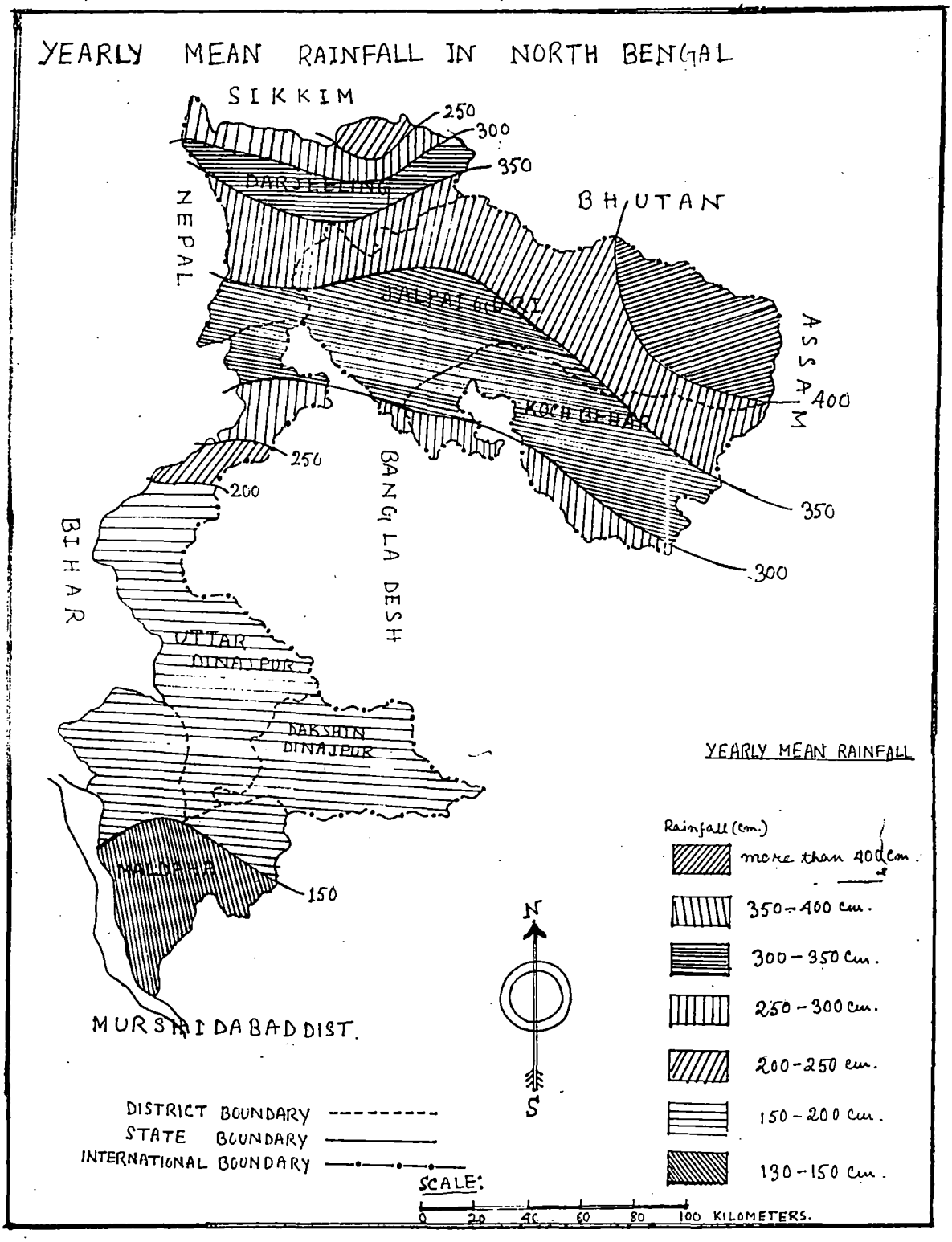
TOPOGRAPHY OF NORTH BENGAL.



Map no 2

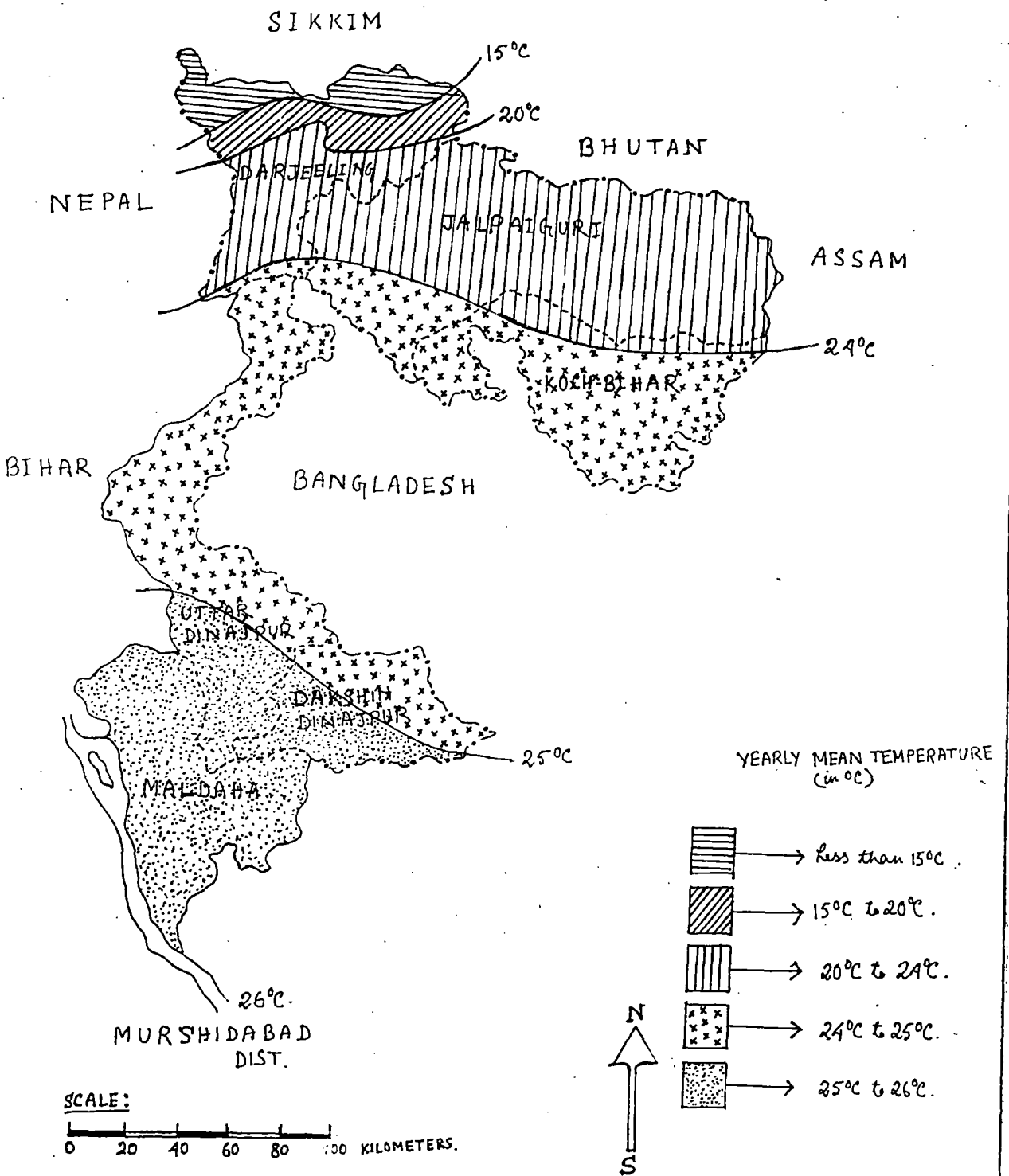

RIVER SYSTEM OF NORTH BENGAL
SIKKIM
BHUTAN
NEPAL
ASSAM
BIHAR
BANGLADESH
RANGIT
MAHANANDA
BALASON
DARJEELING
JALPAIGURI
TISTA
KARTOA
JALDHAKA
TORSA
KALJANI
RAIDAK
GANGADHAR
KOCH-BIHAR
NAGAR
UTTAR DINAJPUR
KOSHI
DAKSHIN DINAJPUR
PUNARBA
ATRAI
KALINDI
TANGAN
MALDAHA
BRAHMAPUTRA
MURSHIDABAD DISTRICT
GANGES
N
S
SCALE:
0 20 40 60 80 100 KILOMETERS

Map no(3)

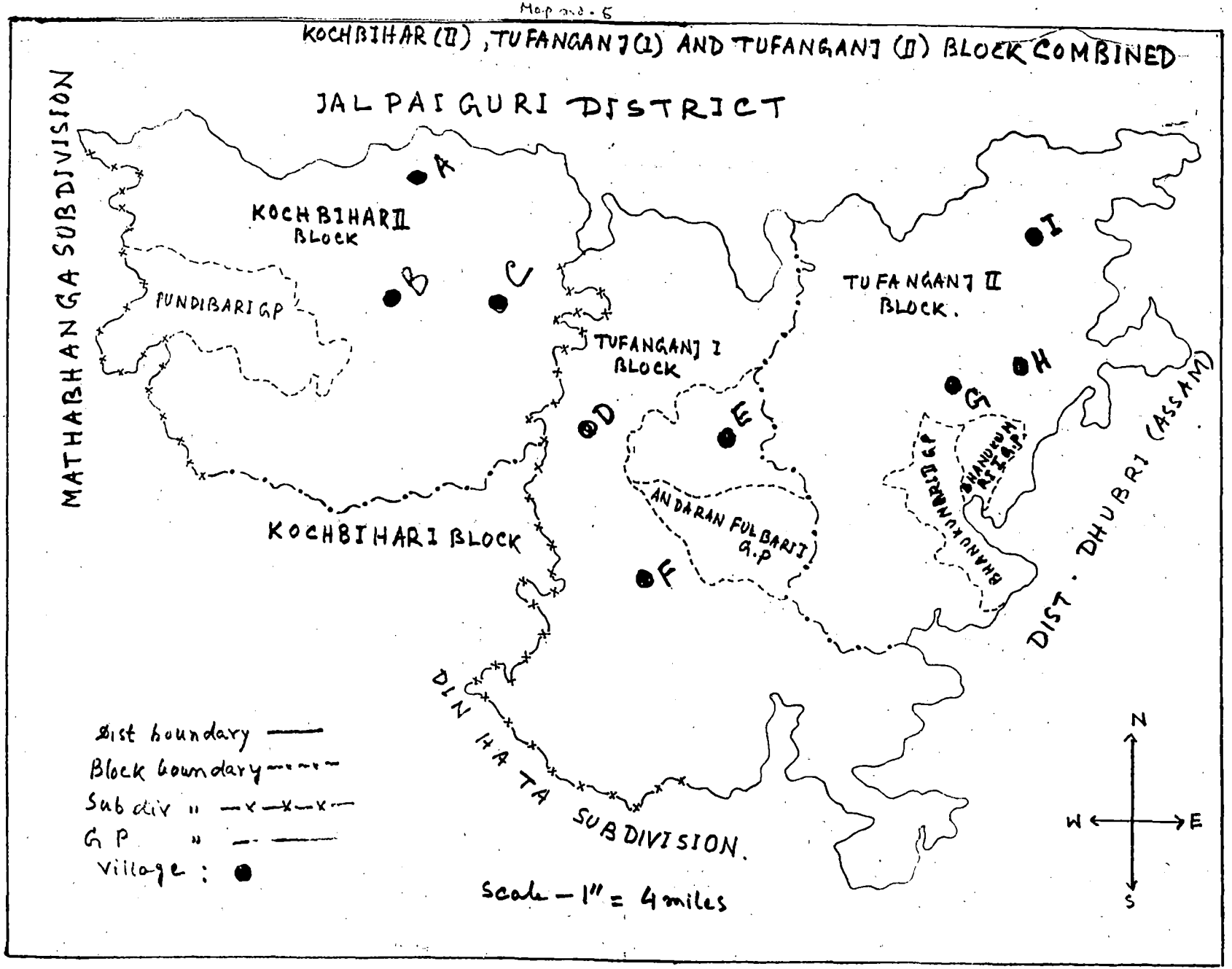

YEARLY MEAN RAINFALL IN NORTH BENGAL
SIKKIM
250
300
350
DARJEELING
NEPAL
BHUTAN
JALPAIGURI
ASSAM
400
KOCH BEHAR
250
200
BANGLA DESH
BIHAR
350
300
UTTAR DINAJPUR
DAKSHIN DINAJPUR
MALDAH
150
MURSHIDABAD DIST.
N
S
YEARLY MEAN RAINFALL
Rainfall (cm.)
more than 400 cm.
350-400 cm.
300-350 cm.
250-300 cm.
200-250 cm.
150-200 cm.
130-150 cm.
DISTRICT BOUNDARY
STATE BOUNDARY
INTERNATIONAL BOUNDARY
SCALE:
0 20 40 60 80 100 KILOMETERS.

Map no. 4

YEARLY MEAN TEMPERATURE OF NORTH BENGAL REGION



Map no. 5


KOCHBIHAR (II), TUFANGANJ (I) AND TUFANGANJ (II) BLOCK COMBINED
JALPAIGURI DISTRICT
MATHABHANGA SUBDIVISION
KOCHBIHAR II BLOCK
FUNDIBARI GP
TUFANGANJ I BLOCK
TUFANGANJ II BLOCK.
KOCHBIHARI BLOCK
ANDARAN FULBARI G.P
BHANUKUMARI G.P
BHANUKUM R.F. & G.P.
DIST. DHUBRI (ASSAM)
DINHATA SUBDIVISION.
A
B
C
D
E
F
G
H
I
Dist boundary
Block boundary
Sub div "
G P "
Village :
Scale — 1" = 4 miles
N
W
E
S