THE DEVELOPMENT OF LOCAL TRANSPORT
IN
BANGLADESH

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Agriculture constitutes about sixty per cent of the GDP in the Bangladesh economy. The present planned developmental efforts are directed towards higher productivity in agriculture and making Bangladesh self-sufficient in foodgrains. The higher productivity goals in agriculture, requiring efficient and timely mobilisation and distribution of inputs and outputs, are likely to lead to higher demand for transport at the local level of the economy.

The agricultural strategy, in combination with the aims of considerable import substituting in foodgrains, fertilizer and cement, among other items, is likely to change the composition of foreign trade of the country requiring reorientation of transport movements both in the area of short-haul and long-haul operation. Hence the need for redirection of resource commitments for development of transport capacities in keeping with the nature and quantum of demand for transport at various levels of the economy.

Past efforts in rural road development were characterised by poor engineering supervision and lack of basic design standard. Consequently, much of the resources spent were wasted. Largely due to lack of year round communication facility in the rural area, present marketing pattern is inefficient and transport costs are higher than what can be achieved.

Planned intensification of agriculture will increase demand on bullocks for draft power. Similarly, an increased marketable surplus will call for higher demand on bullocks for cart-haulage. Without road improvement, there is a danger of transport bottle-necks and continued costly reliance on human portering as a form of transport. There is, therefore, the need for improvement of rural roads to all-weather and flood-free conditions which would offer higher transport capacity and reduced cost of transport - leading to significant resource saving for the economy.

Since transport improvement by itself may not lead to economic development, an integrated development strategy is called for. Transport improvement is considered in a broader context of overall development of the economy. Again, since any form of economic development has important income distribution implication, the need for fair and equitable distribution of development benefits within the community is emphasised.

The work is dedicated to the rural poor in Bangladesh. Should it provoke transport policy changes leading to some improvement, however small, to their lot, the main purpose of this effort will be more than fulfilled.

PREFACE

The idea of the study of local transport in Bangladesh stemmed from those days when I was heading a team of local counterparts in the Bangladesh Planning Commission working in collaboration with a British Transport Consultant Group for undertaking the Bangladesh Transport Survey. The terms of reference of that Survey were fairly comprehensive and included almost all aspects of transport operation in Bangladesh except local transport. As a result the conclusion of that Survey seemed to me to float on the implicit assumption that transport did not pose much of a problem between the farms and the secondary markets. Thus the absence of any empirical evidence in this respect left a source of disquiet and anxiety for me. For I thought that given the structure of the Bangladesh economy and its stage of development, movement requirement of goods at the local level must predominate and, therefore, the need for and the economic implication of, that segment of transport operation was equally, if not more, important. The First Five Year Development Plan of Bangladesh was brought out about the same time and it merely tended to confirm my fears, for the Plan envisaged self-sufficiency in foodgrains by its terminal year and that almost 60 per cent of the country's GDP would continue to generate from the agriculture sector.

The main objective of this work, therefore, is to try and look into the development of local transport in Bangladesh and examine its adequacy against the background of objectives of the Development Plan, particularly in terms of agricultural growth and the foodgrain self-sufficiency programme. Since the primary concern is to move agricultural goods to and from farms, in the form of inputs and outputs, this study relates to local freight movements. Again, since we are concerned about efficient movements of those goods between producers and consumers, we have made the trade and marketing mechanism of the local economy the central focus of our attention.

In the undertaking of this work, I have enjoyed the full and continuous support, guidance and encouragement of my Supervisor, Dr. Clifford Sharp, to whom I am profoundly grateful. The Bangladesh Planning Commission and its staff in the Transport Survey Section generously provided the administrative support by men, equipment and vehicle for carrying out the field survey in Sherpur Thana of Bangladesh. Dr. Mohiuddin Alamgir, Research Director of the Bangladesh Institute of Development Studies, offered valuable suggestions in the final adaptation of the questionnaire forms. Dr. Subrata Ghatak, Lecturer in the Economics Department, was kind enough to read the first draft of the main chapters of the study and made valuable comments. To all of them and to the Planning Commission of Bangladesh, I am very grateful. However, the errors or the weaknesses that may remain are singularly mine.

Finally, much credit goes to my wife Rezwana, and the children, Lubna and Laeka, who generously lent their emotional and practical support. They have been particularly kind in bearing with many lost weekends and evenings. Mrs. Doreen Butler who kindly agreed to type the manuscript with speed did a splendid and diligent job of it and I am grateful to her too.

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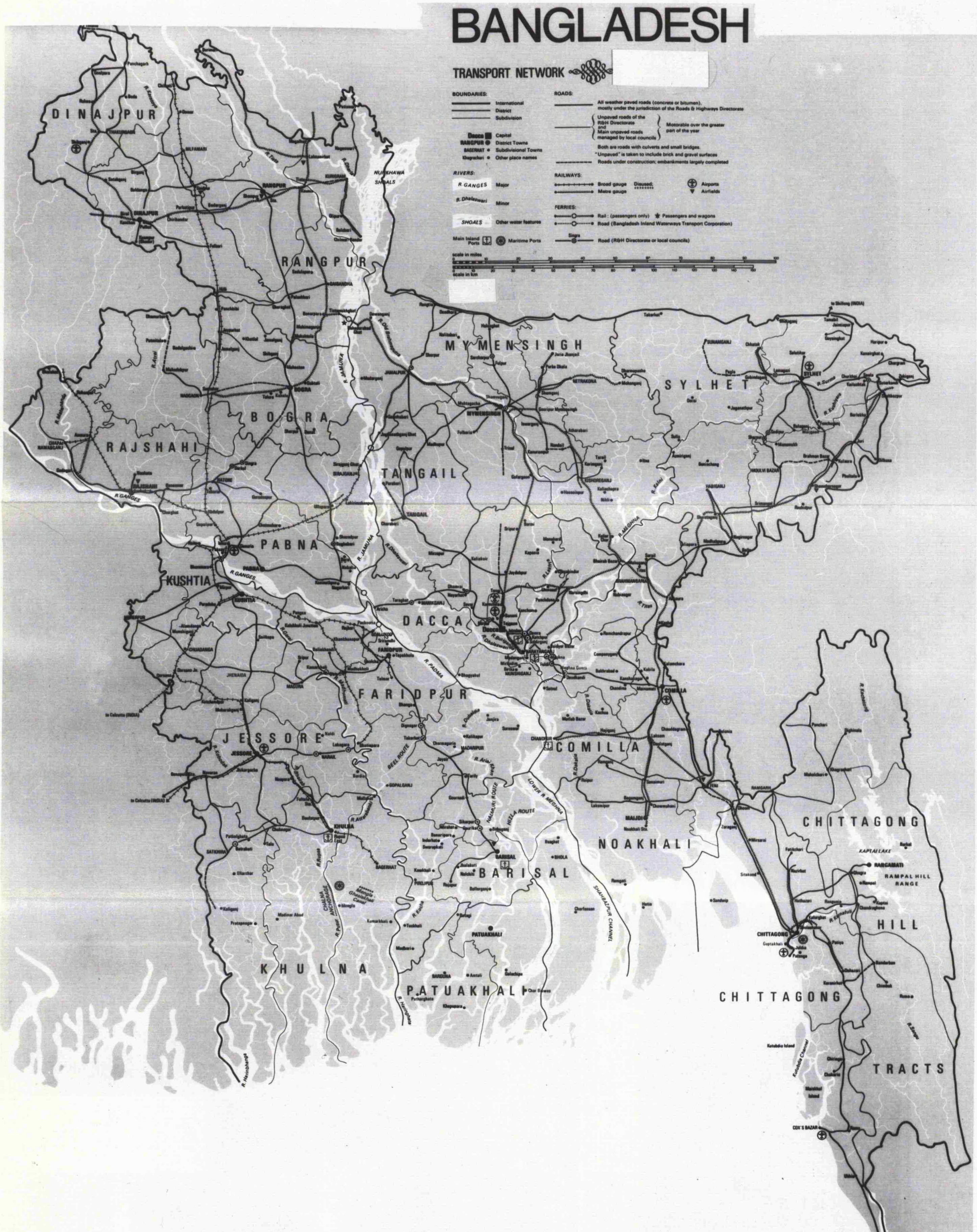
BANGLADESH
TRANSPORT NETWORK
BOUNDARIES:
International
District
Subdivision
Dacca Capital
RANGPUR District Towns
BAGERHAT Subdivisional Towns
Khagrachari Other place names
RIVERS:
R. GANGES Major
R. Dhaleswari Minor
SHOALS Other water features
Main Inland Ports
Maritime Ports
ROADS:
All weather paved roads (concrete or bitumen), mostly under the jurisdiction of the Roads & Highways Directorate
Unpaved roads of the R&H Directorate and Main unpaved roads managed by local councils
Motorable over the greater part of the year
Both are roads with culverts and small bridges.
"Unpaved" is taken to include brick and gravel surfaces
Roads under construction; embankments largely completed
RAILWAYS:
Broad gauge
Metre gauge
Disused;
Airports
Airfields
FERRIES:
Rail : (passengers only)
Passengers and wagons
Road (Bangladesh Inland Waterways Transport Corporation)
Singra
Road (R&H Directorate or local councils)
scale in miles
scale in km
DINAJPUR
RANGPUR
BOGRA
RAJSHAHI
MYMENSINGH
SYLHET
TANGAIL
PABNA
KUSHTIA
DACCA
FARIDPUR
JESSORE
COMILLA
NOAKHALI
BARISAL
KHULNA
PATUAKHALI
CHITTAGONG
CHITTAGONG HILL TRACTS
R. GANGES
R. JAMUNA
R. PADMA
LOWER R. MEGHNA
SHAHBAZPUR CHANNEL
KAPTAI LAKE
RAMPAL HILL RANGE

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CHAPTER I

INTRODUCTION

Attaining food self-sufficiency is not only the highest priority problem facing most of the world's people today, but one that threatens to worsen rapidly in the years immediately ahead. In recognition of this problem of gigantic proportion, in 1975 a World Food Council was set up under the FAO auspices whose primary job would be to promote actions towards higher growth in agriculture production to achieve self-sufficiency in foodgrains in the developing countries. No doubt transport policy makers have an important role to play in achieving this world objective, both in providing necessary transport facilities and services and in contributing to wise investment decisions in related areas that can help assure the supply of additional food and its distribution to consumers.

The most important factor contributing to higher food needs is population growth which is being intensified by industrialisation and urbanisation. Not only is the total demand for food increasing, but more food has to be moved greater distances to feed increasing numbers of non-agricultural families. Transport is becoming a primary factor in food production processes as well, for with the gradual disappearance of unused land in most parts of the world the principal means of increasing productivity is to apply fertilizer, seed, insecticide, and mechanical equipment to existing cultivated areas.

If agriculture is to respond to the growing demand, therefore, it will be necessary to accommodate increased traffic flows in both directions: inputs moving from urban areas to the farm, and output moving from the farm to the city. The task, therefore, involves very large road networks, extensive investment in trucks, the expansion of storage and processing facilities, and new institutional arrangements for managing and financing the total system. As the foodgrain deficient countries tend to have a move towards self sufficiency or even surplus, the demand for transport at the local level will inevitably increase. The nature of such transport demand may increase very rapidly as the subsistence type of rural economy is sought to be transformed into a market economy.

i. Rural Transport Led to Higher Productivity in Many Countries:

The relation between good transportation and the ability to grow and market more food has been demonstrated in many parts of the world. In Thailand[(3)] road building transformed partially used jungle land into highly productive and prosperous farms. Travel time was reduced from eleven hours to three by provision of improved road. The production of sugarcane, vegetables, bananas, and other fruits more than tripled in three years.

In Bolivia[(7)] the road provision reduced travel time in the rainy season from several weeks to fifteen hours and provided a link between the country's food supplies and its people. Until then the price of home-grown rice was 50 per cent higher than imported rice because of the high cost of transport.

It has been observed in the tropical countries in Africa[1] that rural transport is an essential factor for the successful implementation of mass extension schemes in peasant communities and for achieving higher productivity in agriculture.

The recent experience of road construction in some of the limited Barrios (villages) in the Philippines[4] suggests that local roads resulted in increases in farm prices. New roads provided outlets for surplus goods and the former relationship between supply and demand in the barrio was shattered. Invariably, the prices of farm products went up. The volume of farm products sold also increased after the construction of road. A significant effect of the road openings is a drop in the costs of transporting farm products to the market. In terms of social changes the average absolute increase in school enrolment is most significant in the cases of primary and intermediate schools. The rural health units have been established, agricultural extension services expanded and visits of government representatives have significantly increased after the roads were opened.[4]

Similarly in a study made in India in five separate states[5] it was found that frequency of visits of the trucks to the villages increased manifold after improvement to the rural roads. The production of onions and cotton seemed to have increased as a result of higher accessibility and the prospect of getting better prices at the market. Another factor, noticeable to some extent, was the correlation of truck transport with the functional organisation of marketing agencies or links. A shortening of these links through telescoping or rationalisation may have made for a larger penetration of trucks.

In a more recent study(6) of the Indian state of Rajasthan, it has been noticed that development of rural transport has enabled speedier and more equitable distribution of inputs among the farmers, but there still exists some pockets of the state where lack of transport has blocked their adequate input supplies reaching the farmers in time; still worse in some parts where farmers do not know about these inputs.

ii. Adequacy of Rural Roads in Bangladesh:

Bangladesh is basically an agricultural country and about ninety per cent of its people live in the rural country side. In the wake of rising population, the country has steadily slipped behind food production. Its backward state of agriculture is obviously the result of a wide variety of deficiencies, including inadequate water supplies and modern bio-chemical inputs, the dearth of financial resources and the dominance of traditional viewpoints that tend to perpetuate stagnation. But it is held that perhaps the underlying factor of the stagnant agriculture is the absence of ties with the outside world through adequate and efficient means of rural transport and trade channels. As a result, despite the rich soil, its agriculture suffers from low physical and financial returns. Ideally, there should have been the development of rural-urban trade that supplied tools and equipment, fertilizer and consumer goods for the farm population in return for the food and the industrial raw materials for the urban sector. This trade has not developed and there is no doubt that one of the important contributory factors to the absence of a healthy marketing relationship between the two sectors is lack of adequate transport.

iii. Limited Role of Arterial Form of Transport in Bangladesh:

The transport system that exists presently in Bangladesh can be divided into two distinct forms on the basis of their operational features. The first is the arterial inter-urban system comprising the railway, mechanised inland water transport and, lately, a network of all-weather metalled road system. All these forms of transport can be said to be engaged in relatively long-haul operation and catering largely to the needs of a small number of bulk commodities associated with the country's foreign trade.

The second form of transport consists of the non-mechanised rural transport associated primarily with the agricultural sector of the economy. These are the small, but vast number of, country boats in the south and the bullock carts in the north of Bangladesh.

Given the agricultural subsistence type of economy of Bangladesh, it is, therefore, not surprising to find that the arterial freight traffic flow, either through railway or mechanised inland water transport, is relatively small in volume and simple in form and content. It is interesting to observe that about eight commodities - jute and jute products, coal, cement, rice and paddy, sugarcane, wheat, fertilizer and salt - provide more than 75 per cent of the railway's freight traffic and two-thirds of its revenues. Nearly all of these items are bulk in nature and represent relatively long-haul traffic. Another interesting feature of the railway movement is the concentration of traffic flows between a few major points. Seventy per cent of total railway traffic originate or terminate at points which represent 8 per cent of all the points served and 60 per cent of all its traffic is either import or export.

These same features are in fact more dominant in respect of the long-haul mechanised inland water transport. Six bulk commodities - jute and jute goods, foodgrains, P.O.L. (petroleum products), cement, coal and paper - constitute 88 per cent of the total traffic and about 80 per cent of all freight traffic either originate or terminate at four points. Similarly about 80 per cent of the traffic served is either export or import.

Given the structure of the economy of Bangladesh, it was to be expected that the arterial freight flow was simple in form and content and that it would substantially be dominated by the country's foreign trade. Again, since during the decade between 1965 and 1975 the structure of the economy remained substantially the same and the volume of international trade stagnated or even declined, the arterial traffic pattern remained the same in content and declined in volume. This decline in arterial traffic flow is also to some extent due to the introduction of competition of a relatively small but modern truck fleet on inter-urban routes. Some of these routes duplicate the existing railway lines and the inroads made by trucking have been mainly in respect of high-value segment of the railway's commercial traffic. There is clear evidence that on the arterial freight movement side, the transport system suffers from underutilisation in capacity although there is need for modernisation, replacement of capacity, removal of operational bottlenecks and, lastly, the need to re-orient the system to meet higher demand that may be placed on it arising out of fulfilling the various objectives of the current Five Year Development Plan.[4]

iv. <u>Incongruity between the Objectives of the Five Year Development Plan and the Nature of Transport Demand in Bangladesh</u>:

One of the primary objectives of the Development Plan is to make Bangladesh self-sufficient in foodgrains by 1978 and has accordingly given tremendous emphasis on the agriculture sector. Similarly, the Plan recognised that the food self-sufficiency programme and the agricultural expansion programme that will ensue would place heavy demand on the country's transport system. Accordingly the Plan has recognised the need for modernisation of the arterial transport system and has provided for equipping the system. But the Plan seems to have failed to appreciate two major issues associated with the agricultural expansion programme which may have disastrous consequences.

Firstly, it has failed to recognise that demand for transport in countries like Bangladesh predominates at the local level of the economy and hence the need for meeting such demands.

Secondly, since the success of the Plan is overwhelmingly dependent on the growth of the agricultural sector - in terms of food self-sufficiency etc. - it has failed to spell out the implication of such an agricultural expansion in terms of:

a. provision of adequate and cheap means of transport between the points of production and distribution, and,

b. need for re-orientation of transport both in the area of short-haul and long-haul operation.

The above contention could be upheld by saying that the economy of Bangladesh is predominantly agricultural, and, therefore, the requirement for the movement of both freight and passengers <u>within</u> the various districts, for example, is far greater than that <u>between</u> districts - i.e. arterial movements. This argument is supported by such factors as:

i. 85 per cent of rail passengers travel 26.4 miles or less on average.

ii. the pattern of passenger launch services in the inland waterways carrying between 15 and 20 million passengers annually clearly indicated a preponderance of short-haul movements.

iii. bus services providing local needs have expanded rapidly wherever roads have become motorable indicating a substantial popular demand.

iv. the vast number of bullock carts and country-boats in service - both types catering essentially to local demands.

v. the simplicity of foreign trade in form and content and its relatively small volume in quantity signifies its relatively lower demand on arterial transport network that exists presently.

vi. the pattern of administrative control throughout the country centering on district headquarters.

vii. the population distribution spread evenly over countless villages with few major centres of consequence, and finally,

viii. the subsistence type of agricultural economy applicable to most of the country's population.

It is virtually certain, on this basis, that local transport demand predominates. It is also true that the subsistence type agricultural economy now predominant cannot materially progress in the direction of a market economy without basic improvements in local transport permitting low-volume commodities between villages and local and district markets rapidly, reliably and cheaply. This matter, however, has received little attention to date at the national level of transport policy and this is amply demonstrated by the development pattern of existing road network and the allocation of funds for rural roads. Emphasis has been placed on water and rail services, which are essentially trunk line operations, and, where road construction has been involved, there has been a concentration, once again, on arterial connections - in many cases duplicating existing rail arteries. This will, of course, inevitably result in the initial development of road transport services in competition with existing arterial movements rather than an extension of overall services. Road transport, wherever possible, is the logical modern answer to the demand for local transport services offering as it does, a rapid, flexible, reliable service for low-volume, short-haul movements. Unless increased emphasis is placed on road construction at the rural level, local services will continue to remain the province of the bullock cart and the country-boat, as has been the case so far.

The current Five Year Development Plan envisages that the agricultural sector would continue to remain the biggest sector of the economy at the end of the Plan period in 1978 and would contribute little over 55 per cent to the country's Gross Domestic Product (GDP). Consistent with this objective, the Plan[4] aims to achieve the production of the following major physical targets in the agricultural sector:

Table I - 1

Planned Growth in Physical Output in Agriculture
(in million)

		Unit	Benchmark Level (1969-70)	Terminal Year 1978	Percentage increase
1.	Rice	(ton)	11.24	15.08	34
2.	Wheat	(ton)	0.09	0.36	300
3.	Jute	(bales)	6.66	9.10	37
4.	Tea	(lbs.)	63.00	81.00	29
5.	Tobacco	(lbs.)	87.00	147.00	70
6.	Sugarcane	(ton)	6.00	7.42	24
7.	Potato	(ton)	0.78	1.11	42
8.	Oil seeds	(ton)	0.20	0.40	100
9.	Pulses	(ton)	0.29	0.35	21
10.	Fertilizer	(ton)	0.22	1.03	378

Source: Planning Commission, First Five Year Plan.

These are no doubt optimistic targets of the Plan to achieve but to the extent that they are 'technically achievable ~~available~~' it has a staggering implication for the transport sector as a whole but absolutely crucial in terms of movement requirement of both inputs for agricultural production and later the produce itself between farm to market and vice versa. Even though the target of rice production alone will mean self-sufficiency in foodgrains for Bangladesh there is expected to be demand for transport for balancing between surplus and deficit areas. Besides, without adequate provision of transport the planned agricultural expansion itself may be hampered due to lack of efficient and timely distribution of fertilizer, seeds and other inputs.

Given the optimistic possibilities in the agriculture sector as above, the Plan suggests very little in the way of meeting the needs of local transport as opposed to the arterial transport activities - such as the railway, highways, inland water transport, national and international shipping, civil aviation, ports etc. No wonder, therefore, that 13.4% of the total Plan outlay is devoted to a transport system which is geared towards meeting the needs of the inter-district arterial movements and those related to the country's foreign trade.

The Development Plan, however, does suggest that rural roads would be provided within the Rural Works Programme for which a sum of Taka 320 million has been provided for the five year period. This represents 5 per cent of the total allocation in the transport sector and 0.71 per cent of the total Plan outlay. This, therefore, speaks volumes about the Plan's priority as between the various segments and forms of transport system in the country.

This is not to say that by mere provision of improved rural roads the growth objectives in agriculture could be fulfilled. For rural development calls for a concerted action and an integrated approach and, therefore, it cannot be achieved by one development factor alone. Then even if an improved road leads to 'decline in transport cost', it 'must first be passed on to a farmer before he can take full advantage of a road improvement'.[2] It is important that transport in the area is competitive and farmers are able to derive the benefit of transport cost savings arising out of improved road. Income distribution implication of improved road provision, in fact, of any developmental efforts, is crucially important in a community where its members are not equally placed to enjoy the fruits of development.

In the Bangladesh situation, however, although these are important issues, there is ample evidence that the present quality and extent of rural roads are inadequate and there is much scope for the economic efficiency of this segment of transport to be improved. This improvement need not necessarily take the form of providing a very high standard of road but it seems possible that a minimum of improvement consistent with the regions existing and expected traffic levels may lead to significant reduction in the present cost of transport. It is intended, therefore, that the central focus of this investigation is on exploring this possibility.

v. The Hypothesis:

Given the problems of Bangladesh transport as stated above, in summary, we will seek to examine the following hypothesis:

a. The structure of the Bangladesh economy is vastly agrarian. Demand for transport, therefore, predominates at the local level - i.e. for intra-district movement. Transformation of the subsistence economy into a market economy will hinge crucially, if not solely, on the availability of proper market and transport infra-structure facilities at the local level.

b. Present marketing arrangement in the rural areas is not economically efficient and a reflection on inadequate condition of rural roads. There is scope that with improvement to road conditions, the cost of transport can be reduced significantly.

c. There is much potentiality in the agricultural sector and the current Five Year Development Plan forecasts self-sufficiency in foodgrains by the end of the plan period. The Plan's objective is not appreciative of the need for re-alignments of present transport structures - both at the local and national level. As a result, the Plan's resource commitment is not balanced between the needs of local rural transport and the long distance arterial form of transport.

d. Past efforts in rural road development have been largely wasteful in view of inadequate engineering standard. The country's physiographic conditions demand that the rural road should adhere to minimum standard - one which would avoid waste of resources and efforts and, at the same time, be economical.

e. Present land distribution pattern is likely to prevent benefits of road improvement, in fact, of any other improvement, being shared by all farmers, big or small, and hence the need for appropriate policy formulation to deal with the question of income-distribution implication of rural development.

vi. The Study Format:

For a fuller appreciation of the problems and issues raised, it is important that the whole question be placed in a wider perspective. We ought to understand the stage of economic development, the structure of the economy and the potential direction towards which it will move for meeting the fundamental objective of any economic development effort - namely, the raising of the standard of living of its people. In Chapter II we would, therefore, seek to lay the outline of the Bangladesh economy and, also, see if there is any valid and stable relationship between the past development of transport activities and that of the country's GDP.

Similarly in Chapter III, we will lay the transportation perspective to see how various forms of transport are evolving in the changing pattern of trade and economic development. We will try to analyse the existing modes of transport - both local and arterial forms - in terms of their physical characteristics and traffic trends.

In Chapter IV, we will concentrate on the organisational framework within which the transport system operates and is developed in Bangladesh. In particular, we will pay attention to the implication of resource allocation as among various forms and segments of transport in Bangladesh and how the present Five Year Development Plan strikes a balance between its own objectives of agricultural expansion and its resource allocation for creating transport capacity at local and arterial levels.

In the hope of finding an answer to the principal question whether, in fact, there is scope for reduction of transport cost in the rural economy, we have undertaken an area study in Bangladesh. The field investigation was carried out in Sherpur Thana of Bogra District situated in the north-western part of Bangladesh. The area falls within the high land capability zone of the country and has been selected for intensive integrated developmental efforts. Since we have argued that road development may not by itself secure the all-round development of an area, we have sought to examine the question of road improvement in the context of a broad based integrated development programme. In Chapter V, therefore, we have explained the objectives and methodology of the area study undertaken. In addition, we have laid the theoretical basis of an integrated development approach in the evaluation of rural roads in countries like Bangladesh.

Chapter VI details the results of the area study and is divided into three parts. Part I provides the physiographic characteristics of the area so far as they relate to transport and other economic activities. In addition, an attempt has been made to build up an inventory of physical and socio-economic infra-structures. Part II relates to the area's natural and human resources in terms of land availability, production technique and future potentiality. Finally, Part III throws up information about the area's general pattern of trade and marketing and the features of transport movements.

It looks into the present and future probable cost of transport and the cost and economic implication of an improved road provision.

Chapter VII builds on the information in Chapter VI. It follows the integrated development approach and the analysis is carried out in terms of a producer surplus model. The final cost benefit analysis is done through building of various sub-models and taking into consideration all elements of development under the assumption of a without- and with-project package.

Finally, Chapter VIII, the concluding chapter, summarises the findings and conclusions of the study. These relate to the needs of road improvement in Bangladesh and the need for re-orientation of transport policy making - particularly in the context of resource allocation both among the sectors of the national economy and within the transport sub-sectors.

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CHAPTER II

THE BANGLADESH ECONOMY

The economy of Bangladesh is traditionally and predominantly agricultural. About 90 per cent of the country's population is rural, and about 80 per cent of these are engaged in agriculture.(2) Agricultural output accounts for about 55 per cent of the gross domestic product, this proportion has remained virtually constant over the past years. Even with increases in jute manufacture after the partition from (British) India in 1947, total industrial output still accounted for only 9 per cent of the GDP. Sixty-five per cent of all industrial output is accounted for by the processing of jute, cotton, sugar, oil seeds, rice and wood products. Growth and structural change in the Bangladesh economy between 1949-50 and 1969-70 may be seen in the following table.

Table II - 1

Growth and Structural Change in Bangladesh 1949-50 to 1969-70
(Values at constant 1959-60 prices)

Year	GDP million Rs.	GDP per capita (Rs.)	Sectoral Shares of GDP (%)				
			Agriculture	Large-scale industry	Small-scale industry	Construction Transport Power	Services
1949-50	12,374	293	65.2	0.6	3.3	5.6	25.3
1954-55	13,816	290	63.0	1.4	3.3	6.6	25.7
1960-61	15,310	287	62.6	3.0	3.4	7.5	23.5
1963-64	17,855	304	59.4	3.4	3.1	11.3	22.8
1966-67	18,734	290	55.9	5.0	3.2	12.2	23.7
1969-70	22,317	316	55.3	6.0	2.9	12.8	23.0

Source: East Pakistan Economic Survey 1969-70, Planning Department, Government of East Pakistan.

i. <u>The Agriculture</u>:

Bangladesh has been a country of food self-sufficiency for many years, even of surplus in good years. In recent decades, however, it has become a region of growing food deficits. Although grain output has maintained an upward trend, it has now for some years been outpaced by the growth of population; imports of increasing magnitude, both in absolute quantity and in relation to overall consumption have been required. The fact that food production is lagging behind rapid population increase is the central problem of Bangladesh agriculture. The following table would show how foodgrain production has been slipping behind population growth.

The fact is fairly self-evident that as against the steady growth of population, varying between 2.5 to 3.1 per cent per annum, foodgrain production suffered a relative stagnation over the last decades - this has been particularly so in terms of productivity or yield per acre of cultivation. Successive governments had to resort to imports from abroad to feed the population which outpaced production at home.

Table II - 2

Foodgrain Availability and Population Growth in Bangladesh

	Production of rice (m tons)	Imports of rice (m tons)	Production of wheat (m tons)	Imports of wheat (m tons)	Total availability of foodgrains (m tons)	Population (m)	Availability per head per year (lb.)	Percentage of total derived from imports
1948-49	6.74	0.40	0.02	0.10	6.71	41.9	358	7.4
1959-60	8.48	0.46	0.03	0.15	8.43	53.9	351	7.2
1960-61	9.53	0.46	0.03	0.23	9.48	55.6	382	7.3
1961-62	9.47	0.21	0.04	0.20	9.14	57.3	351	4.4
1962-63	8.73	0.54	0.04	0.89	9.50	59.1	360	15.1
1963-64	10.46	0.35	0.03	0.66	10.64	60.9	391	9.5
1964-65	10.34	0.10	0.03	0.25	9.88	62.8	352	3.5
1965-66	10.34	0.38	0.03	0.54	10.45	64.6	362	8.8
1966-67	9.42	0.43	0.05	0.67	9.81	66.5	331	11.2
1967-68	10.99	0.31	0.05	0.71	11.75	68.4	366	9.1
1968-69	11.17	0.24	0.08	0.83	11.41	70.4	363	9.4
1969-70	11.82	0.50	0.10	1.05	12.44	72.4	385	12.4

Source: Planning Department, Government of East Pakistan and Weite - Hettelsater Engineers, Economic Study : Foodgrain Storage and Handling Facilities - June 1970.

Note: Total availability of foodgrains may not match production and import of rice and wheat for 10 per cent of domestic production is deducted for seed, feed, wastage, etc.

Presently about 22 million acres of land are cultivated, half of this is land suitable for double - in some cases triple - cropping, the other half being low-lying areas which are deeply flooded by the water of the rivers or inundated by salt water for a good part of the year. In the dry season effective cultivation requires irrigation for most of the cropped area. The main thrust of agricultural expansion is, therefore, expected to come from increased productivity through the application of modern technology: new and better seeds, better and fuller use of fertilizers, pesticides and water control; as well as more effective institutions for the organisation of production, distribution and marketing.

The land cultivation in Bangladesh is largely done in small plots. There are an estimated 7 million farms. In the context of Bangladesh, even a very small size farm provides an important basis for the livelihood of a household; one out of every four farms in Bangladesh is, in fact, only one acre or less. Such farms, nearly all of which are owner operated, are of course inadequate as an only source of employment and of income for the whole household of typically six or more members, but they do provide a certain measure of security and social standing.

The sizes of farms are such that two out of four farms are between one and four acres. In contrast to the smallest farms, only 60 per cent of these middle-sized farms are owner-operated. Depending on the quality of the land and on its exposure to flooding, drought and salinity, the owner-operated farms are likely to provide the basis for viable subsistence and some market farming. The tenant-farmers have to use part of the produce for rent, sometimes as much as half the crop. While this will increase the volume of agricultural produce that enters the market, it also means that members of these tenant farming families must try to supplement their income as agricultural labourers and as participants in non-agricultural rural activities.

About one quarter of farms in Bangladesh are 4 acres or more. These are the farms from which the main part of marketable surpluses may be derived, though for most of them only during favourable harvests. These farms are well placed for introduction of technological improvements through better seeds, plant control, fertilizers, capital investments etc. More than 50 per cent of these farms are owner-operated, providing an existence which for life in Bangladesh may be considered secure and well-to-do.

While the relatively large farms have the means to mobilise the capital and to introduce the known technological innovations, the small and medium farms have also been found quite efficient in terms of intensity of cultivation and in the use of labour. Evidence(3) in many developing countries including Bangladesh shows that output and employment per unit of land are higher on smaller farms than on large farms. Also, it seems entirely possible that major inputs of the new technology, being highly divisible, can be adopted with equal advantage by small and large farms.

In Bangladesh, half of all value added in agriculture is represented by paddy production; the next important item being jute. There is some domestic production of wheat, pulses, edible oils and other crops which provide important additions and supplements to the diet; and so does fishing - mainly pond and other inland fishing although lately there has been introduction of a trawler fleet for deep-sea fishing.

Paddy is grown on four out of every five acres of total area cropped in Bangladesh. The relative share of paddy fields in total acreage may tend to decrease as other products, including wheat, gain importance. For the foreseeable future, however, rice production will provide the main source of income and livelihood.

ii. New Technology in Agricultural Production:

Productivity of agricultural crops per acre in Bangladesh is low in relation to potentialities within Bangladesh and as compared to other countries. There is scope for very significant improvements through modernisation of agricultural processes and by the much more intensive use of supplementary inputs. The following table shows yields in a number of countries including Bangladesh.

Table II - 3

Yields of Various Crops in Bangladesh and Selected Countries
(1000 kg. per hectare)

	Bangladesh	India	Thailand	Taiwan	S.Korea	Italy	Japan	Mexico
Rice	11.6	16.6	18.7	39.9	46.0	53.0	56.4	28.6
Wheat	8.7	12.1	-	21.0	24.0	23.3	20.7	28.4
Jute	13.4	13.5	12.0	17.4	-	-	-	-
Grain and Pulses	4.5	4.6	-	12.8	10.0	30.7	17.1	25.0
Tobacco	9.1	7.8	10.9	20.6	18.4	16.6	21.3	15.0
Sugarcane	444	483	335	736	-	-	584	625
Use of nitrogenous fertilizer (Kg. per hectare of cultivated area (a)	9.2	7.6	64.6	190.5	138.6	36.7	160.1	16.3

Source: FAO Production Yearbook 1970, Tables 21, 465 and 1.

Note: (a) Defined as arable land and land under permanent crops.

The traditional agricultural practices in Bangladesh have undergone some adaptation to new technologies. The use of fertilizers has always been very low. This is explained by the fact that traditional rice varieties, which in other respects are well suited to the soil and growth conditions of Bangladesh, are tall but weak-stemmed plants. If nitrogenous fertilizer is added, the heads of the plants get heavier and the stems taller and weaker, and the plant, therefore, tends to fall. It is only in recent years, after the breakthrough in plant breeding technologies at the International Rice Research Institute in the Philippines (IRRI) and the initiation of adaptive research in Bangladesh, that cultivation based on new varieties and new practices has become a realistic possibility.

The first attempt was made in the mid-1960s with the introduction of a new seed, called IR8; this proved moderately successful for the winter (boro) crop. For the two other main crops, aus and aman, IR8 turned out to be unsuited, particularly because of the great variation in yields and thus the high element of risk involved for individual farmers. Boro season yields were generally satisfactory, three times the output from traditional varieties was obtained in many instances and farmers rapidly realised the opportunities offered by the new seeds.

The introduction in 1970 of IR20, however, was a major breakthrough for paddy technology in Bangladesh. This seed variety is very much better suited for the main aman crop than are the traditional varieties. With average monsoon conditions yields are high and the plants are moderately resistant to pest. Since 1970 several other new paddy seed varieties have also been developed by IRRI and introduced in Bangladesh, covering all three main crops and different conditions within each group.

With the technological innovations being made available the Bangladesh farmer appears to have responded quite quickly. According to official estimates [1] the area planted with the new high yielding varieties in 1974 covered some 1.7 million acres. It is significant that such rapid farmer acceptance of new seeds has in fact taken place in an otherwise conservative community, has happened in spite of very limited extension services and notwithstanding the fact that farmers have had to adopt new cultivation practices. Generally, for full realisation of their potential, the new seeds require better land preparation, better weed and pest control, more attention to transplanting, more use of fertilizer, and better drainage and irrigation facilities and water control. The new seeds open the opportunity both for high returns from new cultivation practices in these respects, requiring both more labour per acre of land and more supplementary inputs. But all the same, the opening up of new cultivation technologies for all three main paddy crops (as well as for wheat) in Bangladesh gives a fresh opportunity for the country to be self-sufficient in foodgrains.

In terms of development strategy, the significance of the new rice technology is that they provide not only higher yields but also much greater choice and flexibility. Moreover, the creation of the circumstances in which given seeds are most effective depend on national decisions on investment programmes for physical structures and for training and extension, on licensing, import, production and provision of supplementary inputs to make the new seed technology effective, and on institutions and facilities for the off-take, marketing and transportation of the output.

The possibility of increased rice output with the new seeds and technology is very large for each major crop. For good results supplementary inputs of fertilizers, pest controls, irrigation, drainage etc. are essential, most of them yielding output in rough proportion to the extent of their application in the initial stages. Major irrigation and drainage schemes, however, and indeed control of the major rivers and installation of effective coastal embankments, require very large investment and have long gestation periods for their completion and before they contribute significantly to current crop production. The fact that current output can be increased very considerably by concentration on the new seeds, current inputs and relatively small-scale investment programmes, rather than on large scale, indivisible investments which are very costly in terms of both time and finance, provides the basis for an 'inputs' strategy for the medium term future. This inputs strategy leaves major water control investments, if not their planning, to the future. The strategic decisions in terms of concentration and timing of effort become choices between crops and between the several elements of an input package. The great advantage of the new technology for Bangladesh is that it not only allows deferment of the immense major water control schemes but also provides variety and options in the introduction of a new technology.

The First Five Year Development Plan of Bangladesh makes its target dependent on an effective input strategy. Compared to an 'average' pre-Plan year a small increase in the multi-cropping of agricultural land is foreseen, but average yield is expected to grow by over 6 per cent annually, mostly by shifting to new seeds for all three major crops and greatly expanding the area of boro crop for which additional yields with new seeds are higher than for the two other crops. The combined effect of the successful implementation of the Plan programme would result in a total rice output in 1977-78 over 15 million tons which together with projected wheat output and allowing for 'normal' deductions for seeds, feed, waste, would roughly correspond to the expected demand, thus eliminating the need for net imports of foodgrains.

The projected move towards self-sufficiency in food-grains at the end of the Plan period would mean considerable amount of marketable surplus for the areas of surplus production and consequent need for movement of foodgrains both locally and inter-regionally. Foodgrain production is planned to increase from the benchmark level (in 1969-70) of 11.3 million tons to 15.4 million tons. This indicates an increase of 36 per cent over the Plan period and 6.4 per cent per year annually compounded. The target production is planned to ensure self-sufficiency in foodgrains by 1977-78 thereby making costly imports unnecessary in the terminal year of the Plan. Annual breakdown of requirement and projected production as proposed in the development Plan is given below

Table II - 4

Annual Requirement and Projected Production of Foodgrain during the Plan period

Year	Population (in million)	Food requirement in million tons	Gross Production of food-grains in million tons	Foodgrain available for consumption in million tons*	Deficit/ Surplus in million tons
1973-74	76.2	12.04	12.05	10.84	- 1.20
1974-75	78.5	12.39	13.22	11.90	- 0.49
1975-76	80.9	12.75	13.79	12.41	- 0.34
1976-77	83.1	13.11	14.41	12.97	- 0.14
1977-78	85.4	13.90	15.44	13.90	NIL

* After deducting 10 per cent from the gross production for seed, feed and wastage.

Source: Government of Bangladesh, Planning Commission, First Five Year Plan of Bangladesh - 1973.

We have noticed that in the self-sufficiency programme in foodgrains the main reliance is on inputs strategy which primarily consists of high yielding variety of seed, irrigation water and fertilizer. Full advantage of irrigation water and seed may remain unrealised if there is no means of adequate and timely distribution of fertilizer to the farmers. In tonnage terms the use of commercial fertilizer is expected to increase threefold over the benchmark (1969-70) figure of 233 thousand tons. For foodgrain alone the following would be the requirement of commercial fertilizer, pesticides and seeds in thousand tons:

Table II - 5

Annual Input Requirement for the Foodgrain Crops during the Plan period (in tons) (000)

Inputs	Bench mark 1969-70	1973-74	1974-75	1975-76	1976-77	1977-78
Commercial Fertilizer	233.00	340.00	385.00	473.00	581.00	732.00
Pesticides	10.80	13.40	15.20	16.10	17.00	18.00
Seeds	12.63	42.18	23.92	11.31	14.15	18.36

Source: Government of Bangladesh, Planning Commission, First Five Year Plan of Bangladesh, 1973.

Concentration of our attention on foodgrains has been because half of the agriculture sector constitutes of rice production and hence its importance in the economy - not only in terms of what it contributes to the nation's GDP but also due to its implication on marketing and distribution and, in the context of the present work, on the demand for transport. Also other crops must be produced in larger quantity in the interest of creating employment, providing a balanced and adequate diet, improving export potential, and providing inputs for industry. Therefore the Development Plan also lays great emphasis on other agricultural crops like: jute, tea, tobacco, sugarcane, cotton, potato, oil seeds, pulses etc.

The major cash crop is jute, and to a very significant extent the growth of the modern sector in Bangladesh has been dependent on jute production. Some 25 per cent of industrial production is in jute processing; raw jute and jute goods comprised some 90 per cent of export from Bangladesh to foreign countries prior to 1971. While this is the magnitude of importance of jute to the economy of Bangladesh, research into jute cultivation is unfortunately far behind that devoted to the cultivation of rice and negligible in relation to what has been spent on synthetics. Being the largest producer of jute in the world, Bangladesh was in a commanding position in the production of sacking and broadloom carpet backing a couple of years ago. But jute sacking suffered a diminishing demand on world markets as bulk handling of grains and similar formerly bagged commodities became more widespread. In addition substitutes like polypropelene based on petroleum made the situation for jute more vulnerable because the synthetics proved cheaper. The current position is, however, slightly better due to fourfold increase of oil prices and its effects on cost of synthetic production. Bangladesh in the meantime is pressing ahead with research in an effort to preserve jute's place in the world market. The main strategy here again is through improving input technology and thereby to increase yield per acre to bring down unit cost of production.

Although tea provides about 4 per cent of Bangladesh export earnings, the gardens provide employment for about 140,000 workers and meets total home consumption. Formerly it enjoyed a subsidised and protected market in Pakistan. Now it must compete in the world market and, therefore, a great deal of effort is planned to increase yield per acre and to improve quality through better agricultural practices. Similarly the Development Plan is optimistic about attaining higher productivity in other crops (Table I-1) and in almost all cases the dependence has been on better inputs applicability.

The opportunity to increase the output of fish is good. So far fishing activities have been concentrated in the inland waters and the possibilities of the Bay of Bengal have been largely neglected. However, a start has been made with exploiting these resources through the acquisition of a fleet of deep-sea trawlers. There seems to be considerable potential for increasing the consumption of fish and for expanding exports.

The recent war and natural disasters have inflicted heavy casualty on animal resources of the country. More animals will be needed to increase meat and milk availability and also for soil preparation needed with the new input technologies. The basic problem of increasing the number of animals is, of course, that of feed; as in every other case poor rice yields react adversely on other production possibilities. At present cattle as well as men suffer from malnutrition and this is one reason why livestock output has declined in the last ten years. Something can be done to improve the output of livestock other than cattle by improving strains, for example poultry. Realistically, however, efforts to increase the output of livestock are unlikely to be of great significance for some time. Improvements in rice production come first and get the priority.

iii. The Industry:

The growth of non-agricultural sectors in Bangladesh has been limited. Industrial production accounts for under 10 per cent of GDP. There was little tradition of entrepreneurship in the past - before partition in 1947 the industrial and commercial centre of the region was Calcutta. Even after partition much of the limited amount of investment was made by non-Bangladeshis. During its two and a half decades of political association with Pakistan, Bangladesh experienced a fairly mild rate of industrialisation - mainly concentrating in the extraction or processing of indigenous raw materials. Information about output, employment and value-added in the leading large-scale industries is given in Tables II - 6 and 7.

Table II - 6

Output of Selected Manufacturing Industries in Bangladesh

	1954-55	1959-60	1964-65	1969-70	Planned 1977-78	% increase over 1969-70
Tea (million lbs.)	53.8	50.3	62.3	63.0	81	28.6
Sugar (thousand tons)	47	61	77	89	179	101.1
Vegetable Oil (thousand tons)	-	1.8	4.9	6.4	13	100.2
Cigarettes (million)	400	1,100	5,540	17,780	30,226	70.0
Cotton Yarn (million lbs.)	23	49	64	106	219	106.6
Cotton Cloth (million yards)	64	62	49	59	93	57.6
Rayon Cloth (million yards)	-	0.3	0.1	5.0	6.0	20.0
Jute Manufactures (thousand tons)	103	265	289	580	1,046	880.3
Fertilizer (Urea) (thousand tons)	-	-	72	94	1,100	1,070.2
Matches (million gross boxes)	2.4	8.6	10.7	13.0	15.0	15.3
Cement (thousand tons)	50	61	56	53	1,100	1,786.8
Paper and Newsprint (thousand tons)	19.2	39.2	78.8	77.9	100.5	29.0
Iron and Steel (million tons)	-	-	-	2.3	9.5	313.0

Source: Government of Pakistan (Ministry of Finance), Pakistan Economic Survey and Bangladesh First Five Year Plan, 1973.

Table II - 7

Employment and Value-added in Major Large-scale Industries in Bangladesh 1967-68

Industry	Employment (number)	Value-added (million Rs.)	Rank in terms of value-added
1. Jute Textile	100,500	299.2	1
2. Cotton Textile	33,887	146.7	3
3. Tea processing	9,803	115.9	4
4. Matches	9,101	48.5	7
5. Paper	5,301	51.2	6
6. Cigarettes	3,926	214.1	2
7. Jute baling	3,588	42.6	8
8. Shipbuilding	3,242	11.3	13
9. Perfumes etc.	3,217	39.1	9
10. Drugs & Medicines	3,075	32.9	11
11. Iron and Steel	1,778	27.8	12
12. Fertilizer	1,527	38.6	10
13. Rayon	357	59.9	5

Source: Census of Manufacturing Industries (CMI) Report 1967-68.

The large-scale industries of Bangladesh were provided with quite a high proportion of public sector ownership. The Industrial Development Corporation set up a large number of enterprises and pioneered in most new areas.

A consequence of the emergence of Bangladesh through severance of its link with Pakistan has been that the state is the immediate owner of the left-over industries owned by

Pakistanis. Along with the enterprises owned by the Industrial Development Corporation, this gives the state a massive control over manufacturing industries, perhaps including well over two-thirds of the industrial assets and output. This is both an opportunity and a challenge - an opportunity in so far as the otherwise modest sources of public sector revenue would be greatly augmented, and a challenge in so far as the government with limited managerial resources and meagre experience of running commercial enterprises will be faced with the problem of managing a very large number of units.

Although the national accounts show that the large-scale industries in recent years have contributed two-thirds of the value-added in manufacturing, the economy is still very considerably dependent on small and cottage industry. In fact the dependence is very much greater in terms of employment and in terms of the supply of the most important non-food consumption goods, for example, cloth. An attempt is made in the following table to co.pare the three types of manufacturing.

Table II - 8

Comparison of Large, Small and Cottage Industries 1967-68

	Large	Small	Cottage
Value-added per worker (Rs.)	5706	2336	270
Capital/Value-added ratio	1.734	0.583	0.552
Capital/Labour ratio	9892	1363	149
Workers per unit	191	8.15	3.3
Hired workers per unit	100%	85%	0.3%
Employment as percentage of civilian labour force	0.9%	0.9%	5.9%

Source: Bureau of Statistics, CMI Report, 1967-68.

The growth potential of small and cottage industries, however, should not be over-emphasised. In the main they are likely to expand as population increases largely in the direction of duplicating existing activities to take care of the needs of more consumers. They include domestic handloom weaving, a major occupation, and processing foodstuffs for local consumption, which together probably account for half of cottage industry output, the rest being made up of a variety of village activities such as the manufacture of salt and wood products.

In conclusion it may be said that while agriculture must in the next few years be the main growth point for output in the economy, it is inconceivable that the Bangladesh economy can expand production and employment without a fairly rapid growth in industrial output. An increase in output of ten per cent per annum in the industrial sector, as envisaged in the development Plan, would seem to be in keeping with the performance of other economies and something that it might be hoped to attain.

iv. GDP and the Transport Sector:

In a modern economy where almost all economic activities are accounted for, there is often a distinct relationship between the country's GDP and the level of the country's total freight traffic. Such relationship may also be obtained for each of the modes of transport, such as railways, inland water transport or road transport. Tulpule and Tanner[4] have developed a predictive model which is based on the assumption that there is a relationship between the total ton-miles of goods carried in a given year and gross domestic product in the U.K. Given this sort of relationship, forecasts are sought to be made of future freight ton-miles breaking down into the shares of the railways, road transport haulage and so on. While this sort of exercise may be relevant for the developed economies like the U.K., for Bangladesh there seem to be two major difficulties. Firstly, the rural sector of the economy is non-monetised to a significant degree. Some times short-haul movement of cargo by non-mechanised transport may be paid for in kind. The second and the most serious difficulty is that there is no statistical base in terms of tonnage carried from the farm to the market and vice versa. So the ton-miles generated out of the rural activities, most of which is in agriculture, are unaccounted for. The railways have reasonable records of ton-miles carried and, to a more limited extent, so does the mechanised inland water transport. On the road transport sector, which is relatively new but an expanding sector, there is no record of freight movement. In this situation it becomes a difficult task to find out the correlation between the GDP and the total ton-miles. All the same, an effort has been made to juxtapose the growth in the GDP and the ton-miles performed by the Bangladesh railway, Inland Waterways (mechanised sector) and the road transport.

The figures on road transport are the weakest for the estimate has been produced on rough assumptions. Total population of trucks in a given year has been multiplied by the estimated average capacity of each truck, the product of which is multiplied again by the average annual mileage performed by a truck to arrive at the ton miles by road freight transport in a given year. Estimates of road ton-miles are given in Table II-9 and those of combined GDP and ton miles of railway, inland waterways (mechanised) and the road transport in Table II-10. Needless, perhaps, to say again that the most important parts of ton-miles done by the non-mechanised transport associated with the agricultural activities, which, in fact, constitute more than 50 per cent of the GDP, are for the present unaccounted for.

Table II - 9

Estimated Road Transport (Trucking) Ton-miles

Years	Number of Trucks (a)	Estimated Average Capacity in tons (b)	Estimated Average Annual Mileage per Truck (c)	Estimated Ton-miles in millions
1949-50	691	2.5	10,000	17.28
1954-55	2,454	2.5	13,000	79.76
1960-61	4,235	3.0	15,000	190.57
1961-62	4,563	3.0	15,000	205.34
1962-63	6,325	3.0	16,000	303.60
1963-64	6,721	3.5	16,000	376.38
1964-65	6,965	3.5	17,000	414.42
1965-66	7,168	3.5	17,000	426.50
1966-67	7,901	3.5	18,000	497.71
1967-68	8,507	4.0	18,000	612.50
1968-69	8,844	4.0	19,000	672.14
1969-70	9,355	4.0	19,000	711.00

Sources: (a) Table III - 16.

(b) Estimated average from capacity distribution of the truck fleet from year to year.

(c) Estimated from Trucking Survey in East Pakistan, R.W. & R.T. Department 1966, B.T.S. estimates in 1973-74, and as related to road mileage constructed over the period (Table III - 13).

Table II - 10

Trends in GDP and Freight Ton-miles (in million tons) in Bangladesh

Years	GDP (a) (million Rs.)	Index	Railway	Index	IWT (M)	Index	Road Transport (T)	Index	Total (All modes)	Index
1960-61	15,130	100	945	100	775	100	191	100	1,911	100
1961-62	16,206	107.11	973	102.96	901	116.26	205	107.33	2,079	108.79
1962-63	16,130	106.61	1,062	112.38	837	108.00	304	159.16	2,202	115.23
1963-64	17,855	118.01	1,053	111.43	851	109.81	376	196.86	2,280	119.31
1964-65	17,965	118.74	893	94.50	412	53.16	414	216.75	1,719	89.95
1965-66	18,569	122.73	854	90.37	364	46.97	427	223.56	1,645	86.08
1966-67	18,734	123.82	867	91.74	392	50.58	498	260.73	1,757	91.94
1967-68	20,358	134.55	806	85.29	368	47.48	613	320.94	1,787	93.51
1968-69	20,866	137.91	725	76.72	387	49.94	672	351.83	1,784	93.35
1969-70	21,942	145.02	959 (b)	101.48	389	50.19	711	372.25	2,057	107.64

Source: Tables II-8, III-8 and III-13.

Notes: (a) GDP at Constant Factor Cost 1959-60 prices - Pakistan Government, C.S.O. estimates.

(b) Introduced chargeable miles instead of actual miles performed.

(M) Mechanical Ton-miles.

(T) Truck Ton-miles.

It seems that while both the railway and inland water transport in ton-miles terms have experienced steady decline since 1959-60, the country's GDP registered a steady, if somewhat mild, growth over the same period. The estimated road freight ton-miles, on the other hand, grew phenomenally between 1956-60 and 1964-65 and then slowed down but later had a steady, though modest, increase. The growth between 1959-60 and 1964-65 in GDP has been something like 25.5 per cent while during the same period, freight ton-miles by road transport increased by 162.4 per cent. It is clear, therefore, that growth in road ton-miles as compared to GDP has been uneven. But the growth in road ton-miles for the period 1959-60 to 1964-65 seems more related to the increase of road mileage constructed (Table III-13) during the same period. For of the country's total all-weather trunk road of 2,380 miles by 1969-70, about a thousand miles alone were constructed during the period in question (Table III-13). On the whole, total road freight ton-miles as well as the truck population seems to have kept pace with the increasing, if limited, availability of all-weather trunk road system. On the other hand, railway and inland waterways freight ton-miles seem to have suffered stagnation, even decline, despite the modest movement in the growth of GDP. This is not to say, however, that there is no relation between the GDP and the country's all freight ton-miles. But unfortunately the serious dearth of data of ton-miles on local transport movements - particularly non-mechanised road and water transport segments - precludes the building up of total national freight ton-miles. We have, therefore, sought to obtain a certain measure of correlation between the growth in GDP and the total freight traffic as estimated (Table II-10). The results suggest that there is little correlation between the growth in GDP and growth in the total freight traffic; regression analysis on the basis of yearly time series data over the period 1960-61 to 1969-70 (Table III-10) gives the following regression equations using three separate models, namely, linear, double log and semi log.

i. Linear model:

$$y = 24067.43630 - 2.96131X$$

where y = GDP, X = Total freight traffic

$R^2 = .08661$ $F = .75856$

ii. Double log or log linear model:

$$\log Y = 5.34280 - 0.32956 \log X$$

$R^2 = .09499$

$F = .83967$

iii. Semi log model:

$$\log Y = 4.40304 - 0.00007X$$

$R^2 = .09561$

$F = .84572$

It may be noted that in each of the three models the value of R^2 is extremely low and on the basis of the corresponding F values, there is no evidence against the hypotheses of little or a zero correlation between GDP and the total freight traffic.

However, the serious data limitation, particularly of the total traffic data, warrants extreme care in the interpretation of these results.

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CHAPTER III

THE TRANSPORTATION PERSPECTIVE

i. Geophysical situation for Bangladesh transport:

Almost all of Bangladesh is a low tropical plain formed by great rivers and laced with their tributaries and distributaries. The main rivers are fed by the run off from the southern slopes of the Himalayas and an annual precipitation that averages over 75 inches. The transportation system is, therefore, heavily conditioned both by the dense network of rivers and by the extensive seasonal flooding. Over 50 per cent of the country is less than twenty five feet above mean sea level and between 20 and 35 per cent of the countryside is flooded each year.

Given these topographical features of the country large stretches of rail and road alignments must be built on embankments to remain flood-free and these embankments themselves, acting as dykes in flood-prone areas, tend to affect the flooding pattern in unpredictable ways which may have adverse consequences for the rail or road facility itself or to the surrounding area. Numerous bridges and ferries are required and satisfactory construction and installation of these is impeded or rendered expensive by the instability of river banks.

The greatest single barrier to the development of a consolidated transportation system throughout Bangladesh is the Brahamaputra/Ganges/Padma river system, with its formidable width and unstable river banks, effectively splitting the country into two parts. It is logical, however, to assume that the river systems, which impede the development of land transport services, should provide a myriad of natural waterways capable of effective use by inland water transport services. Such is, indeed, the case and the water transport industry, including a large mechanically-propelled freighter fleet, passenger launches and country boats, is active throughout the country. It may, however, be pointed out that in the sphere of arterial freight movements by the mechanically-propelled vessels, the range of activity is somewhat smaller than might be expected, largely due to:

a) seasonal draft limitations on many channels,

b) river bank instability which sometimes restricts loading and unloading facilities,

c) lack of sufficient volumes of traffic to make fuller use of the inland waterways system due to traffic imbalances even though it could prove more economical than the alternative modes available, and,

d) finally, the topography of the country also adversely affects the scope of deep-sea port facilities. The silting action in the many river mouths that line the coast results in draft restrictions which preclude the entry of ocean-going vessels beyond a certain tonnage capacity.

These are, then, some of the geo-physical constraints within which we would seek to lay the Bangladesh transportation perspective.

ii. Operational features - arterial and local forms:

It may, however, be mentioned in the beginning that the transportation system that exists in Bangladesh can be viewed as having two distinct operational features. The first is the long distance arterial transport services comprising the inter-district movements. The other is the transport services at the local level of the economy - basically intra-district operations - associated with the rural and subsistence type farming which is presently the dominant feature of the country's economy.

In the field of arterial transport, the railway and the mechanised inland water transport operations predominate. Road transport is a relatively new phenomenon and its activities are largely limited by a small mileage of all-weather bituminous road network and in terms of its quality, maintenance and accessibility. It is logical, therefore, that growth in the road transport industry has been a slow and cautious one. In a very small way, there are the big country-boats in limited number which are engaged in long-haul transportation. Some of these boats have a carrying capacity in the region of 100 tons and they are mostly limited to distributing a few items of specialised commodities, such as shingles and salt.

The forms of transport which are engaged in short-haul and essentially local operations are those of road transport mechanically operated, such as bus and lorry; small launches in the inland waterways handling both passengers and cargo and are mechanically propelled; and the vast number of country-boats and bullock carts. These last forms are small in capacity, frequently around half a ton, very slow, short-haul in operation and are predominant in the rural country-side. Their total numbers are unknown but it is recognised that they contribute enormously in terms of total ton or passenger miles and, in fact, it is this segment of transport activity which has received very little attention in national transport planning exercise.

In order to provide a fuller picture of all forms of transportation in terms of its operational features and physical characteristics, we will first deal with the arterial forms - namely, the railways and the mechanically propelled inland water transport. Following on from there, we would identify the characteristics and conditions of short-haul local transport activities. Since the main emphasis of this work is to investigate the role and capacity of small and local transport system and its present and future contributions in the economy, we will seek to dwell at length on its operational features and its continued capability as an adequate means of transport in relation to the demand that transformation of the rural economy would entail.

iii. Arterial forms of transport:

a.i. Bangladesh Railway:

Historically, the arterial transport services of what is now Bangladesh were centred on Calcutta (now in India), and both the rail and water systems were formerly part of larger entities serving the whole area of Bengal and Assam.

With the partition of the Indian sub-continent in 1947, and the need for establishing a separate political and economic identity for (the then) East Pakistan, these national trunk routes were severed both physically and administratively, and a period of re-adjustment ensued. A railway system had to be created from the disjointed segments of what was once part of an entire operating entity servicing north-east India. Although technical aspects of railway re-orientation were complex, the strong political, economic and administrative support available to the government-owned railway ensured a rapid readjustment and the railway soon established a pre-eminent position in the transport sector in its long-haul operation. But as in the rest of the world, the railway began to get into serious difficulties as construction of all-weather metalled roads got under way and the country was beginning to have the first influx of low-cost diesel-operated lorries on the inter-urban routes.

a.ii. Railways : physical features:

Table III - 1

Route (R) and Track (T) Miles operated (in miles)

Years		Broad Gauge (BG)	Meter Gauge (MG)	Narrow Gauge (NG)	Total
1959-60	R	545.63	1,149.09	19.75	1,714.47
	T	873.95	1,695.67	22.38	2,592.00
1964-65	R	545.57	1,147.23	19.75	1,712.55
	T	920.82	1,700.03	22.38	2,643.23
1969-70	R	573.57	1,202.04	(N.G.	1,746.77
	T	956.72	1,780.82	(closed	2,737.54

Source: Transport Statistics, Ministry of Planning, January 1972.

Table III - 2

Locomotives Owned

Years	B.G. Steam	B.G. Diesel	M.G. Steam	M.G. Diesel	N.G. Steam	Total
1959-60	141	-	247	51	6	405
1966-67	133	18	237	102	6	496
1969-70	121	18	229	101	-	469

Source: Transport Statistics, Ministry of Planning, January 1972.

Table III - 3. Coaching Vehicles owned

	Broad gauge		Meter gauge		Narrow gauge		Total	
	Passenger carriages	Other coaching	Passenger carriages	Other coaching	Passenger carriages	Other coaching	Passenger carriages	Other coaching
1959-60	296	187	810	307	19	2	1,125	496
1965-66	309	180	1,005	303	32	2	1,346	485
1969-70	275	143	890	335	-	-	1,165	478

Source: Transport Statistics, Ministry of Planning, January 1972.

Table III - 4

Freight Wagons Owned (in terms of 4-wheelers)

	B.G.	M.G.	N.G.	Total
1959-60	3,898	15,730	12	19,640
1964-65	4,883	17,787	12	22,682
1969-70	4,632	14,984	-	19,616

Source: Transport Statistics, Ministry of Planning, January 1972.

The physical features of the Bangladesh Railway as shown in the foregoing tables confirm that the railway system is small and has remained mainly unaltered. Equipment increases and modernisation programmes have emphasised development of the meter gauge system east of the Brahamaputra river. The policy with respect to the broad gauge lines to the west of the river has been one of containment and conservation. This feature of investment policy is evident in respect of routes and tracks, locomotives, passenger carriages and wagons operated.

Note: Sudden reduction of number of wagons between the years 1964-65 - 1969-70 arose due to hold up of large number of wagons in India as an aftermath of the India Pakistan war in 1965.

a.iii. Traffic trend and characteristics of the railway:

Traffic Trend and Characteristics of the Railway:

Table III - 5

Overall Trend in Railway Traffic - 1960-70 (,000)

Years	Broad Gauge (B.G.)				Meter Gauge (M.G.)			
	Freight-train miles	Index	Passenger train miles	Index	Freight-train miles	Index	Passenger train miles	Index
1960-61	703	100	1,741	100	2,034	100	4,133	100
1964-65	674	95.9	2,173	124.8	1,841	90.5	4,742	114.7
1969-70	455	64.7	2,320	133.3	1,776	87.3	5,008	121.2

Source: Railway Yearbook 1970.

Table III - 6

Total of both Gauges : Overall Trend in Railway Traffic

Years	Freight-train miles	Index	Passenger train miles	Index
1960-61	2,737	100.0	5,874	100.0
1964-65	2,521	92.1	6,915	117.7
1969-70	2,231	81.5	7,328	124.8

Source: Railway Yearbook 1970.

Table III - 7

Trends in Passenger Traffic by Railway (,000 million)

Years	Total Passenger carried	Index	Passenger miles	Index	Average lead of a passenger
1960-61	71,175	100	1,882	100	26.4
	(66,281)	(100)	(1,694)	(100)	(25.6)
1964-65	71,326	100.2	1,921	102.1	26.9
	(65,877)	(98.3)	(1,689)	(99.7)	(25.1)
1969-70	72,885	102.4	2,061	109.5	28.3
	(66,795)	(100.7)	(1,765)	(104.2)	(26.4)

(Figures in brackets refer to third class passengers who form the bulk of the railway passenger traffic)

Source: Railway Yearbook 1970.

Table III - 8

Trends in Freight Traffic by the Railway
(,000 tons, ,000 ton-miles)

Years	Freight tons carried	Ton-Miles	Index	Average haul per ton
1960-61	5,885	945,112	100	160.6
1961-62	6,266	973,121	102.96	155.3
1962-63	6,815	1,062,460	112.42	155.9
1963-64	6,784	1,052,686	111.38	155.2
1964-65	6,074	892,965	94.48	147.0
1965-66	5,437	854,040	90.36	157.1
1966-67	5,515	867,002	91.74	157.2
1967-68	4,953	806,142	85.29	162.8
1968-69	4,737	724,965	76.71	153.0
1969-70	4,802	959,495	101.52	199.8

Source: Ministry of Planning Transport Statistics 1972.

Data in table III-7 show about a ten per cent increase in total passenger miles in the decade to 1970, compared with an increase of well over twenty per cent in passenger trains (table III-6). This discrepancy in growth rates can possibly be explained by reduction in fare paying passengers because the load factor on passenger trains is seemingly on the increase. Over the 1960-61 to 1969-70 period the number of fare-paying passengers carried barely increased. The modest increase in passenger miles is the result of an increase in the length of the average journey.

Freight traffic has also declined over the ten year period between 1960-61 and 1969-70. Table III-8 shows that total freight declined by about twenty per cent. But from the revenue earning point of view possibly the decline has not been so severe due to the fact that the net ton-miles of the freight traffic held reasonably steady - in fact, increased slightly. The other interesting aspect of the railway freight traffic is that its average miles carried, that is the average length of the haul, has increased from 161 miles in 1960-61 to 200 miles in 1969-70. The main reason for this sort of change lies in the types of commodities carried and the change that these have undergone over the period. The other possible reason could be the consequence of increasing road transport activities which have been making inroads into the railway traffic in its short-haul segment. It has been mentioned earlier that railways traffic is dominated by the country's imports and exports and thus its mix of commodities as well as the average length of haul are expected to have some appreciable impact on railways overall performance.

Table III - 9

Trend in Carriage of Important Commodities by Railway 1960-70 (,000 tons)

	Commodity	1960-61	1964-65	1969-70
i.	P.O.L. (petroleum products)	256	259	362
ii.	Cement	269	429	287
iii.	Coal	1014	896	136
iv.	Fresh fruits and vegetables	317	471	248
v.	Fuel for Railway	366	416	(merged with items iii and ix)
vi.	Raw jute	570	681	654
vii.	Marble and stone	301	270	137
viii.	Rice	549	406	452
ix.	Railway stones and material other than fuel	548	718	363
x.	Wheat	206	308	613

Source: Railway Yearbook, 1970.

The ten commodities as shown in Table III-9 provide for about 75 per cent of the railways' total traffic and two-thirds of the freight revenues. Nearly all are bulk commodities and represent the items on the country's foreign trade - either as imports or exports.

Another important feature of railway movements is the concentration of traffic flows between a few major points. 70 per cent of total railway traffic originates at 20 system localities and, at the same time, 70 per cent of the traffic terminates at 29 localities. Since 16 of these originating and terminating points are common, it may be said that 33 localities representing about 8 per cent of points served, generate 70 per cent of all traffic. The vast majority of the 427 stations maintained by the railway contribute very little to the system's goods traffic and revenue, and it is extremely likely that a great many do not yield sufficient revenue to justify the expenses incurred in maintaining the facility, if all costs are considered. By all indications it seems increasingly clear that the railway in Bangladesh operates on weak economic grounds and there is danger in the future as the structure of the railway's traffic composition tends to change as a consequence of self-sufficiency in the foodgrain production.

b.i. Inland Water Transport (IWT):

Bangladesh is endowed with considerable length of natural waterways system mainly in the southern part of the country. It is estimated that there are 3146 miles of perennial, 1643 miles of seasonal, and 206 miles of estuary rough waterways. A considerable volume of water freight traffic is carried by mainly two types of water transport system. The first is that segment of the inland water transport industry which provides the arterial transport movements and which are essentially the same type of service as that offered by the freight services of the railway. The other is the vast number of small country-boats which meet the local need and provide the basic distributive system where such waterways exist.

b.ii. Physical features of IWT fleet:

We will, however, first briefly concern ourselves with the mechanised water transport system and seek to look at its physical characteristics.

The figures in table II-10 demonstrate quite a significant tonnage capacity of inland water tonnage on the basis of static capacity available. Taking both the public and private sector vessels, it comes to about 300,000 tons in freight and about 86,000 in number of passengers. Given at least two turn rounds in a month, and eight months operational period in a year, the present fleet should be able to handle about 6 million tons of freight and carry over 1.5 million passengers.

Table III - 10

Mechanised Inland Waterways Fleet

Type of Vessels	Number of Crafts Public Sector	Number of Crafts Private Sector	Carrying capacity (tons) Public Sector	Carrying capacity (tons) Private Sector
Cargo - Bay Crossing Type				
Cargo Coaster	23	24	17,188	14,422
Tugs	5	-	-	-
Flats and Barges	45	-	18,525	-
Oil Tanker	14	7	15,162	6,368
	87	31	50,875	20,790
Cargo - Inland				
Inland Tug/Towing	38	88	1,177)	-
			)	
Harbour Duty Launch	31		177)	-
Inland Flat	90		55,646	
Inland Barge	159	377	43,496	93,083
Jute Boats	151		13,434	
Oil Flat/Barge	2	6	881	836
Self-propelled Barge and Cargo Launch	6	145	1,900	18,110
	477	616	116,711	112,029
Passenger Vessels				(in passengers)
Bay-crossing	7	2	1,504	545
Double-decker	13	38	8,393	11,448
Single-decker	-	560	-	63,988
	20	600	9,897	75,981
	584	1,247	*167,586	*132,819

* including tonnage cargo capacity in passenger vessels.

Source: Bangladesh Transport Survey, Planning Commission, 1973-74.

b.iii. Traffic characteristics and composition:

On the basis of 1969-70 performance, the fleet carried about 2.4 million tons of cargo and 1.3 million passengers - showing substantial underutilisation of tonnage capacity in freight transport similar to that of the railway.

Table III - 11

Goods Handled at River Ports - 1969-70 (tons)

Port	1969-70 Forwarded	1969-70 Received
Ashuganj	1,888	9,446
Barisal	5,523	52,855
Bhairab Bazar	7,216	1,002
Chalna (sea and river port)	632,392	788,546
Chandpur	21,347	73,320
Chittagong (sea and river port)	992,366	80,419
Chandraghona	27,027	127,855
Dacca	17,114	241,538
Khulna	386,103	900,906
Narayanganj	433,822	308,295

Source: Bangladesh Inland Water Transport Authority (BIWTA) Annual Report 1970.

As in respect of the railway, nearly all traffic on the inland waterways mechanised fleet is port oriented and relates to the country's foreign trade. On the commodity composition side of the freight traffic, six bulk commodities constitute 88 per cent of total traffic - such as, jute and jute products, foodgrains, P.O.L., cement, paper and coal - as can be seen in Table III-12.

Table III - 12

Tonnage and Ton-miles of IWT Traffic in 1969-70

Commodity	Tons	% of total	Ton-miles	% of total
Jute and Jute products	809,802	33.80	129,760,289	38.92
Foodgrains	527,746	22.03	41,240,800	12.37
P.O.L.	297,202	12.40	61,061,533	18.32
Cement	210,606	8.79	22,250,068	6.68
Paper	59,641	2.49	3,687,455	1.11
Coal	168,268	7.02	35,114,650	10.52
Others	668,906	13.47	40,241,425	12.07
Total	2,741,171	100.00	333,364,220	100.00

Source: BIWTA, 1970 Annual Report.

Table III - 13

Trends in Freight Traffic by the Mechanised Inland Water Transport

Years	Freight Tons	Freight ton-miles	Average lead
1960-61	2,549,095	774,993,311	304
1961-62	3,011,577	901,428,382	299
1962-63	3,145,496	836,999,917	266
1963-64	3,334,513	851,267,451	255
1964-65	2,941,000	411,740,000	140
1965-66	2,600,000	364,000,000	140
1966-67	2,645,008	392,447,958	148
1967-68	2,605,576	368,228,378	141
1968-69	2,728,000	387,376,000	142
1969-70	2,741,000	389,222,000	142

Source: Ministry of Planning, Transport Statistics 1972, BTS - Planning Commission 1973-74, and Bureau of Statistics - Statistical Digest of Bangladesh 1973.

It can be concluded, therefore, that the mechanised water freight transport industry operates in a limited area, specialises in a limited number of bulk commodities, services a limited number of arterial routes, and has suffered stagnation in traffic growth. Essentially, jute and jute products move southbound to the major ports while imported items like foodgrain, cement, coal and oil move northbound from the ports in the south. Not all water freight traffic is confined, of course, to this pattern. There are some minor movements to and from the northern and north-western parts of Bangladesh but these are hampered by a lack of demand for large bulk movement in which water transport can offer economic advantage and, importantly, by a lack of adequate water courses in terms of both year-round reliable navigable channels and suitable landing sites. These areas depend to a large extent on road movements - present features of which suffer from great inadequacies.

c.i. Road development in Bangladesh:

It has been established that arterial freight movements in Bangladesh are dominated by the Railway and the mechanised Inland Water Transport system. Road transport, while growing rapidly, relatively speaking, since the partition of India in 1947, does not yet play a significant overall role. It is active in certain localities, particularly on short-haul intra-urban operations. Although the nature of road development has been to have a country-wide road network system, the quality and coverage of such system is as yet inadequate both in terms of development of heavy arterial road transport activities and provision of adequate feeder services to the overwhelmingly rural economy of Bangladesh. This basic weakness of the country's present road system is due mainly to three reasons.

Firstly, the area which became an independent entity at the time of the partition of India in 1947 in the form of East Pakistan, had only about 300 miles of all-weather metalled roads. So when the road development work started at Independence, the emphasis was on quantity in the way of linking as many district headquarters by road transport with Dacca, the capital, as possible. This was so as to bring about political cohesion and administrative efficiency. With resources spread thinly all over the country, the quality was sacrificed and, as a result, the commercial goods transport operation was minimal.

Secondly, the road network that came into being anyhow, the big river gaps that existed proved too expensive to be bridged for the traffic to justify in the foreseeable future. The gaps were provided with ferries which, in Bangladesh conditions due to unstable river banks, never came to be operated very efficiently.

Finally, the road system which eventually linked the administrative headquarters in the districts, were not adequately connected or interlinked with a corresponding set of feeder road system serving the remote areas so that its impact could be felt in the rural economy in any meaningful way.

However, an attempt will be made in laying out the features of the present road network and the structure of the road transport industry. Road transport activity is a relatively recent phenomenon in the area, the full implication of which is yet to be fully realised.

Table III - 14

Metalled Trunk Roads in Bangladesh (miles)

Years	Net Addition to Total Mileage	Cumulative Total Mileage	Total Expenditure (in million Taka)
1947-1959/60	708	995	304.8
1960-61	150	1,145	48.2
1961-62	152	1,297	63.3
1962-63	200	1,497	77.0
1963-64	252	1,749	91.0
1964-65	212	1,961	85.0
1965-66	129	2,090	72.5
1966-67	119	2,209	69.5
1967-68	76	2,285	73.7
1968-69	60	2,330	87.1
1969-70	50	2,380	135.8

Source: Transport Statistics, Ministry of Planning, 1970.

Almost two-thirds of the trunk road system is single-lane - 8 feet hard bituminous or concrete top with 3 feet brick shoulders on either side. The remaining one-third is two-lane. These trunk roads, some segments of which are in duplication of the trunk railway routes, connect Dacca with the outlying district headquarters. These roads are maintained by the Central Government through the Directorate of Roads and Highways under the Ministry of Communications who also maintain most of the road ferries. It should be noted that the expenditure incurred over the years, shown in the last column of table III-13, by the Central Government also included the expenditure on building bridges and culverts over the roads built by it.

Another ministry of the central government, namely the Ministry of Local Government, Rural Development and Co-operatives, is also involved in road building activities in that it allocates funds for road building by four groups of local authorities - District Council, Municipal Council, Thana Council, and Union Council. How all this is organised and what type of road they build will be examined in the next chapter in the context of organisational framework of the transport sector in Bangladesh as a whole.

d.i. Growth of road transport in Bangladesh

Against the background of such road developmental efforts in Bangladesh must be viewed the present role and growth of the road transport industry. This form of transport, although still in infancy, proved to be potentially efficient due to its speed, quality of service and flexibility of operation. Its ability to offer personalised service, reduced terminal handling costs, door to door operations, and a combination of both arterial and local service operations have made it a serious competitor to rail transport the world over. Even in Bangladesh, in certain segments of the railway operations, the road transport is already making inroads into the railway's traffic, particularly in the area of high-valued commodities.

d.ii. Structure and operational features of road transport industry:

First, we will make an attempt to look into the structure of the industry as it presently exists.

During the period between the partition of India (in 1947) and the emergence of Bangladesh (in 1971), the commercial road transport industry changed from a passenger oriented industry to a freight oriented one. In 1947, the number of trucks was half the number of buses; by 1970 there were more than twice as many trucks as buses. The growth of the bus fleet was at an average rate of 5.2 per cent per annum, while the truck fleet grew at an average of 12 per cent annually.

Table III - 15

Growth in the Number of Commercial Vehicles
Buses and Trucks

Years	Buses	Trucks
1947	1,379	691
1955	1,563	2,454
1959-60	2,054	3,510
1960-61	2,171	4,235
1961-62	2,478	4,563
1962-63	2,593	6,325
1963-64	2,904	6,721
1964-65	2,969	6,965
1965-66	3,263	7,168
1966-67	3,645	7,901
1967-68	3,978	8,507
1968-69	4,302	8,844
1969-70	4,365	9,355

Source: Ministry of Planning, Transport Statistics 1972, and BTS, Planning Commission 1973-74.

It is apparent that the growth rates of the two fleets were most similar during the 1960s - 7.9 per cent for buses and 10.3 per cent annually for trucks. Expansion, however, was by no means constant nor apparently was it continuous. A deceleration of growth of trucks occurred in the second half of the decade - average annual bus and truck growth rates being 7.6 and 6.9 per cent for the period 1966-70.

Table III - 16

Buses - District and Capacity Distribution
(Capacity in seats for number of persons)

Districts	Up to 15	16-25	26-35	36-45	Over 45	Total	
Dacca	586	97	437	284	254	1,658	(29.1)
Mymensingh	8	113	50	51	6	228	(4.0)
Faridpur	24	3	58	19	-	104	(1.8)
Bakerganj	1	13	101	-	-	115	(2.0)
Chittagong	297	185	212	280	180	1,156	(20.3)
Ctg. Hill Tracts	8	3	32	12	-	55	(0.10)
Sylhet	25	-	454	9	11	499	(8.7)
Noakhali	45	83	89	30	57	304	(5.3)
Comilla	55	119	90	8	1	273	(4.8)
Khulna	71	47	54	2	-	174	(3.0)
Jessore	90	1	316	32	-	439	(7.7)
Khushtia	9	42	62	6	1	120	(2.1)
Rajshahi	33	37	42	5	10	127	(2.2)
Dinajpur	6	31	22	5	4	68	(1.2)
Rangpur	20	42	-	23	31	116	(2.0)
Bogra	43	39	13	8	16	119	(2.1)
Pabna	20	80	22	-	39	161	(2.8)
Total	1,341	935	2,054	764	612	5,706	(100.0)

Source: BTS, Planning Commission 1974.

(Note: Figures in brackets in the last column are percentages of column total)

Table III - 17

Trucks - District and Capacity Distribution
(Carrying capacity in tons)

Districts	Up to 2½	2½ - 5	5 - 8	Over 8	Total	
Dacca	394	1,898	183	-	2,475	(26.5)
Mymensingh	-	129	121	53	300	(3.2)
Faridpur	1	13	2	18	34	(0.4)
Bakerganj	-	10	56	-	66	(0.7)
Chittagong	634	2,136	152	24	2,946	(31.5)
Ctg. Hill Tracts	177	156	9	77	419	(4.5)
Sylhet	37	747	9	2	795	(8.5)
Noakhali	14	202	41	-	257	(2.5)
Comilla	-	236	12	17	265	(2.8)
Khulna	26	115	6	27	174	(1.9)
Jessore	7	305	29	18	359	(3.8)
Kushtia	3	108	91	6	208	(2.2)
Rajshahi	13	219	-	-	232	(2.5)
Dinajpur	6	167	43	8	224	(2.4)
Rangpur	12	276	10	-	298	(3.2)
Bogra	40	105	19	14	178	(1.9)
Pabna	-	110	12	-	122	(1.3)
Total	1,364	6,932	795	264	9,355	(100.0)

Source: BTS, Planning Commission 1974.

(Note: Figures in brackets in the last column are percentage of column total)

Table III - 18

Age Structure of Buses and Trucks
As of end-1969

Year of Manufacture	Bus	Percentage	Truck	Percentage
Up to 1944	1,061	21.4	1,921	23.5
1945-50	457	9.2	642	7.9
1951-55	447	9.2	577	7.1
1956	146	2.9	156	1.9
1957	50	1.0	176	2.2
1958	110	2.2	139	1.7
1959	83	1.7	123	1.5
1960	189	3.8	204	2.5
1961	263	5.3	414	5.1
1962	215	4.3	683	8.4
1963	182	3.7	443	5.4
1964	282	5.7	523	6.4
1965	174	3.5	252	3.1
1966	327	6.6	645	7.9
1967	324	6.5	450	5.5
1968	315	6.4	370	4.5
1969	328	6.6	451	5.5
	4,953		8,169	

Source: BTS, Planning Commission 1974.

Tables III-16 and III-17, showing district and capacity distribution of buses and trucks, confirm that road transport operation is concentrated in a few areas of urban development. Only two districts, Dacca - the capital district, and Chittagong - the port district, share 50 per cent of bus and 58 per cent of truck concentration. In terms of vehicle size, it may be seen that some three-quarters of truck fleet were between 2½ and 5 tons capacity, while a smaller proportion of all buses exhibited seating capacity of between 25 and 35 persons.

The age distributions for buses and trucks are remarkably similar. As of 1969, some 45.7 per cent of trucks and 47.6 per cent of buses were over ten years old. More importantly, vehicles accounting for slightly over one-fifth of both bus and truck fleets were at least 25 years old. The bulk of these older vehicles were World War II military surplus equipment left in the area upon cessation of hostilities.

In terms of ownership structure, the period up to 1970-71 was characterised by very limited direct government ownership of trucks and buses. Commercial public sector ownership was restricted, in essence, to the passenger fleet of the road transport corporation. The bus fleet of the corporation, although nominally over six hundred units, rarely exceeded one-third operational deployment at any one time. Thus the transport of passengers and freight by road was predominantly a preserve of the private sector. While individual owners of buses and trucks generally had only one or a small number of vehicles, owners' associations formed on a local basis commonly provided operational grouping with much larger numbers of vehicles.

Two other categories of commercial vehicles which are playing a limited intra-urban role are a small fleet of taxis and three-wheeled "auto-rickshaws". The operation of taxis is concentrated in Dacca and Chittagong with a fleet of 867 vehicles and are operated entirely by the private operators. The principal role of the "auto-rickshaws" is to provide short-haul passenger taxi services in urban areas, with a marked concentration in the two major centres, Dacca and Chittagong. Dacca accounts for 39 per cent and Chittagong for 35 per cent of the total fleet of 7,875 - the principal expansion of which took place in the early 1960s.

In summary, we can say that the present road transport commercial operation is largely based round a few urban centres. While most of the trucks are involved in short-haul services largely concerned with the movement of sand, bricks, cement and other building materials, inter-city movement of general and bulk commodities is limited, but there are signs of larger and long-haul movements commensurate with development and construction of inter-city metalled all-weather roads. Bus service has expanded wherever possible and has proved a popular mode of transport - given its frequency, speed and comfort. Although bus service is provided mainly for passenger carrying, sometimes, particularly in the inter-district routes, small loads are also carried which makes the bus services play a dual role of passenger carrying and small-load freighting.

iv. World trend in road transport:

Before attention is turned on the status of rural transport and the prospect it holds out in a climate where the emphasis is on all round rural development, it will perhaps add to the perspective to indicate some world trends in respect of road transport and rail performance over the last two decades.

Table III - 19

Growth in Number of Cars, Commercial Vehicles, and Annual Car, Bus and Rail Passenger Kilometres

	1950	1955	1960	1965	1970	% growth per annum
Number of Cars (thousands)						
Africa	800	1,250	1,890	2,500	3,440	21.5
South America	760	1,150	1,650	3,010	4,590	30.0
Asia	500	920	1,730	4,350	12,250	49.0
Number of Commercial Vehicles (thousands)						
Africa	370	540	730	950	1,360	18.2
South America	620	930	1,200	1,650	2,330	18.7
Asia	710	1,300	2,250	2,640	10,680	75.2
Annual Car Passenger Kilometres (thousand million)						
Africa	33	54	83	115	162	24.5
South America	31	50	73	139	215	34.6
Asia	32	56	104	231	539	84.2
Annual Bus Passenger Kilometres (thousand million)						
Africa	25	37	49	64	114	23.4
South America	43	64	83	114	161	18.7
Asia	87	145	226	372	383	22.0
Annual Rail Passenger Kilometres (thousand million)						
Africa	11	13	14	21	25	11.3
South America	26	31	34	33	29	5.5
Asia	160	212	302	395	456	14.2

Source: An Analysis of Some World Transport Statistics by A. H. Tulpule, TRRL Report No. 622.

Table III - 20

Growth of Ton-Kilometres by Road and Rail

	1950	1955	1960	1965	1970	% growth per annum
By Road (thousand million)						
Africa	10	16	23	32	51	25.5
South America	29	49	70	102	152	26.2
Asia	24	44	77	169	283	58.9
By Rail (thousand million)						
Africa	36	48	57	77	99	13.7
South America	27	29	32	38	44	8.1
Asia	115	195	386	457	500	21.7

Source: An Analysis of Some World Transport Statistics by A. H. Tulpule, TRRL Report No. 622.

The trend as suggested in the figures of tables III-19 and III-20 is pretty clear in most of the developing regions of the world - most pronounced in respect of Asia. While the railway has been enjoying a certain growth in absolute terms, it has relatively steadily declined in its contribution to the total transportation haulage in almost all countries of the world. The road and road transport industry has had a phenomenal growth in most of the Asian and African countries. Most of these countries have large agricultural sectors and are seeking to have a move from agricultural dominated economy to a situation of relatively expanded industrial activity. While this is so, it cannot be said at all that the future of rail and, in the case of Bangladesh, long-haul mechanised inland water transport, do not have a future. On the contrary, these forms of transport continue to retain their important role, particularly in respect of dealing with the country's foreign trade and carrying and distribution of bulk type commodities. But it seems very important that while pursuing a national transport policy, the implication of desired changes in the structure of the economy is fully recognised and necessary shift in emphasis as between various modes of transport is brought about. It is also important that each mode of transport is enabled to play its due role and full cognisance is taken of commodity composition as well as national average haulage of traffic at all levels of the economy - local, regional and national.

It has been mentioned earlier about the aim of food self-sufficiency by 1977-78 in Bangladesh as envisaged in the country's Development Plan. This in itself implies that there will be need for distribution of fertilizer, seeds and insecticides into the rural areas and, thereafter, the need for redistribution of foodgrains between the surplus and deficit districts within Bangladesh. This means, in turn, that there will be corresponding changes in the import/export composition of commodities. Whether in fact there is a corresponding shift in emphasis in Plan allocation of resources for various modes and segments of transport needs to be examined and this will be attempted in the next chapter.

v. The state of rural transport in Bangladesh:

It has been stated earlier that rural transport consists mainly of country-boats in the south and the bullock-carts in the northern part of Bangladesh. These forms of transport are slow and prove inefficient and unreliable during some parts of the year. During monsoon or flood season, for instance, country-boats become unreliable and the bullock-cart operation virtually comes to a halt. The scanty nature of transport provision in the country, by typical regions, is shown in the following table.

Although the figures quoted in tables III-21 and III-22 are a little over ten years old, recent indications do not suggest much improvement. The fact that an average village was at least 13.19 miles remote from a metalled road, 22.53 miles from a river station, and 19.65 miles from a railway station, gives adequate insight into the inadequacy of transport facilities for any country.

Table III - 21

Regional Comparison of Local Transport Modes
(per Sample Village)

Areas	Number of Sample Villages	Bus	Car	Auto-rickshaw	Truck	Pedal Rickshaw	Cycle	Hackney Carriage	Cart	Boat
Coastal Belt	40	-	-	0.17	0.10	0.43	4.00	-	1.50	144.00
Eastern Hilly Region	11	1.09	-	0.09	0.18	1.00	1.63	-	1.27	7.54
North Eastern Tea Boro Rice Region	19	-	-	-	0.10	-	1.05	-	0.31	16.63
Central Rice Jute Area	77	0.03	-	0.10	0.02	0.72	3.04	0.16	9.35	104.54
Northern Rice - Potato - Sugarcane - Tobacco area	25	-	-	-	0.04	-	20.84	0.13	52.32	7.80
Western Rice - Pulses Areas	14	-	-	-	-	0.07	6.35	0.78	9.92	14.00
Average		0.08	-	0.09	0.06	0.45	6.00	0.14	12.00	79.00

Source: Agriculture Survey 1965, Bureau of Agricultural Statistics.

Table III - 22

Regional Comparison of Village Accessibility by Major Transport Facility
(Distance in miles)

Regions	Nearest Metalled Road from the Village				Nearest Steamer/Launch Station from the Village				Nearest Railway Station from the Village			
	By all-weather road	By fair weather road	By other paths	Total Distance	By all-weather road	By fair weather road	By other paths	Total Distance	By all-weather road	By fair weather road	By other paths	Total Distance
Coastal Belt	1.09	10.18	10.56	21.83	2.55	6.03	3.37	11.95	1.94	13.11	25.35	40.40
Eastern Hilly Region	8.09	2.00	1.91	12.00	16.50	1.59	0.18	18.27	20.90	2.98	0.91	24.79
North-Eastern Tea Boro Areas	4.89	2.86	10.69	18.44	6.44	1.31	4.12	11.77	0.65	4.44	5.48	10.57
Central Rice - Jute Areas	4.77	2.98	2.11	9.86	6.85	4.95	1.87	13.67	7.44	4.74	2.68	14.86
Northern Rice - Potato - Sugarcane - Tobacco Areas	4.42	3.74	1.08	9.24	72.60	1.70	0.06	74.36	7.36	2.84	0.08	10.28
Western Rice - Pulses Areas	3.42	2.90	1.36	7.70	25.45	0.96	0.59	27.00	10.68	0.71	0.36	11.75
Average	4.04	4.55	4.60	13.19	16.69	3.87	1.97	22.53	6.59	5.85	7.21	19.65

Source: Agricultural Survey 1965. Bureau of Agricultural Statistics, East Pakistan.

vi. Country Boats

There has not been any organised and complete survey of country boats undertaken in Bangladesh. Consequently, the total number of country boats plying on the inland waterways of the country at any one time is unknown. The only estimate of the number of boats was made in 1958 by the District Police Courts, who, by using a crude sampling technique by area, estimated there to have been over 300,000 country boats in the country. In 1973 the Bangladesh Transport Survey carried out for the Planning Commission undertook a sample survey of boats over one ton capacity and were successful in interviewing about 38,000 boat operators - mostly in the central and southern part of the country. This survey concentrated on long distance traffic of goods in a few major inland ports. Therefore, it missed the primary movements of goods from the interior to the markets on river banks.

Capacity break-down of the 38,000 boats interviewed by the Survey is given in the following table:

Table III - 23

Capacity break-down of 38,000 boats interviewed

Capacity (in maunde)*.	Number of boats
30 - 149	19,000
150 - 449	11,400
450 - 999	5,100
1000 - 1499	1,400
1500	1,100
	38,000

Source: BTS Survey 1974, Planning Commission.

(*Note: 1 ton 27.22 maunds)

The Survey claimed that it covered approximately 60 per cent of the total country boat fleet over 30 maunds capacity. Because of the emphasis on main routes and major ports in the south, it argued that, in broad terms, 75 per cent of the country boats of greater than 450 maunds capacity, and 57 per cent of vessels between 30 and 450 maunds capacity were accounted for. On this assumption, the total Bangladesh country boat fleet over 30 maunds capacity would be around 63,300 boats. In other words, on rough estimate, it could be said that the number of boats of 30 maunds capacity and less would number about four times as much as the bigger boats. These smaller country boats seemed to carry all sorts of goods familiar to an agricultural economy - such as, rice, paddy, jute, fruits, vegetables, pulses, wheat, gur, fish, fertilizer, salt, leaves, bamboo, firewood, timber, broken glass, sand, earthenware, pots, iron pipes, corrugated iron sheets, kerosene oil, and sundry manufactured goods.

The bigger boats, on the other hand, seemed to carry more specialised commodities such as, salt and shingles, and were engaged in long haul movements - part of which even negotiated the bay.

Presently, country boat operations are concentrated in the central and southern districts of Bangladesh. However, a trend is discernible that its operation during the wet season is restricted due to heavy river conditions. In the dry season which constitutes for more than half the year in the northern part of the country, the dependence of local transportation on bullock carts is universal and, in fact, it becomes the only form of transportation linking the villages with the regional trading centres or points of the arterial system of communications.

vii. Bullock Carts:

Animal driven carts are in use all over Bangladesh and are the primary means of transport for goods movement between the farm and the village markets which in distance terms ranges between 2 to 6 miles. Bullock cart is also used for longer ranges of distances in northern Bangladesh and in the urban areas where it sometimes performs specialised functions.

By far the great majority of the bullock carts and the bullocks are owned by the farmers and the work animals are used for the joint purpose of land preparation and cart hauling. Frequently, the cart is meant for personal use (for crop movements, produce marketing and personal transport) and, sometimes, it is also used for cash income through operation for others on a hire basis.

In the countryside two forms of ownership and operation are frequently observed:

i. own use - bullock carts owned by the farmer for his own use only,

ii. own use and for hire and reward - the farmer sometimes allows the use of his cart by others on hire but uses the cart for himself most of the time.

There are, however, some bullock carts used exclusively for transport purposes only and are operated on a full-time basis for hire and reward. This type of ownership is not frequent in the villages.

Bullock carts owned by the farmers and operated commercially on a part-time basis represent a more considerable commercial transport capacity than that provided by carts operated exclusively for commercial use. Farmers who provide commercial transport services on a part-time basis also allow their work animals to be hired to other farmers for cultivation purposes. The situation is getting more complicated with the introduction of high yielding varieties of seeds for rice and application of fertilizer which call for a more thorough land preparation to be undertaken. Similarly, the traditional sowing and harvesting patterns are changing and more than one crop is sought to be obtained by application of winter-irrigation. All this is putting a high demand on work animals for farming purposes alone.

It has been indicated that bullock carts provide the primary means of transportation for moving goods over short distances in the most part of the country where future growth in agriculture - in fact a break-through - is likely to take place. In the southern part of Bangladesh, country boats provide a similar sort of transport service as the bullock carts, there also the first movement between the farm and the river bank market takes place by bullock carts. In fact the non-motorised movement by bullock carts and small country boats inter-links the two major segments of the transport network - namely, the local transport and the arterial inter-urban transport system. The local primary movement also inter-links the local economies of the rural areas with the national economy. It is through the prime movement of food-grains, raw materials and the exportable primary commodities from the farms to the secondary markets that the national economy is sustained. It is, therefore, the economic health of this important segment of transport which will occupy our attention in the rest of the sections of this work. Specifically, in Chapter VI, we will deal with the structure of the bullock cart operation in terms of capacity, ownership pattern, operational features and the cost of such operation.

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Chapter III

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CHAPTER IV

ORGANISATIONAL FRAMEWORK FOR TRANSPORT IN BANGLADESH

i. Ministries in charge of transport sector:

We have argued in this chapter (Table IV-1) that the transport sector constitutes an important segment of the national economy in Bangladesh. It absorbs a considerable portion of total national resources and, therefore, plays a significant part in keeping the rest of the other sectors of the economy moving. The sector is organised and administered by two central government ministries - namely, the Ministry of Communications, dealing with Railways, Ports, Roads and Road Transport, and the Ministry of Shipping, Inland Water Transport and Civil Aviation. The two Ministries in the central government are responsible for administration of transport laws and regulations and for initiating and executing all transport development activities through their executing or operational agencies in the form of nationalised transport organisations. Thus, organisations like Bangladesh Railway, Port Trusts, Roads and Highways Directorate and the Road Transport Corporation come under the administrative purview of the Ministry of Communications. The Bangladesh Inland Water Transport Authority, Inland Water Transport Corporation, National Shipping Corporation, Marine Academy, Mercantile Marine Department, Civil Aviation and the Bangladesh Airlines come under the Ministry of Shipping, Inland Water Transport and Civil Aviation. Transport having arterial characteristics in Bangladesh is vastly in the public sector with notable exceptions in the field of road transport and launch operations in the inland waterways. However, the government remains responsible in the regulatory aspects of private transport operation and, importantly, in the allocation of scarce foreign exchange for import of vehicles and launch engines from abroad. So the government's involvement in the transport sector is all-pervasive and, therefore, much depends on the policies pursued at the national level both in terms of resource allocation for various segments and forms of transport and in terms of consequences it produces for the rest of other sectors of the economy and the national economy as a whole.

ii. Resource allocation among the sectors and within the transport sub-sectors:

The National Planning Commission, which is yet another central government organisation, is charged with making inter-sectoral judgements of the country's economy and, on that basis, for producing the national Five Year Development Plan and its annual components. The Planning Commission, in consultation and collaboration with the Ministries, allocates resources for development of the sectors of the economy as well as for each of the components of the individual sector. The current Five Year Development Plan (1973-74 to 1977-78) gives the following development allocation to the various sectors of the economy (Table IV-1).

Table IV - 1

Financial Development Outlay (Taka in million)

Sectors	Five Year Plan Period	(%)	1973-74	(%)	1974-75	(%)
1. Agriculture and Water	10,670	(24.0)	1,600	(30.0)	1,710	(32.0)
2. Industries	8,770	(19.7)	790	(15.0)	710	(14.0)
3. Power and Natural Resources	5,220	(11.7)	640	(12.0)	710	(14.0)
4. Physical Planning & Housing	4,510	(10.1)	270	(5.0)	340	(6.0)
5. Transport	5,940	(13.4)	880	(17.0)	800	(15.0)
6. Communications	1,140	(2.5)	160	(3.0)	170	(3.0)
7. Education and Manpower	3,160	(7.1)	380	(7.0)	330	(6.0)
8. Health and Social Welfare	2,200	(4.7)	200	(4.0)	230	(5.0)
9. Family Planning	700	(1.6)	150	(3.0)	90	(2.0)
10. Government	260	(0.6)	140	(3.0)	140	(3.0)
11. Trade	1,700	(3.8)	30	(0.6)	10	(0.2)
12. Miscellaneous Services	280	(0.6)	20	(0.4)	10	(0.2)
*Total	44,550		5,250		5,250	

Source: Five Year Development Plan, Planning Commission - 1973.

*(Note: Totals may not add up due to rounding)

Table IV-1 merely confirms our earlier contention that the transport sector in Bangladesh is a significant user of national resources in that 13.4 per cent of the total Five Year Plan allocation goes for this sector. In fact the annual plans for the years 1973-74 and 1974-75 allocate 17 and 15 per cent of the total annual plan outlays respectively of the first two years of the Five Year Plan.

The institutional composition of the transport sector is very interesting in that it demonstrates, among other things, the importance attached by the government to each of the sub-sectors of the transport industry. Since resource absorption may be an important criterion for each of the components of the industry in terms of its usefulness to the economy, an attempt may be made to look at the sub-sectoral allocation of resources in the Plan (Table IV-2).

Apart from giving the institutional and sub-sectoral composition of the transport sector, the figures in table IV-2 throw important light regarding direction of resource commitment within the sector and the priority attached in the process of national transport policy making as among the various elements and forms of transport. For example, 21.23 per cent of the sector resource is devoted to the railway and 12.77 per cent (items 4 and 5 of the table IV-2) to the mechanised inland water transport - both these forms of transport, although important, are arterial in nature and, as we have noticed in the last chapter (Tables III - 5, 6, 8 and 13), are suffering

Table IV - 2

Sub-Sectoral Financial Outlay for the Transport Sector (in million Takas)

Sectors	Five Year Plan Period	(%)	1973-74	(%)	1974-75	(%)
1. Bangladesh Railway	1,261	(21.23)	263	(30.11)	190	(24.00)
2. Roads and Highways	1,082	(18.21)	160	(18.14)	160	(20.00)
3. Road Transport	1,049	(17.66)	50	(5.50)	40	(5.00)
4. Inland Waterways Authority	513	(8.64)	110	(12.80)	100	(13.00)
5. Inland Waterways Transport	245	(4.13)	60	(6.00)	50	(6.00)
6. Ports	803	(13.52)	120	(14.00)	140	(18.00)
7. Shipping	313	(5.27)	30	(3.00)	40	(5.00)
8. Marine Academy	8	(0.13)	2	(0.17)	1	(0.20)
9. Mercantile Marine Department	2	(0.03)	1	(0.11)	1	(0.20)
10. Civil Aviation	333	(5.61)	60	(7.00)	60	(8.00)
11. Bangladesh Airlines	323	(5.44)	30	(3.00)	20	(3.00)
12. Transport Research	2	(0.03)	1	(0.11)	1	(0.20)
*Totals	5,940	100	880	100	800	100

Source: Five Year Development Plan, Planning Commission - 1973.

*(Note: Totals may not add up due to rounding)

from declining traffic levels and consequently serious capacity under-utilisation. Similarly the bulk of the allocation for road and road transport (items 2 and 3 of Table IV-2) constituting 35.87 per cent of the sector's resources, is devoted to creating inter-urban road transport facility. So it seems, rather disturbingly, that almost the entire allocation of resources within the transport sector is for creating or sustaining transport capacity at a level - namely, inter-urban arterial level - where the available evidence suggests that traffic demand has steadily declined. Besides, the overall direction of the development plan is such, particularly with regard to its foodgrain self-sufficiency programme by 1978, that demand on arterial forms of transport is likely to decline further.

iii. Relationship between resource allocation and traffic demand:

It has been observed in Chapter III that more than 75 per cent of the traffic of the arterial forms of transport is associated with the country's imports or exports and is constituted by a handful of commodities. Therefore, it is only logical that changes in the commodity composition as well as the quantum of the foreign trade will have their immediate and direct consequences on the traffic pattern of these forms of transport. A look at the trend of the quantum and commodity composition of the country's imports and exports may be justified.

Table IV - 3

Total Traffic Handled at the Ports of Chittagong and Chalna
1961-62 to 1969-70 (,000 tons)

	Chittagong Port			Chalna Port		
	Imports	Exports	Total	Imports	Exports	Total
1961-62	2,556	441	2,897	324	676	1,000
1962-63	2,714	508	3,222	799	712	1,511
1963-64	3,298	563	3,861	861	801	1,662
1964-65	2,864	425	3,289	294	706	1,000
1965-66	3,098	544	3,642	619	872	1,491
1966-67	3,825	504	4,329	989	861	1,850
1967-68	3,541	516	4,057	710	969	1,679
1968-69	4,042	484	4,526	1,078	947	2,025
1969-70	4,463	573	5,036	1,037	1,003	2,040

Sources: Chittagong Port Trust and Chalna Port Directorate Yearbooks for 1970.

Table IV - 4

Commodity Composition of Traffic Handled at the Ports of Chittagong and Chalna 1967-68 to 1969-70 (,000 tons)

Commodities	Chittagong Port 1967-68	Chittagong Port 1968-69	Chittagong Port 1969-70	Chalna Port 1967-68	Chalna Port 1968-69	Chalna Port 1969-70
Imports						
Foodgrains	755	722	1,460	347	401	616
Sugar	-	51	32	-	10	8
Oil Seeds	21	12	6	-	-	-
Oil in drums	130	42	41	-	-	-
Cement	494	552	453	83	181	138
Fertilizer	150	175	204	-	47	-
Coal	105	268	148	173	340	189
Iron & Steel	153	158	74	8	38	25
Other Specified	113	95	60	45	26	18
General & Unspecified	528	691	775	56	36	43
Sub-Total	2,449	2,776	3,253			
Bulk Petroleum Products	1,092	1,276	1,209			
Total	3,541	4,042	4,462	710	1,078	1,037
Exports						
Jute	149	110	146	568	504	532
Jute products	149	149	157	331	370	387
Tea	33	33	36	-	-	-
Timber	22	19	17	-	-	-
Paper	18	14	19	35	35	31
Iron & Steel	8	8	17	-	-	-
Hides & Skin	7	9	7	-	-	-
Oil cakes	10	6	8	-	-	-
Other Specified	23	17	25	7	7	6
General & Unspecified	97	119	141	28	31	47
Total	516	484	573	969	947	1,003
Total of Imports & Exports	4,057	4,626	5,035	1,679	2,025	2,040

Sources: Chittagong Port Trust and Chalna Port Directorate Yearbooks for 1970.

Note: Totals may not sum due to rounding.

Figures in table IV-3 suggest that the quantum of country's imports and exports have had a slow but a steady increase over the period between 1961-62 and 1969-70. It is clear through these figures that the Chittagong Port is basically an import port, importing as much as four times in tonnage than it is through the Chalna Port which, on the other hand, exports twice as much as the Chittagong Port. So there is a degree of specialisation in handling the ports' traffic, in imports by the Chittagong Port and in exports by Chalna Port. But, overall, Chittagong Port remains the most important port for it handles almost twice the quantum of total foreign trade traffic of Chalna and it has connections with the hinterland by all the three major modes of transport, namely, the railways, inland waterways and road transport. The Chalna Port is connected only by waterways; connections by railways and roads are under consideration.

iv. <u>Future foreign trade composition calls for redirection of traffic movement</u>:

Commodity break-up of imports and exports is interesting in that it confirms the contention made in Chapter I that the country's foreign trade and, therefore, the port traffic is dominated by a few major items, such as, foodgrains, cement, fertilizer, coal, raw jute and jute products. It has also been maintained that these few commodities in turn also dominate the arterial traffic by the railways and the inland mechanised water transport. It is curious that it has been suggested in the earlier chapter that both these forms of transport have tended to suffer decline and stagnation (Tables III-8 and III-13) in their traffic performance in the decade ending 1969-70.

Commodity composition of foreign trade traffic is also important and interesting in that items like foodgrains, cement, fertilizer and coal constitute about two-thirds of import traffic for the Chittagong Port in 1969-70 - if we leave out the import tonnage for the petroleum products which have to be handled and transported by specialised and indivisible means or capacity of transport. Similarly, foodgrain is an important item of import for Chalna Port. The Bangladesh's current Five Year Development Plan suggests that the country is going to be self-sufficient in foodgrains and in urea fertilizer by 1977-78 and half the cement requirement will be met from internal production. Coal has already started to be imported through neighbouring India by inland waterways and short distance railway links. The implication of these planned changes in import requirements is that commodity composition, particularly of imports, is likely to change very sharply with the consequence that it will reflect upon performance of traditionally long distance modes of transport. Although the railways and inland mechanised water transport will continue to have those commodities in which the country to move towards self-sufficiency, due to the fact that it implies radical change in internal distribution pattern of the very same commodities, it is likely that the average haulage requirement of freight traffic will shrink markedly and that demand for short-distance traffic will increase rapidly in which either the railway or the mechanised inland water transport will have no special advantage. Therefore, in the light of this implication of the Plan's desired growth in industry and agriculture - especially in the foodgrain self-sufficiency programme - it seems that the Plan's emphasis on the development and maintenance of the arterial transport system - as reflected through resource commitment - is misplaced. The result of such continued pursuit of wrong priority in the national transport policy-making could lead to further underutilisation of capacity in the segment of long-haul transport and lack of capacity where demand for transport predominates - the consequence of both is a possible combination of transport bottle-necks and higher unit cost of transport than the community need bear. That the priorities are wrong has been amply demonstrated by the past trends in long-haul freight traffic and the Plan's inter-sectoral allocation of resources. This contention seems to become stronger if we are to look at and examine the nature and amount of efforts the Plan envisages for development of transport facility at the local rural level of the country's economy, and to this we turn next.

v. <u>Resource for local transport:</u>

The Five Year Development Plan has made some allocation for rural institution building - namely, the integrated rural works programme. This allocation is in fact hidden in the broad allocation of resources for the country's agriculture and water sector (table IV-1) and has an important element of road building efforts in the rural countryside. We will indeed look into the quantum and nature of such efforts in a moment, but first the evolution of the rural works programme may be placed in perspective so that later on one has a better appreciation of this relatively new institution.

vi. <u>Genesis of works programme:</u>

Until the British rule ended in India in 1947, the provision of village infrastructure was the responsibility of the landlords, the Zamindars, a class created by the British Raj primarily to secure collection of revenues and to deal with the rural mass administratively but indirectly. After the partition of British India into Pakistan and India, the national governments in both the countries quickly abolished the Zamindari system but without replacing it adequately by an alternative form of local government institution which could have the means to undertake the rural economic development programme. Thus there existed a period of void when village water-works, roads, schools, dispensaries, etc. were languishing and there were generally no new programmes taken in hand. The need for action was felt particularly in the field of water control, the main need was to clear the existing channels which had been allowed to silt-up from lack of maintenance and to construct new ones, so that the drainage system would be improved. In the dry season these channels would also be usable for storage of water to irrigate a possible winter crop. There appeared the need for improvement of the irrigation channels and the embankments to prevent the onrush of the flood waters from destroying the crops. Over and above this, was the need to build feeder roads. These were intended to be earth roads designed for progressive improvement. They would be useful in widening the local market as well as cutting transport costs in the rural areas. All these tasks, it was felt, could be performed locally, as the villagers were well aware of the need for and functions of these small infrastructural facilities. Finally, there remained an ancillary, though no less important, need for providing employment in the winter months to the under-employed villagers.

While the need was very apparent for the rural works to be undertaken, there seemed to be lack of mobilisation of voluntary labour to undertake the tasks. The villagers were perhaps inherently sceptical about investing their labour free of cost for anything. They seemed to hold any authority of government with deep suspicion, having been subjected to exploitation for generations together. It appeared, therefore, that the rural works could be launched only on a cash-for-work basis as in the U.S.A. during the depression of the 1930's. Thus a programme could be launched as long as one had the cash to inspire the enthusiasm of the unemployed villagers. Another and perhaps more remote, but equally important, need was to supply the additional basic wage goods on which the wages paid to the villagers could be spent so that it did not lead to wage-cost inflation.

An opportunity suddenly seemed to arise with the existence of large food surpluses in the United States of America which inspired President Kennedy on his assumption of the Presidency, to launch his famous Food-for-Peace Programme. This was designed to use Public Law 480 which was already being used to supply commodities to developing countries.

The Rural Works Programme thus had its genesis in the P.L. 480 programme launched in Bangladesh (then East Pakistan) in 1962. The programme as it emerged was designed to supply 621 million tons of U.S. surplus agricultural commodities such as wheat, butter, dried milk, edible oils, animal fats, etc. The commodities were to be paid for in Pakistani rupees, which would accumulate in counterpart funds in Pakistan to be disbursed by the U.S. Government in agreement with the local authorities. Thus the bulk of the finance that was injected into the rural works programme in Bangladesh in the past years came from this counterpart fund held by the U.S. Embassy in local currency.

The rural works programme as introduced in Bangladesh in 1962 operated basically through a three-tier local government system, namely, the district council (19 in number), thana council (413 in number) and the lowest level of administration - the union council (4036 in number). While these three-tier local bodies implemented the programme, the funding was made and supervised by the central government ministry in charge of local government and works programme. Allocation of funds was made on the basis of population.

Planning for rural construction works commenced at the Union Council, the lowest local government institution; each elected member of the council was charged with initiating and formulating plans for projects in his own ward. These were then presented to the Union Council which discussed them and aggregated them into a Union Plan. The Union Plan was submitted to the Thana Council, which on the basis of union proposals, developed the plan for its own projects. Consolidated Thana/Union plans were submitted to the District Council for review and approval. The District Council then submitted these schemes for the entire District, as well as District Council plans, to the Central Government ministry in charge of local government, which again reviewed them. One of the important rules governing the actual use of funds, once they had been provided, was the requirement that labour-intensive techniques must be used where feasible.

vii. <u>Contribution of works programme in the provision of local transport:</u>

This unique programme warranted a separate and detailed performance evaluation study on its own merit. An attempt will, however, be made to throw some light on performance of the programme generally, and later in the context of the area study of a single thana in Chapter VI. Between 1962 and 1968, for which figures were available, the achievements of the rural works programme were impressive, at least financially. Funds available during this period totalled about taka 898 million and were channelled through the various tiers of local authorities as in the following table.

Table IV - 5

Council-wise Expenditure of Works Programme Funds from 1962-63 to 1967-68 (in million takas)

Year	District Councils*	Thana Councils	Union Councils	Total
1962-63	69.20	40.30	-	109.50
1963-64	80.20	81.40	30.20	191.80
1964-65	45.20	60.90	34.90	141.00
1965-66	20.90	151.20	17.20	189.30
1966-67	24.50	76.90	14.30	115.70
1967-68	27.30	108.10	15.60	151.00
Total	267.30	518.80	112.20	898.30
Percentage	29.75	57.76	12.49	100.00

Source: Performance Report on Rural Works Programme 1967-68, Government of East Pakistan Basic Democracies and Local Government Department.

(Note: *District Council allocation inclusive of those to Municipal and Town Committees.)

The bulk of the money was spent by the Thana and Union Councils, for between them they spent a little more than 70 per cent. Most of their work related to the infra-structural development in the rural country-side. The money spent by the District Councils, of about the rest of the 30 per cent, related to urban and semi-urban development works in the towns and cities. So in some respects the money spent by the Thana and Union Councils is more relevant from the point of view of its impact in the rural development. However, of all the money spent through the works programme, the following is the proportion among the various constructional activities.

Table IV - 6

Proportion of Works Programme Funds Spent on Various Items of Works

	Per cent
Roads	74.5
Drainage and Canals	4.1
Embankments	4.0
Community Buildings	16.7
Miscellaneous	0.7
	100.0

Source: Performance Report on Rural Works Programme 1967-68, Government of East Pakistan Basic Democracies and Local Government Department.

The mileage figures given in the performance reports on the rural works programme are quite impressive on the face of it. But it is generally held to be of doubtful validity for records were never well kept, there was double-counting and, frequently, definitions between road construction, repair works and money allocations on paper tended to become blurred. However, after careful cross-checking between independent sources and local authorities' records, a rough picture emerged in terms of total physical capacity produced.

Table IV - 7

Mileage of Roads Built under Works Programme between 1963-64 to 1967-68

	Unpaved Earth Road	Paved Road
1963-64	27,553	4,928
1964-65	16,782	3,976
1965-66	21,410	819
1966-67	16,641	747
1967-68	16,675	658
Total	89,061	11,118

Source: Reconciled between the figures of Basic Democracies and Local Government Department Report 1967-68 and IBRD Land and Water Resources Sector Study, Vol. VI, 1972.

Most of the unpaved earth roads were built by the Thana and Union Councils principally to connect their headquarters with markets, schools and the important road junctions linking an upper hierarchy in transport. These roads generally have a minimum of 10 feet width, fairweather only and are vulnerable to normal flooding. As noted earlier, most of the paved roads were built by the District Councils and in the semi-urban and urban areas. But the quality of these roads also was of poor engineering standards and suffered rapid decay and high maintenance costs.

Although the works programme represented a certain spurt in the rural developmental activities, after 1967 it began to degenerate into a mere political bluff. According to the political pundits, the injection of cash into the rural community further accentuated the polarisation between the mass poor and a coterie of the new rich. Council members, not facing re-election, lost interest and the programme began to be misused to promote narrow interests. There was no effective auditing of expenditure and no records were kept of either expenditures or physical work done. The central government directives, administrative or technical, were progressively ignored.

viii. Quality of works programme roads:

But, for our purpose, we will seek to look more closely at the quality of roads built and what it meant in terms of physical facility created. To do so, we will once again juxtapose the expenditure figures against the quantity of roads built in greater detail for the years available figures would permit.

The figures in table IV-8 are extremely revealing in terms of quantity and types of roads built and the relative expenditure incurred on them, and this, in turn, throws light on the quality of roads built. Of the three years - 1965-66

Table IV - 8

Mileage of Roads Built and Expenditure Incurred in the Works Programme 1965-66 to 1967-68

Years	Roads Built (in miles)				Expenditure Incurred (thousand takas)				Cost per mile			
	Unpaved		Paved		Unpaved		Paved		Unpaved		Paved	
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
1965-66	18,261	3,149	730	161	25,845	6,797	14,491	6,536	1,415	2,158	19,851	40,596
1966-67	13,916	2,725	420	327	19,326	6,696	10,734	12,215	1,388	2,457	25,562	37,355
1967-68	13,580	3,095	355	323	20,687	7,275	14,939	10,739	1,523	2,351	42,082	33,248
	45,757	8,969	1,505	811	65,858	20,768	40,164	29,490				
Total of Paved and Unpaved	54,726		2,316		86,626		69,654					
Proportion between paved and unpaved	100		4.23		100		88.02					

Source: Performance Report on Rural Works Programme 1967-68. Government of East Pakistan Basic Democracies and Local Government Department.

to 1967-68 - detailed figures were available, the ratio between unpaved and paved roads is 100 : 4.23 whereas their ratio of expenditure is 100 : 88. In terms of unit cost, the difference is astronomical, for instance, in 1967-68, per mile cost of unpaved old road was Taka 1523.00, the cost of a mile of paved old road happened to be Taka 42,082 - almost 28 times as much. In respect of new roads, per mile cost of unpaved road was Taka 2351.00 and paved road, Taka 33,248 - the difference is of about 14 times.

We have noted earlier that most of the work relating to paved road was undertaken by the District Councils in the urban and semi-urban areas in which contractors were employed and simple road building implements, such as road rollers, tar boilers and concrete mixers, were used. These roads were generally of single lane width, usually with a maximum formation width of 15 to 20 feet. Usually these roads had some surfacing, generally brick, sometimes concrete or gravel.

The so-called unpaved roads generally had a minimum 10-ft. width and were fair-weather only. Road Supervisors, with some technical training, were employed by Thana and Union Councils who were not permanent staff. Most of these roads served as pathways, they were not above flooding level. The maximum use was made of manual labour and little or no plant was employed.

On the whole, the quality of rural roads built under the works programme, particularly those built by the Thana and Union Councils, left much to be desired. Although some significant amount of the national resources was spent in this effort, in relation to the total requirement, it was rather inadequate and whatever was available was spent too thinly all over the country. The result was that each year a road had to be built all over again, being washed away in the previous monsoon or flood. So it seems that by a major factor the rural road building exercise turned out to be a repetitive and wasteful exercise. We will revert to this quality aspect of the problem in Chapter VI in the context of our area study.

ix. Popular demand for local roads:

Whatever might have been the rationale of allocating resources as thinly as was done, the fact emerges that the local leadership attached a very high priority to communication facility and the demand for transport ranked highest in relation to the other components of the works programme - namely, canal excavation, irrigation, embankment, building community centres, etc. In fact, 74.5 per cent of the total money received under the programme (table IV-6) was spent on road building. On a study of evaluation of works programmes the villagers were asked in four Thanas to give reasons for the increase of production of vegetables and tobacco, and the results were as follows:

Table IV - 9

Reasons for Increase of Production in Vegetables and Tobacco

Thanas	Higher Prices	Improved Communication with local markets	Assurance of regular crop due to drainage and embankments
Comilla	65.0	32.5	2.5
Boda	67.5	25.0	12.5
Shivalay	73.5	19.6	6.9
Narail	57.2	28.5	14.3

Source: Basic Democracies Works Programme and Rural Development in East Pakistan - Rehman Sobhan - Bureau of Economic Research, University of Dacca, 1960.

The study suggested that in fact higher prices were obtained due to increased accessibility of the villages which had had a network of village roads built a year earlier. It seemed very clear, at least for these villages, that lack of communication was the main hindrance towards increasing production of commodities - particularly those of perishable nature - and they responded swiftly to the opening of their villages to the nearby markets by road facility. All the experience and the evidence that have emerged through the introduction of the works programme, despite its many weaknesses, suggest that demand is strong for an improved type, not of very high engineering standard, of roads in rural Bangladesh. We will examine later, in Chapter VI, in the context of the area study, the economics of a road system which will be all-weather, flood-free, and have minimum engineering specifications. But how, in fact, such demand can be met, of the standards of roads needed, within the scope of the current Five Year Development Plan, we will turn next to examine.

x. Plan priority for local roads - is it high enough?

The Five Year Development Plan recommended the recommencement of the Works Programme which was disrupted during the course of the liberation war for Bangladesh. The Plan suggests that the main task of the Works Programme will be to contribute to the attainment of a foodgrain self-sufficiency programme. Then it goes on to outline its order of priority of the works programme activities which are as follows:

(i) Construction and maintenance of irrigation and drainage channels, especially those directly related to pump and tubewell irrigation units;

(ii) Desilting and water-hyacinth clearing of irrigation sources and other earth-works needed to maintain and improve water retention capacity of the sources of irrigation;

(iii) Construction and maintenance of dykes, embankments, culverts and sluice-gates for controlled irrigation and drainage;

(iv) Construction of storage facilities for agricultural produce, especially where village co-operative societies exist;

(v) Construction, repair and maintenance of Kutcha (unpaved) roads;

(vi) Construction of Pukka (paved) roads and bridges.

The total cost of the programme is estimated to be 960 million takas over the five year plan period. The Plan specifically lays down that two-thirds of the amount will be spent on items (i) to (iv), i.e. 640 million takas, and one-third on items (v) and (vi), i.e. 320 million takas. The programme is clearly dependent on local initiative for the most part and will need to be administered by local elected bodies, who are unlikely to adhere to the Plan's given priorities.

In an absolute sense, however, Taka 320 million represents about Taka 64 million a year, about 5 per cent of the allocation given to the arterial form of transport (table IV-2) and about 0.71 per cent of the total Five Year Plan size (table IV-1). What this allocation to the rural road programme means if translated into physical terms, given the current cost of construction, will be a function of the desired engineering standard of rural roads and, as such, we will defer this exercise for the moment. The allocation for the rural roads seems too meagre, but it falls in line with the Plan's mistaken emphasis and priority for the arterial forms of transport. But we have observed earlier on in this chapter that the arterial traffic level was already on the decline and the available evidence suggests that it will decline still further due to directional changes of the country's foreign trade. The Plan's resource allocation exercise in terms of priorities accorded to various transport sub-sectors and the various elements of the works programme, therefore, seems to stand in contradiction to its objectives of rapid agricultural growth and, in particular, to the foodgrain self-sufficiency programme.

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CHAPTER V

THE AREA STUDY : OBJECTIVES, ANALYTICAL FRAMEWORK AND METHODOLOGY

The specific purpose of the area study is to try and look more closely at the local economy so far as it relates to the various economic forces at work at that level. This in turn is expected to throw up information and evidence so that it is possible to test the hypotheses which are set forth in Chapter I and, additionally, to vindicate the tentative conclusions which were arrived at in the preceding chapter.

This meant, therefore, that one needed data at micro region level on such aspects of the economy so that one could understand the production function of an agrarian economic system. Data was needed on natural and human resources of the area; present agricultural production, future potential and other planned development of the area; physical and socio-economic infra-structure in terms of existing transport, markets, warehouse, educational, financial and administrative facilities; and finally, the estimates of present and future costs and prices of goods and services.

Unfortunately, information along these lines is hard to come by in any developing country and, more so, at a micro-regional level. For Bangladesh, the difficulties were varied and manifold - the details of which will be touched on later in this chapter - but nonetheless an area study was proposed and undertaken during November to January 1975-76. The area worked on is Sherpur Thana of Bogra - a north-west district of Bangladesh (see map 1). The details of the area study in terms of why this area was selected, how this was arranged, and what forms of survey work were carried out, will be explained in the last part of this chapter in the context of the methodology of the area study. Next, it seems appropriate to turn to the analytical framework of the proposed area study.

Basically, the main thrust of the argument in this work so far is to suggest that there has been relatively little attention given to the development of local transport in Bangladesh and that the cost of such transport is avoidably high. Also, it is held that the agricultural expansion, as envisaged by the Bangladesh Five Year Development Plan, will generate transport demand in the rural economy and the level of such demand for transport will call for the provision of improved feeder roads in the rural area. This is a situation where transport provision is called for following the demand for transport. While this is likely to be the case if we were to accept the agricultural objectives of the Plan to be given, it is equally true that in a subsistence type of economy as in Bangladesh, where present level of rural traffic is meagre, the improved rural road system could also contribute towards 'development' or higher economic activity of the region.

i. Alternative Evaluation Techniques for Rural Roads:

The popular methodology for evaluation of road projects in that sort of situation is the system of quantification of road user savings both in terms of savings in transport cost and time savings. This is a fairly efficient methodology in cases where normal traffic (or its projected increase) is sufficiently high and transport cost savings are accepted to be reliable measure of benefits from the project. This traditional approach, however, puts the emphasis on the road users and frequently ignores the mechanisms through which transport cost savings may contribute to higher agricultural output and income. This approach may also neglect to look into factors which may work as constraints which may in turn limit the development impact of the road. In a rural subsistence economy like that in Bangladesh, development aspects of road investment are very important and, therefore, the need for an evaluation approach which could take care of the future development possibility. Also, from the analytical viewpoint, it is important that due emphasis is placed on the development impact of rural road projects which for economic justification depend on a large increase in agricultural growth and consequently higher traffic level. It is also important to spell out whether the projected changes in the rural economy are exogenous to the road improvement, in other words, whether agricultural development is programmed independently for the given area or is taken to be contributed by the road improvement itself. In any case, considerable investigation of the rural economy is called for and, in this context, the need for careful examination of the following three points is very crucial:

(i) Distribution of Benefits. Who benefits and by how much of the transport cost savings? The possible beneficiaries are: agricultural producers, transporters, traders, consumers, etc.

(ii) Producer Response. How do producers respond to the lower transport costs as reflected through higher farm-gate prices, lower costs of inputs and overall improved quality of transport services? Does the level of transport cost saving provide a sufficient inducement for further production?

(iii) Non-Transport Constraint. Are there any constraints in the production process which prevent the farmer from deriving the benefit and/or responding to it?

A wider approach is, therefore, needed to go into the questions as raised above, particularly when we are faced with the question of improvement of rural roads which anticipate, through the developmental process, a substantial 'generated' traffic or induced benefits. Besides, we are also in need of an approach whereby project benefits can be obtained directly, in terms of value of net output and income rather than indirectly, as through the traditional approach, in terms of road user savings. There is the additional advantage of the production-oriented approach for the project benefits focus directly on the farm level changes as the subsistence economy seeks to take the first spurt towards a marketing economy.

In the production oriented approach the evaluation of rural roads is sought to be determined on the basis of present and expected levels of economic activity in the area of the proposed road investment. As traffic level is dependent on the level of economic activity, the importance of cost savings on normal traffic will decline in a relative sense, as we turn our attention from a situation of high level economic activity to one of low level economic activity. In other words, in the case of low economic activity area the proportion of induced or generated benefits in the total benefit stream is likely to be higher. So, broadly speaking, there could be two situations with regard to rural road improvement or development proposals. In the first situation, the proposed road investment is in areas where economic activity and, therefore, traffic level, is already high or is expected to be substantial due to successful implementation of the on-going rural development projects. In this sort of situation it is possible to use the road user savings approach as an evaluation technique - possibly with some modifications. The second situation, however, relates to areas with low current level of economic activities and hence scanty traffic level, as may be found in the case of a subsistence type of economy. But they hold much prospect of development with the introduction or provision of necessary infra-structural facilities and inputs for agriculture. The latter case is more relevant for the Bangladesh situation and seems more suitable for application of production oriented economic analysis.

Situation I: This is the case where level of economic activity is already quite high and is expected to be substantially higher as a result of ongoing planned rural development. The 'normal' or the 'without project' traffic and the prevailing cost of transport reflect higher demand for transport which justifies improvement of road capacity either by widening the existing road or upgrading the road to a higher capacity one or by making it an all-weather facility. This situation is quite common in some developing countries where the economy is experiencing a steady growth for some period already. Benefits from investment in this sort of situation are derived largely from road user and time savings on normal traffic, and the amount of development benefit is relatively small. The situation can be shown as in Figure V-1.

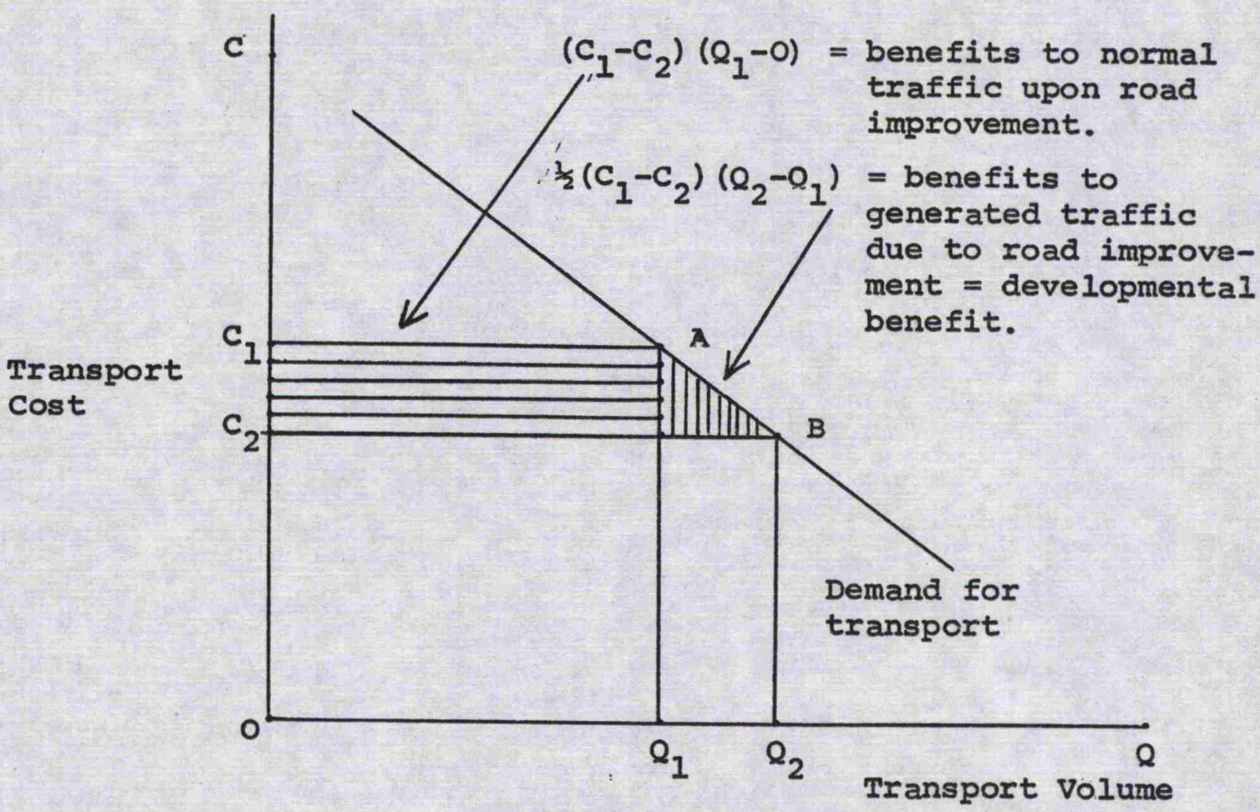


Figure V - 1. Transport Demand Function for Situation I.

It therefore seems possible to visualise a situation as shown above that benefits on normal traffic and by itself sufficiently justifies the road investment proposal. However, to the extent that there is the additional benefit arising out of reduction in transport costs - in terms of development benefit - it should be quantified as far as possible.

Situation II: In this situation there is little traffic on the road and low levels of economic activity in the area where road proposals are made. The economy is presently on a subsistence level but holds considerable agricultural potentiality, such that it can transform itself into a substantial grain surplus area over a period of time and, therefore, needs investments in socio-economic infra-structure and modern agricultural inputs. In this case, for the justification of road improvement, development effects will be crucial and, therefore, the mechanism through which such development effect takes place is central to the analysis. Development benefits, in other words, the induced traffic, may be obtained through both reduction in transport costs as well as a highly elastic demand for transport. The situation may be illustrated in the following figure.

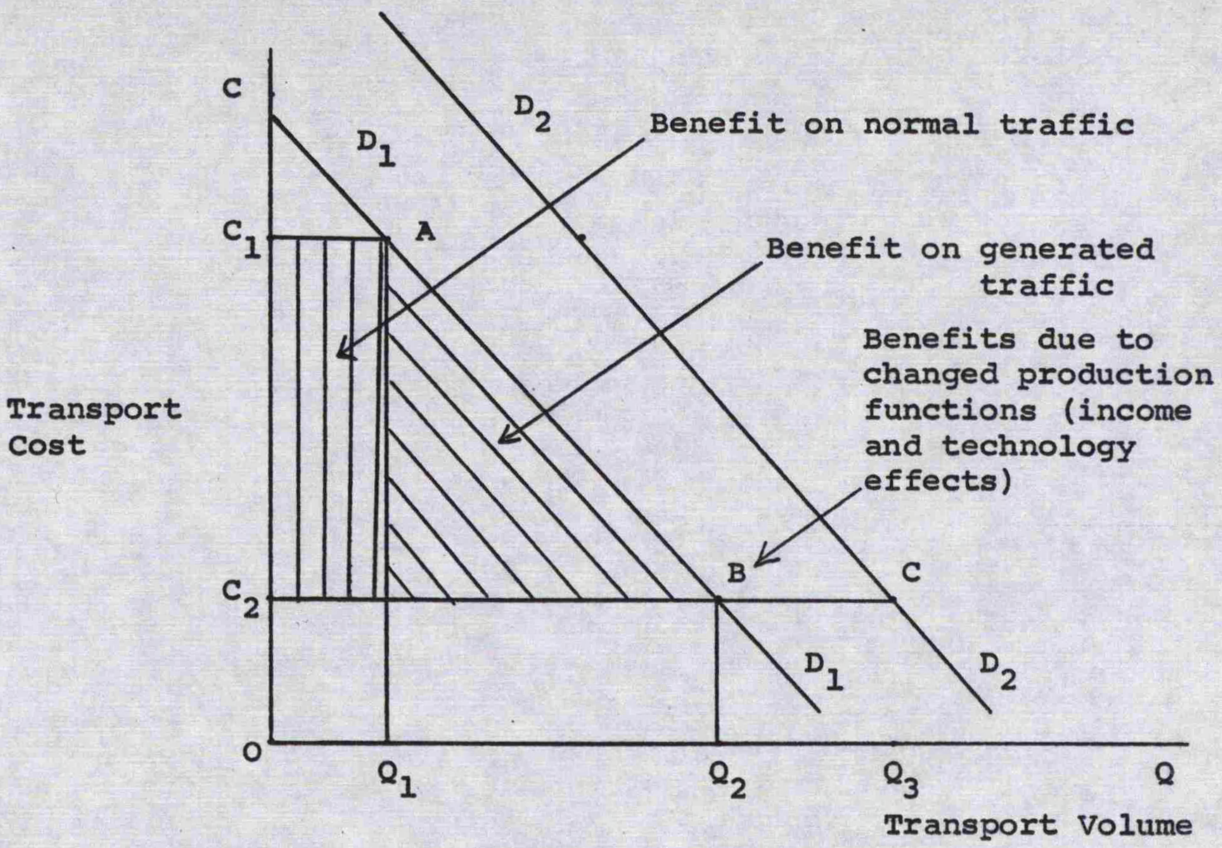


Figure V - 2. Transport Demand Function for Situation II.

In the above figure the size of the developmental benefit is shown by the triangle under the demand curve D_1. Obviously the size of this triangle is much larger relative to the normal cost savings rectangle than shown in Situation I (Figure V-1).

Considerable shift in agricultural production supply is envisaged with the provision of improved road facility and complementary agricultural investments. The demand curve may shift from D_1 to D_2 as a result of change in agricultural production supply which, in turn, may result in a with-project observed traffic volume to Q_3. It seems more appropriate in this case to try to quantify project benefits more directly and through focussing on the underlying production function.

The latter situation as described above seems to conform with the present state of Bangladesh economy. The farmers do not have much surplus to market and, consequently, traffic on the rural roads is meagre. On the other hand, there is tremendous optimism that an agricultural break-through is possible on the basis of a modern input technology - about which we have indicated in chapter II. We, however, recognise that while improved road provision will contribute to developmental benefit, road is not the only element in that developmental process. Therefore, the analytical approach needs to be broadened which will provide a more comprehensive explanation of the impact of rural road projects. An IBRD recent work(2) favours producer surplus analysis for evaluation of rural roads in the developing countries. This approach is also known as the 'social surplus', 'value added' and 'incremental net income' methods. In view of the fact that Bangladesh is seeking to implement integrated rural development programme in a country-wide scale, the producer surplus approach seems more appropriate for evaluation for rural roads in the Bangladesh context. We will explain the theoretical basis for the producer surplus approach and how it needs to be modified to suit Bangladesh conditions.

ii. <u>Producer Surplus Analysis - An Integrated Development Approach:</u>

The producer surplus analysis is expected to combine four distinct effects through benefit measurement:

(i) The incremental surplus (incremental revenues minus incremental costs) realised by various producers because of higher producer prices, lower production costs, and improved market access.

(ii) Benefits accruing to users of the products transported if market prices decline as a result of the road improvement.

(iii) There may be losses accruing to users of the products in other markets who may face higher prices, and,

(iv) Changes in profits realised by middlemen throughout the distribution system.

The first effect is of major importance for it represents real developmental impact of project undertaking in terms of road provision and supplementary investments and constitutes the major source of benefits. The other three effects are also important and may determine the actual level of benefit to be derived from the project.

The producer surplus approach begins by highlighting on a given sector, such as agriculture, and a given product or a set of products - in the Bangladesh situation we may take, for example, Rice.

For this crop, it will be necessary to estimate conditions (such as costs, prices, production quantities) both with and without the project investment, year by year over the project life-time. To illustrate a simplified hypothetical case with respect to Rice production in a given year may be considered with some simplifying assumptions:

(a) Transport cost savings due to the road project are fully passed along to the farmer, in terms of a higher ex-farm price for outputs and a lower delivered price for inputs.

(b) Cost of production of Rice per ton declines due to greater use of modern inputs and technology made accessible by the road project. But to the extent higher production is due to complementary investments (such as fertilizer, irrigation water, credit extension, etc.) these investment costs would also be included in the computation of the project benefits.

(c) For the purpose of the project influence the land area is fixed.

(d) Any increased quantity of Rice produced as a result of the project is not sufficient enough to result in a price fall in the market.

(e) All the Rice marketed is over the improved road.

(f) To the extent possible, economic costs (shadow prices) are used throughout the analysis. Farmers' responses, however, are likely to reflect their perceived costs and values rather than national efficiency prices.

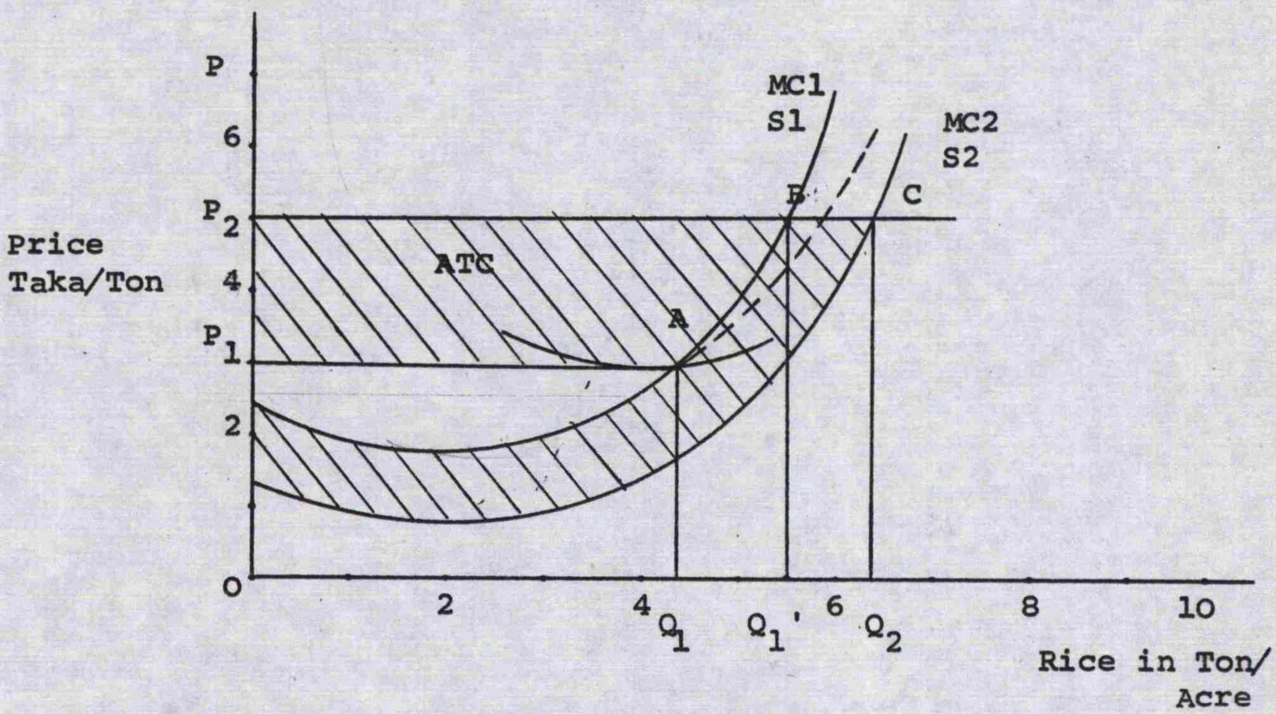


Figure V - 3. Production of Rice in Year N.

The above figure illustrates the production situation for a given commodity, Rice, in a given year. Point A in the figure is without the project situation as quantity Q_1 of Rice is produced at ex-farm price P_1. The without project producer surplus, or net income, is equal to the area below P_1 and above S_1 - the marginal cost (supply) curve. The production situation at point A in Figure V-3 gives the underlying basis for the transport demand shown at point A in Figure V-2.

Now with the road and other complementary investments following changes are envisaged. Firstly, transport cost savings passed on to the farmer, P_2 minus P_1, are reflected in a higher ex-farm income. At this higher price, farmers will produce quantity Q_1 of Rice. This movement along the supply surve, from A to B, is the obverse of the movement along the demand curve in Figure V-2. Secondly, the marginal cost of production, represented by supply curve S1, shifts downward to curve S2, again increasing net farm income; at the new ex-farm price P_2, output increases from Q_1 (point B) to Q_2 (point C). Now, this increase may be caused by (a) increased accessibility and use of new technology through lower prices of transported farm inputs, and (b) improved farming practices brought about by complementary investments, such as irrigation, extension services, high yielding variety seed, etc. The shift in the supply curve in Figure V-3 from S1 to S2 is observed only indirectly in terms of the shifting demand for transport, from D_1 to D_2 in Figure V-2.

Therefore, the road project and any complementary investments have induced a change in output from Q_1 to Q_2, and with-project producer surplus thus becomes the area between P_2 and S_2. Net project benefits, the shaded area in Figure V-3, are simply the difference between 'with' and 'without' project producer surpluses which is, in fact, the incremental net income.

Of course, this simple hypothetical case will need important adjustments in the analysis once this approach is sought to be applied in a specific area study. Vehicle operating cost savings on non-agricultural traffic (e.g. passenger and generated freight traffic) can best be quantified by the traditional road user savings approach. Benefits on such traffic should be added to incremental producer surplus benefits related to agricultural traffic. Then there is the obvious situation that cost savings may not be fully passed on to the farmer. Finally, a correction should be made in the case where local consumption of certain commodities is important (e.g. poultry, vegetables, etc.). This is because local consumers or users of the commodity now face a higher price, offsetting their gain as producers of grain or any other major agricultural commodity, which may be jute.

Figure V-3, however, depicts a static situation in a given year for all the curves are of the short-run type. This is so because for illustrating the theory of producer surplus we took one commodity and a single year of its production. But a dynamic view of the with-project situation can also be shown as in Figure V-4.

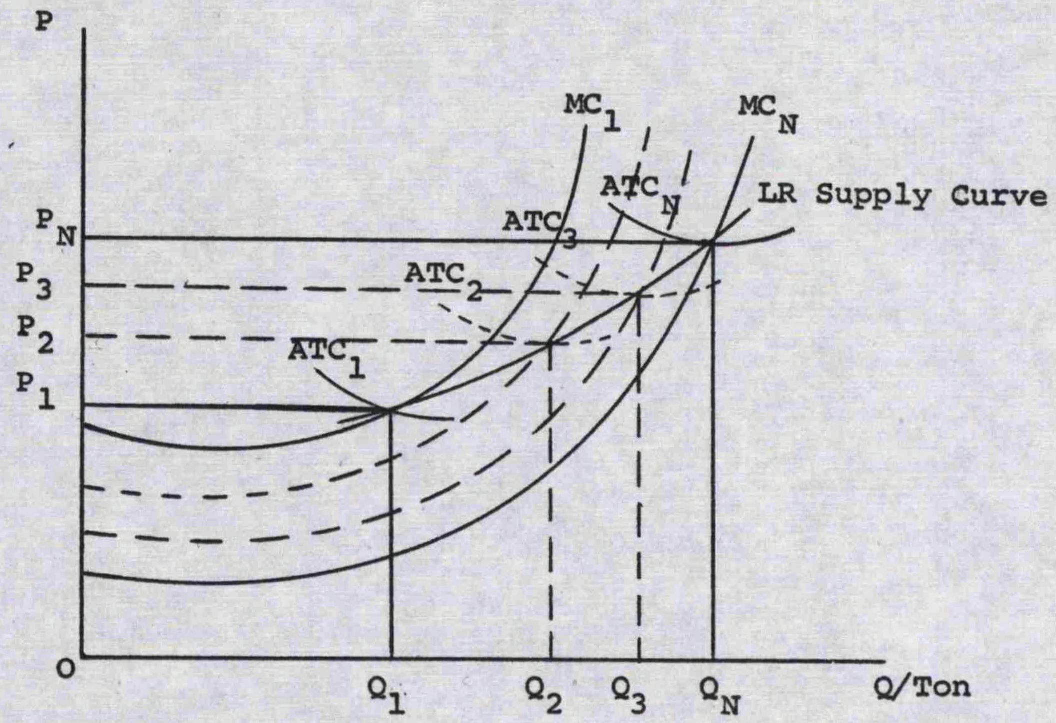


Figure V - 4. Dynamic View of With-Project Case.

In the Figure above, output price and production costs are seen to respond to the project investment over time. However, the farmgate price may not rise immediately because the time necessary for transport cost savings to be translated into lower transport charges. Similarly, production costs may decline slowly as the farmer adjusts to a new use of cheaper inputs, newer seeds, improved technique and so on. The apparent supply curve is thus the long-run supply curve connecting the inter-sections of short-run marginal revenue and marginal cost curves.

The theory of producers' surplus has been presented, as in Figure V-3, on the basis of marginal cost approach. In fact, the problem of defining the marginal cost curve can be avoided by the use of average variable cost for any given output level. For it is apparent that average variable cost at any output level multiplied by the quantity produced yields total variable cost. From the operational point of view this is a simpler technique than deriving the area under the entire marginal cost curve, since only one point on each variable cost curve is needed.

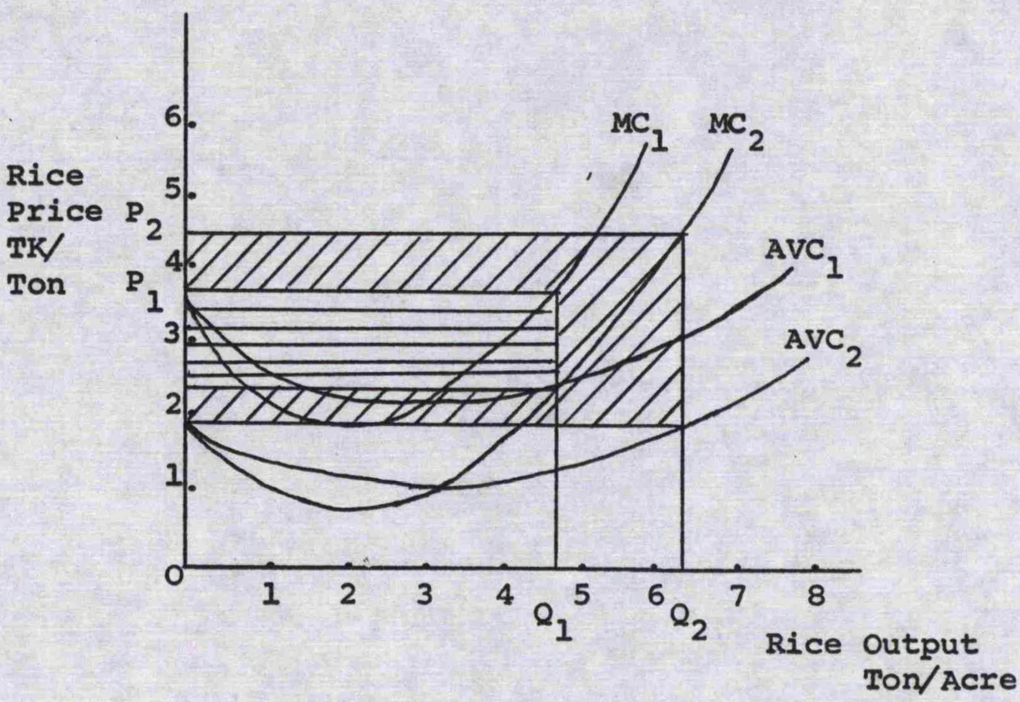


Figure V - 5. Rice Production in Year N
Use of Average Variable Cost.

iii. Methodology for the Area Study:

While it was clearly not feasible that a country-wide survey could be launched to produce the information and evidences for the purpose of testing the hypothesis of this thesis, it became clear that a micro-regional study could be carried out to satisfy the same objective. It was felt, however, that selection of the appropriate area was very important. For the area had to satisfy one of the basic objective conditions of the Five Year Developmental Plan of Bangladesh - namely, the agricultural potentiality of the area in terms of its water and land capability findings. The 1972 IBRD Land and Water Resources Sector Study has divided Bangladesh into four regions on the basis of development potentials. These regions are: The Northwest Region, The Central Region, The Southwest Region, and the Eastern Region. The study maintained that the country's Northwest Region had a higher potential for rapid agricultural development than any other region. This was primarily because of the great extent of highland and shallowly flooded land suitable for cultivation of high yielding Rice varieties. The region, therefore, fits in well with the expectation of the Development Plan in terms of high agricultural growth and a rapid movement towards food-grain self-sufficiency programme. From the point of view of looking into the rural transport demand the area selected for micro-regional investigation fell in this high potential North-Western Region of Bangladesh.

Within this region, the specific area selected was Sherpur Thana of Bogra District. Bangladesh is administratively split into 19 districts. The districts are the second tier of administration, the third tier is the Sub-Division and a few of them make a district. Each Sub-Division of a district is made up of several Thanas - local name for a Police Station - which constitutes the fourth tier. Each Thana is divided into Unions, and Unions into Wards, and, lastly, the villages. For developmental planning purposes, Thanas have been considered the lowest tier of development administration, revenue administration as well as police or general administration. For planning purposes a Thana is not so small as to lose its geographical identity nor so big that rural development work could become unmanageable. There are about 413 Thanas in Bangladesh averaging an area of 125 sq. miles.

Sherpur Thana was selected because the government had picked it up as one of the nine Thanas in Bangladesh for the introduction of integrated rural development programme (IRDP). The IRDP was taken in hand because after the liberation of Bangladesh, the government found that the rural works programme was already under disarray, the thana irrigation programme was lacking and, on the whole, rural development activities were suffering from lack of co-ordination and leadership. So the IRDP was initiated to establish necessary co-ordination not only among various input agencies but also within the package of development programme. Therefore, having picked the nine

Thanas, including Sherpur, the government initiated Thana studies to carry out investigation on water control, irrigation and rural works. These studies produced a wealth of information, hitherto unknown, on the physical constructional side and it was felt that some of this information could be used for the economic analysis purposes.

Finally, from the point of view of undertaking the actual area study Sherpur Thana appeared to be very suitable. For one thing, the District Roads and Highways Engineer readily agreed to provide the administrative support in terms of transport and accommodation. In Dacca, the government's Planning Commission provided the manpower and finance to undertake the studies in the villages of Sherpur Thana for ten days and, in all, about 120 man-days were spent on the field survey. It was so arranged that the field study was accepted as part of the government's preliminary pilot study so that costs could be borne by the government - although later it was possible to bring back all the data sheets to England for analysis.

Lastly, and perhaps most importantly, the introduction of rural integrated development programme in the Sherpur Thana seemed to suggest that a simpler version of a producer surplus model could be worked out to see if it worked for Bangladesh. For the analysis, in fact, was basically an integrated approach seeking to identify and appraise all other sub-sectors within the development area. In the event, it was possible to establish close and useful contacts with local officials and agricultural experts who offered their local experience and knowledge towards meeting some of the crucial information gap.

Initially four forms of field surveys were proposed: i. Roadside Interview of Vehicles or Porters, ii. Market Trader Interview, iii. Vehicle Operating Cost Interview, and iv. Farm Household Input/Output Survey.

The purpose of the Roadside Interview exercise was to identify the general traffic and type of traffic pattern in terms of origin, destination, trip length, commodity movements, load factor, etc., and, on that basis, if possible, to derive a traffic flow within the area of study. This exercise was tried on four roads on the first day and it became very clear that traffic was extremely meagre and that flow of traffic was in fact market (known locally as 'Hat') related which occurred twice a week. Thus roadside interview was abandoned in favour of market entry volume survey. It was found that there were at least four to five entrances to each Hat. But the volume of traffic was so heavy that it was not possible to interview all the transporters or porters coming into Hats. Therefore, another questionnaire was formulated, the fifth one, known as Roadside/Market Entry Interview. This interview was carried out with every tenth vehicle or porter coming into the Hat. Thus it was possible to estimate both the total volume of traffic coming into the market or Hat and to obtain detailed information on this traffic through the Roadside/Market Entry Interview of Vehicles and Porters.

The Market Trader Interview forms were used within the Hats to derive information about consignments, seasonal variation, frequency of visit to the market by the traders, ownership of transport, general transport and storage adequacy in the market, and the speed with which goods are cleared for shipment to the terminal destinations.

Again, within the market, vehicle owner operators were identified and interviewed for obtaining operating cost structure. Wage costs were derived from interviewing some of the non-owner transport operators.

Finally, the Farm Household Input/Output Survey was carried out in 108 village farm households. Sherpur Thana consists of 9 Unions, from each Union two villages were randomly selected, and within each village two households of each of the three sizes of households were interviewed. These households were small size, 0 - under 2½ acre size; medium size, 2½ - under 7½ acre size; and large size, 7½ acres and over. The Input/Output Farm Survey was designed to provide information about total land holding, land utilisation, crops produced, inputs used; marketing, storage, transport requirements of the household; livestock position, cost and price of farm produce. The questionnaire forms may be seen in Appendix 'A'.

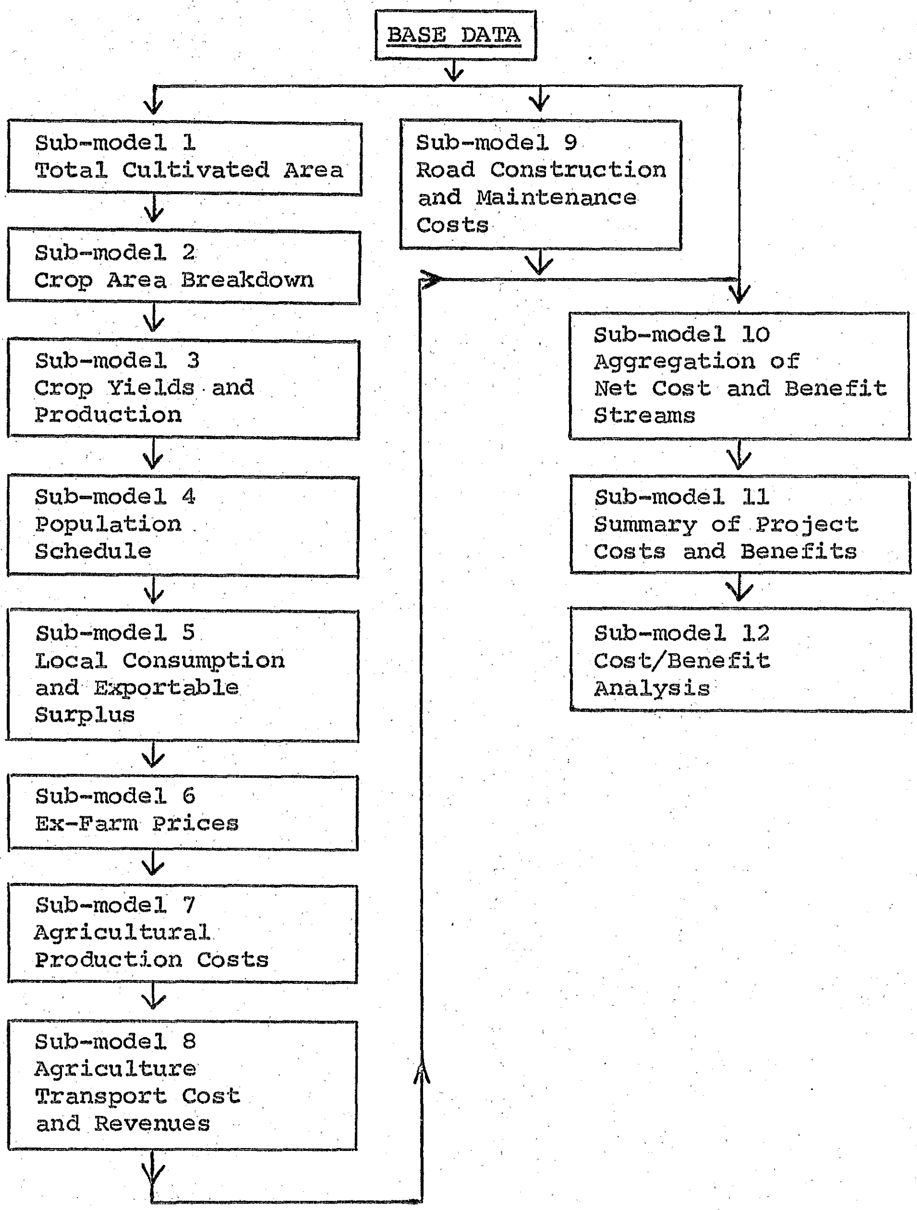
In addition to the field surveys an inventory of present road system and other physical infra-structure, such as storage, marketing, educational institutions, community centre, etc., has been prepared. A few pictures of road conditions during the dry season have been taken.

The information collected has been analysed in the next chapter. It throws light on the existing situation in terms of physical infra-structure available, natural and human resources of the area and, finally, on the economics of transport operation. One of the spin-offs of the analysis has been that there is some good information with which to try a simplified version of a producer surplus model which we have done in Chapter VII. The producer surplus approach analysis, it is hoped, will help to focus on the difference in the net income of the agricultural producers and transporters <u>with</u> and <u>without</u> the road improvement and the complementary incremental investments and expenditures in agriculture.

The producer surplus model tried for Sherpur Thana differs from the IBRD approach with respect to a few assumptions arising out of the peculiar feature of the Bangladesh economy. For in Bangladesh, there is no new land as such which can be brought under cultivation. Instead, there is the prospect of increased cropping intensity. As such, incremental acreage assumed over the project period has been based on increased cropping intensity.

Similarly non-agricultural traffic, particularly after the commissioning of the project, although important in terms of fuller estimation of cost and benefits, has not been taken into consideration on the grounds that it is not likely to be significant enough. However, these deviations from the IBRD approach have been explained along with each of the sub-models in Chapter VII.

The formulation of the proposed producer surplus model will proceed in the following flow of sub-model estimation:


BASE DATA
Sub-model 1
Total Cultivated Area
Sub-model 2
Crop Area Breakdown
Sub-model 3
Crop Yields and Production
Sub-model 4
Population Schedule
Sub-model 5
Local Consumption and Exportable Surplus
Sub-model 6
Ex-Farm Prices
Sub-model 7
Agricultural Production Costs
Sub-model 8
Agriculture Transport Cost and Revenues
Sub-model 9
Road Construction and Maintenance Costs
Sub-model 10
Aggregation of Net Cost and Benefit Streams
Sub-model 11
Summary of Project Costs and Benefits
Sub-model 12
Cost/Benefit Analysis

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CHAPTER VI

THE AREA - SHERPUR THANA

PART I: Physiography and Physical and Socio-Economic Infra-structure:

i. Physiography and climate:

The physiography[6, 7] of the region is similar to that of the north-western part of Bangladesh with land sloping downward in a south-easterly direction. The elevation above sea level varies from 60 ft. to 25 ft. in the southern side. The Karatoa river passes through the Thana dividing it into two parts. The Bangali river forms the eastern boundary of the Thana and is perennial but with varying degrees of droughts. The western side is part of the area known as Barind area characterised by relatively high ground largely unaffected by annual floods, whereas the eastern part of the Thana forms part of the Teesta flood plains. The Barind area is of reddish clay and is shallowly flooded by rain water in the monsoon season. The flood plain in the eastern part is relatively more vulnerable to annual flooding during the monsoon by the flood waters from Brahmaputra and Teesta rivers. The soil in this area is alluvial and naturally fertile. In the entire Thana, there are a large number of artificial ponds and a number of shallow natural reservoir areas which hold good prospects for low-lift pumping for irrigation purposes.

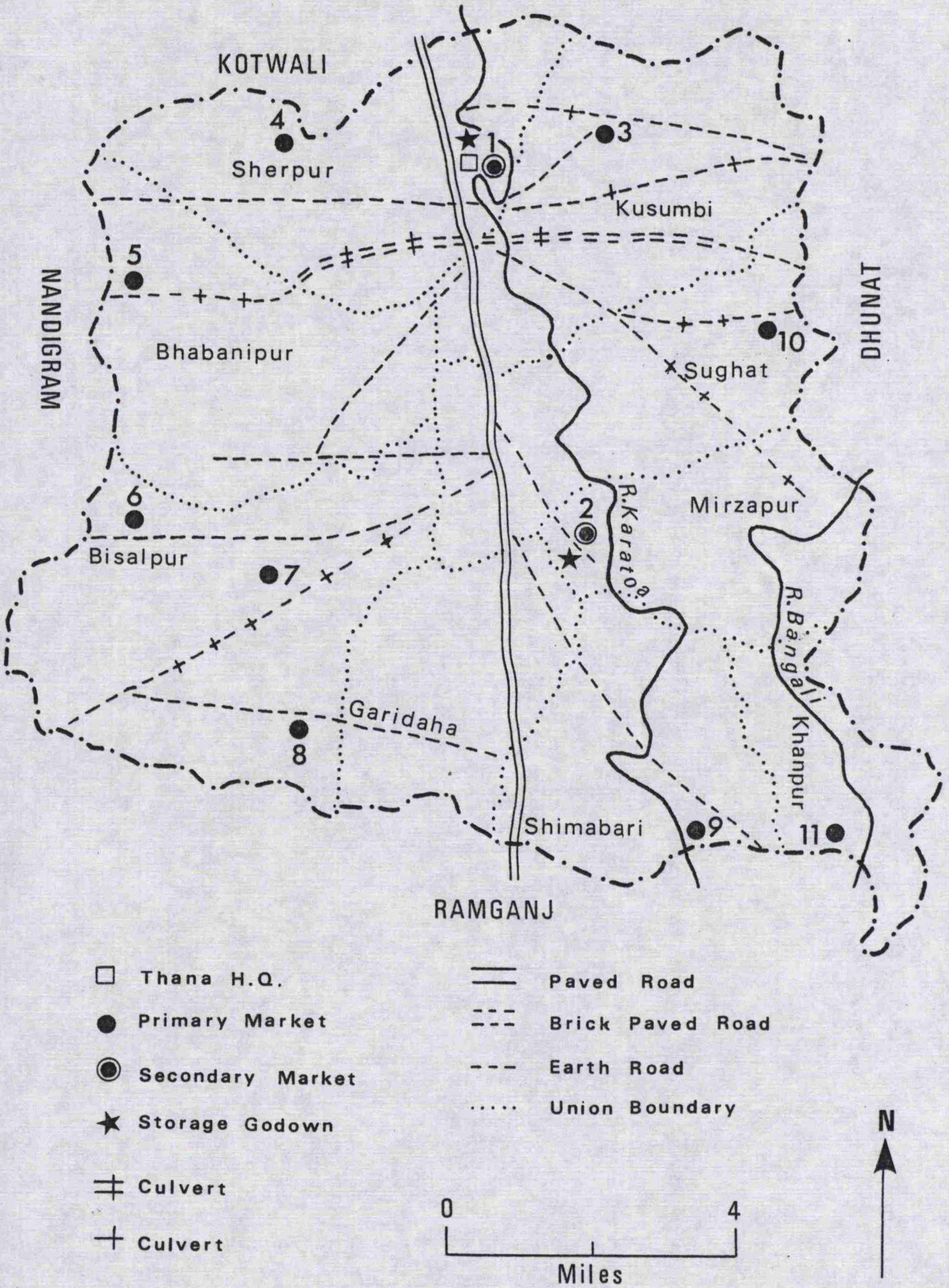
The climate is relatively warmer during summer and cooler during winter than other parts of Bangladesh. The maximum temperature is reached in March and April, sometimes exceeding 100° F. With the advent of rains in June, the temperature falls. During the monsoon, the mean maximum temperature is about 88° F., the mean minimum being about 75° F. From October the temperature begins to fall - the mean minimum reaching 50° F. The winter of Bangladesh stretches up to the end of February, and temperature rises sharply from the beginning of March.

The winter months are dry months as well. For although the annual rainfall in the area is about 69 inches, most of it, about 56 inches, falls during the monsoon - June to September. Mean relative humidity is high throughout the year. The high April temperatures coincide with the lowest mean relative humidity of 55 per cent. During the hot monsoon months the humidity is sometimes as high as 90 per cent.

ii. <u>Transport inventory</u>:

Sherpur Thana is somewhat advantageously placed due to the fact that an 18 feet wide north-south highway passes through the middle of the Thana (map on page VI-3). This road connects the Thana very closely to the district headquarters of Bogra only 12 miles to the north and, indeed, to the other big towns and commercial centres to the south. Ironically, this highway facility makes the Thana somewhat

SHERPUR THANA



unrepresentative in relation to most of the 413 Thanas that exist in Bangladesh. Rural Development Officials both at the Thana and at Dacca tended to agree that unique accessibility as provided by the highway which effectively split the Thana into two parts, provided one of the good reasons as to why this Thana was chosen by the government for intensive development effort through the Integrated Rural Development Programme (IRDP). For the purpose of this study also IRDP interest was one reason, and easy accessibility the other. Given the resources for an area field study, it seemed very convenient to be based in Bogra for the return to the Thana in the early morning. From the highway itself, most of the interior parts were not beyond a day's walking, back and forth, for the necessary interview work.

iia. Road and river communications:

Most of the western part of the Thana is on relatively high ground and is not subjected to heavy flooding. The only form of accessibility is by road. On the eastern part the river Karatoa runs north-south all the way through the Thana - somewhat roughly parallel to the highway. This river is not perennial and most of it dries up during the winter. On the south-eastern corner of the Thana there is a small stretch of another river named Bangali which almost borders with the adjoining Thana of Dhunat. Local transport on the eastern side of the highway is also predominantly by road except that people do take advantage of the river transport whenever boating is possible.

ii.b. Quantity and quality of existing roads:

Prior to the introduction of the Works Programme in 1962, local road construction was the responsibility of the District Boards and Local Union Councils. But in fact none of them had any genuine technical capacity to build roads either in quantity or quality. The real spurt was provided with the introduction of the Rural Works Programme in the sixties. However, no systematic record existed with the Circle Officer in charge of Development (C.O., Dev.) as to the actual phasing of the road building works and how the money was spent. The C.O.'s (Dev.) Office produced a figure for roads and culverts which were constructed until December 1975 but it did not tally with the physical verification which was undertaken shortly afterwards. The roads and culverts - both claimed and verified - in Sherpur Thana stood as follows:

Table VI - 1

Roads and Culverts in Sherpur Thana

		Claimed by C.O. (Dev.)		Actually existed	
Type of Road	Width	road miles	number of culverts	road miles	number of culverts
Paved	18 ft.	34	7	14	5
Brick-soled	12 ft.	9	4	4	3
Earth	10 ft.	117	46	31	15

Source: C.O. Dev., Sherpur Thana, and Area Road Survey in 1975/76.

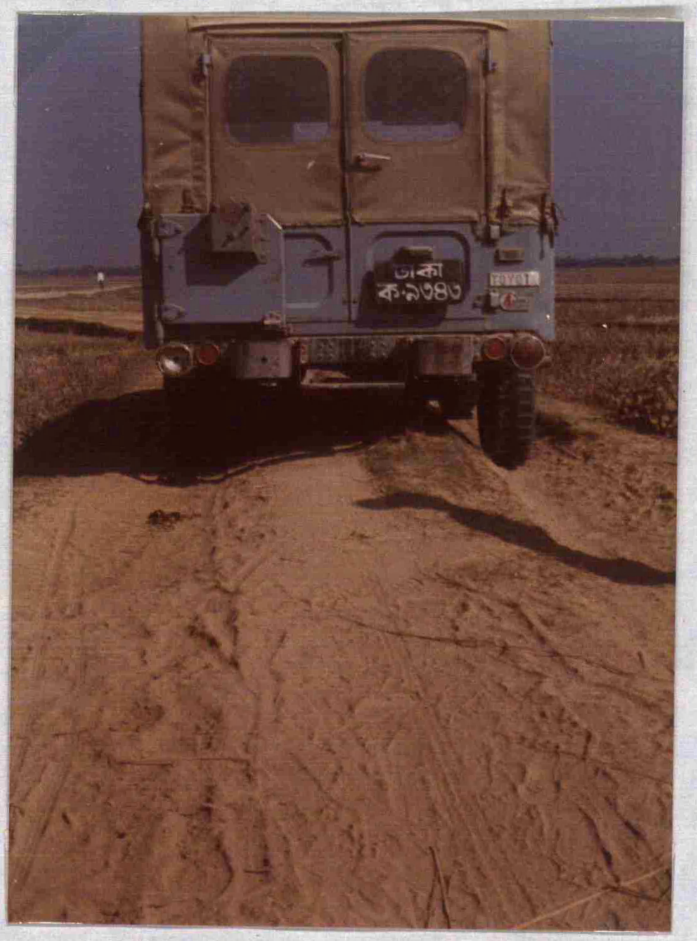
Curiously enough, the C.O. (Dev.) Office had produced a road map for our benefit which tended to confirm the actual findings during the course of the survey. When pressed harder about the reason for the discrepancy between his records and the actual findings, it emerged that money was spent on the same roads and culverts year after year under capital account but in fact it amounted to up-keep and reconstruction of the existing road facilities. Two stretches of road of about 7 miles which appeared on the C.O. (Dev.) map did not exist at all on the ground. The reason seemed to be that either the roads may have been planned but never constructed due to lack of funds, or even if constructed, no money was available subsequently for their up-keep or reconstruction and, therefore, the following monsoon or flood had wiped them away completely. The C.O. (Dev.) Office could not confirm either way.

The paved highway was the responsibility of the Roads and Highways Directorate of the Central Government. Although normally well maintained, the stretch of the highway which passed through Sherpur Thana was in considerable disrepair in December 1975. The speed was restricted to 30 miles an hour and one could exceed it only with considerable risk of accident.

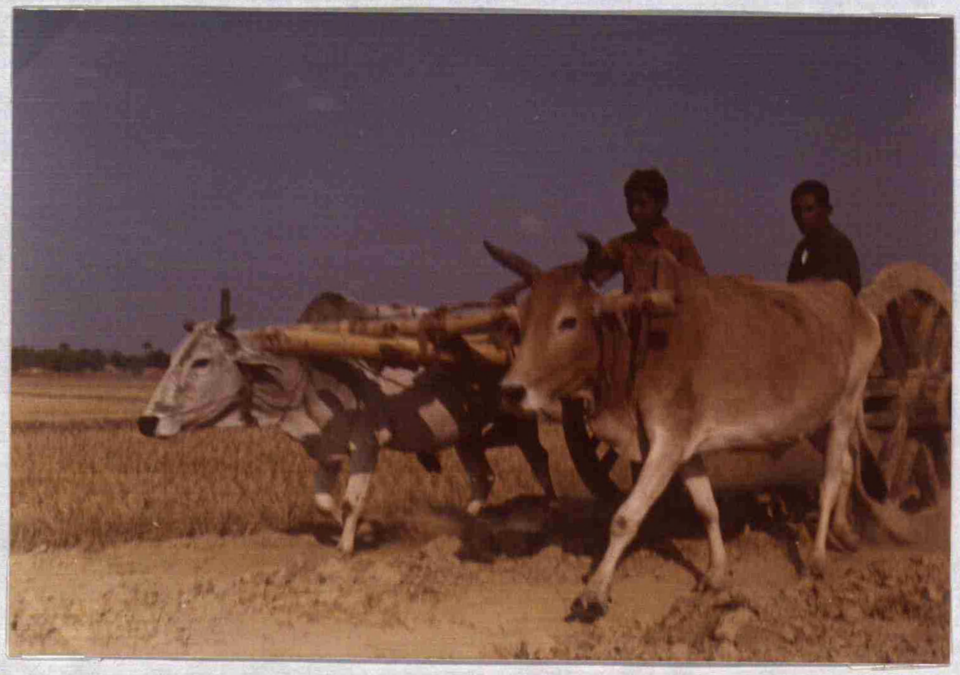
The remaining 31 miles of earth road and 4 miles of brick paved road were the responsibility of the C.O. (Dev.) within the Thana. These earth roads were built during the sixties under the works programme. Their quality was reasonably uniform within the Thana. Built on an average embankment height of 3 ft., they were 10 ft. wide and with a side slope of 2:1. The construction methods employed depended heavily on the use of local labour using spades and head baskets. Compaction was by hand rammers. Sometimes Road Supervisors, with some technical training, were employed and they were responsible to the C.O. (Dev.) who was a civil servant. The central Ministry which provided the funds under the works programme did not lay down any standards or construction specification except to suggest that the work had to be done with maximum use of manpower.

The earth roads in the Sherpur Thana were fair-weather only (see photo-plate on page VI-8). It was reported that all the roads in the eastern part of the main highway were subjected to flooding during the peak of the monsoon season. The roads on the western side were slightly better off, but went under water if the flooding level went slightly higher than normal which occurred every two or three years. Generally, the roads lacked pulverisation resulting in many air pockets and voids and followed by severe deterioration of embankments after each monsoon. The field survey was carried out in the later part of December 1975 and early January 1976, the peak of the dry season. Attempt was made to travel over each of the earth roads by a 4-wheel-drive Toyota Land Cruiser. In none of the roads was it possible to travel by this sturdy

Photo Plate 1



4-Wheel Land Cruiser negotiating Typical
Earth Road in Sherpur Thana, December 1975



Bullock Cart in Sherpur, December 1975

vehicle beyond 3 or 4 miles from the main highway, and many times the vehicle got stuck due to the breaches in the embankment which were yet to be repaired. The only vehicle which seemed to be fit to negotiate the earth road during the dry season was the bullock-cart with average speed of 2-2½ miles an hour depending on load and condition of the road. But the bullock-cart traffic contributed significantly to the deterioration of the earth embankment if it were not well compacted or adequately surfaced. For, frequently, the wooden-made bullock cart wheels are fixed with iron rims to make them longer lasting. But tests carried out in India (4) suggested that such iron-rimmed wheels imposed surface pressures up to seven times those by (8 ton axle) lorries with pneumatic tyres. In the case of lorries, the total weight is evenly distributed through the axles and thus the maximum shear stress at the surface on any one point is much less. But the bullock cart wheels bring much more shear stress at the surface and cause much more damage to the inadequately compacted rural roads. During the wet season, most of the earth roads become almost unuseable or just usable at great risk and cost to the commodity carried. If the flooding is just above normal, it becomes difficult to trace the road alignment and the villages get disconnected from one another and completely marooned.

The only brick paved road stretching about four miles long seemed capable of taking motorised vehicles and withstood the ravages of flood and monsoon. This road was 12 ft. wide with two layers of bricks - the top layer with bricks laid on edge in herringbone bond. The road, however, did not seem well maintained at the time for there were a number of holes where the bricks opened loose.

Most of the culverts, whether on earth, brick or paved road, seemed to be in reasonable condition and withstood the ravages of the weather. They were mostly of one lane having a clear roadway width of 10 ft. 6 ins. and designed for H15 (15 ton) loading. Given the present traffic volume and its individual load factor, the culverts seemed over-designed. At the same time, there were quite a number of road gaps which were yet to be filled by bridges or culverts.

As for the network planning of the existing roads within the Sherpur Thana the recent IRDP study observed that "local influential people used the available money to connect their individual villages to the main Highway, rather than for connecting the farm land or village with primary and secondary markets or with the Thana head quarters". The road map of the Thana bore adequate testimony to the faulty net-work planning. During the course of the survey, it did occur to us that some of the markets, locally known as 'hats', were not connected by road. We had to use nominal pathways to reach the market.

In summary it can be said that the major drawbacks of the rural road building programme in the past have been mainly in the area of standard of construction, road gaps and appropriate network planning. The obvious areas of bringing about improvements would be, first of all, to give more attention to the site control of the construction work, and in particular to the compaction of embankments. There does not seem much point in road building unless the embankment height is built at least 1½ to 2 ft. above high flood level so that the investment can be secured with routine maintenance. The present situation is one of making fresh effort in tracing the road out following the aftermath of the monsoon and flood. The pictures taken of some of the roads give clear indication of very poor quality of road building effort in the Sherpur Thana (see photo plate on page VI-12). The question of higher design standard for the road is of course tied with the level of traffic that is expected to be generated and the costs involved. But the minimum standard required is unquestionably one which would enable the road to withstand the monsoon and the seasonal flooding, so that road building is not an annual wasteful exercise, and to make it all-weather condition.

ii.c. <u>Resources devoted to road building and results obtained</u>:

Although exact figures as to the money available under the works programme over the years, were not available either at the Thana level or at the Central Government, it was estimated that on an average about Taka 200,000.00 a year between 1962-63 and 1967-68, were available for Sherpur Thana. Of this amount, about threequarters, i.e. about Taka 250,000

Photo Plate 2

Typical Earth Road under Works Programme in
Sherpur Thana, December 1975

a year was spent on road construction, and in the six years this amounted to Taka 1.5 million.

When asked about the Thana's present road building programme, the C.O. (Dev.) provided the following information as to the Thana's Five Year Plan for roads and bridges. Of course, funds for the programme have not been committed or allocated and it is unlikely that anything near the amount claimed would be forthcoming.

Table VI - 2

Sherpur Thana Five Year Road Development Plan

Type of work	Miles	Estimated Cost Taka	Per Mile Cost Taka
1. Earth road	30	60,000	2,000
2. Earth road	12	12,000	1,000
3. Brick paved road (Herringbone bond)	21	840,000	40,000
4. Bridges - R.C.C.	11 Nos.	978,000	
5. Culverts - R.C.C.	15 Nos.	154,000	
Total		2,044,000	

Source: C.O. (Dev.), Sherpur Thana, 1975-76.

However crude the cost figures may be, the interesting point to note here is that if all the money spent on earth road during the six years between 1962-63 and 1967-68 were spent on brick paved road, even at the current estimated prices, the Thana would have been left with at least 20-25 miles of brick paved road on which further improvement could have been undertaken if necessary. The other disturbing point to be noted is the continued difference of money allocation, and hence quality, between earth and brick paved road. The C.O. (Dev.) Office agreed that the allocation on the earth road was for repair and maintenance purposes and not for upgrading.

The fact that emerges from the analysis of works programme effort in road building is that there has been colossal waste of resources due to lack of adherence to any purposeful design standard of rural road construction. This point is amply demonstrated by the discrepancy between the official claim of C.O. (Dev.) of constructing 117 miles of earth and 9 miles of brick paved road, and the physical existence of 31 miles of earth road and 4 miles of brick paved road (Table VI-1). No wonder, therefore, that certain complacency is expressed from time to time about the achievement of the works programme looking at the resources devoted to building roads. This is, however, no criticism of the works programme itself, for, after all, after many years of void in developmental work in the rural country side, the programme had provided a fresh impetus in rural development. This was by all means a welcome innovation and in fact, given the resources available, much fuller benefit could and ought to have been achieved.

ii.d. <u>River transport</u>:

We have mentioned in the beginning of this part that there are two rivers which flow through the Sherpur Thana. Karatoa river, although not perennial, runs almost parallel to the highway - north to south. The Bangali river is, on the other hand, a perennial river but is almost a border river and enjoys some influence with the two markets in the south-eastern corner of the Thana. The Karatoa river plays an important marketing part in that one of the only two important secondary markets, namely, Mirzapur Hat, sits on the bank of this river. During the dry season, stretching from October to March/April, the river draught falls below 2 feet which makes it very difficult for the big boats to come right up to the 'Hat' site. It was observed during the course of the 'Hat' survey that smaller boats requiring between 1 and 2 feet draught were being used for ferrying goods for up to 6-8 miles downstream, across the Thana, where bigger boats were waiting for loading directly from the smaller boats. So although the river had some importance in the transportation of goods, it functioned more as the highway, clearing goods from the secondary market to the terminal destination outside the Thana.

A pair of wooden ferry boats were operated on the Karatoa river by the local union council for ferrying pedestrians, goods on head-loads, and carts across the river. It was, however, impossible to ferry our survey vehicle across to the other side due to lack of any permanent loading/unloading ramp with the ferry.

iii. Forms of transport:

Motorised forms of transport exist in the Thana due to the existence of the stretch of paved highway linking the Thana with the rest of the country. Both bus and truck services operate through the Thana. However, no motorised vehicle can ply on the earth roads of Sherpur. A $2\frac{1}{2}$ tonner truck was located on the only brick paved road for collection of paddy from the remote village market. This operation was unique and rather the exception to the rule so far as the Thana was concerned. The truck driver was interviewed and he explained that he was operating on behalf of a wholesaler in Bogra town to collect a specific consignment and he himself was not a regular visitor. But he maintained that should more roads in the Thana become operable by light commercial vehicles then more and more trucks would venture into the interior of the Thana for transportation purposes.

However, the story of forms of transport within the Thana is in fact the story of bullock carts, push carts, head-loads, tricycle rickshaws and cycles.

Since push carts and cycle rickshaws have to have licences from the Sherpur Municipality, their licensed numbers were available from that Office. There were 38 push carts and 60 cycle rickshaws. Push carts are in some ways similar to the cart pulled by a pair of bullocks but in fact are pulled and/or pushed by manual labour. Their average capacity is in the region of 7 maunds[a] or about one quarter of a ton. They

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a. Note: 27.22 maunds = 1 ton.

seemed to be more concentrated around the Thana town surrounding the Thana headquarters.

Cycle rickshaw is basically for passenger carrying purposes in the rural areas. Frequently some loads of up to 3-4 maunds are also carried. During the dry season, rickshaws are seen in the interior of the Thana and their speed is limited to 2-3 miles an hour.

Bullock cart is by and large the main means of transport, especially so for goods carrying purposes. Their capacity varies from 10/12 to 25/30 maunds. The bullock cart operator has to pay Taka 5.00 annually as licence fee to the local Union Council and since its operation did not involve the Thana authority, the latter did not keep any records of bullock carts. It was also difficult to obtain the figures of bullock cart population from the nine Unions involved for not only did they not keep proper records but also their offices were not open every day. Two of the Union offices which were contacted reported that they received the fees from bullock carts under miscellaneous heading. This all but precluded the possibility of making an estimate of the cart population on the basis of fees received in the Thana.

However, in the Farm Household Input/Output survey, the questionnaire asked for the information about the ownership of any form of transport equipment or any animal for transport. Of the 108 farm households interviewed, 16 households reported that they possessed 20 bullock carts; 12

households possessed one each, and 4 households reported that they possessed 2 each. In percentage terms it meant, therefore, that 11.11 per cent of the reported households had one cart each and 3.7 per cent had two carts each. In order to obtain an approximate figure of the possible bullock cart population in the Thana, we applied these percentages to total number of households in the Thana which was 23,997 according to the 1974 Population Census (3) of Bangladesh. This gives the figure of 2,639 households having one bullock cart each (i.e. 2,639 carts) and 887 households having two carts each (i.e. 1,774 carts). The total estimated carts in the Thana, therefore, comes to 4,413. The total estimated number needs to be treated with some caution. This is because the sample is biased towards the big households who constitute one third of the total households surveyed while in actual fact they represent only 7.85 per cent (Table VI-12) of the farm-sizes in Bangladesh. Out of the 20 bullock carts which were located among the 108 households their capacity varied from 12 to 35 maunds. 14 carts had 24 maunds capacity, 4 of 12 maunds, and 2 of 35 maunds which gave a weighted average capacity of 23 maunds each.

Only 7 per cent of the 108 households reported possessing a bicycle, which meant that there were 8 bicycles reported. If we were to use the same proportion among the total households in the Thana, the total number of bicycles could be estimated to number 1,679.

Therefore, the total number of non-motorised vehicles in Sherpur Thana in December/January 1975/76 is as follows:

Table VI - 3

Estimated Number of Non-Motorised Vehicles in Sherpur Thana

Type of Vehicle	Number	Average capacity
1. Bullock carts (a)	4,413	23 maunds
2. Push carts (b)	38	7 "
3. Cycle rickshaws (b)	60	4 "
4. Cycles (a)	1,679	
5. Boats	Nil	

Sources: (a) Author's Field Survey (1975-76) - Farm Household Input/Output Survey.
(b) Sherpur Municipality, 1975-76.

Although the Thana possessed a river, none of the households reported possessing a boat. Most of the boats which were intercepted during the course of the market survey reported that they had come from outside the Thana - mostly at the behest of the traders who would take the goods out of the Thana. The ferry boat operation across the river was under the local Union Council who owned the pair of boats. The ferry operation seemed highly beneficial to the local people for their own movements between the two parts of the Thana as well as for their trade and marketing.

iv. Markets and stores:

Since the mechanics of marketing and storing associated with an agricultural community is very important we will deal with it in the last part of this chapter following on from looking into the natural and human resources of Sherpur Thana in Part II. Here we will consider merely the physical existence of markets and stores. There are two types of markets in the area depending, to some extent, on the nature of trading taking place. The primary markets are those which are numerous and more immediate to the farmers, especially in terms of nearness to the households. There are 9 primary markets in Sherpur Thana which are held on two specific days a week and theoretically throughout the year. These markets, locally known as 'Hats' (pronounced 'hut') are very poorly equipped. They are held generally on slightly higher ground, on an open field and do not have storage, stalls or any drainage facilities. There is no postal or telecommunication facility. At the end of the market day, the place turns into an ordinary piece of open land. This land is, however, owned by the local authority, in this case by the Circle Officer in Charge of Revenue Administration. The C.O. (Rev.) auctions off the market to the highest bidder for one year in exchange for a fixed fee frequently depending on the area of land ear-marked for the market and sometimes on the importance of trade.

The secondary markets are also similar to the primary ones in some respects such as that they are also on open fields, owned by the C.O. (Rev.) and lacking in any basic modern facilities. There are, however, some storage facilities, some permanent shops and milling facilities. But they are also held twice a week and round the year. The importance of the secondary markets or 'Hats' is that they handle larger volumes of goods, both on a retail and wholesale basis, and they are the 'importer' and 'exporter' of deficit and surplus commodities respectively for the Thana. They are, therefore, also the 'generator' of traffic for the inter-urban arterial movements. Sherpur Thana has two such secondary markets. Table VI-4 gives the list of markets in the Thana in 1975-76.

Storage has an important role to play in the process of production, marketing and distribution in an economy. In Sherpur there is one foodgrain storage godown, locally known as the LSD (local storage depot), owned by the government Food Department. Sherpur being a marginally surplus Thana in a good harvest year, the purpose of the storage godown is to store foodgrains which are bought by the government under its foodgrain procurement scheme. This LSD has a 1,000 ton capacity, built in brick and concrete and is well connected by the highway. Other storage capacity is located at the Sherpur Thana headquarters office having about 975 sq. ft. area. This is owned by the Bangladesh Agricultural Development Corporation responsible for supplying agricultural inputs to the farmers such as, fertilizer, seeds, diesel oil, and pesticides. Private godowns are extremely limited and are concentrated in the two secondary markets along with a few permanent shops in the Thana town shops.

Table VI - 4

Markets in Sherpur Thana

Market No.	Name of the Market	Union Location	Type of Market	Market days	Communication and other facilities available
1.	Sherpur	Khamarkardi	Secondary	Monday Thursday	Connected by River, Highway and Post Office.
2.	Mirzapur	Mirzapur	Secondary	Wednesday Saturday	Connected by River, Highway and Post Office.
3.	Fulzor	Kushumbia	Primary	Wednesday Saturday	Earth road.
4.	Kallayani	Sherpur	Primary	Tuesday Friday	Village path.
5.	Bhabanipur	Bhabanipur	Primary	Sunday Thursday	Earth road.
6.	Bishalpur	Bishalpur	Primary	Monday Saturday	Earth road.
7.	Dayalasana	Bishalpur	Primary	Wednesday Friday	Village path.
8.	Beorapara	Bishalpur	Primary	Sunday Thursday	Earth road.
9.	Shambazar	Shimabori	Primary	Sunday Thursday	River.
10.	Chandaikona	Sughat	Primary	Monday Thursday	River and earth road.
11.	Madhyabhag	Khanpur	Primary	Wednesday Saturday	River.

Source: C.O. (Dev.), Sherpur Thana Office, 1975-76.

None of the 108 farm households interviewed had any form of separate godowns. The farmers held their surplus food-grains (for consumption later in the year or for sale) in earthen pots, locally known as 'Jala'. These are about 2-4 maunds capacity and kept within the living quarters of the farmers. The absence of a separate unit of storage capacity within the household is because the area has a typically subsistence economy and, besides, the surplus farmer gets rid of excess shortly after the harvest thereby not needing any separate storage space.

Since Sherpur Thana has been found to have high agricultural potentiality on the basis of water and land capability study[(1)] the government has taken up the Thana for intensive development through local development institutions, such as the IRDP, TIP and RWP. Under the development programme there is provision for deep tube-wells and low lift pumps. Tube-wells are for lifting underground water, and the low lift pumps are being employed for surface water utilisation, such as, from rivers, ponds and reservoirs. Inventory of low lift pumps and deep tube-wells is as follows:

Table VI - 5

Number of Low Lift Pumps and Deep Tube-Wells with capacity and acreage commanded

Number and Capacity of Low lift pumps		Acreage Commanded	Number of Deep Tube-wells	Acreage Commanded
1 Cusec	2 Cusec			
4	95	3,948	14	90

Source: BADC Pump and Tubewell Project 1975-6; Bogra.

v. Civil amenities:

Civil amenities such as educational institutions and hospitals and clinics are frequently the beneficiaries of improvements of rural infrastructure. Although it is difficult to quantify those benefits, yet those benefits are by no means negligible.

Table VI - 6

Educational Institutions of Sherpur

Type of Institution	Number	Student Enrolment Number
College	1	1,175
Secondary School	10	3,386
Junior High School	4	445
Primary	108	17,026
Madrasha (religious school)	6	1,066
	129	23,098

Source: Bogra Education Department.

Table VI - 7

Hospitals, Clinics, Dispensary in Sherpur

Name of Facility	Type of Facility	Nos.	Who runs it
Rural Health Centre	Outdoor Clinic	1	International Relief Organisation
Charitable Dispensary	Outdoor Clinic	6	Local Government
Veterinary Hospital	Outdoor Clinic	1	Government
Hospital	25-bed capacity	1	Government

Source: Office of Civil Surgeon, Bogra.

Finally, there is great importance attached to the presence of central government and its agencies in the participation of local development. Therefore, a list of the variety of such offices is given below which provides a fairly good picture of a Thana administrative form and structure. Most of these offices do not exist below the Thana level.

Table VI - 8

List of Government Offices/Agencies represented at Thana Level

	Office/Agency	Designation	Number of Officers
1.	Police Station	Officer-in-Charge	2
2.	Thana Circle Officer (Development)	C.O. (Dev.)	1
3.	Thana Revenue Office (Revenue)	C.O. (Rev.)	1
4.	Thana Co-operative Office	Co-operative Officer	1
5.	Education Office	Education Officer	1
6.	Agriculture Office	Agricultural Officer	1
7.	Sanitary Inspector's Office	Inspector	1
8.	Sub-Registrar Office	Sub-Registrar	1
9.	Family Planning Office	Family Planning Officer	1
10.	Thana Project Office (IRDP)	Project Officer and Deputy Project Officer	2
11.	BADC Unit Office	Section Officer	1
12.	Thana Irrigation Office	Irrigation Officer	1
13.	Office of Inspector of Malaria	Inspector	1
14.	Office of Inspector of Food	Inspector	1
15.	Office of Local Supply Depot	Inspector	1
16.	Office of Shallow Tube-well Projects, BADC	Assistant Engineer and Section Officer	2

Source: Office of the Sub-Divisional Officer, Bogra.

PART II: Natural and Human Resources

i. Land Availability - land use and population:

The area of Sherpur Thana is about 115 square miles, 73,600 in acres - of which 62,585 acres are cultivable. The population, according to the national census (2) undertaken in 1974, is 127,113 which gives a density figure of 1,105 per sq. mile. The average density is less than that of either the Bogra district or the national average (Table VI-9).

Table VI - 9

Area, Population and Density

	Area in Sq.Mile	Population (a) 1961	Population (a) 1974	Increase	Population per sq.mile 1961	Population per sq.mile 1974
Sherpur Thana	115	86,822	127,113	46.4%	755	1105
Bogra District	1,502	1.58(m)	2.22(m)	40.5%	1052	1478
Bangladesh	55,598	50.80(m)	71.50(m)	41.0%	914	1286

Source: (a) Census Commission, Bangladesh Government, Population Census of 1974.

Note: (m) in millions

Between 1961 and 1974, Sherpur Thana has had a growth rate higher than that of both districts and of the national average growth in population. But its population density figure, i.e. population per sq. mile, continues to remain lower than that of the district and of Bangladesh national average.

The area of 115 sq. miles comprises 73,600 in acreage terms - out of which an estimated[7] 62,585 acres are cultivable land. Given the Thana's present number of 23,997 households, average acreage of cultivable land per household comes to about 2.61 acres. Table VI-10 gives the breakdown of the land-use of the total acreage.

Table VI - 10

Land Use Distribution in Sherpur

	Land Use	Acreage	Per Cent
i.	Cultivable land	62,585	85.00
ii.	Cultivable waste	3,575	4.88
iii.	Not cultivable (unculturable)	1,148	1.56
iv.	Water surface (pond, canal, river, etc.)	942	1.28
v.	Homesteads	5,145	7.00
vi.	Fruitgarden	205	0.28
	Total	73,600	100.00

Source: IGU/RD Authority, Dacca, Agro-Economic Survey, 1974.

Cultivable land is land that is already under cultivation but which may remain fallow for any season in a given time. From this point of view land acreage brought under cultivation is pretty high compared to the total land area in the Thana. The proportion appears to be higher than the national average (Table VI-11). The situation is borne out by the fact that between 1961 and 1974 the Thana experienced a higher than national average increase in population (Table VI-9) and hence the pressure on land. However, the fact that Sherpur Thana is located in the relatively high region of Bangladesh makes it possible that the area is relatively less subjected to deep flooding and hence a high proportion of the area could be brought under cultivation.

Table VI - 11

Per Capita Land Availability

	Bangladesh	Sherpur
Total Area (Acres)	35,280,000	73,600
Cultivated Area (Acres)	22,494,000	62,585
% of cultivated land to total area	63	85
Population (1974)	71,500,000	127,113
Cultivated land per capita (Acres)	0.31	0.49

Sources: IGU/RD Authority, Dacca, Agro-Economic Survey, 1974.
Census Commission, Bangladesh Government, Population Census of 1974.

It is quite evident from the tables VI-10 and VI-11 that since a very high proportion of the existing land is already cultivated, there is not much scope for any additional land to be cultivated. Only 4.88 per cent of land in the area falls in the category of cultivable waste, i.e. land that can be brought under cultivation with improvement made to it. Therefore, in future any additional supply of crops has to be obtained through higher cropping intensity and higher yield per acre. It is estimated[7] that the present cropping intensity is about 1.29 which can be raised to 2.05 by the provision of irrigation water in the dry season. The cropping intensity is calculated by the formula:

$$\frac{\text{Total cropped area in a given year}}{\text{Total cultivable land}} \times 100$$

This means effectively that the present acreage of 62,585 cultivable land represents some 80,727 acres cropped acreage on the basis of 1.29 cropping intensity. By achieving 2.05 cropping intensity it can further be increased to 128,299 acres of cropped acreage - an increase of 59 per cent.

ii. <u>Land Ownership - farm size distribution and cultivation characteristics</u>:

We have noted (page VI-29) that on the basis of 23,997 households and the total cultivable land in the Thana, the average household size of holding is 2.61 acres. This is a good indication of the average farm size in the area. Nevertheless, we will seek to have a possible breakdown of the proportions of various farm sizes on the basis of national estimates.

The figures in Table VI-12 give a fairly clear picture of the smallness of the farm size in Bangladesh and likewise in Sherpur Thana. Almost one quarter of the farms are below 1 acre in size and about 83 per cent of all farms are below 5 acres. Surely, these proportions have greatly worsened by now through the operation of the inheritance law in the country.

Table VI - 12

Distribution of Farms by Size

Sizes of Farms in acres	Bangladesh* Percentage of Farms			Estimated for Sherpur** Number of households
Under 1.0	24.96	56.63	82.95	5,990
1.0 to under 2.5	31.67			7,600
2.5 to under 5.0	26.32	35.52		6,316
5.0 to under 7.5	9.20			2,208
7.5 to under 12.5	5.25	7.85		1,260
12.5 to under 25.0	2.16			518
25.0 to under 40.0	0.36			86
40.0 and above	0.08			19
	100.00			23,997

Sources: * Bureau of Agriculture Statistics, Master Survey of East Pakistan Agriculture, Seventh Round, Phase II - 1968.

** Estimated for Sherpur using the percentage distribution of farm sizes for the country as in 1968.

Moreover, these figures imply that a great proportion of farmers own only a little plot of land or are almost landless. The only national figure that exists is the 1966 Agricultural Credit Survey (12) and this suggests that about 6.7 per cent of people in the countryside are landless. This figure has some consistency with the Master Survey of East Pakistan Agriculture (7) which shows 'agricultural labourers' not owning farming land as constituting 8.61 per cent of the rural population of age ten and above. Although the proportion of landless agricultural workers may have increased by 1976-77, it seems that Bangladesh has a surprisingly low proportion of 'landless' farmers. But this ought not to be a source of complacency in view of the overwhelming number of farmers possessing only a tiny piece of land, their near 'landless' situation and, indeed, the worsening land/man ratio for the country due to rapid population increase. This pattern of land ownership and the farm size that exists in Bangladesh today has profound implications in terms of income distribution effect resulting out of developmental efforts in the rural countryside - irrespective of whether the development takes the form of improved provision of feeder roads, irrigation water, modern agricultural inputs like seeds, fertilizer, insecticide etc., or the extension of credit facilities. Frequently, these sorts of improvements tend to affect various income-groups or various sizes of farm households differently, and, therefore, the desired objectives of development efforts hinge on the responses of each of these group members. This being a crucially important aspect of the entire development exercise, we will seek to deal with this question separately in Chapter VIII of our study.

The other aspect regarding the land ownership pattern, which has an equally important implication for the income distribution question, is in respect of the structure of land tenure. The 108 farm household input/output survey carried out by the author reveals that an overwhelming proportion of household farms, estimated 69 per cent, are operated by the owners themselves which also represents a very high proportion of the farm area - estimated 87 per cent.

Table VI - 13

Estimated Land Tenure in Bangladesh and Sherpur Thana

	Percentage of Farms			Percentage of Farm Area		
	Bangladesh*			Bangladesh*		
Type of Tenure	1960	1968	Sherpur**	1960	1968	Sherpur**
Owner operated farm	61	66	69	82	83	87
Owner-cum-tenant operated farm	37	30	33	18	17	12
Tenant farm	2	4	1			1

Sources: * 1960 - Pakistan Census of Agriculture, A Summary of East Pakistan Data.
1968 - Master Survey of Agriculture.

** Author's Field Survey, 1975-76, Sherpur, Farm Household Input/Output Survey.

Although the 108 farm households surveyed represent less than half per cent of the total number of households within the Sherpur Thana, its pattern of tenure seems reasonably in line with the trend in the rest of the country.

The final point that can be made regarding land ownership pattern relates to the fragmentation of land holdings in Bangladesh. Land fragmentation is fairly extensive and the situation goes on deteriorating. Fragmentation of holdings entails higher local movement requirement for both the farmers and the goods - be it in the form of inputs or outputs. Although these movements are frequently very small and often performed by head loading or shoulder loading or by the bullock carts, there is an element of transport cost involved. In total terms it is quite significant in as much as only about 90 per cent of the land holdings in Bangladesh are fragmented according to 1960 Agricultural Census [3] and this situation has almost certainly grown worse by now.

Table VI - 14

Fragmentation of Landholdings in Bangladesh

Number of Fragments per Farm	Per cent of Total Number of Farms
Non-fragmented	10
2 - 3 fragments	21
4 - 5 fragments	17
6 - 9 fragments	23
10 or more fragments	29

Fragmentation of Different Sizes of Farms	Fragmented Farms as Percentage of All Farms in the Size Class
Small Farms (less than 2.5 acres)	83
Medium-sized Farms (2.5 to 12.5 acres)	97
Large Farms (12.5 acres and more)	97

Source: Pakistan Census of Agriculture, A Summary of East Pakistan Data, 1960, Government of Pakistan.

Figures did not exist for Sherpur Thana separately, but there was no question that the fragmentation problem was as acute there as in the rest of the country.

iii. Land Utilisation and Cropping Pattern:

We have noted in chapter I (Table I-1) that important agricultural crops of Bangladesh are rice, jute, tea, sugarcane, tobacco, potato, oilseeds and other vegetables. But by far the most important crop in terms of contribution to value added in agriculture land utilisation is rice production. Before we proceed to look into the cropping pattern in Sherpur, it may be worthwhile to have a look at the overall Bangladesh situation in this respect.

Rice crop dominates the land-use and the pattern of agricultural economy. It is grown as a subsistence crop and, therefore, it has close links with rural movements requirement. If more is produced and if it exceeds subsistence requirement of the local area, it will at once reflect in terms of traffic flows and transport demand.

Rice is produced in three different varieties and in three seasons. The three cropping seasons, named after their variety, are Aus, Aman and Boro. The Aman season itself produces two different crops - broadcast aman and transplanted aman. Now, due to recent technological innovations in the shape of high yielding varieties (HYVs) - requiring slightly different cropping practices, the new sowing/harvesting pattern

Table VI - 15

Land Utilisation and Cropping Pattern in Bangladesh
(Averages for three years, 1966-67 to 1968-69)

	Rice Variety								
	Aus	Aman	Boro	Total Rice	Jute	Sugar cane	Oil seeds	Others	Total Cropped Acreage
Cropped Acres (million)	7.61	14.38	1.65	23.64	2.32	0.10	0.79	3.39	30.24
% of cropped acreage	25.17	47.55	4.46	78.18	7.67	0.33	2.61	11.21	100.00
% of cultivated acreage	33.87	64.00	7.34	105.21	10.32	0.45	3.52	15.09	134.58

Note: Cropping intensity, defined as total cropped acreage as percentage of cultivated acreage, is shown in the last column, last row entry. It would be higher if defined, as is done sometimes, as the percentage of net area sown (i.e. cultivated area less current fallow). Total acreage is 22.47 million.

Source: Government of Pakistan (Ministry of Agriculture and Works), Agricultural Statistics of Pakistan, Fact Series VI - January 1970, and IBRD - Proposals for an Action Programme, East Pakistan Agriculture and Water Development 1970 (mimeo.)

has complicated the already inexact distinction among different varieties of rice crops. Presently, with the increasing degree of introduction of HYVs, there is hardly a month in the year when a rice crop is not being harvested somewhere in the country.

The Aus crop accounts for about a quarter of rice production and its production has expanded relatively fast. This crop is important in the drier part of north-western Bangladesh (where Sherpur Thana is located) which has a high land capability. High yielding variety seed has recently been introduced which holds out prospect for doubling of yield per acre.

Aman rice is the largest single crop among the rice varieties constituting about 55-60 per cent of the total grain output. There has been a recent breakthrough in high yielding seed production which would apply equally to both transplanted and broadcast varieties of Aman rice. The problem that now remains is one of efficient organisation for the application of the new technology.

The Boro crop is the main dry season grain, although contributing a relatively small proportion of the total grain output, 16.8 per cent, its production has expanded by about fourfold in the last decade. Its yield per acre is likely to increase two to three times with the introduction of high yielding variety seed and the accompanying inputs.

Table VI - 16

Sowing and Harvesting of Grain Crops and their Relative Components in Bangladesh (1969-71 average)

Crop Name	Usual Period of Sowing	Usual Period of Harvesting	Acreage (million)	Yield per ton/acre	Production million tons	Per cent
Aus (TV)	March/April	July/August	8.0	0.35	2.8	24.8
Aus (HYV)	-	-	-	0.72	-	-
Aman (HYV) (Transplant)	July/August	November/ December	1.2	0.82	0.6	5.3
Aman (TV) (Transplant)			8.3	0.48	4.0	35.4
Aman (Broadcast)	March/May	November/ December	4.8	0.39	1.9	16.8
Boro	November/ January	April/June	2.4	0.79	1.9	16.8
Wheat	November/ December	February/March	0.3	0.33	0.1	0.9
			25.0	0.45	11.3	100.0

Source: Planning Commission, Government of Bangladesh, Economic Survey, 1974.

* TV = Traditional Variety. HYV = High Yielding Variety.

Sherpur Thana being in the high land capability area, intensive effort is sought to be made to boost rice production with the help of a package of investment programme. Rice is by far the most important agricultural crop in the Thana and all the varieties mentioned earlier on, are produced. Among the other notable crops produced are jute, sugarcane, potato, mustard, chillies, wheat and a variety of local vegetables.

With the introduction of some limited irrigation facilities during the dry months, the Thana has been experiencing a higher cropping intensity in the recent past. Tables VI-17 and VI-18 show that cropping intensity was 1.22 in 1973-74, increasing, though nominally, to 1.29 in 1974-75. In the latter year, higher crop production is attributed to very favourable weather in Bangladesh, in fact in the whole of the Indian sub-continent, which experienced a bumper crop in many years.

Rice constituted 91.62 per cent in 1973-74 and 91.36 per cent of the total cropped acreage, although it represented 53.07 per cent and 54.26 per cent of the total production tonnage in the two years respectively. The rest of the other agricultural crops claimed less than 10 per cent of the cropped acreage but represented almost 45 per cent in terms of production tonnage. Of course, this happened due mainly to the bulky and high weight commodities like potato and sugarcane.

Table VI - 17

Cropped Acreage, Production, Yield per Acre
by type of Agricultural Crops in Sherpur Thana - 1973/74

Crops	Cropped Acreage	(%)	Production/ Tons	(%)	Yield per Ton/Acre
1. Rice (Paddy)					
i. Aman (TV)	31,463	(41.16)	16,675	(26.86)	0.52
ii. Aman (HYV)	5,098	(6.67)	4,129	(6.65)	0.81
iii. Aman (Broadcast)	5,725	(7.49)	2,232	(3.60)	0.39
iv. Aus (TV)	19,280	(25.21)	5,398	(8.70)	0.28
v. Aus (HYV)	3,012	(3.94)	2,229	(3.59)	0.74
vi. Boro (TV)	3,844	(5.03)	1,422	(2.29)	0.37
vii. Boro (HYV)	925	(1.21)	860	(1.38)	0.93
Sub-Total:	69,347	(91.62)	32,952	(53.07)	
2. Jute	1,987	(2.60)	1,073	(1.73)	0.54
3. Mustard	92	(0.12)	41	(0.07)	0.45
4. Potato	2,308	(3.02)	6,832	(11.00)	2.96
5. Wheat (TV)	382	(0.50)	96	(0.15)	0.25
6. Wheat (HYV)	596	(0.78)	328	(0.53)	0.55
7. Sugarcane	764	(1.00)	13,752	(22.15)	18.00
8. Others (principally vegetables etc.)	970	(1.27)	7,000	(11.28)	
Total	76,446		62,074		

Source: Thana Agriculture Officer, Sherpur, 1975-76.

Table VI - 18

Cropped Acreage, Production, Yield per Acre
by type of Agricultural Crops in Sherpur Thana - 1974/75

Crops	Cropped Acreage	(%)	Production/ Tons	(%)	Yield per Ton/Acre
1. Rice (Paddy)					
i. Aman (TV)	29,837	(36.96)	15,515	(22.88)	0.52
ii. Aman (HYV)	7,914	(9.80)	6,569	(9.68)	0.83
iii. Aman (Broadcast)	5,680	(7.04)	2,215	(3.26)	0.39
iv. Aus (TV)	18,632	(23.08)	5,217	(7.69)	0.28
v. Aus (HYV)	4,789	(5.93)	3,544	(5.23)	0.74
vi. Boro (TV)	3,900	(4.83)	1,560	(2.30)	0.40
vii. Boro (HYV)	2,270	(2.81)	2,179	(3.21)	0.96
Sub-Total:	73,022	(91.36)	36,799	(54.26)	
2. Jute	1,980	(2.45)	1,069	(1.58)	0.54
3. Mustard	90	(0.11)	40	(0.06)	0.45
4. Potato	2,700	(3.34)	8,424	(12.42)	3.12
5. Wheat (TV)	390	(0.48)	97	(0.14)	0.25
6. Wheat (HYV)	795	(0.98)	437	(0.64)	0.55
7. Sugarcane	775	(0.96)	13,950	(20.57)	18.00
8. Others (principally vegetables etc.)	975	(1.20)	7,000	(10.32)	
Total	80,727		67,816		

Source: Thana Agriculture Officer, Sherpur, 1975-76.

The other interesting and important point to be mentioned from the above two tables, is the change in percentage terms among the varieties of rice crops both in their cropped acreage and production. There appears to be a clear indication of movement or change towards HYV of rice. This trend, according to the agricultural experts, is likely to gain momentum with the success of the efforts by all concerned in mobilising the new input technology, in terms of irrigation water, fertilizer, seed, pesticide, extension service, credit, transport, warehouse, and all the rest. Since much of the success lies in the provision of these and other inputs, we next turn our attention to the individual parts of that package and seek to examine in that context the present and the direction of future production techniques and possibilities.

iv. <u>Production Techniques</u>:

In the Sherpur Thana, apart from the recent introduction of fertilizer, HYV seeds in respect to rice crops, and the limited irrigation facilities, the agricultural practices are by and large traditional. If we separate the cropped acreage under HYV grain crops, 80.48 per cent of the land and 81.24 per cent of crop tonnage come under the traditional agriculture.

Table VI - 19

Land under TV and HYV Crops in Sherpur in 1974-75

Crops	Cropped Acreage	(%)	Production/Tons	(%)
1. Rice (Paddy)				
i. HYV	14,973	18.54	12,292	18.12
ii. TV	58,049	72.82	24,507	36.14
2. Wheat (HYV)	795	0.98	437	0.64
3. Wheat (TV)	390	0.48	97	0.14
4. Others	6,520	7.18	30,483	44.96
Total	80,727		67,816	

Source: Derived from Table VI - 18.

The form of the traditional agriculture is basically tilling of land with a pair of bullocks and almost complete dependence on rainfall for land preparation and sowing. Application of modern implements in the shape of tractors, harvesters, sprayers, etc., or modern inputs like fertilizer, HYV seed, insecticide, etc.is very rare. In Bangladesh too these are relatively new developments and at present efforts are being directed towards bringing more and more land under modern and scientific cultivation. The process of this transformation in agricultural practices is basically a slow one, for it begins with educating the tradition-bound farmers, mobilising inputs and providing for scarce foreign exchange resources for imports, at least initially, of the necessary implements and inputs.

Table VI - 20

Progress with HYV Acreage and Production in Sherpur

Crops Cultivated	0 - under 2½ acres				2½ - under 7½ acres				7½ - over			
	1974-75		1975-76		1974-75		1975-76		1974-75		1975-76	
	Acres	(%)	Acres	(%)	Acres	(%)	Acres	(%)	Acres	(%)	Acres	(%)
Acreage:												
TV Rice	31	(70.45)	29	(65.91)	94	(67.63)	90	(64.75)	365	(73.89)	361	(73.08)
HYV Rice	10	(22.73)	12	(27.27)	38	(27.34)	41	(29.50)	89	(18.02)	96	(19.43)
Other Crops	3	(6.82)	3	(6.82)	7	(5.03)	8	(5.75)	40	(8.07)	37	(4.49)
	44	(100.00)	44	(100.00)	139	(100.00)	139	(100.00)	494	(100.00)	494	(100.00)
Production (Tons):												
TV Rice	16.74		17.36		48.88		47.7		175.20		166.06	
(Per Acre)	(0.54)		(0.59)		(0.52)		(0.53)		(0.48)		(0.46)	
HYV Rice	8.40		10.08		30.78		34.03		69.42		76.80	
(Per Acre)	(0.84)		(0.84)		(0.81)		(0.83)		(0.78)		(0.80)	

Source: Author's Field Survey (1975-76): Farm Household Input/Output Survey, Sherpur.

Since rice cultivation is by far the most important occupation in terms of employment, production and land utilisation, we have sought to examine the progress of introduction of HYV rice in Sherpur Thana and the form and content of various inputs in the present production technique.

There is reasonable indication from the above table (VI-20) that an increasing amount of land is being brought under HYV rice cultivation by all size-group farm households. Although it may be reading too much into the figures (second row, table VI-20) for only two years, it seems that the smaller the farm size the more intensive is the effort by way of putting relatively more land under HYV rice cultivation. Also, smaller farmers have higher yields per acre through intensive agricultural practices. This trend appears consistent with the overall Bangladesh agricultural situation where a large number of very small farmers (Table VI-12) are trying to eke out a livelihood against the increasing population trend which calls for as intensive cultivation as possible. This holds out at least one hope that should appropriate policy be pursued with respect to agricultural development, farmers, irrespective of their sizes, are likely to respond positively.

Table VI-21 indicates steady, if somewhat slow, progress in the application of various forms of inputs in the 108 farm households surveyed in 1975-76. Except in the case of draft animals owned per acre of land, the picture that emerges is that the relatively big farmers are using higher percentages of fertilizer, seed and irrigation water per acre of land.

Table VI - 21

Rate and Extent of Input Consumption in Sherpur

Inputs	0 - under 2½ acres		2½ acres - under 7½ acres		7½ acres and over	
	1974-75	1975-76	1974-75	1975-76	1974-75	1975-76
i. Fertilizer Used (lbs.)	1875	2341	6200	6633	26024	28158
ii. Fertilizer Used per Acre (lbs.)	42.61	53.20	44.60	47.72	52.68	57.00
iii. HYV Seed Used (lbs.)	2.12	2.54	7.00	9.46	26.00	32.4
iv. HYV Seed Used per Acre (lbs.)	0.21	0.21	0.18	0.23	0.29	0.33
Irrigation						
v. Number of low-lift pump (LLP) owned personally	3	3	4	5	8	9
vi. Power Tiller (hand-driven) owned personally	-	-	3	3	4	6
vii. Total number of animals owned	35	36	98	110	387	378
viii. Of which, number of Draft Animal	19	19	60	65	213	204
ix. Number of Acres per Draft Animal	2.31	2.31	2.31	2.13	2.32	2.42

Source: Author's Field Survey (1975-76): Farm Household Input/Output Survey, Sherpur.

Note: 36 Farm Households in each size group.

To the extent they are a bit deficient in animal draft power, it is being compensated for by their use of recently introduced hand-driven power tillers. It seems quite clear from the evidence found that in the process of introduction of modern inputs, bigger farmers appear to have a slight edge over the smaller ones. This situation can in fact be the consequence of a number of reasons. Bigger farmers may have ready capital to buy the inputs and do not depend entirely on the credit availability. They may have easier or more influential access to the credit that may be available or they may even be in a position to buy some of the inputs from the smaller or poorer farmer at a premium. These possibilities have serious implications from the point of view of income distribution as a result of changes in the production techniques. All improvement, whether it is introduction of modern inputs or irrigation water or improved transport provision, has its possible influence on the producers. But if this happens to differ from farmer to farmer depending on their size holding, then the optimum result of a proposed investment may not be fully realised and, in our case, any proposed road improvement may fail to pass on the total improvement benefit to the farmers who may, therefore, continue to lack an inducement for higher production. We will revert to this issue in chapter VIII in the context of income distribution implication for rural development.

v. Production Costs:

We have noted in the earlier section that the mainstay of future agricultural growth is the progressive application of modern inputs and better agricultural practices. To this end, there has been some modest progress in Sherpur Thana in as much as 18.54 per cent of the cropped acreage has been brought under the high yielding variety of rice (Table VI-19). It, therefore, seems clear that input costs will be significant in the production of the main agricultural crops. But before we go into the individual items of costs, it would seem to be appropriate to point out several problems in building up the production cost figures for various crops.

Firstly, cost figures applicable for Sherpur Thana would be different from the rest of the country. For it has its unique soil and agronomic conditions requiring different doses of fertilizer, insecticide, irrigation water, and possibly different inter-cultural operation. Therefore, cost figures relevant for Sherpur may not be exactly applicable for other parts of Bangladesh. This is not to say, however, that the degree of such cost variation could be so dramatically different as not to have any relevance at all.

Secondly, since subsistence type of economy is frequently associated with significant scale of non-monetised transaction, in the case of Bangladesh, many of the inputs are paid for in kind. For example, the payment of land rent by sharecroppers, the full or part payment of the fodder of bullocks - and in their case the conversion of payment in kind into money values introduces a good measure of arbitrariness in the figures. Similarly, for the inputs procured from within the farm - such as manures, or tools made by the farmer himself, the computation of such costs needs to be standardised.

Thirdly, there is the serious problem of computing costs of family labour. Workers in the family do not necessarily work according to a time schedule or job description, and frequently combine their work with other, non-farm activities.(4)

Finally, the cost figures are not always a good proxy for the actual physical amount of inputs applied to land. Given the imperfections in the factor market,(5) some farmers would pay more or less than others for the same physical amount of input. For example, the farmers with better access to market would pay a lower price. Similarly, farmers owning large amounts of land may be able to make a more optimal use of their large inputs, such as, tractor, tubewell or bullock, than the smaller farmers. On the other hand, the farmer would pay a higher price for labour than the small farmer who relies mainly on family labour.

Given these limitations in the exercise in estimating production costs, care has been taken for arriving at as approximate an estimate as possible for the various agricultural crops in the Thana. The figures obtained, in Table VI-22, relate to cost of production both under the present regime of agricultural practices and the recommended incremental

Table VI - 22

Estimated Cost of Production and Quantity Yielded per Acre of Land in Sherpur Thana both without and with Incremental Doses of Inputs

		TV-Rice	HYV-Rice	Jute	Potato	Sugar cane
1. Seed						
Existing Dose	Amount (lbs.)	-	35.00	12.00	30.00	2.00
Cost	Cost (TK.)	-	35.00	18.00	60.00	4.00
Recommended Dose	Amount (lbs.)	-	80.00	16.00	50.00	3.00
Cost	Cost (TK.)	-	80.00	24.00	75.00	6.00
2. Fertilizer						
Existing Dose	Amount (lbs.)	30.00	130.00	20.00	25.00	2.00
Cost	Cost (TK.)	35.00	178.00	27.00	34.00	2.70
Recommended Dose	Amount (lbs.)	80.00	300.00	50.00	160.00	5.00
Cost	Cost (TK.)	93.00	410.00	68.00	218.00	6.80
3. Pesticide/Insecticide						
Existing Dose	Amount (lbs.)	5.00	5.00	4.00	4.00	1.00
Cost	Cost (TK.)	15.00	15.00	12.00	12.00	3.00
Recommended Dose	Amount (lbs.)	12.00	12.00	8.00	20.00	2.00
Cost	Cost (TK.)	36.00	36.00	24.00	60.00	6.00
4. Irrigation						
Existing	Cost (TK.)	50.00	80.00	25.00	25.00	2.00
Recommended	Cost (TK.)	75.00	200.00	40.00	50.00	3.00
5. Labour including Extension						
Existing	Cost (TK.)	210.00	240.00	210.00	120.00	10.00
Recommended	Cost (TK.)	270.00	350.00	300.00	180.00	15.00
6. Draft-Power						
Existing	Cost (TK.)	150.00	175.00	80.00	120.00	4.00
Recommended	Cost (TK.)	200.00	280.00	120.00	150.00	6.00
Total Existing Cost		460.00	723.00	372.00	371.00	25.70
Total Recommended Cost		674.00	1,356.00	576.00	733.00	42.80
Quantity yielded without incremental doses of inputs (acre/ton)		0.51	0.81	0.54	1.12	18.00
Quantity yielded with incremental doses of inputs (acre/ton)		0.60	1.28	0.60	2.20	24.00

Source: Author's Interview with Sherpur Thana Agriculture Officer, doses of inputs as envisaged in the Thana Agricultural Plan. The cost figures themselves are adjusted with the import/export border prices and internal distribution cost, thereby reflecting the economic cost of production which differs from what the farmers have to bear. Presently, almost all items of agricultural inputs are subsidised and they, therefore, had to be adjusted. Most of all, the estimate has heavily drawn on the experience of Thana Agricultural Officer, Extension Worker and, above all, the farmers.

The yield difference in the various crops as shown in Tables VI-18 and VI-22 is attributable to the planned increased doses of inputs, better agricultural practices and provision of increased irrigation facilities. Total increased production in the Thana as a whole, taking other things as given, would depend on the amount of land acreage which could be brought under high yielding varieties of crops - principally grains. This would in turn depend on future development and potentiality of the area, and to this aspect we now turn.

vi. Future Development Potential of the Area:

One of the most important findings of the recently undertaken Soils and Land Capability Survey [13] is that the north-western part, including Sherpur, of Bangladesh, is suited for agricultural intensification with an inputs package consisting of improved crop varieties, fertilizers and pesticides, but without major investments in drainage or flood protection works and without irrigation being crucially essential - although this would provide valuable benefits. Primarily because of this reason, the area has been selected for intensive package programme within the scope of integrated rural development scheme. The area has been found suitable for multiple cropping with improved inputs. According to the Agricultural Experts and local men, it should be possible to achieve a dissemination of improved practices, notably introduction of HYV rice seeds, to 50 per cent of the cultivable acreage within the next ten or twelve years. The programme in the area, however, calls for concentrated and devoted efforts of extension staff and timely provision of the inputs.

The basic input for the production process is, of course, land. Most cultivable land in Sherpur, as in the rest of the country, is already under cultivation (Table VI-10), and the percentage of cultivable waste, the land that can be improved and brought under cultivation, is very small (4.88%). For all practical purposes, the cultivable land is fixed, but what is possible is to increase cropped acreage by resorting to multiple cropping. In fact, the agricultural potentiality of the area lies in the combination of two efforts - one is to have an additional rice crop in the winter (HYV Boro) in a wider area based on irrigation water. The other is to bring an increasing amount of land under HYV cultivation with application of improved quality seed and fertilizer. In the application of both of these efforts, Sherpur Thana is regarded as a high potential area.

Farmers in Sherpur are already aware of the new varieties of seeds, pesticide and fertilizer. Concerted extension work and adequate and timely supply of these inputs are likely to help bring more land under HYV cultivation. Given the country's planned objectives, and the intensive efforts launched in the Thana in particular, possibilities are high that the required chemical inputs could be mobilised for the area.

We have already observed in the first part of this chapter that the area experiences a yearly rainfall of about 69 inches - most of it falling between mid-May to mid-October. Rainfall in the winter months, therefore, becomes inadequate to sustain crop maturation. But since both surface and ground water availability is sufficient, minor irrigation can be provided by low lift pumps from surface water or by tubewells (deep or shallow) from ground water. It would then be possible to obtain an additional rice crop and higher productivity in other winter crops. Additional benefits will be that land preparation will not depend on monsoon rain. We have noted (Table VI-5) that about 4,000 acres of land have already been brought under irrigation water and the present plan of the Thana envisages for 34,000 acres[2] over the next twelve years.

vii. <u>Draft Power Inadequacy for Intensive Cultivation</u>:

Although the current projections of increased grain production in Bangladesh are so much dependent on the use of high-yielding varieties of seeds, fertilizer, pesticides and irrigation water, there could be serious limitation to the proposed intensive and multiple cropping arising out of insufficient availability of draft power for land preparation. For the present land preparation is done, in overwhelming measure, by bullocks pulling indigenous wooden ploughs. Adequate cultivation usually requires 4-6 ploughings followed by two or more levelling passes. With some 22 million acres under cultivation in Bangladesh (Table VI-11) each at an intensity of about 150 per cent, each of the 5 million pairs of working animals presently available has 6 to 7 acres to cultivate (for Sherpur 4.26 acres - Table VI-21). This demands extending the cultivation time over several months. In a situation where only one rice crop a year is grown, the pressure on time for land cultivation is not unduly serious; but with the introduction of multiple cropping, in some cases up to three, associated with new and high yielding varieties, the timing of land preparation becomes critical if optimum planting times are to be achieved. Complexities associated with the new and additional sowing and harvesting times (Table Vi-16) make heavier demands on the present work animals which are also used as almost the sole motive power for rural transport in the north-western part of Bangladesh today.

Because of high demand on land for human food, there is hardly any mentionable amount of natural grazing land for the work animals. The tight foreign exchange position of the country has led to a total ban on imports of feedstuffs. Thus the entire feed supply for the livestock population is derived from domestic sources and it subsists on food crop residues - paddy straw, broken rice, rice bran, rice husks, etc. The animals are, therefore, often weak and small. Cattle in Bangladesh is never used singly, unlike in other countries of the Southeast Asia.

The complex question of draft power requirement against the problems of animal shortage, its weak constitution, provision of better implements, mechanisation prospects etc. no doubt warrants a separate and detailed study. But for the immediate future the realities point towards the fact that the available work animals would be required more on the field with the progressive intensification of agriculture. The implication of this reality on the continuing use of draft animals for haulage purposes is clear. For not only are the animals required to spend more time on the land but also, they have to haul a higher production tonnage. Although Sherpur Thana is slightly better off than the national average in terms of land : draft animal ratio (based on sample Farm Household Input/Output Survey), its programme for intensive cultivation is likely to be in a similar difficult situation in respect of availability of bullocks for cart hauling.

viii. Human Resources:

The 1974 Population Census of Bangladesh (Table VI-9) estimated the population of Sherpur to be 127,113 - an increase of some 46.4 per cent over the previous census taken in 1961. This increase is higher than the national average of 41 per cent over the same period. Even so, Sherpur is still slightly less densely populated, 1105 people per square mile compared to the national average of 1286. The north-western part of the country is least densely populated and being comparatively more productive, there has been some migration of population to this part of the country from the rest, principally from the nearby districts in the south-east. There is no apparent labour shortage in the area. But there are records of labour being brought from the south for earth-cutting and during peak harvesting season.

The introduction of high yielding variety seeds for rice and the possible third winter rice crop, will demand a higher degree of labour participation. Given the present supply of farm labour and the ease with which additional labour can be mobilised, and given overall surplus labour in the country, there is no apparent problem for human labour.

The present natural growth of population is 3 per cent per annum. There are extensive population control measures in hand and these can reasonably be expected to have some progress in the coming years. For our purposes, while estimating the area's exportable surplus over consumption over a 12 year period (in the next chapter) we have assumed future population increase at the rate of 2.8 per cent yearly in the first six years and 2.5 per cent in the subsequent six years of the proposed development project period for the area. Government's success in the family planning and population control programmes depends to a large extent on the mobility with which the family planning workers can operate and the speed with which the country's literacy programme can advance. In the efficient carrying out of these tasks, an improved rural road system can greatly contribute. The benefits of an improved road system on these counts are most difficult to quantify but it may prove to be crucially important in a country which is striving hard to bring about a measure of population control and raise the level of living of its people.

On the basis of assumptions made, the estimated population projection for Sherpur Thana stands as follows:

Table VI - 23

Population Projection for Sherpur Thana (1974 Census)

1974-75	127,113
1975-76	130,672
1976-77	134,331
1977-78	138,071
1978-79	141,937
1979-80	145,911
1980-81	149,996
1981-82	153,746
1982-83	157,589
1983-84	161,528
1984-85	165,566
1985-86	169,705
1986-87	173,948

Source: Census Commission, Government of Bangladesh. Population Census of Bangladesh, 1974.

PART III: Pattern of Trade, Marketing and Transport Flows:

The nature of traffic flows, trade or marketing pattern depends to a large extent on the character of the economy of a country or a region. In the case of Bangladesh, or Sherpur Thana for that matter, the nature of its economy, in terms of density of population, land use, cropping pattern, production technique etc., significantly determines the nature and volume of marketing and the direction in which it flows.

However, since demand for transport is basically derived demand and follows from the need for marketing of agricultural surplus, the central focus of our analysis in this part will be on the markets, locally known as 'Hats' (pronounced h-ū-t) and the trading associated with them. Therefore, the markets and the trading pattern in terms of their nature, volume and direction, are assumed to be the determining factors of rural traffic. We shall, first of all, therefore, seek to deal with the markets and the trading or marketing pattern in Sherpur Thana.

i. Market and Trade Pattern:

We have mentioned briefly in part I that there are eleven markets in Sherpur, nine primary hats and two secondary hats. Because of the subsistence nature of the economy, marketable surplus from each farm being small and because of lack of efficient transportation facilities, the primary markets are numerous. Farmers, therefore, find it more convenient either to sell at the farm gate or in the immediate primary market ('hat'). The first link in the marketing chain is, therefore, the farmer or producer himself. Those who buy at the farm gate or at the primary market are some rural consumers, who do it in small scale, but the main customers, who also provide the important second link, are in fact the itinerant traders - locally variously known as 'Beparis', 'Farias' or 'Kutials'. These itinerant traders having bought the goods at the primary markets or sometimes at the farm gate arrange for shipment to the next higher tier of the marketing system - the secondary markets (which are also known as 'hats'). Between the producers and these itinerant traders, whether at the farm gate or at the market place, there occasionally exists another group of intermediaries, locally known as 'Dalal' or go-between agents. Their function is in some respects important for they are not only informers in respect to market conditions and prices but help introduce the itinerant traders to the surplus farmers and vice versa. Once the traders assemble their commodities at the secondary market, it is then the big agents or traders, locally known as 'Aratdars', who arrange for temporary financing, storage and final despatch to the terminal markets. In addition to the two-step movement of commodities between producer and the secondary market, there is also the simultaneous movement by some producers directly to the secondary market depending on the location, distance, season and convenience of the producer. Since from the point of view of our study we are seeking to examine the requirement of rural local transport, we will confine ourselves to movements of goods up to the secondary market - channels of marketing up to which are presented diagrammetically as follows:

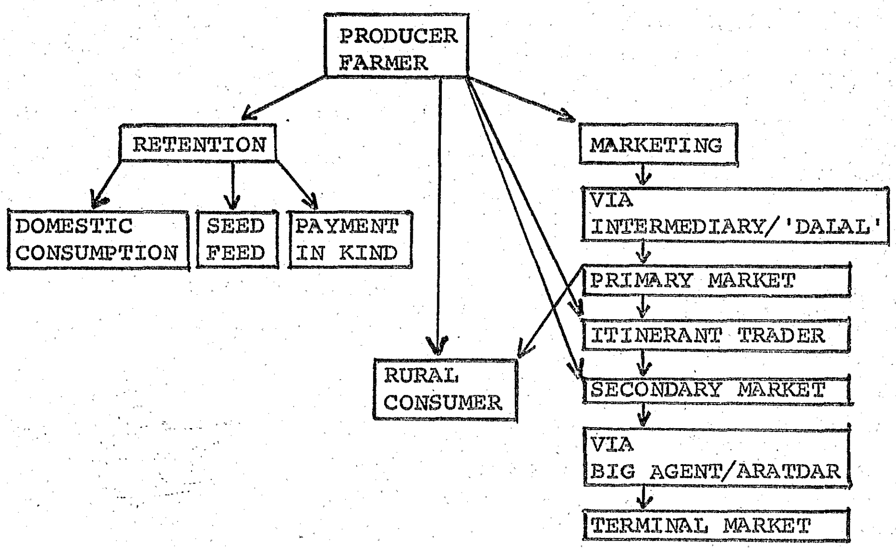

Figure VI-1 Channels of Marketing in Sherpur Thana of Bangladesh 1975-76.

In the absence of proper and adequate communication, both in terms of transport and market information, the role played by the intermediaries, the itinerant traders or the big agents, are very important for the rural economy. The intermediaries frequently provide the market intelligence. Through them the farmers sometimes get to know about developments in the area of agriculture modernisation - in the shape of new inputs, agricultural credit availability etc. - and generally about the outside world. The itinerant traders bring up the necessary finance in the initial trading of agricultural goods. Similarly, the big agents, the 'Aratdars', at the secondary market provide the finance and short-term storage facilities before the goods move on to the terminal market.

ii. Production Marketing:

The commodities that enter the market and the trading pattern in Sherpur Thana are many and varied. The main commodities already listed (Table VI-18) are rice/paddy, jute, mustard, potato, wheat and sugarcane. From the tonnage point of view, rice/paddy, jute, potato and sugarcane are important. The items under 'others' are principally varieties of tropical vegetables, fruits and spices. The principal winter vegetables, amongst many, are Brinjal, Cauliflower, Cabbage, Pumpkin, Tomato, Beans, etc.; summer vegetables are Brinjal, Patal, Lady's finger, Cucumber, Karola, etc.; important spices are Chillies, Onion, Garlics, Tumeric, Ginger, Coriander, etc., and important fruits are Banana, Mango, Jackfruit, Melon and Citrus fruits. From the tonnage point of view, Brinjal, Cauliflower, Cabbage, Onions, Banana, Mango, Jackfruit are important.

All these commodities appear both in the primary and secondary markets and roughly follow the trade pattern described. There are, however, slight variations or special features with individual commodities depending on its quality or processing characteristics. Rice which is produced in paddy form, needs to be parboiled, dried and husked. Most of these processing takes place within the farm immediately after the harvesting period and relate to the quantity retained on the farm. Frequently paddy marketed is not husked and is arranged in most cases by the trader at the mills located at the secondary market. Sometimes some of such milled rice is filtered back into the primary market for the rural consumer. There is then the government intervention in the local marketing scene in respect to rice and paddy. In the rice deficit areas government runs a rationing system, known as Modified Rationing, in the rural area on population basis and releases foodgrains in the local market. In the rice surplus areas, government introduces rice procurement schemes in the local areas. While these operations on the part of the government are as yet limited mainly due to the fact that most of the farms are small and inaccessible. Finally, the government also enters the local markets in the case of natural disasters, frequently in the shape of flood or cyclone.

Jute marketing is similarly organised through the two-tier system of marketing in the local area. Some of the secondary markets specialise in jute trade and have facilities for preliminary sorting and baling of jute. Unlike rice, jute is not held on the farm and thus most of what is produced is marketed. Jute mills and Government's Jute Marketing Corporations enter the market for direct purchasing but seldom seen to be penetrating beyond the secondary market. Therefore, very large numbers of intermediaries, agents and traders who operate in jute marketing, seem to be able to defeat the price support scheme of the government and, as a result, the jute farmers are deprived of the minimum floor price prescribed by the government.

Sugarcane marketing has its unique special feature in the sense that the main consumers of cane are the sugar mills. Farmers are, however, tempted to produce 'Gur' - a form of indigenous sugar - to fetch higher prices. But they are precluded by the Sugar Product Control Order of 1956 which gives each sugar mill a monopoly area within which 'Gur' production is banned. The mill authority arrange for procurement of the sugar canes from the main road collecting centres, railway station, or the farmer has the option to deliver the cane at the mill gate. In case of Sherpur Thana, the nearest mill is located at the Bogra town - about 12 miles from the Thana headquarters located by the main highway. Since sugarcane is harvested during the dry season, frequently bullock carts are used by the farmers, their own or hired, for delivery. But as collecting points are few and far between and are generally not organised efficiently and timely, and with mills located miles away, sometimes much time is lost before the cane is crushed at the mills. There is progressive loss of sugar content if there is delay in extraction for sugar after the cane has been cut. It is estimated that there is a loss of 9 per cent sugar content after five days and about 20 per cent after ten days. The rest of other agricultural commodities take the traditional form of marketing.

iii. Inputs Marketing:

The form of inputs marketing is quite different from the agricultural commodities. From the marketing point of view, the main inputs for agriculture today, and applicable for the most part of north-western Bangladesh having high agricultural potentiality, are Fertilizer, HYV seed for rice and wheat, and diesel oil for pumps where increasing numbers of irrigation pumps are being deployed.

Distribution of fertilizer is centrally organised by the Bangladesh Agricultural Development Corporation (BADC). BADC hires contractors to carry and distribute fertilizers up to its Thana godowns, from where it is sold to local dealers for distribution to the farmers. There is in fact a local committee at the Thana level comprised of BADC, Thana Agriculture Officer and the C.O. (Dev.) who allot fertilizer to the dealers for despatch up to the Union level (the next smaller administrative hierarchy). Each union is divided into wards and the respective ward committees decide about distribution and allocation to the individual farmers. In a sense the Union level corresponds to the primary market stage for agricultural produce.

While the above pattern is still, by and large, the basis of fertilizer distribution in the local area, a recent change of policy has made the co-operative, at least theoretically, the sole distributor of inputs like fertilizer, seed, oil and also irrigation pumps and water. The integrated rural development programme, IRDP, is designed to get increasingly involved in the rural production, distribution and marketing process through the co-operative system.

HYV seed being a relatively recent introduction, it is not yet distributed as elaborately as fertilizer. Seed is supplied by the BADC up to the Thana headquarters from where individual farmers have to buy directly and transport it to the farms.

Distribution of oil for the irrigation pumps takes a more specialised form, for most of the pumps are run by a Power Pump Group when it comes to using the irrigation water but the machine or the pump itself is maintained by the BADC engineer while it is operated by a BADC trained group manager appointed by the Power Pump Group. The oil is delivered (in 44g. barrels) at the BADC godown in the Thana headquarters and it is for the individual group managers to indent for oil, take delivery and transport to their respective farms. While the operation seems simple enough they are frequently encumbered by a variety of problems - including lack of transport, high proportion of transport cost and anomalies associated with irregular deliveries.

Most inputs are non-bulk in nature and do not call for heavy movement requirement. But the most important element is in respect of timely delivery at the farm gate which, in turn, crucially hinges on the quality and state of local transport available within each area.

iv. Market Surveys:

We have explained in Chapter V the forms of field surveys undertaken in Sherpur. Also, we have explained the rationale of focussing our attention on the markets ('hats') for they served as the nerve centre of all the trading activities, thereby generating by far the main flows of rural traffic. While most of the information relating to movement of commodities, their average trip length, load factor, cost of transportation, etc. is generated through the market entry interviews, one important drawback of the survey is that it was not possible to estimate the present total traffic volume of the Thana. This exercise was abandoned pretty early during the field work, for the level of traffic on individual road stretch was very meagre and, besides, the resources available, in terms of man-power, would not have been adequate to cordon the whole Thana for a day's snap-shot picture of traffic flows and, then, on that basis, to proceed in building present daily traffic level. However, in the course of estimating future traffic flows, estimates will be sought to be made indirectly by translating exportable surplus of the area in traffic flows. This will be done in the next chapter.

We have explained earlier on (Table VI-4) that there are eleven markets in Sherpur Thana, two secondary and nine primary markets. We have surveyed both the secondary markets (Nos. 1 and 2 on the map) and four primary markets. Primary markets (Nos. 4, 6, 9 and 10 on the map) surveyed were selected on the basis of relatively easy accessibility from the main road so that interviewers could walk into the market and get back to the main road by early evening.

All markets begin transactions from about 2 p.m., and go on until 8 or 9 p.m. At night-fall, oil lamps are lit and movement of people and transport takes place in the dark. Traders begin to arrive from the later part of the morning; in the case of the secondary markets (1 and 2) some traders arrive very early having travelled, sometimes, overnight. They are mostly on bullock-carts. The six markets which we have surveyed are all held twice a week, while we have surveyed them once with the exception of one of the secondary markets (No. 2) which we had to do twice. For the first effort was only a partial success because the market proved to be too big for six enumerators. As a result a lot of entries into the market were unrecorded and it was not possible to interview the major agents (Aratdars) to obtain a fair picture of goods which left the market for terminal destinations. In the event, we repeated the survey on the second market day with twelve enumerators. In our estimates, it is the information on the second day which has been incorporated.

While surveying the markets, enumerators were stationed on the market entries, varying from 4 to 8, about 40-50 yards away from the market itself so that the traffic could be stopped and interviewed while still journeying into the market. While arriving at the market site, possible entry points were identified and accordingly enumerators were stationed, wherever possible two men on each point. Even so, there were some leaks in the market inflow because some, particularly people with head or shoulder load, walked across the field, deliberately or otherwise, avoiding the enumerators. However, in the estimation of total flows this under enumeration has been adjusted by inflating the total volume by 5 per cent. Estimation of market outflows became impossible because such outflows went on up to 8-9 p.m. and it was not possible to undertake written work with nightfall. However, estimates of main commodities leaving for terminal markets were made by interviewing the traders (Aratdars).

v. Markets and Marketable Surplus:

Each entry into the markets was recorded in terms of mode of transport, type of commodity and load volume. So this gave us a reasonably good picture of total volume of traffic coming into the market on a given day, mode of transport use and the commodities coming in for trade. Every tenth entry, irrespective of mode, volume or commodity, was interviewed in detail which gave further information about distance travelled and time taken for it, purpose of journey, capacity of vehicle, value of load, load factor, circumstances of the journey explaining whether he was a hired porter, carrier, or, in case of vehicle, whether owner driver. Also information was obtained about the buying and selling price and, finally, cost of carrying. This information was, where suitable and necessary, multiplied by a factor of ten to arrive at the estimated total figures.

For the purpose of analysis, information regarding four of the primary markets has been lumped together; this was also the case in respect of the two secondary markets. This has been done in view of the similarities in terms of volume of traffic, type of commodities, average distance of haulage, mode of transport used, the nature of the trading pattern, etc., in primary and secondary markets. However, just before putting up the picture of volume and commodities of market inflows, it is important that we take cognisance of the degree of marketable surplus in terms of commodities produced and the proportion of which is marketed. These figures relate to the 108 farm households survey in Sherpur Thana.

Table VI - 24

Production of Agricultural Crops and Proportion of which is Marketed in Sherpur Thana (1974-75): By Household Size Groups (Acres) and Production in Tons

	0 - under 2½			2½ - under 7½ acres			7½ - over		
	Production	Of which Marketed	(%)	Production	Of which Marketed	(%)	Production	Of which Marketed	(%)
1. Rice	25.14	9.55	3.80	79.66	2.31	2.90	244.62	10.52	4.30
2. Jute	1.08	1.08	100.00	2.60	2.55	98.00	4.00	3.96	99.00
3. Mustard Seed	0.07	0.04	60.00	0.18	0.07	40.00	0.75	0.37	50.00
4. Potato	3.05	2.59	85.00	8.12	6.50	80.00	28.18	21.14	75.00
5. Wheat	-	-	-	-	-	-	2.50	1.87	75.00
6. Sugarcane	4.50	3.63	80.75	7.80	7.02	90.00	20.15	16.12	80.00
7. Chillies	0.25	0.24	95.00	1.20	1.08	90.00	2.85	2.56	90.00
8. Tobacco	-	-	-	-	-	-	1.50	1.50	100.00
9. Pulses	0.30	0.18	60.00	0.75	0.37	50.00	1.20	0.60	50.00
10. Fruits	3.50	2.97	85.00	5.00	3.90	78.00	12.00	9.00	75.00
11. Vegetables	0.20	0.16	80.00	0.75	0.64	85.00	1.75	1.23	70.00

Source: Author's Field Survey (1975-76): Farm Household Input/Output Survey, Sherpur.

Although the questions were asked in December/January 1975-76, the information in Table VI-24 relates to the previous year. For during the current year of the survey, the farmer was still in the process of marketing. The Thana has been a surplus area in terms of food production for many years until recently when the increase in population tended to outpace production increase. However, during the two consecutive years of 1974-75 and 1975-76, the Thana became a surplus area - primarily, as was generally held, due to good weather, and partly due to the recent introduction of HYV seeds and some limited winter irrigation resulting in an additional crop. This is not to say, however, that there is no rice marketing even in a deficit year. Farmers do market some rice for cash purposes or even to trade between grades of rice, so that they can purchase their non-farm commodity requirements, such as textiles, matches, kerosene oil, etc. The information in the table, however, confirms the dominant nature of the rice economy at the farm level. Although the big size farmers (7½ acres and over) market a proportionately higher volume of rice, the proportion marketed by the smallest size (0 - under 2½ acres) farmers is higher than the middle size (2½ - under 7½ acres) farmers. This is probably due to the fact that the small farmers have relatively more debt obligation which they have to meet immediately after harvest, or they may trade relatively more than others between grades of rice - selling fine quality to buy more of coarse quality. This is also the trend in respect of other commodities, such as, mustard seed, chillies, pulses and fruits. A similar trend is also discernable between the medium and big farmers in respect of fruits and vegetables. The other important trend discernable in the marketing trend is the very high proportion of marketing of almost all other crops. Jute processing is not done at the village level, sugarcane has to be marketed under statutory obligations, and most of the mustard seed is processed elsewhere and, therefore, most of their produce is marketed. As for other items, although they are not very important either in tonnage or acreage, nevertheless a great proportion of them is marketed. This is so perhaps largely because of the farmers' requirement of cash for things other than the basic food items . However, although it seems that if production of non-rice items can be increased considerably then they would continue to be marketed in high proportion. But it seems likely that with increased income, arising out of increased production, the farmers themselves are likely to consume relatively more of the incremental production of both rice and non-rice items. The increase in consumption, however, is frequently not beyond nutritional requirement.[1]

vi. <u>Market Inflow - Volume and Commodities:</u>

Inflow of goods into the markets was on the basis of counts of each entry, either of transport or porter, into the market. Table VI-25 gives information of a single day volume

Table VI - 25

Incoming Volume of Traffic into Markets - by Commodities and Percentage of Total Tonnage into Primary/Secondary Markets and by Mode of Transport:

Commodity	Primary Markets (4)						Secondary Markets (2)					
			Number of entries by		Percentage of Total Tonnage by				Number of entries by		Percentage of Total Tonnage by	
	Total Ton	Per Cent	Human Portering	Bullock Cart	Human Portering	Bullock Cart	Total Ton	Per Cent	Human Portering	Bullock Cart	Human Portering	Bullock Cart
Rice/Paddy	259.00	83.00	10,290	224	52.00	48.00	300.00	72.00	6,660	314	38.00	62.00
Jute	15.00	4.78	405	16	41.00	59.00	17.06	4.12	394	17	35.00	65.00
Sugarcane	-	-	-	-	-	-	12.50	3.00	189	15	20.00	80.00
Potato	9.67	3.10	295	7	68.00	32.00	9.60	2.30	459	7	62.00	38.00
Mustard Seed	3.58	1.25	207	2	81.00	19.00	6.00	1.40	640	2	87.00	13.00
Chillies	3.80	1.23	172	82	82.00	18.00	8.00	1.87	115	4	78.00	22.00
Vegetables	3.85	1.27	239	1	94.00	6.00	13.00	3.12	168	5	87.00	13.00
Fruits	2.60	0.78	153	1	91.00	9.00	4.80	1.15	708	2	81.00	19.00
Manufactured items	5.60	1.74	272	1	93.00	7.00	12.26	2.94	427	3	87.00	13.00
Others	8.90	2.85	625	2	93.00	7.00	33.78	8.10	1,992	7	91.00	9.00
Total	312.00	100.00	12,658	256	55.00	45.00	417.00	100.00	11,752	376	47.00	53.00

Source: Author's Field Survey (1975-76): Market Entry Volume Survey, Sherpur.

of traffic into four primary markets and two secondary markets, and breaks it down into major commodities traded there. Additionally, it also gives the distribution of the total entry between bullock carts and porters - head or shoulder loading.

The importance of the secondary markets is at once clear from the point of the volume of goods traded there alone. Total volume traded in the two secondary markets is almost a third more than the amounts traded in the four primary markets surveyed. From the point of view of modes of transport used in marketing it is clear that there is significant reliance on human transport in terms of head or shoulder loading (photo-plate on page VI-75) in both the markets. However, dependence on bullock carts seems to be higher for secondary markets for although a higher volume of goods is traded there, the number of entries by human porter is significantly less. This possibly explains the relatively longer average farm distance to the secondary market, to which we will refer again a little later, and possibly because the trade is relatively more in the hands of organised group, whom we identified before as itinerant traders, agents, big traders ('aratdar') etc., and they have higher accessibility to bullock carts. Or, perhaps the sheer volume of trade calls for a form of transport which is in addition to the human form of transport.

Photo Plate 3

Typical Shoulder Load on Way to the 'Hat'.
The only brick-paved road in Sherpur Thana,
December 1975

Rice/Paddy, as usual, is again by far the single most important item coming into the markets in volume terms. Although in absolute terms the volume of rice/paddy is higher in the secondary markets, its proportion to the total volume is considerably less (72 per cent) as compared to 83 per cent in the primary markets. This difference is, however, explained by the fact that sugarcane featured only in the secondary market and, besides, some items, such as vegetables, manufactured items and 'others' are traded in larger volume in the secondary market than in the primaries.

Apart from bullock carts and human portering there was no other form of transport in the primary markets - barring only some odd number of bicycles on which people came to buy goods, and they are, therefore, ignored. In the secondary markets, all entries were either in bullock carts or human portering. However, in both the secondary markets a few trucks were lined up on the main highway, ready to transport the exportable surplus from the Thana. Some of their operators were interviewed to ascertain their destination and mileage (Table VI-35). Both the secondary markets are located between the main highway and the Karatoa river and, as such, there were boats on the river similarly for the purpose of transporting goods out of the Thana. Some of the boat men were interviewed about their destinations and distance. During the dry weather, when the field survey was carried out, the river transport did not seem to be particularly efficient due to the draught restrictions, and the boat men could not fully load their boats. Since the main purpose of the study was not to look into inter-district movements, both the traffic on the river and the main highway was ignored.

vii. Mode Dependence of Commodities and their Average Load:

We have mentioned in the previous section that bullock carts are being used more extensively in the secondary market than in the primary market. While this trend is discernable among almost all the individual commodities in the two types of markets, there seems an additional feature in the use of modes by commodities, which is that some commodities seem to be more dependent on one form of transport than the other.

Even though porting by human transport is significant and important, organised trading in respect of rice/paddy, jute, sugarcane and, possibly, to some extent, potato, has bias towards the use of bullock carts. Regarding load factor, the proportion is uniformly considerably lower for porting in the secondary market than in the primary market - this seems to be largely due to variation in the average distance to be hauled to the two types of markets. Load factor in the bullock cart operation in the secondary market is higher than in the primary in most commodities except in the cases of fruits and vegetables.

Table VI - 26

Mode of Transport Used (in %) and Average Load (Mnd.) by Commodities

Commodity	Primary Markets (4)					Secondary Markets (2)				
	Porting	Average Load	Bullock Cart	Average Load	*	Porting	Average Load	Bullock Cart	Average Load	*
Rice/Paddy	51.50	0.35	48.00	15.00	100	37.00	0.45	62.00	16.00	100
Jute	40.00	0.40	60.00	15.00	100	36.00	0.42	64.00	18.00	100
Sugarcane	-	-	-	-		18.00	0.32	80.00	18.00	100
Potato	68.00	0.60	32.00	12.00	100	68.00	0.35	38.7	14.00	100
Mustard Seed	86.00	0.40	14.00	12.00	100	83.00	0.21	15.00	14.20	100
Chillies	84.00	0.50	16.00	12.00	100	80.00	0.15	18.00	12.00	100
Vegetables	92.00	0.40	8.00	14.00	100	86.00	0.18	14.00	10.00	100
Fruits	87.00	0.40	13.00	14.00	100	82.00	0.15	17.00	12.00	100
Manufactured Items	90.00	0.50	8.00	12.00	100	71.00	0.55	12.00	14.00	100
Others	91.00	0.35	7.00	12.00	100	83.00	0.38	10.00	14.00	100

Note * - Total may not add up to 100 due to 'other' modes, cycling, etc., not included.

Source: Author's Field Survey (1975-76): Market Entry Volume Survey, Sherpur.

viii. Utilisation of Bullock Carts:

Utilisation level of any form of transport depends largely on the load factor of individual movements, distance the traffic moves over a given period of time, usually a year, and, finally, the number of operational days in that given period. All these factors themselves, in turn depend on the nature and composition of the economy, seasonal factors and, indeed, the quality of the road system at the time. In the case of Sherpur too, all these factors combined to determine the form, utilisation and operational characteristics of the bullock cart traffic. We have observed the quality of road that exists presently in Sherpur in Part I. We have also examined in the same part the climatic condition of the Thana, particularly in terms of level of rainfall. It follows, therefore, that the quality of existing roads and the effect of monsoon largely determine the level of utilisation of the carts in the Thana. The following tables - Tables VI - 27, 28, 29, 30 and 31 - are presented for a clearer presentation of the situation in respect of rural transport utilisation in the Thana.

Table VI - 27

Levels of Utilisation of Carts - Average Number of Days used in a Year:

Days used per month	Dry Months (October-March) Per Cent	Wet Months (April-September) Per Cent
1 - 7	22.00	74.00
8 - 15	47.00	23.00
16 - 21	28.00	3.00
30	3.00	-
	100.00	100.00

Source: Author's Field Survey (1975-76), Vehicle Operating Cost Survey, Sherpur.

Table VI - 28

Levels of Utilisation of Carts - Range Distance Travelled by Incoming Traffic to Markets:

Within Miles	Per Cent of Incoming Traffic		
	Primary Market	Secondary Market	
1	23.00	15.00	-
2	30.00	27.00	16.00
3	27.00	29.00	27.00
4	13.00	15.00	36.00
5	3.00	4.00	18.00
6	2.00	2.00	3.00
7	1.00	2.00	-
8	1.00	1.00	-
9	-	2.00	-
10	-	1.00	-
Over 10	-	2.00	-
	100.00	100.00	100.00*

Note * Per cent of incoming traffic entering secondary market but originating from the primary market.

Source: Author's Field Survey (1975-76), Road Side/Market Entry Interviews, Sherpur.

Table VI - 29

Levels of Utilisation of Carts -
Mean Distance Hauled by Modes into Markets:

Mode	Mean Distance (miles) from Farms to: Primary	Secondary	Primary to Secondary
Bullock cart	2.31	3.17	3.65
Portering	1.36	1.40	-

Source: Author's Field Survey (1975-76), Road Side/Market Entry Interviews, Sherpur.

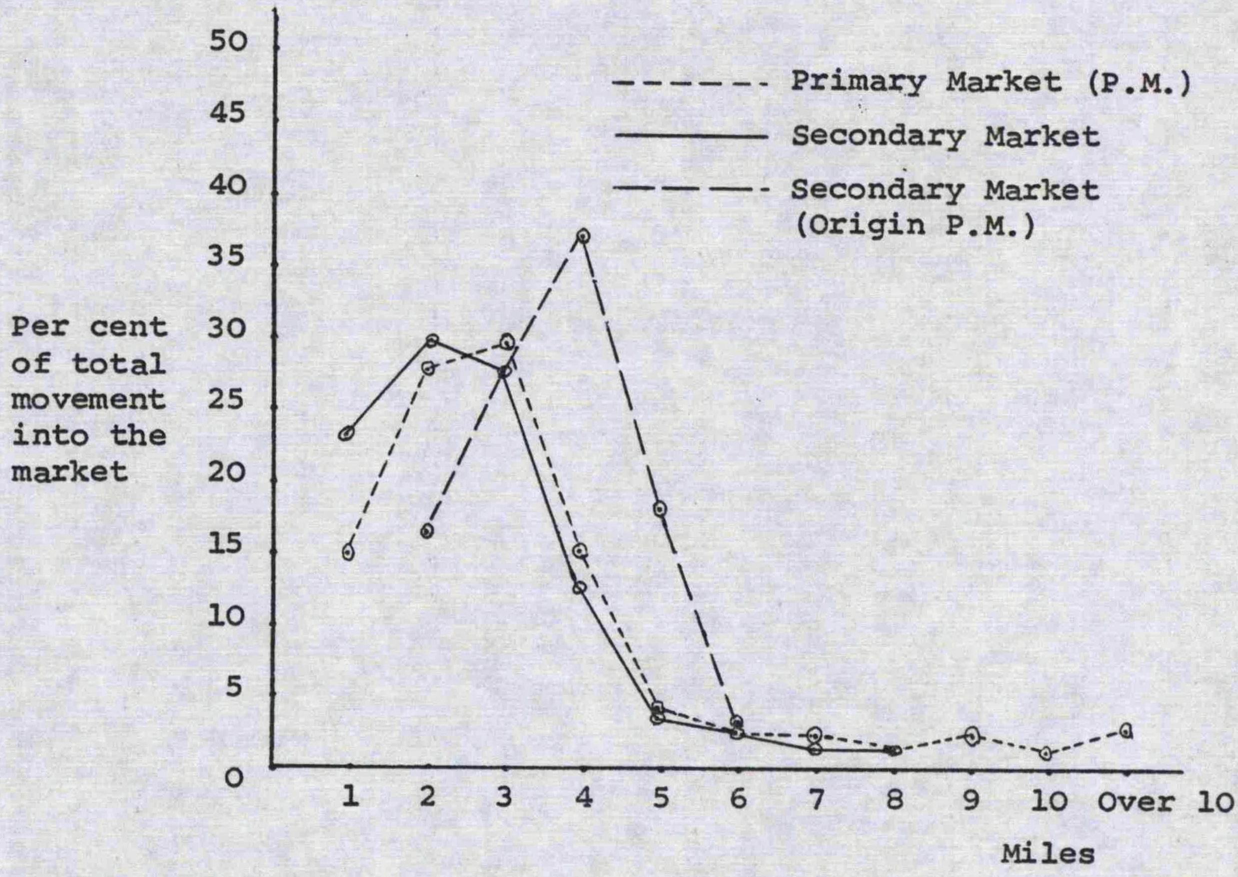

Figure VI-2 Per cent of traffic over the distance range.

Table VI - 30

Levels of Utilisation of Carts - Average Capacity and Load of Carts and Utilisation Factor - by Commodities:

Commodity	Average Capacity of Cart (Mnds.)	Average Load	Load/Utilisation Factor (%) One way	Load/Utilisation Factor (%) With empty back haul
Rice/Paddy	24.00	14.40	0.60	0.30
Jute	24.00	16.50	0.69	0.34
Sugarcane	30.00	18.00	0.60	0.30
Potato	18.00	13.00	0.72	0.36
Mustard seed	18.00	13.00	0.72	0.36
Vegetables/Fruits	18.00	12.00	0.66	0.33
Manufactured items	18.00	14.50	0.80	0.40

Source: Author's Field Survey (1975-76), Road Side/Market Entry Interviews, Sherpur.

Table VI - 31

Levels of Utilisation of Carts - Frequency of Visits to the Markets by the Traders and Transport Operators (in Per Cent):

Frequency	Season: Dry Trader	Dry Transport Operator	Wet Trader	Wet Transport Operator
Weekly	10	19	26	36
Twice Weekly	85	62	58	42
Fortnightly	4	13	12	14
Monthly	-	3	-	4
Occasionally	1	3	4	2
Total	100	100	100	100

Source: Author's Field Survey (1975-76), Market Trader Interview and Vehicle Operating Cost Survey, Sherpur.

viii.a. Seasonal Factor on Utilisation:

That climatic condition in combination with the present quality of road in the Thana has much to do with the utilisation level of both the cart and road capacity is amply borne out by the evidence presented in tables VI-27 and VI-31. Average days the transport is used during the dry and wet weather vary significantly. From table VI-27 it is further possible to derive that on an average of both dry and wet season, total number of operable days are 109 days. Should weather be the only determinant factor in the use of the carts, and if road conditions could be improved to make it all-weather condition for cart operation, theoretically the number of operable days would increase to 144. Whether in fact the number of days to be used for transport operations could be so increased with improvement in road condition would inevitably depend on the farming demand on the bullocks. Suffice it to say here, however, that the increase in the number of days available for transport use would lead to higher possible utilisation of carts resulting in lower unit cost of transport. Similarly, seasonal factors are quite distinct in the trading of commodities or the transport equipment itself (Table VI-31). Evidence seems to be quite strong that the state of road condition in the Thana is not neutral in its effect on marketing or trading in terms of timing of such economic activities.

viii.b. Distance Factor on Utilisation:

Since primary markets are more numerous than secondary ones, average distance carted to the former is shorter (2.31 miles) than to the latter (3.17). While this is quite expected, the disturbing new element is in respect to the average distance from the primary to the secondary market (Tables VI-28 and 29 and the Figure showing per cent of traffic over the distance range). The two-step movements in the process of marketing, mentioned earlier in this part, are quite significant, particularly so in respect of the major commodities like rice/paddy, jute, potato, etc. This implies that transport cost is significantly high in the present regime of two-step marketing practices. It seems possible that a higher level of accessibility of farms from the secondary market could lead to simpler marketing pattern, by avoiding at least one step, which in turn would lead to a lowering of transport cost. The implications of these various distance ranges will be examined later in this part, but we may conclude that the difference in distance ranges between one and two-step marketing seems to have important cost implications.

viii. c. Load Factor on Utilisation:

In the same way seasonal and distance factors have their influence on the level of use of transport and, in fact, its cost of operation, load factor has its equal share in that influence. It, however, seems to be the case that seasonal factors, along with the road conditions, have their influence on the average load factor of carts in Sherpur (Table VI-30). Although back-haul cargo could dramatically alter the picture of utilisation of carts, but it is generally recognised that back-haul cargo is very small and, therefore, almost insignificant. Thus the estimates of load/utilisation factor have been shown both on the basis of one-way haulage and round trip haulage with empty back haul. From the point of view of one-way traffic, utilisation level is not too bad - given the much lower load factor achieved during the wet period. The situation, however, does point towards the fact that given improved road condition, at least to all-weather operable condition, there is much scope for improving the load factor, thereby attaining a lower operating cost of transport. To summarise, an improved road situation could lead to a lowering of unit cost of transport in Sherpur by bringing out three main effects:

a. all-weather road condition could increase the number of days cart operation possible, leading to total annual mileage.

b. load factor could increase with improved journey condition and removal of physical hazards during the wet season, and,

c. average load distance could be reduced by increased marketing between farms and the secondary markets.

These together with time savings in journey times are likely to bring about substantial benefits to all concerned, farmers, traders, transport operators, and perhaps also to the consumers of agricultural commodities.

ix. Ownership Pattern of Bullock Carts:

We reported in the inventory of transport section in part I that of the 108 farm households interviewed, only 16 households reported possessing carts for transport purposes. Here we present the same picture according to farm household size and, in addition, the percentage of traders operating in the primary and secondary markets owning carts.

Table VI - 32

Cart Ownership among Farm Households and Market Traders

	Farm Households by size groups (36 in each group)		
	0-2½ acres	2½-7½ acres	7½ acres and over
Numbers owned	4.00	7.00	9.00
% of total number owned	11.11	19.44	25.00
Average capacity (maunds)	24.00	20.00	25.00
Condition	Fair	Fair	Fair

	Traders dealing in markets	
	Primary	Secondary
Per cent reported owning	16.00	34.00
Average capacity (maunds)	20.00	28.00
Condition	Fair	Fair

Source: Author's Field Survey (1975-76), Farm Household Input/Output Survey, Sherpur; and Market Trader Interview, Sherpur.

Although the number of households in each size is the same, larger households possessed proportionately more vehicles.

This shows that larger households are better off in hauling their own goods - without requiring to depend on hiring. Relatively higher numbers of traders owned carts compared with farmers, and secondary markets traders owned more carts (34%) than their counterparts in the primary markets. Figures for per cent of traders owning carts are somewhat dubious for two reasons. Firstly, there is the possibility of double counting, for the same trader operator interviewed in the primary market could appear in the secondary market too. Secondly, some of the traders, particularly those operating in the secondary market, may have originated from outside the Thana, possibly from the nearby Bogra town, and, therefore, could not be said to represent the strength of bullock capacity in Sherpur.

x. Operational Characteristics of Bullock Carts:

Unlike in the case of motorised vehicles, such as trucks or buses, bullock carts are not categorised on the basis of their operational characteristics. Whether the cart is used only as personal transport or for commercial purposes, no distinction is made, for all carts have to pay a fee of Taka 5.00 yearly to the Union Council.

Most of the carts interviewed in the markets reported to be operating for the owner's own account as well as for hire and reward, and even, at times, doing both at the same time (Table VI-33). Farmers sometimes bring loads of others along with their own. However, operators interviewed at the secondary market accounted for 67 per cent of combined operation for hire and reward and own account operation. There was a very small proportion of cart operators operating for hire and reward only. Carts operating on own account only is quite significant, 35 per cent reported so in the primary market, and 21 per cent in the secondary market. For the owners of these carts, either commitment to farming was too high, or the farmers were reasonably well off not to need to seek an income through transporting.

Table VI - 33

Operational Characteristics of Bullock Carts

Market	Cart Operated For (in per cent)		
	i. Own Account only	ii. Hire and Reward only	iii. For both i and ii.
Primary - 100	35	7	58
Secondary - 100	21	12	67

Source: Author's Field Survey (1975-76), Vehicle Operating Cost Survey, Sherpur.

xi. Human Portering:

Human portering of goods by head-load or shoulder-load is a very important form of transport in the Thana, as indeed in the rest of the country. On the basis of four primary markets and two secondary markets surveyed, it is found that about 55 per cent and 57 per cent of the total tonnage is brought to the primary and secondary markets respectively by human portering (Table VI-25). We have already noted earlier on (section vii of this part) that the use of bullock carts is proportionately high in respect of rice/paddy, jute and sugar-cane and, to some extent, potato. This is possibly due to relatively more organised marketing arrangements for these commodities. As for the rest of the commodities, dependence on human porterage is overwhelming, except that it is slightly lower in the secondary market than in the primary market (Table VI-26).

In terms of average distance carried by portering, it is significant that average distance travelled to the primary market is 1.36 miles and to the secondary market 1.40 miles (Table VI-29). This slight difference seems to be due to the fact that primary markets are more numerous than secondary markets.

It is, therefore, well established on the basis of evidence given above that human portering is very important for the marketing of produce in the agricultural sector. The scale and extent of portering are also a reflection on the rural unemployment level, level of income of the rural community and, possibly, also on the dearth of a better form of transport. Although frequently the farmer himself is the porter of his goods and does not account for the cost of transport, the cost of portering is no doubt costlier than bullock-cart transport. We will seek to derive a hypothetical unit cost of human portering on maund-mile basis and compare it with that of bullock carts later in this part of chapter VI.

xii. Storage Facility:

We have mentioned in part I of this chapter that farmers do not possess any storage capacity on the farm itself. This means that they do not possess any institutionalised storage capacity which could be identified as a separate unit other than the farmer's own dwelling. Despite this situation, farmers do in fact store their foodgrains and other storable items. In almost all the households surveyed, it was found that the farmer used his own living quarters for storing purposes. This was frequently unscientific and led to loss of grain between harvesting and consumption. It is believed that food availability could be increased by reducing the loss by protecting the grain from contamination by molds, insects and rodents. However, opinions[9] seem to vary as to the seriousness of on-farm storage losses and the economic feasibility of provision of storage facility in a situation where farmers do not have much surplus to store or for marketing purposes. But it seems to be an enormously important matter in view of the future prospect of increased agricultural productivity and, indeed, surplus beyond the subsistence requirement. It is already a problem at the national level with two consecutive bumper harvests in 1974-75 and 1975-76. In Sherpur Thana headquarters it was found that the government's local storage depot of 1,000 ton capacity was already full (photo plate) and grain was being stacked in the open space. It, therefore, seems very important that the storage

Photo Plate 4

1000 Ton Capacity Local Storage Depot.
Rice/Paddy being stacked outside after
the storage has been filled, December 1975
Sherpur Thana

problem is accorded special attention in view of capability to increase yields of agricultural production in the future.

We have observed earlier in part I that no storage facility existed in the primary markets. There were, however, some storage facilities in the secondary markets. Some of these were of a permanent nature, brick built with tin shades. Most others were of temporary construction in tins and bamboos. The big traders ('aratdars') frequently used such facility as transit godowns before goods were shipped for the terminal markets. In the market trader interviews undertaken, traders were asked about these facilities, and the following were the representative replies:

Table VI - 34

Storage Facility at the Secondary Market

	Per cent of Traders Reporting
Traders not needing storage capacity	26.00
Need occasionally	21.00
Always use storage of some kind	38.00
Demand unfulfilled	15.00
	100.00

Source: Author's Field Survey (1975-76), Market Trader Interviews, Sherpur.

It is the small traders who act sometimes as intermediaries who reported not needing any storage facility. Even though 38 per cent of the traders use storage, in fact their need was greater and could be in a better position if better and more storage capacity was created or available in the market. However, in view of the fact that the market was held only twice a week and that a very high proportion of those commodities destined for the terminal markets leave the market the same day, storage capacity did not appear to be a critical hindrance in the marketing of goods once, of course, such goods had reached the market.

Table VI - 35

Commodities Traded at the Secondary Market and the Proportion Leaving the Market the Same Day for Terminal Destination

Commodities	% leaving	Terminal Market (distance in miles)	Mode Used
Rice/Paddy	68.00	150	Boat, Road, Rail.
Jute	90.00	165	Road, Rail.
Sugarcane	90.00	12	Road.
Potato	60.00	120	Road, Boat, Rail.
Chillies	75.00	150	Road, Rail.
Vegetables	95.00	45	Boat, Road.
Others (including fruits)	65.00	30	Road, Boat.

Source: Author's Field Survey (1975-76), Market Trader Interviews, Sherpur.

A very high percentage (90% and more) of jute, sugarcane and vegetables are cleared by the same day. Trading is very active in respect of jute because of keen competition among jute traders in the terminal market. Sugar Mills employ their own agents to buy from the road points and the market. Vegetables are lifted quickly, possibly due to their perishability.

One final reason for general fast clearance of the market is because the markets become empty and desolate in the rest of the week and, therefore, generally insecure.

xiii. <u>Prices and Charges</u>:

Sometimes price variation in goods in different markets may give an important clue as to the factors contributing to such variation. It is often held that transport costs or charges significantly determine the variation of prices of agricultural commodities between markets in the rural economies. But, of course, theory of prices would suggest it is in fact the demand and supply of commodities which inter-act to determine the 'market' price. Transport charges or cost is merely the marketing cost inherent in the prices. However, we will seek to look, first, at the variation of prices of commodities at the farm gate or, as if it were to be sold at the farm gate, at the primary market and at the secondary market. We will also look into the charges of cart transport under dry and wet conditions and finally, we will examine the economic cost of cart transport as they exist at present and try to estimate the proportion of such transport cost into the prices of major agricultural commodities.

Table VI - 36

Price Variation in Agricultural Commodities between the Farm and the Markets: (December/January 1975-76 - Sherpur) - Prices in Taka

Commodities	Farm Gate (a)	Primary Market (b)	Secondary Market(c)	Per cent Price Variation between a and b	b and c	a and c
1. Paddy (mnd.)(i)	62.00	66.00	68.00	6.45	3.03	9.67
2. Rice (mnd.)	105.00	112.00	116.00	6.66	3.57	10.47
3. Sugarcane (mnd.)	4.50	-	4.82*	-	-	7.10
4. Potato (mnd.)	80.00	82.00	86.00	2.50	4.88	7.50
5. Dry Chillies (mnd.)	380.00	395.00	408.00	3.90	3.29	7.37
6. Brinjal (seer) (ii)	0.74	0.79	0.87	6.76	10.13	17.57
7. Cauliflower (0.5 seer)	0.40	0.45	0.60	12.50	33.33	50.00
8. Tomato (seer)	0.35	0.40	0.50	14.28	25.00	42.86
9. Mustard Oil (sr.)	-	16.00	15.15**	-	-5.60	-
10. Salt (sr.)	-	0.85	0.80**	-	-6.25	-
11. Onion (sr.)	1.50	1.60	1.68	6.66	5.00	12.00
12. Pulse (masur) (sr.)	-	6.50	5.80**	-	-12.07	-
13. Kerosene Oil (mnd.)	-	105.00	98.00**	-	-7.14	-
14. Fresh Egg (dozen)	4.50	5.00	5.50	11.11	10.00	22.22
15. Banana (dozen)	3.50	3.95	4.20	12.86	6.33	20.00

Note: * Prices for sugarcane at the secondary market actually represent prices at the collecting point on the main road.
** Commodities originating from the secondary market.
i. (mnd.) - 'maund' - 1/27 ton. ii. (sr.) - 'seer' - 1/40 maund.

Source: Author's Field Survey (1975-76): Farm Household Input/Output Survey and Market Entry Interview, Sherpur.

There seems to be quite a significant variation in the prices, particularly in respect to the perishable items, between the pairs of market centres. While the prices obtained at the primary and secondary markets were obtained from the markets themselves, as if at the going rate of those commodities on the given market, the prices as shown for at the farm gate need to be treated with caution. For the situation there was not of farmers setting about selling things with buyers milling around and bargaining, as it happens in the markets. Farm gate prices are as reported by the farmer during interview in the course of the farm household input/output survey. But it was generally held that prices indicated by the farmers were those that could be offered to the itinerant trader at the farmer's door step. To the extent that we would wish to look into the degree of difference in prices, the information available is fairly representative.

Although transport charges are higher than the cost and our real purpose is to look into the implication of proportion of such cost within the prices, we may nevertheless have a look into the transport charges as they generally obtained in Sherpur - and to which the farmers, the traders, and in fact, all concerned, frequently referred.

Table VI - 37

Bullock Cart Charges (Taka per maund-mile)

Distance Range	Dry Period	Wet Period	Percentage Variation
Up to 2 miles	0.62	0.75	21.0
3 - 6 miles	0.52	0.65	25.0
7 - 10 miles	0.36	0.52	44.0

Source: Author's Field Survey (1975-76), Farm Household Input/Output Survey, and Roadside/Market Entry Interviews, Sherpur.

Charges for bullock cart transport is quite a reflection on the condition of the roads - particularly in respect of the variation brought about by the seasonal factor and its influence on the condition of the road. Such variation is strikingly high if compared to the 7-10 miles distance range.

However, since transport cost element in the prices of commodities is an important indicator of transport condition prevailing, we will attempt to look into the percentage of transport cost per maund in the prices of various agricultural commodities (Table VI - 38). Also, we will try to see how those percentages change as between the markets and the commodities themselves.

Table VI - 38

Proportion of Estimated Transport Cost (in Taka) in the Prices of Commodities at the Markets (Prices in Maunds)

Commodity	Primary Market Price	Per Cent of Transport Cost (a)	Secondary Market Price	Per cent of Transport Cost if direct from farm (b)	Per cent of Transport Cost if via Primary Market (c)
1. Paddy	66.00	3.62	68.00	3.16	6.35
2. Rice	112.00	2.83	116.00	1.85	3.72
3. Potato	82.00	2.65	86.00	2.50	5.02
4. Dry Chilli	395.00	0.55	408.00	0.53	1.06
5. Brinjal	31.60	6.87	34.80	6.19	12.41
6. Cauliflower	36.00	6.03	48.00	4.48	9.00
7. Tomato	16.00	13.56	20.00	10.75	21.60
8. Mustard Oil	640.00	0.34	606.00	0.35	0.71
9. Salt	34.00	6.38	32.00	6.72	13.50
10. Onion	64.00	3.39	67.20	3.20	6.43
11. Pulse (Masur)	260.00	0.83	232.00	0.93	1.86
12. Kerosene Oil	105.00	2.06	98.00	2.19	4.41

Source: See Tables VI - 29, 40.

Notes: (a) On the basis of 4.62 miles round trip between farm and primary market (Table VI-29) by bullock cart @ TK. 0.47 per maund/mile (Table VI-40) - cost per maund to the primary market is estimated to be TK. 2.17.

(b) On the basis of 6.34 miles round trip between farm and secondary market (Table VI-29) by bullock cart @ TK. 0.34 per maund/mile (Table VI-40) - cost per maund to the secondary market is estimated to be TK. 2.15.

(c) On the basis of two step movements - farm to primary and then to secondary market - entailing (4.62 + 3.65 miles) 8.27 miles round trip via primary market, at an estimated cost of TK. (2.17 + 2.15) 4.32 per maund.

Haulage distance is clearly an influential factor in transport cost element. Commodities hauled directly to the secondary market had relatively less transport cost component than those taken to the primary market. Apart from the haulage influence on the proportion of cost element, these figures (in Table VI-38) need to be treated with caution. For the proportion of transport cost has been based on the values of commodities as reflected in their prices rather than on their individual weight : value ratios. As a result, transport cost element, in the low-value but high-weight commodities, such as, Tomato, Salt, Brinjal, etc., has high transport cost. The reverse seems to be true about Dry Chilli, Mustard Oil and Pulses. Neither truly reflects the position, but it seems that transport cost component is basically high because of present marketing arrangement involving higher mileage than necessary. This is probably, confirmed by our findings (Table VI-25) earlier that a very high percentage of low-valued commodities - precisely those which we encounter in Table VI-38 - are carried by human portering, cost of which are not conceived, far less estimated, by the farmers.

Despite the limitation of the exercise in Table VI-38, the evidence produced is strong enough to suggest that transport cost component is higher if marketing is done via the primary market than if done direct into the secondary market. In the latter case, there is significant transport cost reduction to be achieved.

xiv. Cost of Transport Operation:

Since bullock cart operation is dominant in the entire trading and marketing pattern in Sherpur, we, first of all, attempt to build up its cost of operation in economic terms (Table VI-39).

In estimating the economic cost of cart operation in Sherpur Thana, an attempt has been made to distinguish economic cost as it is different from commercial cost which reflects through the market prices. This is, however, an extremely difficult exercise in the context of developing countries like Bangladesh for all sorts of distortions remain in the market prices due to taxes, subsidies, duties, scarcities, etc. For the purpose of measuring the real cost to the economy in resource terms, such prices are not very useful. In this situation it becomes necessary to form a consistent basis so that the prevailing market distortions can be eliminated and it becomes possible to choose between alternative investment projects on the basis of their respective economic costs in resource terms. This being a fundamental issue in the economic decision making process, the Bangladesh Planning Commission, government's central economic planning body, has already set out to produce the accounting (economic) prices based on valuing all inputs and outputs in terms of their opportunity cost in foreign exchange. Much of this effort is based on Little and Mirrlees[(8)] approach as recommended for developing countries.

Table VI - 39

Economic Cost of Cart Operation in Sherpur
(in Taka)

	Without Road Improvement	Without Road Improvement Annualised Cost	With Road Improvement	With Road Improvement Annualised Cost
1. Fixed Cost				
i.a. Bullock Pair	917.00		917.00	
b. Annual Interest @ 15% on amortisation over the life period of: 4 years (without) 5 years (with)		85.96		110.00
c. amortised sum, net	917.00		917.00	
	-200.00		-200.00	
of end value	717.00	179.25	717.00	143.40
ii.a. Cart	650.00		650.00	
b. Annual Interest @ 15% on amortisation over the life period of: 5 years (without) 7 years (with)		58.50		55.71
c. amortised sum, net	650.00		650.00	
	-100.00		-100.00	
of end value	550.00	110.00	550.00	78.57
2. Variable Cost				
a. Replacement Maintenance Cost (yearly):				
i. wooden wheel pair		180.00		135.00
ii. iron rim pair		60.00		45.00
iii. body frame		150.00		112.50
b. Operating Cost (yearly)				
i. incremental animal feed cost @ Tk. 4 a day x 108 days		432.00		432.00
ii. cart operator wage @ Tk. 4 a day x 108		432.00		432.00
iii. shoeing bullock hooves		54.00		40.50
iv. lubrication of wheel axle		25.00		18.75
Total:		1,765.71		1,603.43

Source: Author's Field Survey (1975-76): Operating Cost of Vehicle (Cart) Survey, Interviews with Cart Owners, Operators, Farmers, etc., Sherpur.

In deriving the economic costs for the purpose of this study, accounting price factors have been used in so far as they have been evolved by the Bangladesh Planning Commission. They related until recently to skilled and unskilled labour, agricultural land, oil, accounting rate of interest, timber, trade service, electricity, water, main agricultural inputs, steel, etc.

xiv.a. Cost of Bullock Cart Operation:

We have taken the cost of a pair of bullocks in their normal working condition and the cost has been adjusted with recent import cost from neighbouring India. Although these bullocks have been imported mainly to augment draft power for agriculture, we have assumed that at least one third of their main working life will be used for cart hauling. Accordingly, one third of their cost (TK.917.00 out of TK. 2750.00) has been assigned towards the capital cost of a bullock pair in the cost exercise in Table VI-39. Similarly, the recommended accounting annual rate of interest has been assumed to be 15 per cent, although most farmers who obtain loans from the institutionalised agencies, such as the Co-operative Bank or Agricultural Bank, obtain them at almost half the accounting rate. But in reality the majority of the farmers do not get easy access to such loans and, as such, depend on the traditional money lender and pay a very high rate of interest. We have also assumed that the capital amount is amortised in equal instalments over the assumed life period of the bullock pair. Therefore, the amount on which rate of interest is chargeable is net of amortisation payment in the preceding year. Amortisation sum itself, however, has been estimated after deducting the end value or residual value of the capital. This means, therefore, that while interest is applicable to the total capital cost, amortisation cost is annualised not on the whole or total capital cost but total capital cost less end value. Similar treatment has been given to the cost of the cart having due regard for the economic cost of timber. The exercise is a rough approximation in respect to the items relating to variable cost. But most of these cost elements are based on discussion with the local people, such as the bullock cart operators, farmers, cart-builders and the local engineer in charge of roads and road maintenance. An attempt has been made to build these variable cost figures on the basis of road conditions which prevailed during the time of the field survey and a possible improvement to the 'next best' situation which we assumed to be of brick surfaced, ten feet wide on top to match with most of the existing drainage structures (such as the culverts) and with such embankments height which will keep the road flood-free.* The proposed brick surface road is also similar to a small stretch of such road already in existence in Sherpur, and which has already been mentioned in our statement on inventory of road in part I of this chapter. We will revert to road construction and its costs and the cost of maintenance a little later again.

* Note: The height of the embankment suggested is above flood level in a normal flood situation which is regular.

We have assumed that the improved condition of the road will increase the working life of the bullock pair by one year and that of the cart by two. Similarly, we have assumed that the improved road condition will lead to cost reduction by at least one quarter and it applies to the items of replacement maintenance cost and the items of shoeing of bullock hooves and lubrication costs under the item of operating cost. Cart operator wage cost is adjusted to the accounting ratio relevant for unskilled labour. Since cart operation is assumed for one third of the working period of the bullock pair, it is estimated to operate for 108 days a year. Finally, it has been assumed that cart haulage entails incremental feed requirement for the bullocks which, in effect, means that without the haulage requirement the bullocks would have to be fed but at reduced extent. Therefore, on the 108 haulage days an incremental feed cost has been added. Under these assumptions the costs for cart operation under 'without' and 'with' improvement of road condition are TK. 1766.71 and 1603.43 respectively, which implies a cost reduction of 9.26 per cent.

However, the main source of benefits arising out of road improvements is mainly in the form of all-weather condition of the road resulting in the possible increased length of average haulage, higher load factors and increased operable days in the year. While the nature of the benefits will be examined later, for now we may seek to look into the implication of road improvement in the cost of cart transport in in terms of unit maund-mile (Table VI-40). In this, however, we have assumed that increasingly more farmers will bring their marketable surplus to the secondary market which would result in considerable reduction in the present large scale two-step marketing pattern described before. This means, therefore, that average distance of one day's cart haulage will increase towards one round trip between the household and the secondary market which is 6.34 miles (Table VI-29). Similarly, it is assumed that due to the improved condition of the road, average load factor of the carts will improve to at least 10 maunds from the present 7.5 maunds (assuming empty back-haul). However, we will examine the implication of such changes in average mileage and load factor on maund-mile cost on the basis of annual cost of cart operation (Table VI-39) under 'with' and 'without' road improvement assumptions.

Table VI - 40

Maund-Mile Cost of Bullock Cart Transport under Varying Range of Mileage and Load Performance

Without Improvement				With Improvement			
Annual operating days	Average Daily Miles	Average Load (mnds.)	Cost per maund mile (TK.)	Annual operating days	Average Daily Miles	Average Load (mnds.)	Cost per maund mile (TK.)
108	4.62	7.5	0.47	108	4.62	10.0	0.32
108	6.34	7.5	0.34	108	6.34	10.0	0.23
108	7.30	7.5	0.30	108	7.30	10.0	0.20
108	8.00	7.5	0.27	108	8.00	12.0	0.15
108	10.00	7.5	0.21	108	10.00	12.0	0.12

Source: See Table VI-39.

The above table is by and large self-explanatory. However, it may be mentioned that we have not varied the number of operable days in the year for the bullock cart in view of the fact that it is unlikely that bullocks could be made available for a longer period than indicated or assumed in the exercise. For, on the basis of evidence that we obtained earlier on, regarding the land preparation requirement of high yielding varieties of rice and the possibility of a third winter rice crop, the pressure on and the demand for the bullock draft power will increase greatly as more and more land is brought under HYV cultivation.

Further, the table (VI-40) suggests that there is much scope for cost reduction of local transport operation with the proposed road improvement. The important implication of a higher average daily mileage and a higher average load is not merely confined to lower unit cost, which is anyhow desirable, but also the ability of the existing transport capacity to transport greater volume of goods tonnage, thereby minimising the need for additional investment for augmenting transport capacity.

In terms of marketing opportunities, even if there is considerable amount of movement to the primary markets, the unit cost of maund-mile, after improvement of road, is expected to be reduced from TK.0.47 to 0.32 - a reduction of 32 per cent. If more and more farmers were to switch to the secondary market directly, the reduction would have been from TK. 0.47 to 0.23

- i.e. 51 per cent. These are no doubt significant resource savings for the economy as a whole.

xiv.b. <u>Cost of Tractor Trailer Operation</u>:

Without the road improvement which we have indicated so far, the other possibility of significant transport improvement at the local level of Bangladesh, in fact lies tied up with the question of mechanisation of agriculture. If it were possible to introduce tractors for ploughing, the same motive power in conjunction with a trailer could substantially add to the transport capacity in the rural area. The advantage with tractor is that it is a rugged vehicle and is able to operate without being much hampered by the present state of rural roads. But in countries like Bangladesh with high unemployment level, mechanisation is not readily welcomed and, therefore, mechanisation of agriculture programme could hardly progress much beyond the planning stage. But, nevertheless, we have sought to look into the possibility from the rural transport point of view. We have estimated the economic cost of operation of a tractor trailer on much the same principle as for the bullock cart operation. The significant differences are, however, in respect of operating days, average capacity and the average daily distance it can travel around.

Table VI - 41

Economic Cost of Operation of a Tractor Trailer for Transportation Purposes

1. Fixed Cost		
		Annualised Cost
a. Tractor Tk. (1/3 of total cost)	20,000.00	
b. Trailer	12,000.00	
	32,000.00	
c. Annual Interest @ 15% on amortisation over the life period of 15 years		2,560.66
d. amortised sum net of end value	32,000.00 - 4,000.00 28,000.00	1,866.66
2. Variable Cost		
i. Maintenance		4,500.00
ii. Wages for driver (for haulage purpose)		2,000.00
iii. Fuel, oil, lubricant, tyre, etc.		13,000.00
iv. Overheads, including building, insurance, etc.		7,000.00
		30,927.32

Source: Author's Field Survey (1975-76): Estimates based on Comilla Pilot Project Mechanisation Programme, 1972, Ministry of Local Government, Bangladesh Government.

As with the bullocks, we have taken one third of the capital cost for the provision of the tractor, assuming somewhat arbitrarily that one third of the tractor life would be devoted to transportation purposes. Assuming 108 annual tractor operating days, 50 maunds for average capacity and 75 per cent load factor thereby reducing the average capacity use to 37.5 maunds (18.75 maunds with empty back-haul), with four round trips of 6.34 miles each trip - i.e. 25 miles daily mileage, annual maund miles come to: 108 x 18.75 x 25 = 50,625. Cost per maund mile, therefore, comes to TK. 30,927.32 ÷ 50,625 = TK. 0.61. This cost is even higher than the bullock cart operation in the 6.34 miles round trip distance range under 'without' road improvement situation (Table VI-40). With improvement, however, the cost of cart operation is much improved but it is generally believed that with the sort of improvement envisaged for the existing road, there is not much scope for cost reduction per maund mile for the tractor trailer as average distance load factor is unlikely to increase significantly. This is so due to the nature of operational range of rural goods movements in Bangladesh today. For once the produce is hauled to the secondary market, it becomes very much within the reach of truck operation - unit cost on which is dramatically low compared to either bullock cart or tractor trailer operation. Given the average annual mileage of about 19,000 miles and average capacity of 5 tons for a diesel operated truck, the cost per ton-mile in 1973 was TK. 0.416, or maund mile = 0.015.(10)

xiv.c. Human Portering:

We have observed (Table VI-25) that human portering is a very important form of transport in the Thana, for about half the tonnage transported to the market is done by portering - by shoulder load or head load. Since most of such portering is done by the farmers themselves, often costs are not realised. It is perhaps not socially desirable that this is seriously considered as an alternative viable means of transport. It is, therefore, very difficult to derive a maund-mile cost of transport by portering. In this situation, the only rough approximation that can be sought to be made is on the basis of accounting price of unskilled labour to reflect true cost of porter hire.

We have observed (Table VI-26) that average load of portering varies among items of commodities carried, but the weighted average load per porter comes to 0.40 maund. Given empty return, average trip load comes to 0.20 maund, times 2.80 miles round trip to the market (secondary) gives 0.56 maund/mile. This at an accounting wage-cost of TK. 4.00 a day, comes to TK. 7.14 per maund/mile for portering. The unit cost figure thus arrived at is a most astounding one to reconcile with or to meaningfully compare with any other form of transport.

In fact, given the unemployment level in the rural sector, most of the farmers who bring the goods to the market do not have an alternative gainful occupation during the time they are engaged in load carrying. However, it seems that two elements, if it were possible to quantify them, could have helped to produce a more useful cost figure. Firstly, if the farmer had the choice between rest and recreation, and load carrying so that we could seek to derive a trade-off price between the two. Secondly, if we could put a cost on the incremental exhaustion or decay in the porter's physical health due to load carrying. Unfortunately, no study exists along this line, so that we could indicate a meaningful unit cost for human portering.

xv. <u>Cost of Road Construction and Maintenance</u>:

In the absence of a rigorous traffic flow study, it is difficult to prescribe any definite design standard for the individual stretches of road. The problem is almost doubly difficult if it were to be for a feeder road system on which the present traffic level on any segment of the road network is very meagre. Thus while recommending improvement of the feeder road system, the danger is real that the road may be over designed and without reference to the expected traffic level. In the Sherpur situation, which is also universally applicable for most of the rest of Bangladesh, given the fact that much of the efforts in road building are wasted due to such an inadequate engineering specification (observed in part I of this chapter), the first requirement, therefore, is to secure the investment which is made every year on the roads. In order to do this, the roads need to be built above normal flood level, up to which, in fact, the existing culverts were made, and in order to ensure all-weather condition either gravelling or brick-paving is suggested. Since Bangladesh is not endowed with natural gravelling materials in large quantities, attempts are made to pave the road by bricks specially built for the purpose. These considerations apart, there is a stretch of a few miles of brick-paved road in Sherpur and, therefore, we tended to conclude that the minimum prescribable for the Sherpur Thana is brick paved road. This, of course, does not mean that all the roads of Sherpur Thana should or can be upgraded to brick paved at once but that will be the minimum standard to which all rural feeder roads ought to be built in the future. Since the cost of road will be taken up as a necessary investment requirement in the integrated development model in the next chapter, we will examine the cost per mile of building and maintaining such brick paved road in Sherpur Thana.

As far as possible, cost of construction and maintenance has been adjusted by the accounting price ratios. Construction technique envisaged is labour intensive but use of equipment will be made for compaction purposes. On the basis of the cost estimates for constructing the existing 31 miles of earth road (Table VI-1) and maintaining them on a yearly basis come to TK. 2,829,308 for construction and TK. 133,765 for yearly maintenance. In addition, every four years there will be an additional maintenance cost of Taka 86,800.00.

Table VI - 42

Estimated Cost per mile of Brick Paved Road: Construction and Maintenance (in Take)

	Cost Items	Construction Cost of Brick Paved Road including embankment		Recurrent Cost of Maintenance (yearly)
i.	Supervision	1,175.00		105.00
ii.	Labour	4,800.00		1,235.00
iii.	Equipment	2,418.00		500.00
iv.	Material	57,000.00		
v.	Diesel Fuel	875.00		325.00
vi.	Overheads	25,000.00		750.00
		91,268.00		4,315.00
			+	2,800.00 additional every four years

Source: Executive Engineer, Roads and Highways Directorate, Bogra.

xvi. Adequacy of Transport in Sherpur:

Irrespective of the quality or cost of existing transport facility in the Thana, frequently the farmers or traders offered their judgement as to their adequacy. The field surveys were designed to register those views. Table VI-43 gives the reaction of the heads of the farm households and the traders who were interviewed.

Table VI - 43

Adequacy of Transport in Sherpur - Per cent of Traders and Farm Household Reporting

	Market Traders					
	Primary Market		Secondary Market		Farm Household	
	Dry	Wet	Dry	Wet	Dry	Wet
Adequate	18	2	12	-	34	5
Inadequate	60	48	68	42	52	59
Very Poor	22	50	20	68	14	36
	100	100	100	100	100	100

Source: Author's Field Survey (1975-76), Farm Household Input/Output Survey, and Market Traders Interviews, Sherpur.

The judgement against the present condition of the transport facility is pretty overwhelming. Although it is certain that these views do not reflect any economic appreciation of costs involved in having improved road system, their views are important in the context of democratically arrived decision making process at Thana level. We observed already (Table IV-6) that of the resources available under the Works Programme in the sixties, 74.5 per cent was devoted to road building. The decision to do so was made at the Union or Thana and by the locally elected leadership. Whether those roads were adequately built is a different matter which we dealt with in chapter IV. But the point that comes out from the responses of the farmers and market traders in 1975-76 is that the present condition of the road is considered inadequate and that the wet season makes it worse.

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CHAPTER VII

INTEGRATED DEVELOPMENT APPROACH - PRODUCER SURPLUS MODEL

We have explained the theoretical basis of the producer surplus analysis in chapter V. In this chapter, we will look into the question of improved road provision in terms of its costs and benefits, not in isolation but as part of an integrated development package which would include all costs and benefits. Furthermore, as we would proceed with each component of such a project package, we would estimate the inputs and outputs under conditions of 'with' and 'without' the projects. This approach would help us identify the incremental costs and benefits of each component of the project package. While proceeding with the flow of calculations for the integrated development model, we will explain the underlying assumptions under which each of the sub-models is estimated and projected over a period of twelve years from the beginning of 1975-76 - the year of undertaking the area study of Sherpur Thana. Although the Bangladesh Five Year Development Plan was launched in 1973-74, our base-line data for Sherpur Thana were collected in the middle of 1975-76 and, therefore, we have assumed this year to be the first year of the integrated development package to be introduced. In terms of the area of influence, we assume that Sherpur Thana alone will be influenced by the desired development activities, although we recognise that this is a simplifying assumption given the fact that the area is not by any means isolated from its adjoining Thanas or that the proposed development will not benefit the neighbouring areas. But we feel secure in the thought that the government's present policy is to bring the entire area of north-west Bangladesh under integrated development programme for the area has been identified as having high development potentiality. Besides, the thana based development plan is designed and, therefore, expected to benefit the thana population mainly.

i. Sub-model 1 : Total Cultivated Area:

Sub-model 1 computes total cultivable land in the Thana over the project period. We observed in Table VI-10 that of the total area of 73,600 acres in Sherpur Thana, 62,585 acres were being presently cultivated. Although we noted there (Part II of Chapter VI) that some 3,575 acres of land were cultivable waste which could be brought under cultivation with improvements to the land, we would assume that for agricultural purposes the land presently cultivated (62,585 acres) is fixed. For although some land can be improved, we assume that with increase in population there will be need for more land for homesteads. Similarly, once the development of the local economy is well under way, some land will be needed for grazing of farm animals, for recreation of the people and for general construction purposes.

The prospect of agriculture development lies in terms of increase in the intensity of cultivation and introduction of modern techniques. We also observed (Chapter VI, part II) that there is good prospect for increasing cropped acreage by increasing cropping intensity from present level of 1.29 to 2.05, which in acreage terms means, theoretically, an increase of cropped acreage from 80,735 to 128,299 acres. While this is a possibility mainly based on provision of irrigation water during the dry season over a long period of time, it is estimated in the context of our project period that 50 per cent of the land will attain 2.05 cropping intensity. We, therefore, estimate the increase of cropped acreage to 95,129 on the basis of an average cropping intensity of 1.52 in the terminal year of the project.

In the sub-model 1, we also assume that even without the project package, there would have been some small increase in the cropping intensity due to the pressure of population increase. We, therefore, calculate the total cultivated area in cropped acres both 'without' and 'with' project. The cultivated area is estimated on the basis of assumed cropping intensity over the project period which, in turn, is based on proposed expansion of irrigation programme in the Thana. We also assume that the first two years would have no increased intensity as the project would take some time to get fully started.

Table VII - 1 : Sub-model 1

Total Cropped Area

Year	Input (Cropping Intensity) Without	Input (Cropping Intensity) With	Output (Acreage) Without	Output (Acreage) With
1	1.29	1.29	80,735	80,735
2	1.29	1.29	80,735	80,735
3	1.29	1.33	80,735	83,238
4	1.30	1.36	81,360	85,116
5	1.30	1.38	81,360	86,367
6	1.31	1.40	81,986	87,619
7	1.31	1.42	81,986	88,871
8	1.32	1.44	82,612	90,122
9	1.32	1.46	82,612	91,374
10	1.33	1.48	83,238	92,626
11	1.33	1.50	83,238	93,877
12	1.34	1.52	83,864	95,129

ii. <u>Sub-model 2 : Crop Area Breakdown:</u>

Since there are differences in prices, production and yields as among various crops, we will seek to derive a crop area breakdown for the purpose of determining agricultural value added for each crop. In fact, the crop area breakdown is obtained as a finer division of the Total Cultivated Area output derived in Sub-model 1.

In choosing the crops for which we will seek to derive crop area, we will take broadly two varieties of rice - TV and HYV, jute, potato and sugarcane. These crops constitute 98.11 per cent of the cropped acreage (Table VI-18) and 88.83 per cent of production tonnage (Table VI-18) of Sherpur in 1974-75. In terms of cropped acreage (1.20 per cent) and production tonnage (10.32 per cent) the item 'others' (Table VI-18) is important but it would be difficult to handle in this exercise because it is composed of a myriad types of vegetables and fruits and all varieties of indigenous productions. However, it is hoped that non-inclusion of this item will not seriously alter our final results in terms of costs and benefits of the proposed investment package.

In the Sub-model 2, the crop area breakdown for jute, potato and sugarcane is not likely to alter over the project period for it is assumed that production increase of these crops is likely to be obtained through application of modern inputs rather than increase of actual cropped area. In the case of rice, however, there is likely to be a shift of acreage from traditional variety (TV) to high yielding variety as a result of application of modern inputs including high yielding variety of seeds and irrigation water. We assume, however, that this change in the adoption of HYV rice will be much slower in the 'without' project case than in the 'with' project case. The initial crop area breakdown is based on information in Table VI-18.

Table VII - 2 : Sub-model 2 (Input)

Crop Area Breakdown (per cent)[a]

	Rice				Jute		Potato		Sugarcane	
	TV		HYV							
Year	Without	With	Without	With	Without	With	Without	With	Without	With
1	72.82	72.82	18.54	18.54	2.45	2.45	3.34	3.34	0.96	0.96
2	70.82	72.82	20.54	18.54	2.45	2.45	3.34	3.34	0.96	0.96
3	69.82	69.36	21.54	22.00	2.45	2.45	3.34	3.34	0.96	0.96
4	68.82	67.36	22.54	24.00	2.45	2.45	3.34	3.34	0.96	0.96
5	67.82	65.36	23.54	26.00	2.45	2.45	3.34	3.34	0.96	0.96
6	66.82	63.36	24.54	28.00	2.45	2.45	3.34	3.34	0.96	0.96
7	65.82	61.36	25.54	30.00	2.45	2.45	3.34	3.34	0.96	0.96
8	64.82	59.36	26.54	32.00	2.45	2.45	3.34	3.34	0.96	0.96
9	63.82	57.36	27.54	34.00	2.45	2.45	3.34	3.34	0.96	0.96
10	62.82	55.36	28.54	36.00	2.45	2.45	3.34	3.34	0.96	0.96
11	61.82	53.36	29.54	38.00	2.45	2.45	3.34	3.34	0.96	0.96
12	60.82	51.36	30.54	40.00	2.45	2.45	3.34	3.34	0.96	0.96

Note: (a) Expressed as per cent of total cropped area. Percentage figures do not add up to 100 due to exclusion of items like 'others', Mustard and Wheat.

Table VII - 3 : Sub-model 2 (Output)

Crop Area Breakdown (in Acres)

Year	Rice				Jute		Potato		Sugarcane	
	TV		HYV							
	Without	With	Without	With	Without	With	Without	With	Without	With
1	58791	58791	14968	14968	1978	1978	2697	2697	755	755
2	57176	58791	16583	14968	1978	1978	2697	2697	755	755
3	56369	57734	17390	18312	1978	2039	2697	2780	755	799
4	55992	57334	18336	20428	1993	2085	2717	2843	781	817
5	55178	56449	19152	22455	1993	2116	2717	2885	781	829
6	54783	55515	20119	24533	2009	2147	2738	2926	787	841
7	53963	54531	20939	26661	2009	2177	2738	2968	787	853
8	53549	53496	21925	28839	2024	2208	2760	3010	793	865
9	52723	52412	22751	31067	2024	2239	2760	3052	793	877
10	52290	51277	23756	33345	2039	2269	2780	3094	799	889
11	51458	50093	24588	35673	2039	2299	2780	3135	799	901
12	51006	48858	25612	38052	2055	2331	2801	3177	805	913

iii. Sub-model 3 : Crop Yields and Production:

The main purpose of the sub-model 3 is to quantify agricultural production by crops without and with the project package. We have mentioned already that incremental production with the project is based not through cultivation of additional land but on increased intensity of cultivation of the existing available land and through adoption of improved agricultural practices resulting in higher yield per unit of cropped acreage.

We have estimated the crop area breakdown for each crop in the sub-model 2. We have estimated likely production yields per acre (Table VI-22) on the basis of specified recommended doses of modern inputs. These yield figures would thus apply for land 'with' application of investment project package. As for land 'without' project, we will assume yield levels as obtained for 1974-75 (Tables VI-17 and VI-20) in Sherpur Thana - a year nearest to our base-line data. The figures for Rice (both TV and HYV) are the average of the range of three farm sizes. We summarise the yield figures in the input data for the sub-model 3.

Table VII - 4 : Sub-model 3 (Input)

Yield Per Acre Ton

	Rice (TV)		Rice (HYV)		Jute		Potato		Sugarcane	
Years	W/O	With	W/O	With	W/O	With	W/O	With	W/O	With
1-12	0.51	0.60	0.81	1.28	0.54	0.60	1.12	2.20	18.00	24.00

Once we have obtained the appropriate yield data as inputs into the sub-model 3, we can now go on to derive the agricultural production as output data for each crop. In the sub-model 3 output, we have crop-wise production data under 'with' and 'without' situations and their respective totals.

Table VII - 5 : Sub-model 3 (Output)

Agricultural Production (Tons)

Without Project

Year	Rice TV	Rice HYV	Jute	Potato	Sugarcane	Total Crops
1	29983	12124	1068	3021	13590	59786
2	29159	13432	1068	3021	13590	60270
3	28748	14086	1068	3021	13590	60513
4	28556	14852	1076	3043	14058	61585
5	28141	15513	1076	3043	14058	61831
6	27939	16296	1085	3067	14166	62553
7	27521	16961	1085	3067	14166	62800
8	27309	17759	1093	3091	14274	63526
9	26889	18428	1093	3091	14272	63775
10	26668	19242	1101	3114	14382	64507
11	26244	19916	1101	3114	14382	64757
12	26013	20746	1109	3137	14490	65495

Table VII - 6 : Sub-model 3 (Output)

Agricultural Production (Tons)

With Project

Year	Rice TV	Rice HYV	Jute	Potato	Sugarcane	Total Crops
1	35275	19159	1186	5933	18120	79673
2	35275	19159	1186	5933	18120	79673
3	34640	23439	1223	6116	19176	84594
4	34400	26148	1251	6255	19608	87662
5	33869	28742	1270	6347	19896	90124
6	33309	31402	1288	6437	20184	92620
7	32719	34126	1306	6530	20472	95153
8	32098	36914	1325	6622	20760	97719
9	31447	39766	1343	6714	21048	100318
10	30766	42682	1361	6807	21336	102952
11	30056	45661	1379	6897	21624	105617
12	29315	48706	1399	6989	21912	108321

iv. Sub-model 4 : Population Schedule:

We have estimated the total agricultural production over the project period. We now need to estimate the local consumption requirement and, on that basis, the marketable or 'exportable' surplus from the area. Effectively, it is this surplus which is 'exported' from the region which constitutes the main bulk of traffic over the improved road system. This separation of local consumption requirement and exportable surplus is also required because we assume that the quantity locally consumed is not translated into traffic and, therefore, the expected transport cost savings would not apply to this output. We estimate the local consumption requirement on the basis of population in respect of those commodities, rice and potato, for which per capita consumption figures may be obtained or estimated. For jute and sugarcane, it is in fact the extent of marketing which would be the determinant factor. For, most of the jute is marketed by the farmer for processing elsewhere. Although we observed in Table VI-24, that two per cent and one per cent of jute is held at the farm by the medium and large farm households respectively, for simplicity we will assume that 99 per cent of jute will be marketed without the project as at present, and with the project one hundred per cent will be marketed. As for sugarcane, the export from the area is in the form of cane and not sugar. Since per capita consumption of sugar in terms of sugarcane does not seem to have been estimated for the country, for this item also we will go by percentage of marketing figures as in Table VI-24. We will assume that without the project 90 per cent of the sugarcane will be marketed as at present for the small and medium size farm households (Table VI-24) who are by far the majority. With project we will assume that farms will be more accessible to the sugar mill agents and, therefore, 100 per cent of the produce will be marketed. This assumption will also meet the present statutory requirement that all sugarcane farms in the area should allow for 100 per cent procurement of cane for the sugar mill in Bogra district. But before we arrive at the consumption or marketable surplus estimates, it would be appropriate to lay down the population sub-model for the area.

Table VII - 7 : Sub-model 4 (Output)

Total Population in Sherpur Thana

Year	Population	Year	Population
1	130672	7	153746
2	134331	8	157589
3	138071	9	161528
4	141937	10	165566
5	145911	11	169705
6	149996	12	173948

v. Sub-model 5 : Local Consumption

Once we have obtained the population estimates, we would need figures for per capita consumption for those crop items for which figures are estimated both under without and with project assumptions. We have explained a little earlier that consumption estimates for rice and potatoes would be available and that exportable surplus estimates for jute and sugarcane would be arrived at on the basis of per cent of production to be marketed - which, in turn, is based on estimates in Table VI-24.

Consumption estimates for rice and potato are based on Nutrition Survey conducted by the Dacca University Bio-chemistry Department in 1974[1] which gives the present level of consumption in the rural area and the future recommended consumption level on the basis of nutrition requirement. For our purpose, we will assume that the present level of consumption will relate to without project situation and recommended level of consumption to with project situation.

Table VII- 8(a) : Sub-model 5(a) (Input)
Local Consumption per capita, per Year (lbs.)

	Without Project	With Project
Rice	410	545
Potato	30	70

Table VII- 8(b) : Sub-model 5(b) (Input)
Marketable Surplus per Year (in per cent)

	Without Project	With Project
Jute	99	100
Sugarcane	90	100

With the inputs given as above, we will now set about calculating for each year and each crop, total consumption for the area. We then obtain the total exportable surplus for the area by subtracting the local consumption from total production as shown already in the sub-model 3.

Table VII - 9 : Sub-model 5 (Output)

Total Agricultural Production (TAP), Total Local Consumption (TLC) and Total Exportable Surplus (TES)

	Without Project			With Project		
Year	TAP	TLC	TES	TAP	TLC	TES
1	42107	23918	18189	54434	31792	22642
2	42591	24587	18004	54434	32683	21751
3	42834	25272	17562	58079	33593	24486
4	43408	25980	17428	60548	34534	26014
5	43654	26707	16947	62611	35501	27110
6	44235	27455	16780	64711	36495	28216
7	44482	28141	16341	66845	37407	29438
8	45066	28844	16222	69012	38342	30670
9	45317	29565	15752	71213	39300	31913
10	45910	30304	15606	73448	40283	33165
11	46160	31062	15098	75717	41289	34428
12	46759	31839	14920	78021	42322	35699

Table VII - 10 : Sub-model 5 (Output)

Jute (Tons)

Year	Without Project TAP	Without Project TLC	Without Project TES	With Project TAP	With Project TLC	With Project TES
1	1068	11	1057	1186	0	1186
2	1068	11	1057	1186	0	1186
3	1068	11	1057	1223	0	1223
4	1076	11	1065	1251	0	1251
5	1076	11	1065	1270	0	1270
6	1085	11	1074	1288	0	1288
7	1085	11	1074	1306	0	1306
8	1093	11	1082	1325	0	1325
9	1093	11	1082	1343	0	1343
10	1101	11	1090	1361	0	1361
11	1101	11	1092	1379	0	1379
12	1109	11	1098	1399	0	1399

Table VII - 11 : Sub-model 5 (Output)

Potato (Tons)

	Without Project			With Project		
Year	TAP	TLC	TES	TAP	TLC	TES
1	3021	1750	1271	5933	4084	1849
2	3021	1799	1222	5933	4198	1735
3	3021	1849	1172	6116	4315	1801
4	3043	1901	1142	6255	4436	1819
5	3043	1954	1089	6347	4560	1787
6	3067	2009	1058	6437	4687	1750
7	3067	2059	1008	6530	4805	1725
8	3091	2111	980	6622	4925	1697
9	3091	2163	928	6714	5048	1666
10	3114	2217	897	6807	5174	1633
11	3114	2273	841	6897	5303	1594
12	3137	2330	807	6989	5436	1553

Table VII - 12 : Sub-model 5 (Output)

Sugarcane (Tons)

Year	Without Project			With Project		
	TAP	TLC	TES	TAP	TLC	TES
1	13590	1359	12231	18120	1812	16308
2	13590	1359	12231	18120	1812	16308
3	13590	1359	12231	19176	0	19176
4	14058	1406	12652	19608	0	19608
5	14058	1406	12652	19896	0	19896
6	14166	1417	12749	20184	0	20184
7	14166	1417	12749	20472	0	20472
8	14274	1427	12847	20760	0	20760
9	14274	1427	12847	21048	0	21048
10	14382	1438	12944	21336	0	21336
11	14382	1438	12944	21624	0	21624
12	14490	1449	13041	21912	0	21912

vi. Sub-model 6 : Ex-Farm Prices:

In this sub-model we would need to place values on outputs which we have estimated already in the earlier sub-models. While placing the values on commodities, we have taken the import or export border prices(2) which correspond more closely with world prices in 1975-76 and have thereby avoided local distortions of all kinds which may be reflected in the estimated ex-farm or market prices (Table VI-36).

We have, however, made one simplifying assumption in that farm-gate prices with project are higher than the price of exportable surplus. This has been done under the assumption that with the project there will be transport cost savings and all of it will be passed on to the farmer, so that ex-farm prices will rise to the extent of transport cost saving due to the improved road condition. We assume that the extent of price variation without and with project situations, will be given by the unit cost difference of transport (sub-model 8) resulting from road improvements. Thus the farm-gate price increase with-project is estimated by taking the transport cost difference of TK. 4.32 per ton times 6.34 miles average movement envisaged with road improvement which amounts to TK. 27.39.

Table VII - 13 : Sub-model 6 (Input)

Farmgate Prices (Taka per ton)

Crop	Farmgate Price for Local Consumption		Farmgate Price for Exportable Surplus	
	Without	With	Without	With
Rice	3186	3213.39	3186	3213.39
Jute	6836	6863.39	6836	6863.39
Potato	2546	2573.39	2546	2573.39
Sugarcane	132	159.39	132	159.39

Having obtained the farmgate prices, we will now set about calculating the total value of production of each of the commodities, the value of their production consumed locally, the value of the exportable surplus from the area, and, finally, we will add up the values of production of all the crops.

The difference between without- and with-project production values of all crops will give us the net benefit which we will incorporate as benefit stream B_1 in the cost-benefit sub-model 10 later on.

Table VII - 14 : Sub-model 6 (Output)

Value of Agricultural Production - Rice
(Taka '000)

Year	Total Value of Rice Production		Value of Production Consumed Locally		Value of Exportable Surplus	
	Without	With	Without	With	Without	With
1	134153	174918	76203	102160	57950	72756
2	135465	174918	78334	105023	57361	69894
3	136469	186630	80517	107947	55952	78683
4	138298	194564	82772	110971	55526	83593
5	139082	201194	85088	114079	53993	87115
6	140933	207947	87472	117273	53461	90669
7	141720	214799	89657	120203	52062	94596
8	143580	221762	91897	123208	51683	98555
9	144380	228835	94194	126286	50186	102549
10	146270	236017	96549	129445	49721	106572
11	147066	243308	98964	132678	48102	110631
12	148974	250712	101439	135998	47535	114715

Table VII - 15 : Sub-model 6 (Output)

Value of Agricultural Production - Jute
(Taka '000)

Year	Total Value of Jute Production		Value of Production Consumed Locally		Value of Exportable Surplus	
	Without	With	Without	With	Without	With
1	7301	8140	75	0	7226	8140
2	7301	8140	75	0	7226	8140
3	7301	8394	75	0	7226	8394
4	7355	8586	75	0	7280	8586
5	7355	8716	75	0	7280	8716
6	7417	8840	75	0	7342	8840
7	7417	8964	75	0	7342	8964
8	7472	9094	75	0	7397	9094
9	7472	9218	75	0	7397	9218
10	7556	9341	75	0	7451	9341
11	7556	9465	75	0	7451	9465
12	7611	9602	75	0	7506	9602

Table VII - 16 : Sub-model 6 (Output)

Value of Agricultural Production - Potato
(Taka '000)

Year	Total Value of Potato Production: Without	Total Value of Potato Production: With	Value of Production Consumed Locally: Without	Value of Production Consumed Locally: With	Value of Exportable Surplus: Without	Value of Exportable Surplus: With
1	7691	15268	4456	10560	3236	4758
2	7691	15268	4580	10803	3111	4465
3	7691	15739	4708	11104	2984	4635
4	7747	16097	4840	11416	2908	4681
5	7747	16333	4975	11735	2773	4599
6	7809	16565	5115	12061	2694	4503
7	7809	16804	5242	12365	2566	4439
8	7870	17049	5375	12674	2495	4367
9	7870	17278	5507	12991	2363	4287
10	7928	17517	5644	13315	2284	4202
11	7928	17749	5787	13647	2142	4102
12	7987	17985	5932	13989	2055	3997

Table VII - 17 : Sub-model 6 (Output)

Value of Agricultural Production - Sugarcane
(Taka '000)

Year	Total Value of Sugarcane Production		Value of Production Consumed Locally		Value of Exportable Surplus	
	Without	With	Without	With	Without	With
1	1794	2888	179	288	1614	2599
2	1794	2888	179	288	1614	2599
3	1794	3056	179	0	1614	3056
4	1856	3125	186	0	1670	3125
5	1856	3171	186	0	1670	3171
6	1870	3217	187	0	1683	3217
7	1870	3263	187	0	1683	3263
8	1884	3309	188	0	1696	3309
9	1884	3355	188	0	1696	3355
10	1898	3401	190	0	1709	3401
11	1898	3447	190	0	1709	3447
12	1913	3493	191	0	1721	3493

Table VII - 18 : Sub-model 6 (Output)

Total Value of Agricultural Production - All Crops
(Taka '000)

Year	Without	With
1	150939	201214
2	152251	201214
3	153255	213819
4	155256	222372
5	156040	229414
6	158029	236569
7	158816	243830
8	160806	251214
9	161606	258686
10	163652	266276
11	164448	273969
12	166485	281792

vii. Sub-model 7 : Agricultural Production Costs:

In the sub-model 7, we would seek to estimate the agricultural production costs in the 'without' and 'with' project situation. The distinction will be made between land under existing agricultural practices and the land which will gradually be brought under high yielding variety of inputs - principally improved seeds, fertilizer and irrigation water. We estimated the costs in Table VI-22 in Chapter VI, where we also explained that in the Bangladesh situation there was little prospect for bringing in new land under cultivation. Hence the distinction between without- and with-project is made on the basis of existing and recommended incremental doses of inputs. Sub-model 7, therefore, gives us existing and incremental agricultural development costs - their difference would thus give us the net cost of production.

Table VII - 19 : Sub-model 7 (Input)

Agricultural Production Costs (Taka per Acre)

Crops	Without	With
TV - Rice	460.00	674.00
HYV - Rice	723.00	1356.00
Jute	372.00	576.00
Potato	371.00	733.00
Sugarcane	25.70	42.80

By aggregating the costs of production for each crop, sub-model 7 will estimate the total production costs of all crops. The difference between without- and with-project total production cost figures would give the net production cost of the project package and this net cost figure will be used as cost stream C_1 in the sub-model 10 which will aggregate the net cost and benefit streams of the project.

Table VII - 20 : Sub-model 7 (Output)

Agricultural Production Cost - TV-Rice, HYV-Rice & Jute
(Taka '000)

	TV-Rice		HYV-Rice		Jute	
Year	Without	With	Without	With	Without	With
1	13792	23775	8766	25979	397	683
2	13412	23775	9711	25979	397	683
3	13224	23347	10184	31783	397	704
4	13136	23186	10738	35457	400	721
5	12945	22828	11216	38974	400	731
6	12852	22450	11782	42581	404	742
7	12659	22053	12263	46275	404	752
8	12562	21634	12840	50055	407	763
9	12369	21195	13323	53923	407	774
10	12267	20736	13912	57877	409	784
11	12072	20258	14399	61916	409	794
12	11966	19758	14999	66045	412	806

Table VII - 21 : Sub-model 7 (Output)

Agricultural Production Cost - Potato, Sugarcane and Total of All Crops
(Taka '000)

Year	Potato		Sugarcane		Total of All Crops	
	Without	With	Without	With	Without	With
1	1121	4349	349	776	24425	55562
2	1121	4349	349	776	24991	55562
3	1121	4483	349	821	25275	61138
4	1129	4585	361	839	25764	64788
5	1129	4652	361	851	26051	68036
6	1138	4718	364	864	26540	71355
7	1138	4786	364	876	26828	74742
8	1147	4854	369	888	27325	78194
9	1147	4921	369	901	27615	81714
10	1155	4989	370	913	28113	85299
11	1155	5055	370	925	28405	88948
12	1164	5123	372	938	28913	92670

viii. Sub-model 8 : Agricultural Transporter's Costs and Revenues:

Estimation of costs and prices on account of transport for the agricultural producers is very important. For not only this estimate which is designed to indicate the real resource savings which can be obtained through an improved provision of transport in the area of our study, but also it would indicate the extent to which the farmers would stand to gain in terms of further induced production as a result of transport cost savings passed on time. However, this connection between transport savings and increased production is a complicated one and requires a detailed understanding of the transport cost and price mechanism of an area for a long period of time. In the context of our present study, we have made the simplifying assumption that transport cost savings as a result of improved road provision will pass on to the farmer in the shape of higher prices for the produce.

In this sub-model 8, we will basically seek to estimate the prices and costs of transport for the agricultural produce which would leave the area in the form of agricultural surplus which, in turn, effectively constitutes our main traffic volume which will move over the improved road. The costs and prices are given in Taka per maund-mile both without- and with-project situations. These two situations are based on the present unimproved condition of the road and its future improved condition respectively. The improved condition of the road results from upgrading of the existing road to an all-weather flood-free condition on which the bulk of the traffic would still be bullock-carts.

We similarly assume that the main type of conveyance to be used under improved condition of the road will be bullock-carts. For simplicity, we do not provide for a transport mix although it is possible that some minor trucking operation will begin to appear with improved quality and all-weather condition of the road. Also, we are not considering the inputs traffic for agriculture. In volume terms they are not likely to be great and thus not able to alter the results of our exercise significantly. Besides, the main benefit of improved road with respect to inputs is likely to be in terms of quick and timely availability of the inputs which is very important for Bangladesh agricultural development.

In the exercise for agricultural vehicle operating costs and transport prices, we have derived the unit price/cost figures from our estimates in Chapter VI - Tables 37 and 40. Transport price or charge figures are based on assumptions of dry-period and wet-period conditions which, in our sub-model 8, we will interpret as with- and without-project situations respectively and the figures that we will use are applicable for bullock-cart traffic operating in the range of 3-6 miles (Table VI-37). By estimating the difference between with- and without-transport charges, we will derive the net revenues which we will use as benefit stream B_2 in the sub-model 10 later on.

Unit cost figures have, of course, been derived (from Table VI-40) without- and with-project assumptions. The relevant range of mileage assumed is 6.34 miles and the unit cost is as derived for this range but converted into unit cost per ton-mile for the purpose of the model.

Table VII - 22 : Sub-model 8 (Input)

Agricultural Vehicle Operating Costs and Transport Prices
(Taka per ton-mile)

	Without	With
Average Transport Price per Unit	17.55	14.04
Average Transport Cost per Unit	9.18	6.21

Table VII - 23 : Sub-model 8 (Output)

Agricultural Transporter's Costs and Revenues - Rice (TV and HYV)
(Taka '000)

	Agricultural Transport Cost		Agricultural Transport Revenue	
Year	Without	With	Without	With
1	1059	891	2024	2015
2	1048	856	2003	1936
3	1022	964	1954	2179
4	1014	1024	1939	2316
5	986	1067	1886	2413
6	977	1111	1867	2512
7	951	1159	1818	2620
8	944	1208	1805	2730
9	917	1256	1752	2841
10	908	1306	1736	2952
11	879	1355	1680	3065
12	868	1406	1660	3178

Table VII - 24 : Sub-model 8 (Output)

Agricultural Transporter's Costs and Revenues - Jute
(Taka '000)

Year	Agricultural Transport Cost		Agricultural Transport Revenue	
	Without	With	Without	With
1	62	47	118	106
2	62	47	118	106
3	62	48	118	109
4	62	49	118	111
5	62	50	118	113
6	63	51	119	115
7	63	51	119	116
8	63	52	120	118
9	63	53	120	120
10	63	54	121	121
11	64	54	122	122
12	64	55	122	125

Table VII - 25 : Sub-model 8 (Output)

Agricultural Transporter's Costs and Revenues - Potato
(Taka '000)

Year	Agricultural Transport Cost		Agricultural Transport Revenue	
	Without	With	Without	With
1	74	73	141	165
2	71	68	136	154
3	68	71	130	160
4	66	72	127	162
5	63	70	121	159
6	62	69	118	156
7	59	68	112	154
8	57	67	109	151
9	54	66	103	148
10	52	64	100	145
11	49	63	94	142
12	47	61	90	138

Table VII - 26 : Sub-model 8 (Output)

Agricultural Transporter's Costs and Revenues - Sugarcane
(Taka '000)

Year	Agricultural Transport Cost		Agricultural Transport Revenue	
	Without	With	Without	With
1	712	642	1361	1452
2	712	642	1361	1452
3	712	755	1361	1707
4	736	772	1408	1745
5	736	783	1408	1771
6	742	795	1419	1797
7	742	806	1419	1822
8	748	817	1429	1848
9	748	829	1429	1874
10	753	840	1440	1899
11	753	851	1440	1929
12	760	862	1451	1950

Table VII- 27 : Sub-model 8 (Output)

Total Agricultural Transporter's Costs and Revenues - All Crops
(Taka '000)

Year	Total Agricultural Transport Cost		Total Agricultural Transport Revenue	
	Without	With	Without	With
1	1907	1653	3644	3738
2	1893	1613	3618	3648
3	1864	1838	3563	4155
4	1878	1917	3607	4334
5	1847	1970	3533	4456
6	1844	2026	3523	4580
7	1815	2084	3468	4712
8	1812	2144	3463	4847
9	1782	2204	3410	4983
10	1776	2264	3397	5117
11	1745	2323	3336	5258
12	1739	2384	3323	5391

Given the nature and structure of economy of the area under study, it is only to be expected that non-agricultural goods traffic would be very meagre. In the future, however, with improved provision of road and with higher per capita income as a result of sustained integrated development, it is likely that there will be some non-agricultural traffic over the project period. But it is contended that the main traffic by overwhelming measure will continue to remain agricultural and, therefore, a small non-agricultural traffic which may be generated will not invalidate the results of this exercise.

Sub-model 9 : Road Construction and Maintenance Costs:

In this sub-model, we will seek to estimate the road construction and maintenance costs for the area. We concluded in part III of Chapter VI, that there is great need for upgrading the earth roads of Sherpur Thana to a design standard which would secure the road investment from destruction due to annual flooding. This meant that the road embankment height needs to be above flood level and brick-paved so that it can be in all-weather condition. We estimated the construction and maintenance cost per mile of all-weather brick-paved road in Table VI-42. We assume that construction of 31 miles of existing earth road (Table VI-1) in Sherpur Thana can be finished in two years and that it will be annually maintained up to its original construction standard. Thus sub-model 9 will summarise road construction and maintenance costs and transfer these to the cost-benefit sub-model 10 as cost streams C_3 and C_4 respectively.

Table VII - 28 : Sub-model 9 (Output)

Road Construction and Maintenance Costs
(Taka '000)

Year	Construction Cost	Maintenance Cost
1	1000	-
2	1830	-
3	-	134
4	-	134
5	-	134
6	-	221
7	-	134
8	-	134
9	-	134
10	-	221
11	-	134
12	-	134

Table VII - 29 : Sub-model 10

x. Aggregation of Net Cost and Benefit Streams

(Taka '000)

Years	Net Incremental Agr.Production Cost C_1	Net Incremental Agr.Transport Cost C_2	Road Construction Cost C_3	Road Maintenance Cost C_4	Net Incremental Agr.Production Value B_1	Net Incremental Agr.Transport Revenue B_2
1	31137	-	1000	-	50275	94
2	30571	-	1830	-	48963	30
3	35863	-		134	60564	592
4	39024	39	-	134	67116	727
5	41985	123	-	134	73374	923
6	44815	188	-	221	78540	1057
7	47914	269	-	134	85014	1244
8	50869	332	-	134	90408	1384
9	54099	422	-	134	97080	1573
10	57186	488	-	221	102624	1720
11	60543	578	-	134	109521	1922
12	63757	645	-	134	115307	2068

Table VII - 30 : Sub-model 11

xi. Summary of Project Costs and Benefits
(Taka '000)

Year	Total of Net Cost Streams $(C_1 + C_2 + C_3 + C_4)$	Total of Benefit Streams $(B_1 + B_2)$	Net Benefits
1	32137	50369	18232
2	32401	48993	16592
3	35997	61156	25159
4	39197	67843	28646
5	42242	74297	32055
6	45224	79597	34373
7	48317	86258	37941
8	51335	91792	40457
9	54655	98653	43998
10	57895	104344	46449
11	61255	111443	50188
12	64536	117375	52839

Table VII - 31 : Sub-model 12

xii. Discounted Project Costs and Benefits

Cost/Benefit Ratio

Discounted at 15%

Year	Discounted Costs	Discounted Benefits
1	28248	44274
2	24495	37039
3	23686	40241
4	22421	38806
5	20994	36926
6	19537	34386
7	18167	32433
8	16787	30016
9	15577	28017
10	14300	25773
11	13169	23960
12	12068	21949
	229449	393820

C/B : 1.72

REFERENCES

Chapter VII

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2. Ministry of Trade and Commerce, Government of Bangladesh, Foreign Trade Statistics, 1976.

CHAPTER VIII

SUMMARY OF CONCLUSIONS

As we have observed, agriculture is by far the most dominant feature of the Bangladesh economy. Almost sixty per cent of its GDP came from this sector. Even so, rapid population increase has made the country deficient in food-grains. Therefore, much of the present planned efforts are directed towards higher productivity in agriculture and there is much optimism that, based on a bio-chemical inputs technology, the country can move from a position of foodgrain importing to one of at least self-sufficiency. This implies, effectively, that if the subsistence type economy is to be transformed into a market economy, under which there will be two-way movements of inputs and outputs, the demand for improved local transport will increase. Similarly, there will be need for rationalisation of present marketing and trade patterns.

In view of the emphasis on the agriculture sector, particularly in terms of the food self-sufficiency programme and planned higher domestic production of bulk-type industrial goods, the need is apparent that the respective roles of local short-haul transports and the long-haul arterial forms of transports are identified and their proposed developments reflect the basic objectives of the Development Plan.

While there is need that rural roads should be built or the existing ones improved, it is important that due care with respect to design standard be given on the basis of traffic potentiality and the geographical features of the area. For it provides little benefit if the road built during the dry period cannot withstand the climatic conditions of the wet season and thus the road has to be built all over again. So the minimum engineering specifications, in Bangladesh conditions, are to be such that the road facility can be kept intact with normal periodic maintenance and that it is possible to upgrade it if traffic level demands.

Transport facility is no doubt a necessary, but not a sufficient, condition for an area's development. For the area's development an integrated and all-round development approach is necessary. Finally, the full potentiality of a development effort may not be realised, if the benefits of development do not reach all the people of the area in equal measure. Thus any developmental effort, whether transport or anything else, to be successful in its objectives, must ensure this distributive justice.

It is against these backdrops of issues and problems, which we raised in the very beginning of our study, that we will seek to outline our conclusions. The conclusions themselves are, however, based on our investigation carried out and evidence found in the course of the study.

1. One of the major difficulties faced while embarking on this study has been the lack of much reliable information relating to transport activities at the local level of the Bangladesh economy. We were, therefore, unable to take account of freight ton-miles performed by the non-motorised rural transport in the country. As a result, our efforts to derive a relationship between the country's GDP and its total national freight ton-miles were not fully successful. For the results obtained suffer from information gap with respect to local transport and some inconsistency relating to motorised road transport. The results, in the event, suggest that there is little correlation between the growth in GDP and the growth in the total freight traffic. Regression analysis on the basis of yearly time series data over the ten year period in the sixties gives an extremely low value of R^2 on the basis of corresponding F values.

2. Long-haul freight traffic by railway and IWT (mechanised) is relatively small in volume and simple in form and content. It consists of a small number of bulk-type commodities which are associated with the country's foreign trade. The arterial traffic has been stagnating for over a decade and is vulnerable to competition from the relatively small but efficient road transport which has had a phenomenal growth during the same period.

3. The Five Year Development Plan envisages self-sufficiency in foodgrains by the end of the Plan period and increased domestic production of bulk type industrial goods, such as cement and fertilizer, and that coal will be imported from India requiring shorter haulage. These imply change of commodity composition of the country's foreign trade and, as a result, of the arterial freight traffic. The indications are, therefore, strong that arterial forms of transport will not experience much increase in traffic in ton-mile terms and, in all likelihood, will come under keener competition from the road transport.

4. The goals of self-sufficiency in foodgrains and increased production of other agricultural crops, as projected in the Plan, will imply heavier movement requirements of both inputs and outputs, particularly in areas identified as having high land capability and where intensive development efforts are being carried out. In terms of resource commitment for transport development as among its various forms and segments, the Plan seems to have failed to strike a balance. Whether there is inter-sectoral balance in the proposed investment programme is a question outside the scope of this study, but the mere fact that allocation for rural transport constitutes a bare 5 per cent of what is allocated to the arterial form of transport, is a sufficient indication of the Plan's lack of appreciation of the implication for transport demand at the

local level arising out of its own growth objectives in the field of agriculture. The possible consequence of this might be in the combined form of transport bottle-necks and a higher cost of transport than the community need bear.

5. The efforts in the development of rural roads in the sixties under the works programme are laudable but they have turned out to be largely wasteful due to non-adherence to any minimum engineering specification. Limited funds available for road building have been used thinly over a wide area and construction has taken place unsupervised and without meeting the minimum requirement of either pavement compaction or embankment height. As a result, most of the roads so built fell prey yearly to monsoon and normal flooding, thereby precluding the possibility of stage construction of those roads.

Seasonal factor is very important from the point of view of its influence on a road's capability to move traffic all the year round. There is much indication that transport charges are higher during the wet period and, in fact, percentage variation between dry and wet period is greater with increase in distance and the diminishing frequency of visits by the traders to the market. All these point to the fact that due to lack of all-weather condition of roads, transport charges are higher than could be achieved and marketing activities are reduced.

6. The present production technique in agriculture is highly dependent on animal draft power. In view of the need for labour-intensive technique in the entire production process in the Bangladesh economy, this dependence on animals for draft power will continue to remain in the foreseeable future. In fact, the dependence is likely to grow rapidly in view of a possible additional winter crop based on irrigation and due to intensive cultivation requirements associated with the introduction of modern bio-chemical inputs for agriculture. On the other hand, there is extremely limited land available for cattle grazing or for producing appropriate animal feeds. There is already evidence of shortage of animal draft power during some periods of the year due to change in the sowing/ harvesting pattern of newly introduced high yielding varieties of crops. On top of everything, since more is sought to be produced, hence more needs to be transported. Therefore, indications are strong that demand on animals for cart hauling will rapidly grow as more marketable surplus is produced on the farm. The possibilities, then, seem to be real that there is likely to be a critical shortage of work animals both for land preparation and cart hauling. Improvement to roads to all-weather condition and a simpler marketing arrangement are likely to augment the capability of the presently available transport to move a higher tonnage and at a reduced cost.

7. We observed that almost half the present traffic is carried by human portering. While this may be a gainful occupation for otherwise unemployed labour in the rural economy, future developments in agriculture, particularly relating to the need for more intensive care for high yielding varieties of crops, may cause a shortage of human labour for portering. Because of this higher employment opportunity associated with high yielding varieties of crops and, also, because of the expected higher income levels arising out of higher agricultural productivity, it is not known how the farmers will face up to the new trade-off situation between leisure and portering. But, on the whole, it seems possible that relatively less traffic will be carried by human portering, resulting in higher demand for other forms of transport.

8. The cost of operation of any form of transport is significantly determined by the level of its utilisation. In Sherpur Thana, utilisation level of bullock carts is determined by three main factors, namely, seasonal, average haulage distance and the load factor. But it seems that the seasonal factor influences the other two factors significantly by way of contributing to the change of operable condition of roads. Change in operating conditions in transport due to change in road condition is pretty well reflected in the variation of transport charges between dry and wet periods and in the frequency of visits to the market by traders and

transport operators. On the other hand, cost of operation of bullock carts can be reduced if they can operate for an increased number of days in the year, if average trip distance can be increased and, finally, if average load can be increased.

9. The present marketing pattern is inefficient and is the product of the absence of all-weather roads and low marketable surplus. The unit cost of transport is considerably higher than what could be achieved. This is certainly, at least partially, reflected in the price variation of commodities between markets. Prices tend to increase with the increasing distance to the market and such price-increase is more pronounced with respect to perishable items of marketed commodities. With increased marketable surplus, a two-step marketing regime will be inefficient and cost of transport avoidably high. With road improvement to the condition of flood-free and all-weather operable standard, the unit cost of transport between farm and primary market can be reduced from TK. 0.47 to TK. 0.32 - a reduction of 32 per cent. If the marketing pattern can be made simpler and there is direct farm to secondary marketing, the cost of transport is estimated to be reduced from TK. 0.47 to TK. 0.23 - a reduction of 51 per cent. These are no doubt significant possible cost savings with the proposed improvement to the road condition. Looked at from a different angle, this also implies additional transport capacity creation without requiring additional

investment for it. Improvement to the road condition, therefore, holds out definite prospect of considerable resource savings.

10. Since economic development is not merely a function of improved transport provision, attention is thus concentrated on the production process spurred by a package of investment programme including transport. A simplified producer surplus model under the assumption of an integrated development programme indicates a favourable cost benefit ratio of 1 : 1.72. Costs include net incremental agricultural production cost, net incremental agricultural transport cost and cost of improved road provision and its maintenance. On the benefit side, benefits include net incremental agricultural production value and net incremental agricultural transport revenue. The simplification in the estimate of costs and benefits, however, meant substantial under-estimation of benefits. For example, benefits from non-agricultural goods traffic and passenger traffic have been ignored. These, together with the benefits arising out of agricultural inputs traffic, are likely to be considerable. Benefits accruable to agricultural inputs traffic may be relatively small, but the main benefit to be achieved is in terms of a possible quick and timely delivery of the inputs. Similarly, benefits due to higher mobility of agricultural extension workers, family planning instructors, health and social workers and the higher

general mobility of everyone concerned with the developmental activities, are considerable, though unquantifiable, and to that extent the project benefits have been under-estimated. Lastly, benefits arising out of time savings of both goods and passengers have not been quantified but they are likely to be no less significant.

11. We took the simplified assumption in the producer surplus model that transport cost savings due to improved roads will be fully passed on to the farmer in the form of increased farm price. Normally the transport sector is likely to retain some of the benefits in the shape of increased net profit. Thus it is entirely possible that transport cost reduction may not automatically lead to transport rate reduction.

Similarly, transport development, in fact, any form of economic development has its serious income distribution implication in that developmental benefits may not reach everybody equally. As a result, developments like road improvement schemes may even worsen the income disparity among the people of an area. In Sherpur, bigger farmers are in a relatively advanced position with respect to the introduction of modern inputs, like fertilizer, seed and irrigation water. They also own a higher proportion of hand driven power tillers and bullock carts. These give ample cause for concern that with improved road conditions and resulting reduction in cost of transport, they will reap proportionally higher benefits from the developmental undertaking. This is a serious prospect not only in terms of polarisation of the rural community between haves and have-nots but also that the prime objective of development may be defeated. For the bulk of the small farmers may not feel encouraged to undertake modern and intensive cultivation. This situation, therefore, calls for institutional arrangement for equitable distribution of benefits as far as possible.

12. Under a democratic regime, local developments including transport improvement questions are subject to local planning efforts of the Thana or Union Councils under the elected leadership. It, therefore, becomes important how that leadership or the people of the area view the priorities of their development requirement. In this, their feelings, perhaps based on their everyday experience rather than the economic assessment of a transport planner, become more important and it is, therefore, so reflected in their decisions. This was the case in the sixties when the bulk of the funds available, however inadequate, under works programme were spent on road building and it still seems to be the case with the overwhelming proportion of the people suggesting that they suffer from inadequate transport facilities and they are inclined towards giving a high priority to transport improvement.

APPENDIX 'A'

SHERPUR THANA SURVEY FORMS

(Vehicle Operating Cost)

6. Operational cost:

   a. Crew - permanent, temporary, other

   b. Taxes i) ii) iii) iv)

   c. Other charges:

7. Present worth:

8. Life of the vehicle:

APPENDIX 'A'

MARKET ENTRY VOLUME SURVEY - I

DATE
TIME

NAME OF MARKET   NAME OF THE ROAD   INFLOW

COUNT	VEHICLE/PORTER	COMMODITY	LOAD VOLUME (MND)

APPENDIX 'A'

ROAD SIDE/MARKET ENTRY INTERVIEW - II

LOCATION: / DAY / DATE / HOUR /

1. Vehicle type: (underline) — Truck, Car, Bus, Auto-Rickshaw, Pedal-rickshaw, Bullock-cart, Push-cart, Mule-Donkey-cart, Porter, Animal -pack, any other

2. a. Travelling to: (name & underline) — Village, P.S., nearest town, market
   - distance:

   b. Travelling from: (name & underline) — Village, P.S., nearest town, market
   - distance:

3. Purpose of journey: Government duty, pilgrimage, visit friends/relative, buy goods, sell goods, to work, returning from work, etc.

4. Capacity (in maunds):

5. Commodity carried:

	Main	% of total	Secondary	% of total
name:				
- estimated value of the load:				

6. Loading factor proportion (ring one) — 0, ¼, ½, ¾, or 1+

7. a. From start of journey, hours/days spent ....

   b. Cost per day for food and shelter ....

8. Circumstances of the journey:
   FARMER-PORTING/CARTING; HIRED PORTING/CARTING

9. a. Buying price of commodity:

   b. Selling price of commodity:

10. Cost of carrying:

MARKET TRADER INTERVIEW - III

Commodity Market Date

1. Quantity Purchased/Sold:

% Destined for Outside Thana	Average Distance	Mode Used
(i)	(ii)	(iii)

2. If alternative mode available with unit cost of transport.

3. Frequency of visit to the market:

Season	Weekly	Twice Weekly	Fortnightly	Monthly	Occasionally
Dry:					
Wet:					

4. If any form of transport owned - if yes:

Number	Average capacity	Condition

- if no, average delay in hiring transport: day hours

5. Condition of transport availability for marketing:

	adequate	inadequate	very poor
Dry period -			
Wet period -			

6. Storage availability in the market by capacity:

owned	hired

7. Per cent of goods bought/sold and shipped to the terminal market the same day:

   a. destination - miles

   b. mode used -

APPENDIX 'A'

VEHICLE OPERATING COST - IV
(CART, TRACTOR, TRAILER)

1. Respondent:

a. Status - owner - shareholder/Permanent/Temporary Employee/other (tick)

b. How many other vehicles owned:-

c. Operated for: i. own account only
ii. hired and reward
iii. both i and ii

d. Frequency of visit to the market:

	Weekly	Twice Weekly	Fortnightly	Monthly	Occasionally
Dry -					
Wet -					

2. General:

a. Type of vehicle (local name) -

b. Dimension - length, breadth, height, loaded draught

c. Capacity with weight unloades -

d. When built

e. Where built

3. Capital Cost:

a. Cost including ancillary equipment - such as sails/trailer etc.

b. How was purchase financed (bank borrowing, private finance etc.)

c. Terms of repayment -

d. Its present market price -

e. Materials (itemwise) quantity unit cost total cost

ii) labour(itemwise) - man-days unit cost daily rate

Total Cost

4. Repairs:

- major repair/rebuilding cost:

year	description	cost

5. Operations:

a. Main operation areas: from to

b. Utilisation - Average number of days it operates:

i. Dry months (Oct.-March) ii. Wet months (April-Sept.)

APPENDIX 'A'

FARM HOUSEHOLD INPUT/OUTPUT SURVEY - V

1. Farmer (head of household) Village:
   a. Name
   b. Age
   c. Place of birth
   d. Year of settlement in the area

2. Landholding

	Owned	Rented in	Rented out	Operational holding

3. Land utilisation (in area): (by proportion to crops and other use)

	Owned	Rented	Sharecropped
a. Land used for cultivation:			
b. Land under homestead:			
c. Land in other use (specify):			

4.

Inputs (in qty.)	Last year	This year	Price paid	Bought at	Carried by (mode)	Cost of carriage
a. Fertilizer						
b. Insecticide						
c. Irrigation water						
d. HYV seed						
e. Any other						

5.

Of total rice land (acres)	Last year	This year
a. traditional varieties		
b. HYV		

(Farm Household Input/Output Survey)

Production and Marketing:

6. Crops grown last year (in qty.) and proportion marketed with unit price at which sold:

ommodity	Total Production	Quantity sold				Quantity bought			
		Total	After one month	After two months	Later	Total	After one month	After two months	Later
			1	2	3		1	2	3
i. Rice (TV)									
ii. Rice (HYV)									
iii. Pulses									
iv. Oil seed									
v. Wheat									
vi. Jute									
vii. Sugarcane									
ii. Tobacco									
ix. Potatoes									
x. Chillies									
xi. Fruits									
ii. Vegetables									

7. With respect to each of the above commodities:

	i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.
a. Place where sold or bought												
b. Distance												
c. How carried												
d. At what cost												
e. Term of sale Tk./md.												

(Farm Household Input/Output Survey)

8. Storage facility, if any:

   a. Capacity -

   b. What is usually stored -

9. Livestock

	Last year	This year
a. Number of farm animals owned -		
b. Number engaged on farming -		
c. Number engaged, if exclusively, on other activities - such as water drawing, cart-hauling, oil-milling etc. -		
d. Months when and number of animals required on the farm -		
e. Months when animals idle -		
f. Number of animals hired for any activities -		
g. Number of animals owned or hired jointly -		

10. Transport:

   a. Does the farmer own any form of transport equipment or any animal for transport purpose:

      i. Number of animals

      ii. Number of carts with average capacity

   b. Has the farmer paid to have any goods transported to or from the farm: if yes:

      i. type of goods -

      ii. origin

      iii. destination

      iv. journey cost

      v. mode of transport

   c. Transport facility during dry and wet months:

      i. adequate

      ii. inadequate

      iii. very poor

APPENDIX 'B'

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