TRANSPORT AND ECONOMIC DEVELOPMENT IN RURAL BANGLADESH

by

Abul Hasan Muhammad Sadeq

A thesis
presented to the University of Manitoba
in partial fulfillment of the
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DOCTOR OF PHILOSOPHY

DEDICATION

To my beloved parents
Who wish to see me happy and high
Here and after.
And to Faheem and Zakiya
For whom I wish the same.

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And above all, "Alhamdu Lillah."

ABSTRACT

The relationship between economic development and transport changes, particularly those in rural transport, is controversial and needs further research, so that transport may be fully incorporated into economic planning. This thesis examines the relationship between transport and economic development in the context of rural Bangladesh. Four main components sustain the thesis: a literature review of work on transport and economic development; a critical analysis of the recent Bangladesh Rural Transport Study, undertaken by the Planning Commission of the Bangladesh Government in collaboration with a British University research team; a systematic analysis of the growth and distribution effects of transport changes in rural Bangladesh; and finally, the development of a model which integrates both growth and distribution effects of transport changes for use in project evaluation and planning.

The literature review reveals that a wide variety of approaches have been taken in analyzing the relationship between transport and economic development, and that there is an equally wide disparity in perceived effects, ranging from promotional through permissive to negative. Analysis of the Bangladesh Rural Transport Study shows it to be

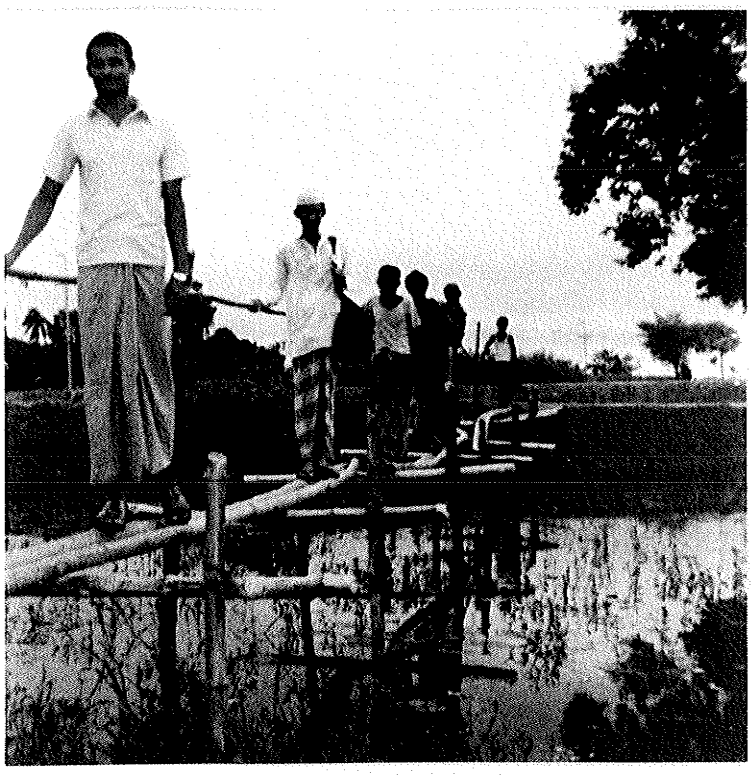
incomplete in its methodology and also in its application; the thesis argues that its methodology needs to be augmented by including the full range of benefits derived from transport changes, and their effects on economic development, and to be strengthened by a balanced consideration of distribution and growth effects. The analysis of the effects on growth and distribution which transport changes in rural Bangladesh would likely produce reveals positive impacts; the importance of complementary investment is emphasized. A beneficial balance of economic growth and income distribution effects is clearly achievable.

The construction of a model which focuses on and combines the growth and distribution components of transport supported development completes the thesis. The model includes both positive and normative elements and provides for the evaluation and priorization of transport projects in an planning process. An example of the application of the model reveals a sharp contrast between its output and that of the often used user cost analysis.

1. Shoulder-loading

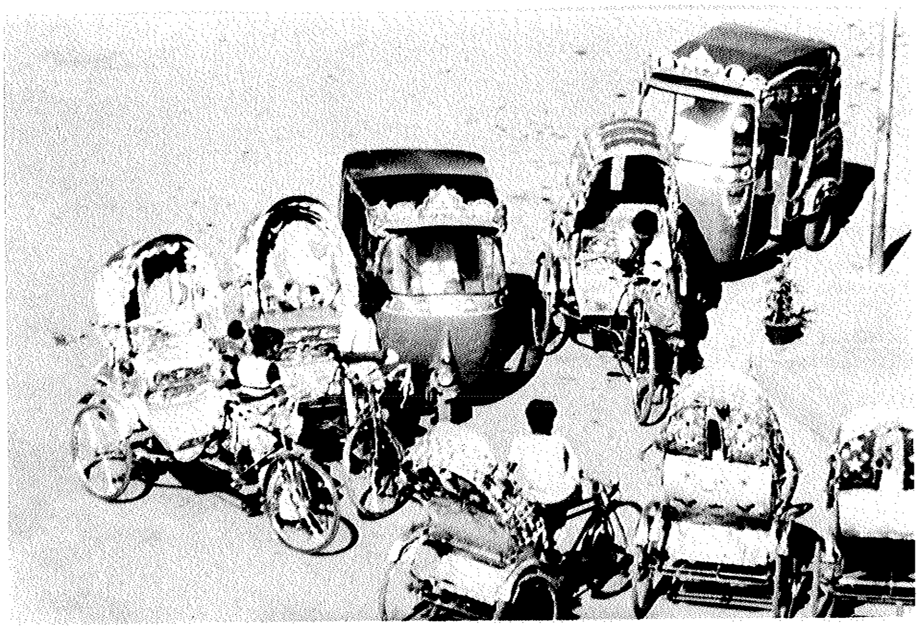
2. Head-loading

3. Cargo shipment by bullock-cart
Source: B.L.C. Johnson, Bangladesh, Heinemann and Harper & Row



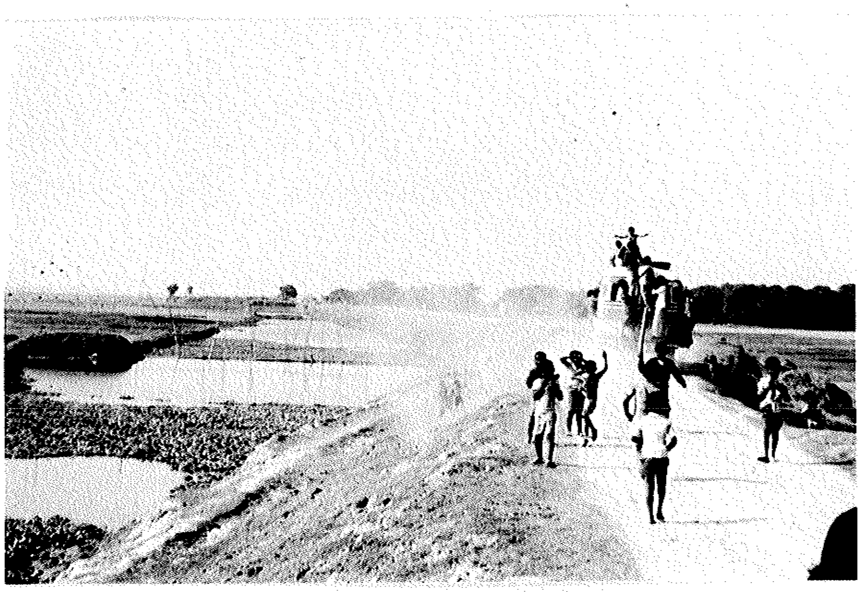
4. Bridge on a rural road

5. Arterial passenger transport by bus
Source: B.L.C. Johnson, Bangladesh



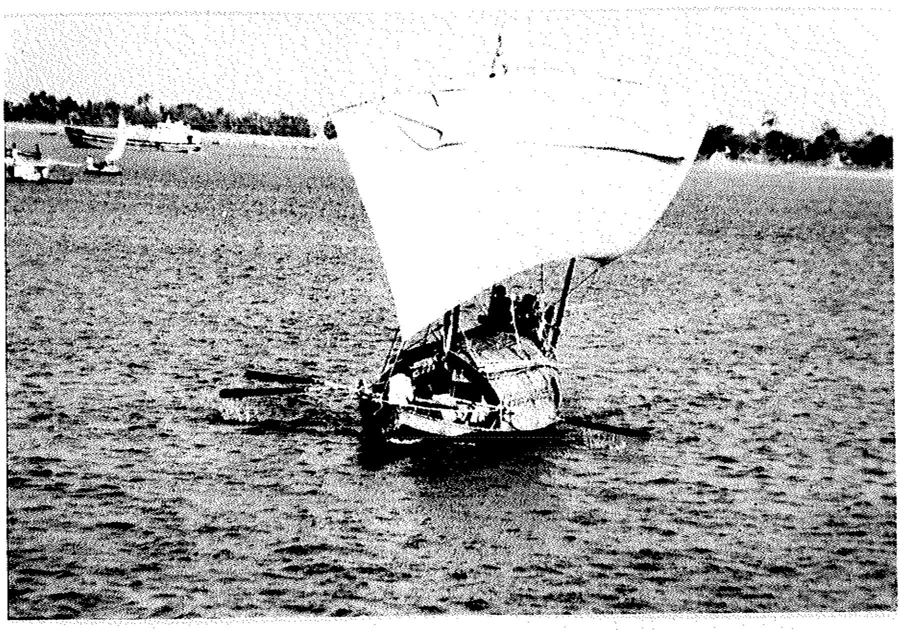
6. Pedal rickshaws and auto-rickshaws
(Photograph: J.R. Rogge)

7. Road traffic in a Bangladesh community
(Photograph: J.R. Rogge)



8. An improved major rural road with bus traffic
(Photograph: J.R Rogge)

9. Country boats with arterial freight boats in the background. (Photograph: J.R. Rogge)



10. Arterial freight boat (Photo: J.R. Rogge)

Chapter I

INTRODUCTION

> "Transport is only one of the many ingredients necessary to accelerate the pace of economic progress, but in many instances it plays the key role, and in all cases it sets the limit".
> Wilfred Owen:
> Distance and Development.

Transport, with its implications for production and distribution in both rural and urban sectors, and for the maintenance and development of national and regional social infrastructure, is a pervasive element in the economics of all nations. This study will address economic planning issues in the rural economic development of Bangladesh with particular reference to transport. More specifically, this study will investigate the implications for growth and distribution of rural transport in a planning perspective.

The process of economic development has many components and none of them is sufficient in itself to accelerate economic development. Transport has often been identified as a strategic factor in the process but its role is controversial and inadequately understood. Analysis of transport and its relationship to public policy and planning is especially significant in less developed countries (LDCs), which have sharp limitations on their resources for investment and transport changes often have major financial implications.

Bangladesh, like most LDCs, is predominantly a rural economy.[1] Any developmental effort which is broadly based will need to address rural economics. Recently, there has been controversy about the role of rural transport in the economic development of rural Bangladesh[2] and, more generally, the controversy over the potential of transport as a development instrument has continued to be of interest in many countries.

In view of the inadequately understood and controversial role of rural transport and its large financial commitment, the phenomenon should be investigated carefully for sound public policy and efficient planning for development. The objective of this study is to examine the issue in the context of Bangladesh. That is, to investigate the probable contribution of rural transport to the development of the country and to examine how the benefits, if any, of transport changes may be distributed among the affected population.

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[1] More than ninety percent of the population of Bangladesh live in rural areas. The rural character of the economy will be described later.

[2] A study which has created the controversy will be critically analysed in Chapter III.

It is interesting to note that the direction and significance of rural transport's contribution may well depend on time and space. It is possible, in principle, that it plays a key role in the development of some particular areas, while its contribution may be quite insignificant or even negative in other regions. It is therefore important to evaluate particular projects individually in order to see their economic viability and to make a priority ranking for the purpose of planning. As will be seen later, the traditional evaluation technique takes only a part of benefits into consideration and ignores other developmental and distributional effects.[3] It is therefore useful to develop a model which incorporates both aspects of growth[4] and distribution in the same model. It is an objective of this study to develop such a model.

In general, the main questions or issues to be addressed are the following: (1) the effect on income growth of rural transport changes, initial transport provision, and transport improvement; (2) the role of rural transport in the development of small/cottage industries in rural areas; (3) the role of complementary investment; (4) the impact of ru-

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[3] Some of the literature discusses the distribution effects qualitatively, but does not include them in the model meant for evaluation.

[4] It will be seen later that the traditional approach considers the transport user cost savings as the only benefit to be derived from transport changes in the evaluation of rural transprt in Bangladesh. The present study will investigate growth effects as well as user cost savings.

ral transport changes on the distribution of income, and (5) the development of a model for the evaluation of comprehensive rural transport projects.

1.1 THE BANGLADESH ECONOMY

This section presents some statistical information on the country which is relevant for the forthcoming analysis in this study.

Established in 1971, Bangledesh is a small but densely populated country with a total area of 55,598 square miles.[5] The total population was 90 million in 1981 and the density of population 15,566 per square mile.[6] The total fertility rate is 6.6 in urban and 7.1 in rural areas. The population growth rate is 2.36% per annum.[7] More than 90% of the population live in rural areas and 80% of the population depend on income earned from agriculture. More than 55% of the Gross Domestic Product (GDP) in 1980-81 came from agriculture.[8] The percentage of the civilian labor force employed

[5] Bangladesh Bureau of Statistics (BBS), Government of Bangladesh (GOB), Statistical Pocket Book of Bangladesh, (Dhaka: BBS, 1980), p.81.

[6] Ibid., p.84.

[7] Ibid., p.84.

[8] The sectoral contribution to GDP (in percentage) is as follows: agriculture (55.43%), industry (8.45%), transport (5.32%) and all others (30.8%). See Government of Bangladesh, Ministry of Finance and Planning, Bangladesh Economic Survey, 1981-82, (Dhaka: Ministry of Finance and Planning, 1982), p.3.

in agriculture is 78%.[9]

Although Bangladesh is an agriculturally based economy, her agriculture is underdeveloped, and accordingly her GDP and per capita income are low. The GDP in 1980-81 at constant prices is 6,917 crore Taka, and per capita income is Tk.769.[10] The intensity of cropping is 153.18.[11] The percentage of cultivated area irrigated is 11.15% and the crop area under improved seeds as a percentage of the total cropped area is 19%. The fertilizer input used per hectare is 29.98 kg.[12] The average productivity of traditional variety rice is 9.78 and that of high yielding variety (HYV) rice is 48.28.[13] The proportion of agricultural students per economically active person in agriculture is 0.0001216,[14] of agri-

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[9] The percentage of civilian labor force employed in different sectors are as follows: agriculture (78%), industry (7%) and services (15%). See World Bank, Bangladesh : Current Trends and Development Issues, (Washington, D.C.: IBRD, 1979), p.1 of Country Data.

[10] Ibid., p.2. The exchange rate of the Taka is US$1=Tk.15.122 during July 1977-June 1978 (subsequently the value of Taka has fallen further). See World Bank, op. cit.,(p. Currency Equivalents).

[11] The intensity of cropping (IC) is defined as IC=(area cropped/area sown)100. See BBS, GOB, Statistical Pocket Book of Bangladesh, p.215.

[12] Ibid., p.162.

[13] See Bangladesh Engineering Consultants Ltd., Feasibility Study: Fulchari Thana, 1981, a report prepared for the Ministry of Local Government, Rural Development and Cooperatives (MLGRD), Government of Bangladesh, (Dhaka: MLGRD, 1981), pp. F-21,22.

[14] BBS, GOB, Socio-Economic Indicators of Bangladesh, (Dha-

cultural extension personnel per farmer (household) 0.0005, and of veterinarians per 100,000 livestock units (1980-81) as follows: cattle (3.7) and poultry (1.4).[15] Domestic production of staple food as a proportion of consumption in 1979-80 is rice (0.95) and wheat (0.31).[16]

Because the rural people are poor, they do not have adequate credit facilities. There are two sources of credit in rural areas: financial institutions such as banks,and local money lenders. The share of rural areas in total institutional credit in 1978-79 was only 9.8%, and the amount of rural credit per household from institutional sources was Tk.106.[17] Interest rates on scheduled bank loans (effective 15th October, 1980) are 12% per annum to agriculture, 13% to small/cottage industries and to less developed areas, and 15% for general loans.[18] The interest rates on loans from local money lenders which predominate in Bangladesh villages are high, but vary depending on time and place. According to one study they range from 50% to 200% per annum.[19]

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ka: BBS, 1981), p.185.

[15] Ibid., pp.191, 187.

[16] Ibid., p.118.

[17] BBS, GOB, Socio-Economic Indicators of Bangladesh, p.157, 159.

[18] BBS, GOB, Statistical Pocket Book of Bangladesh, p.382.

[19] The Overseas Development Group (ODG) and the Transport Survey Section (TSS) of the Planning Commision, Government of Bangladesh, Bangladesh Rural Transport Study (hereafter referred to as Bangladesh Rural Transport Study

Rural areas of Bangladesh lag behind in educational, marketing and other facilities. The literacy rate in percentage of total population is 20.2% (1974 census),[20] and 38 percent of the villages have primary schools.[21] Only 0.13 percent of the villages have primary market facilities, and 5 percent have electricity.[22] The percentage of adults with membership in co-operatives is 11.84.[23] Health services are poor in rural Bangladesh: 5 percent of the villages have health centres, and there are 4,263 hospital beds in all the rural health centres[24] where more than 80 million people (90% of 90 million) live. Per capita availability of medicine and pharmaceuticals is Tk.26.60 (1978-79).[25] The population per physician is 11,350 and population per hospital bed is 4,430.[26]

Two further problems are high unemployment and a large external debt. The number of unemployed mandays as a percentage of total available mandays among the agricultural labor force is 19.3 (1979), and the percentage of women in

only), (Norwich: University of East Anglia, 1978).

[20] BBS, GOB, Statistical Pocket Book of Bangladesh, p.142.

[21] BBS, GOB, Socio-Economic Indicators of Bangladesh, p.105.

[22] Ibid., pp.106, 108.

[23] Ibid., p.126.

[24] Ibid., pp.106,432.

[25] BBS, GOB, Statistical Pocket Book of Bangladesh, p.436.

[26] World Bank, op. cit., (country data : p.1).

filled positions is 10.05 (1980).[27] The amount of export (f.o.b.) is worth Tk.11,208 million, while the amount of imports (c.i.f.) is worth Tk.31,266 million with a trade deficit of Tk.20,058 million (1980-81).[28] The total amount of external debt is US$ 2,556 million (1980-81).[29]

1.2 INCOME AND INCOME DISTRIBUTION

According to a World Bank ranking, Bangladesh is the fifth poorest country of the world.[30] In 1980, the GNP per capita in Bangladesh was US$ 130, while the third and fourth poorest countries had per capita GNP of US$ 80 (Bhutan) and US$ 120 (Chad) respectivly (the relevant data for the first and second poorest countries are not available). The highest GNP per capita was US$ 26,850 in 1980 (United Arab Emirates). For a comparision, the per capita GNP of some selected countries is provided in Table 2 (column 2). The comparision reveals that the country with the highest per capita GNP has more than two hundred times the per capita GNP of Bangladesh.

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[27] BBS, GOB, Socio-Economic Indicators of Bangladesh, pp.177,200.

[28] BBS, GOB, Statistical Pocket Book of Bangladesh, p.86.

[29] World Bank, op. cit., (country data. : p.2).

[30] World Bank, World Development Report 1982, (New York: Oxford University Press, 1982, p.110).

The income distribution of Bangladesh is generally skewed, particularly in rural areas. Since adequate information on rural income distribution is not available, the distribution of land ownership is often uesd as a proxy. The distribution of land ownership in Bangladesh is uneven and is shown in Table 1.

As Table 1 shows, 8% of the rural population do not own any land, and 51% of them own only 9% of land acreage, whereas the highest 9% of them own 36% of land.

The overall distribution of household income is also uneven in Bangladesh. The relevant data for Bangladesh as well for some other selected countries are provided in columns 3 through 8 of Table 2. As the table shows, the bottom 40% of the population possess only 18% of household income, while the highest 20% of the population possess 42% of household income. The highest 10% of them own 27% of household income. The overall income distribution condition in Bangladesh is, however, more or less comparable with that in some neighbouring countries, except for Nepal, where income distribution appears to be worse. The relevant information for centrally planned countries is not available for a comparision.

TABLE 1

Size Distribution of Land Ownership in Bangladesh

Size group (acre)	% of rural population		land area owned	
	In %	Cumulative %	% of area (acre)	Cumulative %
Zero	8.28	8.28	0.00	0.00
0.01-1.00	42.33	50.61	9.30	9.30
1.01-2.00	16.78	67.39	14.43	23.73
2.01-3.00	9.86	77.25	13.18	36.91
3.01-4.00	6.48	83.73	11.13	48.04
4.01-5.00	4.25	87.96	9.00	57.04
5.01-6.00	2.96	90.94	6.90	63.94
6.01-7.00	2.09	93.03	5.69	69.63
7.01-10.00	3.32	96.35	10.71	80.34
10 & above	3.65	100.00	19.66	100.00

Source: F.T. Jannuzi and J.T. Peach, The Agrarian Structure of Bangladesh: An Impediment to Development, Westview Press, Colorado, 1980, p.99 (based on the Land Occupancy Survey of 1977). (Abridged).

TABLE 2

GNP Per Capita and Income Distribution in Some selected Countries

Countries	GNP per capita in US dollars 1980	Percentage Share of Household Income by Income Groups*					
		Lowest 20 percent of population	Second quitile	Third quintile	Fourth quintile	Highest 20 percent of population	Highest 10 percent of population
Bangladesh	130	6.9	11.3	16.1	23.5	42.2	27.4
Nepal	140	4.6	8.0	11.7	16.5	59.2	46.5
Burma	170	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
India	240	7.0	9.2	13.9	20.5	49.4	33.6
Pakistan	300	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Canada	10,130	3.8	10.7	17.9	25.6	42.0	26.9
U.S.A.	11,360	4.5	10.7	17.3	24.7	42.8	26.6
United Arab Emirates	26,850	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.

* Income distribution figures pertain to different years: Banglades (1973-74), Nepal (1976-77), India (1975-76), Canada (1977) and U.S.A. (1972).

Source: World Bank, World Development Report 1982, Oxford University Press, 1982, pp.110-11, 158-59.

1.3 THE TRANSPORT SYSTEM

Despite its essentially rural economy and the fact that more than 90% of its population lives in rural areas, Bangladesh's rural transport system is underdeveloped. The transport system in Bangladesh is mainly arterial, and has been developed not for the efficient movement of the majority of the country's population, but on a "piece-meal" basis for administrative convenience and for the movement of exports and imports.

The dividing lines of fragmented pieces of agricultural land are usually used as roads for movement from farming fields to farmers' houses and local markets, and to kutcha (unpaved earthen) roads, railway stations and/or to waterways for travelling and shipment to thana[31] headquarters, trade centres or to urban areas. The few formally constructed rural roads are usually in poor condition and in most cases unsuitable for the movement of manually operated vehicles like bullock carts and pedal rickshaws. In many other cases, there is no formal transport infrastructure, and railway services and navigable waterways are not available in most of the rural areas. "As a consequence," the Planning Commission of Bangladesh (PCB) observes, "many road gaps are still existing and large tracks of rural areas having higher potential of development are still standing in

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[31] A thana is the lowest administrative unit of Bangladesh.

isolation."[32]

The most important means of cargo shipment in rural areas is headloading. Other means may sometimes include animal, bullock cart, thela,[33] pedal rickshaw and small country boats. In some semi-urban areas, auto-rickshaw and some other mechanized vehicles may be used. Small country boats are the main means of transportation where navigable waterways are available. Movement of people and goods often involves inter-change between two or more modes.

The land surface of Bangladesh is more or less flat but low and often criss-crossed by canals, creeks and low muddy land. Although most of the areas are flooded for a few months of the rainy season, so that country boats can be used, navigable waterways are not available for the rest of the year except in some southern riverine areas of the country.[34] Movement on foot across paddy fields, canals and muddy low land is extremely time-consuming and difficult. "During wet season," a study observes, "travel is slow, dif-

[32] Planning Commision, GOB, Road Development Programme of Bangladesh (Phase 1), Transport Section Paper No.2, (Dhaka: Planning Commission, 1981), p.3.

[33] A thela is a two-wheeled non-mechanized wooden vehicle which is usually pushed and pulled simultaneously by two men from the two ends of the vehicle.

[34] Presently waterways are not available in nearly two-thirds of the country during dry season, and accessibility to rural areas by water transport is decreasing rapidly due to the rapid rate of siltation in recent years. See Planning Commision, GOB, Road Development Programme of Bangladesh, p.7.

ficult and sometimes treacherous, as people often have to walk in ankle deep mud, wade through canals and cross rivers on narrow makeshift bamboo foot-bridges to reach their destination."[35]

The arterial transport network consists of roads, railways, waterways and civil aviation, and is dominated by the shipment of exports and imports and provides mainly inter-city and seaport-to-city connections. There are 2,500 miles pucca roads (with betumen and concrete), 1,786 miles of rail lines and 2,500 miles of all-weather waterways in the country. Ten percent of the villages of the country are 16 or more miles away from the nearest metalled road, 18% of the villages are 11 or more miles away, 28% of the villages are 8 or more miles away, 39% of the villages are 6 or more miles away, and 31% of the villages have access to metalled road within two miles of walk. The density of roads (km. of road per 100 km. of total geographical area of the country) is 3.45 in 1978, where road includes tracks for the use of pedestrians and vehicles,[36] while the population density is 1,566 per square mile.[37]

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[35] Lewis Berger Inc., Rural Roads Study, vol.1. (East Orange, New Jersey: Louis Berger Inc., 1979), p. I-3.

[36] Ibid., p.167.

[37] BBS, GOB, Statistical Pocket Book of Bangladesh, p.84.

[38] GOB, Second Five Year Plan, 1980-85, (Dhaka: Planning

There are five kinds of roads in Bangladesh[38] : (1) national highways which connect the national capital with divisional headquarters[39] and major regional centres, (2) regional highways which connect district headquarters and orher industrial/commercial centres and one region with another, (3) district roads which connect sub-divisional headquarters and commercial centres with each other and with the road system, (4) feeder roads which connect major and medium sized markets and thana headquarters to the arterial transport system, and (5) rural roads which provide intra-village and inter-village linkage and connect villages with local markets, trade centres and thana headquarters. These can however be broadly classified into two groups : (1) arterial road transport, which includes national and regional highways and district roads, and (2) rural road transport which includes feeder and rural roads. The present study deals with this rural transport system. Table 3 provides an overview of the existing position of transport system in rural Bangladesh.

As Table 3 shows, about 55% of the thana headquarters and 67% of the major and medium markets do not have paved road connections. In addition, there exist 5,000 small market

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Commission, 1980), p. xv-21.

[39] The country is divided into 4 divisions, 21 districts, 71 sub-divisions, and 486 thana for administrative purposes. See BBS, GOB, Statistical Pocket Book of Bangladesh, p.81.

places which do not have any motorable road linkage.

TABLE 3

Road Connections to Centres of Activity

Centre	% of centre linked by paved road	% of centres not linked by paved road
Divisional Head Quarters	100	00
District Head Quarters	95	5
Sub-Divisional Head Quarter	79	21
Thana Head Quarters(Outside municipal areas)	45	55
A-Category markets	41	59
B-Category markets	27	73

Source: Planning Commission, Government of Bangladesh, Road Development Programme of Bangladesh, Transport Section Paper No.2, April, 1981. (Percentage calculated).

Bangladesh plans to develop growth centres at thana or sub-thana level trade centres, which are supposed to play a key role in the development of surrounding villages. In order to make this policy a success, the growth centres need to be connected with surrounding villages and to provide other complementary facilities.

1.4 THE CONTROVERSIAL NATURE OF THE PROBLEM AND RATIONALE OF FURTHER RESEARCH

The relationship between transport and economic development is a subject of considerable theoretical controversy and practical importance. While the practical association between transport and economic development is not denied, views differ as to the causal relationship between them. Some posit that the adequacy of transport is a prerequisite of economic development which initiates and promotes development by creating facilities of easy, inexpensive and fast marketing and input supply. Others emphasise the supportive rather than promotive role of transport, because, according to them, transport can only satisfy the demand created by economic growth which is caused by factors external to transport. The other extreme position is that transport makes a negative contribution to economic development, since it competes with other productive investment needs and creates regional inequalities in favor of those regions which possess improved transport facilities.[40]

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[40] This debate has led some writers to analyse historically the experience of the presently developed countries, in order to investigate the extent to which transport facilities contributed to the economic development of these countries. The conclusions of these historical analyses also remain controversial. The controversy on the relationship between transport and economic development in general will be critically analysed in the following chapter.

The controversy has practical implications for rural development. If transport is considered a prerequisite for economic development, improvements to the rural transport system should precede other efforts to stimulate economic growth. If, on the other hand, transport plays a supportive rather than an active role in economic development, improvements can be delayed until they are justified by increased demand.[41]

The division of opinion is evident in a study carried out jointly by the Overseas Development Group (ODG) of the University of East Anglia, and the Transport Survey Section (TSS) of the Planning Commision (PCB) of the Government of Bangladesh.[42] Interestingly enough, they produced a report after studying five thana at micro level, which was jointly acceptable, but failed to agree on a single set of conclusions and recommendations. The ODG members do not see the present condition of rural transport in Bangladesh as a major constraint on agricultural development. Transport improvements, in their view, will probably be justified only when a significant agricultural surplus resulting from agricultural development generates a larger traffic flow.

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[41] The literature on rural transport and economic development will be reviewed in the following chapter.

[42] See <u>Bangladesh Rural Transport Study</u>.

The PCB members hold a different position. According to them, the present state of rural transport in Bangladesh provides a "positive constraint" on agricultural development, and transport improvements must be carried out to generate higher levels of income and to reduce poverty. The PCB position implies a positive, rather than a supportive, role for rural transport in the generation of a higher level of income in Bangladesh. On the other hand, the ODG cosiders it a supportive, rather than a positive, variable in the development process.

The Planning Commission of the Bangladesh government has confirmed its position in its later literature and development efforts. In its view, the inadequacy of rural transport is a "deterrent" to rural development, and no plan for rural development can be considered without a corresponding plan for the improvement of the of rural transport system. Therefore, greater emphasis is to be placed on the development of rural transport in future.[43]

Bangladesh's Second Five Year Plan (1980-85) reflects this emphasis. In a program calling for 4,612 miles of road development during 1980-85, rural roads alone (called "feeder roads" in the Plan) constitute 2,100 miles, and out of 1,300,00 rft (running feet) of bridges and culverts planned, 90,000 rft are planned for the construction of bridges and

[43] Planning Commission, GOB, Road Development Programme of Bangladesh,(Phase-1), p.6-7.

culverts on the feeder road system alone.[44] From these development efforts, it appears that the government of Bangladesh accepts the conclusion of the Planning Commission, rather than that of the ODG.

The phenomenon should therefore be carefully studied for several reasons. First, the controversy between the two sides of the BRTS study team has raised an interesting question as to the role of rural transport in economic development. Second, the issue should be examined to see if the government's continued emphasis on rural transport changes is justified. Third, a serious economic analysis, free from the weaknesses of the existing literature, is necessary to see what rural transport can do for the development of rural areas and for overall economic development in the context of Bangladesh. Fourth, it is necessary to examine the mechanism through which rural transport can play its role in economic development with special reference to Bangladesh. Fifth, a model needs to be developed for the evaluation of comprehensive rural transport projects which should incorporate both growth and distribution effects of transport changes.

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[44] Government of Bangladesh, Second Five Year Plan 1980-85, p.XV-20.

1.5 THE ANALYSIS

The background of present work, the description of the existing transport system in Bangladesh and government efforts to develop it, is placed in the introduction. This is followed by a review of literature on transport and economic development, both general and rural. There will be a critique of the existing literature in general, and a detailed critical analysis of the BRTS in particular. The BRTS study is analysed in greater detail because it originated the controversy on the role of rural transport in the economic development of Bangladesh, which is really an official study.

Any serious investigation of the effects of rural transport changes on economic growth and income distribution raises the following problems : (1) identification of variables that link rural transport with objective variables (growth and distribution); and (2) investigation of the linkage and relationship between rural transport and the objective variables via link variables.

The effect of rural transport changes on income growth may originate in their effects mainly on agricultural production and rural-based small/cottage industries. Other variables which may link transport with agricultural production include the following: (1) the size of cultivable land (transport linkage may open up some areas for human settlement and agricultural operation); (2) agricultural input and technological change (transport changes may help diffuse ideas and introduce improved technology for higher production); (3) the penetration of development efforts and agricultural extension services (improved transport may facilitate efficient provision of these services); (4) access to institutional credits (when distance from banking services and an information gap may affect distribution of institutional credits, transport changes may help increase efficiency); (5) crop composition (transport changes and the possibility of fast shipment may lead to an efficient crop composition depending on land suitability, instead of on factors like perishability and marketability); and (6) marketing facilities (improved marketing facilities consequent upon transport changes and resulting higher profits may lead to higher production).

In addition, rural transport may influence the expansion of rural industries through some link variables in Bangladesh. They may include the following : (1) the timely supply of inputs and raw materials at low costs; (2) expansion of markets; (3) access to extension services for rural industries; and (4) access to institutional credits for non-agricultural activities.

This work is expected to be a contribution to knowledge in several ways. First, there will be a critical analysis of the Bangladesh Rural Transport Study (BRTS) which has created the controversy about the role of rural transport in economic development of Bangladesh. Second, a critique of existing literature on the subject of transport and economic development will be provided. Third, not only transport cost savings, but the major developmental effects of rural transport changes will be examined. Fourth, the effect of rural transport on the distribution of income will be examined through linkage analysis. Fifth, the mechanism through which rural transport can contribute to economic development in the context of Bangladesh will be analysed. Sixth, a model will be developed for the evaluation of comprehensive rural transport projects which will incorporate both growth and distribution effects of the project.

Chapter II

TRANSPORT AND ECONOMIC DEVELOPMENT - A LITERATURE REVIEW

In order to place the basic research in perspective, this chapter will provide a critical review of selected literature on the general relationship between transport and economic development and then will turn to that dealing with the relationship between rural transport and economic development.

2.1 TRANSPORT AND ECONOMIC DEVELOPMENT - GENERAL

Economists and geographers have often investigated the role of transport in the economic development of nations. Their findings and positions differ but can be broadly classified into four groups. The role of transport in economic development has been perceived to be (1) promotional, (2) permissive, (3) promotional and permissive depending on the level of economic development attained, and (4) negative.

The promotional role implies a causal relationship from transport to economic development. The permissive role implies that transport facilities simply meets the demand which is created by activities initiated by forces external to transport sector and that they thus permit or support development. The third view suggests that a basic minimum of transport is necessary or promotional; once this is provided, its role essentially meet a threshold requirement. In its negative impact, transport affects local activities adversely by facilitating external competition, by increasing inequality in interregional development, and by absorbing scarce resources available in the country which might have better alternative use.

W.W. Rostow emphasizes the promotional role of transport in the process of economic development.[45] Transport is seen as a component part of a 'viable base' for modern industrial development.

> The point of substance is that the preparation of a viable base for a modern industrial structure requires that quite revolutionary changes be brought about in two non-industrial sectors: agriculture and social overhead capital, most notably in transport.[46]

He argues that the railroad is "the most powerful single initiator of take-off" in the economic histroy of the United States, and that it "played an extremely important part" in the economic development of other developed countries as well.[47]

In the period of take-off, transport played three important roles in the economic development of the United States. First, transport charges were reduced, new areas were con-

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[45] W.W. Rostow, The Stages of Economic Development, (Cambridge: Cambridge University Press, 1960), pp.24-26.

[46] Ibid., pp. 25-26.

[47] Ibid., p. 55.

nected, and commodities were brought to the market; thus the market was enlarged by the railway transport network. Second, it contributed to the development of the export sector of the economy which generated capital for internal growth. Third, the growth of the railway led to the development of the iron, coal and engineerng industries.

Rostow identifies three characteristics of social overhead capital such as transport. They are a long gestation period, lumpiness of investment, and impersonal benefits. Because of these characteristics, the government of a country should play its role in providing social overhead capital.

> it is clear that a very high proportion of total investment must go into transport and other social overhead capital....[48]
> ....Government must generally play an extremely importment role in the process of building some overhead capital.[49]

Thus, according to Rostow, the role of transport in the process of economic development is promotional and significant, and he is positive about government provision of transport facilities.

Wilfred Owen recognises many factors which contribute to the development process.[50] None of them alone is sufficient to bring about material well-being for the people, but

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[48] Ibid., p.24

[49] Ibid., p.25

[50] Wilfred Owen, Strategy for Mobility, (Washington: The Brookings Institution, 1968), p.1.

transport is important.

> Transport is a necessary ingredient of nearly every aspect of economic and social development. It plays a key role in getting land into production, in marketing agricultural commodities, and in making forest and mineral wealth accessible. It is a significant factor in the development of industry, in the expansion of trade, in the conduct of health and education programs, and in exchange of ideas.[51]

From the historical standpoint, he argued that transport had provided an important base for economic development in the United States, Japan, the United Kingdom and other developed countries.

The ways in which he perceives that transport has played its role in the developed countries, and still can do so elsewhere, are the following. First, it reduces shipment cost. Second, it saves shipment time. Third, it widens markets both internally and externally. Fourth, it helps industrial growth by ensuring the timely supply of fuel, raw materials and spare parts. Fifth, it changes the outlook of the people affected in a constructive manner. Sixth, it provides an incentive for the emergence of entrepreneurship. Seventh, it facilitates the provision of information about and the diffusion of, new technology. Eighth, it helps combat sickness and disease. Finally, it helps maintain the internal integrity and internal security of a country.[52]

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[51] Ibid., p.1

[52] Ibid., pp.5-9, 22-29,83

Owen also observes a causal relationship between poor transport and poverty in developing countries. "Poor transport is a major factor in world hunger."[53]

In the agricultural sector, poor transport has several adverse effects. The high cost of transport or inaccessibility to markets discourages the production of surpluses; thus the volume of production is affected. It causes delays in shipment of agricultural products and as a result perishable items are damaged during shipment. Further, it causes delays in getting agricultural inputs like fertilizer, pesticides etc. Finally, it is an obstacle to the receipt of information on better technology.

The manufacturing sector is also affected by a poor transport system. Inadequate transport adversely affects the timely supply of food, raw materials and spare parts. This limits the operation of machines and equipment to below capacity levels. Difficulties in rapid shipment necessitate large inventories to be maintained for meeting fluctuations in demand. Immobility reduces the size of the market, both internally and externally, and limits the benefits obtainable from specialization and trade.

Owen provides what he calls "impressive statistical evidence" of the developmental role of good transport systems in Bolivia, Thailand, Costa Rica, Liberia, Egypt, India, and other nations, to illustrate their beneficial promotional

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[53] Ibid., p.5

effects.[54] The literature on economic development has been relatively silent about the transport element in the development process. This silence, according to Owen, is due party to the lack of proper understanding of the role of mobility and accessibility in economic development.[55] Owen observes that the role of transport is promotional in principle, but its effectiveness may depend on the special circumstances of individual countries. The developmental role of transport may be limited, and even negative, depending on circumstances and the appropriateness of the policies adopted.

Mistakes in transport policy may take the form of "errors of location, technology, design, timing, or the mistake of investing in transport at all."[56] Efficient transport planning must consider investment priorities, the growth potential of the area to be served by the transport facility, and investment in the complementary projects. A good transport network across the north pole will have little developmental impact.

In sum, the role of transport, according to Owen is positive and promotional provided that its effects are not offset by faulty policies on location, technology, design, timing, and alternative investment priorities.

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[54] Ibid., pp.7-10

[55] Ibid., p.14

[56] Ibid., p.18

George W. Wilson posits that transport is a stimulus to increased production, but warns that its effectiveness depends on two conditions - the creation of economic opportunity and the response to economic opportunity.[57]

The first condition depends upon the resource base of the areas served by transport service, transport charges, and levels of commodity prices. The second requires awareness of economic opportunity and appropriate attitudes towards economic change.

Wilson argues that if a new territory is connected by a transport network, the developmental impact will vary depending on the fertility and suitablity of the soil and/or forest for production. If the quality of the land is good, transport cost reduction and connection of the area with markets will lead to increased agricultural production. This increased production will have little or no effect on prices as they are determined outside the local area and the stimulus to development will not be lessened.

When transport charges fall, revenue in the transport sector is affected to the degree determined by the elasticity of demand for transport and the unit cost of transport service. If unit costs of transport service fall with volume and the demand for transport service is elastic, both producers of commodities and transport operators will ben-

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[57] George W. Wilson, "Towards a Theory of Transport and Development" in B.H. Hoyle(ed), Transport and Development, (London: Macmillan, 1973), pp.208-230.

efit. However, the creation of opportunity is not enough to provide promotional effects if there is no response from the people. The response may be positive, zero, or even negative depending on different socio-economic factors.

The response to the opportunity created by transport improvement depends on three factors: awareness of the opportunity and the attitude of the people towards economic change, availability of funds for investment, and the volume of potential benefits compared to those of alternative investment opportunities.

Awareness depends on the number of people affected by the transport network and their accessibility to it. If only a few people are served by the transport facility, response is expected to be low. Again, even if it is constructed through a densely populated area, but is not accessible, response will be limited.

For instance, a pipeline serving two particular points may result in very little response whereas an unlimited access road can have a strong effect. Wilson notes that a road network is more accessible than any other mode of transport and has a high capacity for response.

Attitudes to investment depend on the nature of investment. Some kinds of investment may directly influence production with little effect on attitude. For example, if some machines are added to a firm, the production can be increased with no impact on human attitudes. On the other hand, investment in education does not directly increase production, but it does influence attitudes towards economic life and change. According to Wilson, transport is intermediate between these extremes, i.e. transport influences both attitude and production simultaneously.

The second factor influencing response is the availability of finance. If there are no funds for investment, entrepreneurs cannot initiate economic activity. Sometimes local finance is limited but people from elsewhere may come forward to capitalize on the opportunity created by transport facilities.

The availability of finance is, however, only permissive in nature. The utilization of investable funds may depend on the presence of other favorable conditions for investment. For example, if the import of vehicle and spare parts is restricted by the imposition of heavy taxes, investment on trasport trade can be severely limited.

Finally, the response to opportunity created by a transport system depends on the magnitude of benefits obtainable from it. If the potential benefits do not compare favourably with investment alternatives, the response will be limited.

In short, although the role of transport in economic development is promotional, its effectiveness depends on how much opportunity is created by it, and the response of the people to this opportunity, which further depends on awareness, attitudes, availality of finance, and the volume of potential benefits.

B.H. Hoyle points out that there is an optimum transport capacity for every country which depends on the level of development attained.[58] The relationship between transport and economic development is dependent on the particular nature or range of the transport mode involved, the nature of the economy in which the transport facilities are to be operated, and the present level of economic development of that economy.

Hoyle divides modern transport services into two broad phases - initial transport provision and transport elaboration. The first phase, initial transport provision, ranges from zero transport availability to a level below which it limits economic growth. This phase "involves the construction of major rail arteries, modern roads and port facilities."[59] Transport in this phase creates a "wide variety of new economic opportunities ... and is therefore likely to promote growth."[60]

Once this phase is completed, further development of transport is likely to be permissive or supportive rather than promotional. In this phase, transport constitutes one of several factors in which investment can be channeled pro-

[58] B.H. Hoyle, "Transport and Economic Growth in Developing Countries : The Case of East Africa", ibid., p.51

[59] Ibid., p.51

[60] Ibid., p.13.

ductively. Transport elaboration "involves the extension of the basic system including improvements in the efficiency, which permits a higher level of economic development."[61]

Transport, in Hoyle's analysis, is a "sine qua non" for the LDCs because it is "the key to modern economic growth" in these economies. Its role is promotional at the initial stage of development. Its elaboration thereafter "does not necessarily encourage any further growth" unless complementary investment is made elsewhere. This appears to imply that the role of transport can in principle be promotional even after the initial stage if it is supplemented by other measures.

An ideal-typical sequence of transport expansion from the geographic and politico-economic standpoint has been illustrated by Edward J. Taaffe, et al.[62] There are six phases of transport expansion which are related to different levels of economic development. The first phase involves only scattered small ports for the locational convenience of domestic fishing and occasional trading vessels. In this phase there is a very limited number of hinterlands.

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[61] Ibid., p.51.

[62] Edward J. Taaffe, Richard L. Morrill and Peter R. Gould, "Transport Expansion in Underdeveloped Countries : A Comparative Analysis", ibid., pp.32-49

Penetration lines are built in the second phase to connect administrative centres in the ports with the interior areas for military and political control, for mineral exploitation and for access to areas of potential agricultrual export production. These connections have two important effects. First, they create comparative locational advantages for the areas connected to the ports. Second, the importance of ports connected by penetration lines increases compared to others. Hinterland transport costs are reduced and markets expand at both port and interior centres.

The third phase involves the emergence of feeder roads which focus on the ports connected by penetration lines and on interior centres. The major ports can enlarge their hinterland as a result of these feeder routes, which also give rise to small nodes along the lines of penetration. The importance of other ports without interior connections continues to fall.

As the feeder development continues, and some nodes along the penetration lines enjoy more feeder connections, areas of interior concentration emerge. This is phase four. Further, with feeder connections for the major ports and the interior nodes the important nodes require linkage. This is done in the fifth phase. Finally, phase six is the period of the development of national trunk routes or main arteries for the connection of important places of economic activity.

This type of transport expansion with economic development, or economic development with transport expansion, may be seen in countries where economic activities are initiated and dominated in the beginning by external forces. This is the case in some African countries which Taaffe et al are studying. It may not be proper to generalize this type of sequence for all developing countries. One may, however, see the relationship between transport and economic development in this sequence. Transport increases the importance of some areas rather than others, which implies that the connections are initially promotional. In the later phases, important centres of economic activity are interconnected to meet the demand for movement among the centres. This implies a permissive role of transport development.

Albert O. Hirschman provides a general relationship between social overhead capital(SOC), the hard core of which is restricted to transportation and power, and direct productive activities (DPA).[63] According to him, the role of SOC is permissive, but some SOC is a prerequisite of DPA.

> Investment in SOC is advocated not because of its direct effect on final output, but because it permits and, in fact, invites DPA to come in.[64] SOC is required as a prerequisite of DPA investment. Access to an area by sea, road, rail or air is indispensable before other economic activities can

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[63] Albert L. Hirschman, The Strategy of Economic Development, (New Haven : Yale University Press, 1960), pp.83-89.

[64] Ibid., p.84

unfold there.[65]

Beyond this initial requirement of some SOC investment, the relationship between SOC and DPA is technologically indeterminate within a wide range. Within this range, the cost of DPA output will be inversely related to SOC availability. There exists an optimum combination of them, but the scarcity of resources in LDCs may restrict the achievement of this optimum. A path of unbalanced growth between SOC and DPA is conceivable. Two principal sequences have been suggested : one in which growth is associated with excess capacity of SOC, and another which starts with a shortage of SOC.

The first sequence with excess capacity of SOC makes DPA less costly and provides an incentive for investment in DPA. In the second sequence, the DPA output will be expensive, whereas investment in SOC may be encouraged which in turn facilitates DPA output. Thus both sequences encourage development, the relative effectiveness of which depends on the strength of entrepreneurial motivations and on the response to investment in SOC to reduce obstacles to economic growth from high transport costs.

The trend towards the permissive view of the role of transport has led to a major work which re-examines the contribution made by transport in the economic development of

[65] Ibid., p.86

North America. Contrary to the generally held belief, some writers, for instance Cootner and Fogel, attempted to show that railways did not promote or precede economic development in the United States, but rather followed it.

Cootner recognises that "the development of relatively cheap land transport was of critical importance" for the rapid economic development of the United States.[66] But, according to him, one should not infer from this that railroads acted as a positive stimulus to development. Railroads did not promote or precede growth, but followed it to meet demand for transportation.

The demand for transportation was created by three basic types of movement needs. First, the rapid growth of urbanization created a high demand for wood to be used both as fuel and for house construction. The nearest supplies were exhausted so that distant sources of supply had to be reached. Second, the growth of scattered urban centres resulted in an additional demand for the movement of passenger traffic among them. Canals could not compete with the railways because of their slow speed. Roads had also a lower speed than rail. In the late 1830's trains could travel at 60 miles per hour compared to 15 or 20 miles per hour by road. Third, there was the emergence of intercity trade in

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[66] Paul H. Cootner, "The Role of Railroads in United States Economic Growth", Journal of Economic History (September, 1963), pp.477-521.

commodities.

The role of railways in the United States was to meet demands for mobility at lower cost rather than to act as a stimulus for economic growth.

> The main significance of railway for United States economic growth in the 1830's was that it enabled this country to expand its population and production at a lesser cost than would otherwise have been the case, rather than that it was the driving force of United States economic growth.[67]

It has been generally argued that the development of railways in the United States contributed to the growth of iron and steel industries. Cootner argues the opposite. According to him, iron and steel consumption by the railway transport system was "a drain and not a stimulus to economic development."[68] However, this was overbalanced by benefits through the provision of mobility at cheaper cost.

Robert Fogel critically evaluates the role of railroads in the development of United States economy.[69] He examines the contribution of 'railroads in terms of primary consequences, essentially transport cost savings, and derived consequences or 'changes in the spatial distribution of economic activity.' In both respects, the role of railroads is not impressive because shipment by waterways could have been

[67] Ibid., p.501.

[68] Ibid., p.514.

[69] Robert William Fogel, Railroads and American Economic Growth, (Baltimore: John Hopkins University Press, 1964).

much cheaper than by railways. This, however, makes no allowance for other costs involved in transport by waterways such as time costs and cargo losses in transit. Making allowance for such costs, transport cost savings could be positive, but insignificant compared to the gross national product of the country. These savings contributed only a six-tenth of one percent of GNP in 1890. Therefore, according to Fogel, the role of railroads in reducing transport costs was unimpressive in the economic history of the United States.

The role of transport in the economic development of two major communist countries, namely the USSR and China, has been examined by Holland Hunter.[70] Transport policy in these countries has been "the servant of heavy industry". The establishment of heavy industry has been the national priority in order to "catch up with and surpass the advanced economies of the west", to the deliberate neglect of agriculture, other light industries and passenger transport. Transport facilities were provided only to meet the demand created by heavy industries located in a few points and not to provide social overhead capital to encourage decentralized entrepreneurial activities. This was done by the intensive use of existing facilities, with the creation of new transport only if existing ones cannot meet demand even after such inten-

[70] Holland Hunter, "Transport in Soviet and Chinese Development", Economic Development and Cultural Change (1965), pp.71-84.

sive use.

Hunter inferes, from this communist experience, support for the position "that the massive expansion of transport capacity is not a prior condition for economic progress,"[71] although it aids developmental activities. He arrives at "injunctions" for developing countries. First, make use of inherited railroads intensively round-the-clock by employing more labor, increasing capital productivity and rebasing scarce resources for industrial development. Second, build facilities for transport "sparingly" creating, in terms of Hirschman's terminology, a shortage of SOC and excess DPA, since, even if the balance between them would be better, the LDCs cannot afford it. Third, examine and explore all the possible "technological options" and use the one having a comparative advantage.

In sum, according to Hunter's view, transport has played only a permissive role in this communist experience. The lessons can usefully be appliedd by countries presently wishing to develop.

There have been several attempts to analyse the negative role of transport systems. First, there has been the use of Gunnar Myrdal's analysis of regional economic inequalities.[72] Myrdal argues that any sudden and deliberate change

[71] Ibid., p.83.

[72] See, for example, G.W. Wilson, B.R. Bergman, L.V. Hirsh

in a region produces two kinds of effects, backwash effects and spread effects.[73] The backwash effect draws investable capital and human resources from other regions to an expanding one. Thus an expanding region supported by transport changes will develop partly at the cost of other regions raising the possibility of increasing regional economic inequalities.

The spread effect arises when non-expanding regions benefit from expansion elsewhere. If industries in the expanding region use raw materials produced in some other regions, employment, output, and income will increase in those regions. Extension of the expansionary effect to non-expanding regions thus occurs.

According to Myrdal, the relative strength of the backwash and spread effects depends on the level of economic development in the country involved. The strength of the spread effect is positively, and that of the backwash effect is negatively, related to the level of economic deveopment that a country has already achieved. The LDCs of the present world are therefore expected to have higher backwash than the spread effects. In such cases, if economic opportunities are created by transport expansion, this will lead

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and M.S.Klein, <u>The Impact of Highway Investment on Development</u>, (Washington: The Brookings Institution, 1966), pp.9-10.

[73] Gunnar Myrdal, <u>Rich Lands and Poor</u>, (Harper and Row, 1957), pp.23-38.

to regional inequality in the distribution of developmental efforts and activities.

A protectionist argument is developed by Schumacher.[74] The essence of the argument is simply that initial industrial development requires protection from competition of superior goods produced in relatively developed areas. If infant industries are not thus protected, they may die during infancy. Protection is provided, in part, by high transport costs. In this situation, if a transport system is improved, the protection is withdrawn and the resulting competition may damage existing industrial activity and industrial expansion.

This argument implies an effect opposite to the preceding one. While transport expansion leads to the economic development of a region at the cost of others in the former, it retards development of the region in the latter because of the competition from other regions.

Finally, there is concern about misallocation of resources. Transport expansion or improvement may absorb some of the scarce resources which might have better alternative uses elsewhere. If this is so, growth will be restricted. Errors in the planning of investment may arise when both quantifiable and non-quantifiable benefits are to be includ-

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[74] E.F. Schumacher, Roots of Economic Growth, (Delhi: Gandhian Institute of Studies, 1962), p.38.

ed in calculations as often occurs in the case of transport investment. Wilson et al points out that predictions about the future benefits of transport investment may be subject to error because of 'the lumpiness, longevity and externalities associated with transport' investment which make the calculations of costs and benefits more difficult.[75]

2.2 A CRITIQUE

The preceding review of selected analyses of the role of transport in economic development reveals a wide range of issues and arguments in this field of controversy. It does not seem appropriate to argue in a generalized and mutually exclusive way that the role of transport is promotional, or permissive, or negative, or that it contributes positively in economic development without qualification, or that its effect on economic growth is only restrictive.

The relationship between transport and economic development is a two-way inter-action process having elements of both promotion and permission with a possibility of negative impact if transport policy is improperly formulated.

It is the relative strength of the two roles, promotional and permissive, that is important from an analytical and policy standpoint. It seems reasonable to argue that a basic minimum of transport facilities will have a relatively

[75] Wilson et al, op. cit., pp.9-10.

stronger promotional role. The non-linkage and isolation of a region may lead to self-reliant and self-supporting farming without providing any incentive to produce surplus and to specialize, since there is no mobility for marketing. In addition, production may be affected by an inadequate or untimely supply of inputs when movement and shipment are difficult. In this situation, the provision of transport linkages facilitating the purchase of inputs and the sale of output may change the whole nature of economic activity in the area. Such promotional effects of initial transport provision continues up to a threshold level, beyond which the promotional role gets weaker than the permissive role, and below which the inadequacy of transport limits economic growth.[76]

It is, however, difficult to determine this threshold level. There is no clear criterion to suggest a level below which the inadequacy of transport may have a detrimental effect on growth and therefore its provision is most likely to be promotional. Again, any generalized rule may not be applicable everywhere; rather it may depend on the individual circumstances of a particular case. In a region with high growth potential, the provision of transport is expected to have stronger promotional effects than in a a region without it. The growth potential may include several things includ-

[76] A similar position is held by Hoyle. See his "Transport and Economic Growth in Developing Countries : A Case of East Africa", B.H. Hoyle, ed., op. cit., p.51.

ing human and natural resources, their magnitude and quality; geographic relationships, etc. When these factors are considered, it may well happen that transport provision in one area may be promotional and may provide incentives for further production, whereas the same provision is simply permissive in other regions of the same country.

Hirschman's analysis, which implies a kind of substitubility between SOC and DPA, appears to overemphasize the role of transport. Once the threshold level of transport is provided, its function is not the creation of economic opportunity or the initiation of economic activity, rather it can support DPA investment. At that level, it is difficult to achieve further growth by creating an excess capacity of SOC and a shortage of DPA, because the role of transport is then mainly to support DPA and is not an equally effective substitute for it. The shortage of DPA investment is likely to affect growth adversely even if there is excess SOC, since the additional SOC will not have anything to support.

Hunter's advice to the LDCs to take a lesson from communist experience may not be appropriate for many less developed countries. The railway networks in these countries are often not extensive. As a consequence, a mere emphasis on the intensive use of existing railroads will leave many areas isolated and unreachable. In addition, most of the LDCs are still mixed economies, with varying degrees of public involvement in economic activities, and require the growth of private entrepreneurship for development. While a centrally planned economy can deliberately locate a planned industrial base on the basis of existing transport facilities, these institutional possibilities are unrealistic in many LDCs.

The negative case based on Myrdal's analysis seems to support in principle the promotional role of transport. What is negative is the side-effect on the development process initiated by transport provision. That is, the attractiveness of the region drives away human and investable resources from other regions thus leading to increased inequality in regional economic development. This side-effect should not necessarily follow if transport facilities are reasonably provided in all areas, instead by concentration on a particular region. In addition, transport may be used as a tool to attain equality in regional development. Relatively underdeveloped regions can be provided with improved transport facilities to accelerate their growth and development. The use of planning, to which Myrdal is sympathetic, provides a constructive distributional balance of effects.

The infant industry argument for the protection of local industries by imposing a transport barrier to potential competition overlooks the other side of the argument. If it is accepted that a transport barrier protects local industries from competition, this barrier may also adversely affect local industries by affecting the timely supply of inputs, raw materials and accessibility of potential markets. There seems to be a trade-off problem here. While competition is undesirable the loss of these benefits is also not desirable. The net impact will depend on the relative strength of these two undesirable effects.

The possibility of a negative effect of transport provision or improvement through the misallocation of resources is always possible. But this kind of error is not necessarily specific to transport planning, the same may happen in other sectors as well. However, the possibility of error may be high in transport planning. Emphasis should therefore be placed on the systematic analysis of benefits and costs.

To conclude, transport plays its role in the economic development of a country or region, the direction, nature and effectiveness of which depend on the level of economic development attained in individual cases and the appropriateness of policy and planning. An analysis without reference to the level of development already achieved by the country concerned may lead to misleading conclusions. It seems therefore appropriate for any serious examination of the relationship between transport and economic development carefully to specify the context in which the problem is to be dealt with, especially whether it is a developed country or a less developed country, because the role of transport may depend on the level of development achieved. In addition, it appears to be important to be more specific about the type of transport used within a country since different types of transport may play very different roles in the development process. While a transport system in a country may be classified in different ways, it is useful to divide it into arterial and rural/feeder transport for careful investigation in dealing with LDCs which are predominantly rural in nature. Because the objective of this study is to examine the role of rural transport in the economic development of Bangladesh, an examination of the findings of research on rural transport and economic development is now appropriate.

2.3 RURAL TRANSPORT AND ECONOMIC DEVELOPMENT

Less developed countries are predominatly rural in character. In general, about 80 percent of their population live in rural areas, and a major part of GDP and of foreign exchange earnings come from agriculture.

Unfortunately, systematic work and research on the role of rural transnport in economic development is limited. It has largely been neglected not only by development and transport economists but also by agricultural economists. This is striking in the light of the fact that transport stands first in the ranking of five 'essentials' for the development of agriculture in Mosher's paper on the problems of subsistence farmers. No systematic study in the economics of rural transport has been undertaken by any agricultural economist.[77]

Development economists concerned with the problem of underdevelopment in LDCs raise the issue of rural transport in an incidental manner. A few empirical studies have also been carried out by governments for policy reasons but they are kept uncirculated in official files.

However, it is useful to review some of the literature available which deals with rural transport, or includes it as a part of the problems related to agricultural or rural development. Three different views on the role of rural transport can be distinguished: positive, supportive, and negative. The first two types sometimes differ in an analytical sense but the most important difference is between these and the negative views. The negative view heavily stresses the distributive aspect of the problem but also

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[77] A.T. Mosher, "The Development Problems of Subsistence Farmers", paper presented at Agricultural Development Council Conference on Subsistence and Peasant Economics, Honolulu, Feb.28 - March 6, 1965, quoted in Southwood, Herman M., and Bruce F, Johnston, ed., Agricultural Development and Economic Growth, (Ithaca, New York: Cornell University Press, 1967), p.121.

recognizes the effect of rural transport on income growth. In addition, this view raises the question of investment priorites and opportunity cost. Although rural transport can contribute to economic growth, competing investment opportunities may have a higher growth potential. The positive or supportive views are dominant while the negative view has a small place in the relevant literature.

In Rural Transport and Economics Development, a study of the Rajasthan State of India, Tripathi consideres rural transport as a key to the economic prosperity of the state.[78] He explains how the inadequacy of rural transport can limit the economic development of a rural area, and how its improvement can make positive contributions. Lack of transport makes the village dwellers "fatalistic in beliefs and orthodox in practices", and consequently they remain deprived of the fruits of technological change in agriculture and are engaged in subsistence activites.

> Due to the unsatisfactory nature of transport, knowledge about improved agricultural practices, seeds, implements and fertilizers hardly finds its way to remote the villages with the result that their primitive self-sufficient economy seldom gives place to modern exchange economy. The absence of transport and communication facilities forces the life in rural areas to move at a very slow tempo.[79]

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[78] P. C. Tripathi, Rural Transport and Economic Development, (Delhi: Sultan Chand and Sons Publishers, 1972), pp.20-23, 133-154.

[79] Ibid., p.22

In addition, rural industrialization is important to provide work for the seasonally unemployed people in agriculture. If transport is not improved at the village level, rural industries will grow only along the existing roads and railways and this will contribute to regional disparity in economic growth. In short, rural transport makes facilities accessible to the people, allows interaction among them for the dissemination of ideas, and thus provides an important component of infrastructure.

The development of rural transport has been uneven in Rajasthan. However, transport helped the economic growth of villages where it was relatively adequately provided and its inadequacy restricted growth where it was poorly provided. The following reasons were cited. First, the cultivators are motivated to introduce new practices, and the inputs are distributed through the extension workers of a "panchayat Samiti", or local level organisation, covering an area of up to 14,000 square kilometers. Villages with better transport usually receive the first attention of the extension workers. As a result, 4 percent of the farmers recieved improved wheat seeds in 1961-62, and less than 10 percent of them got fertilizer in 1963-64. The supplies of other inputs as well have been discouraging. Second, it is estimated that additional land (up to 20%) can be brought under cultivation if a transport link is provided. The net area sown has increased in those areas where transport has been improved. Third, the cropping pattern is changed from subsistence to commercial crops in villages which were far from markets, but are now provided with transport facilities. The study shows a positive relationship between the availablity of truck transportation and the commercialization of cropping practices. Fourth, the trader penetration into villages having better transportation increases, leading to higher farm gate prices, and thus transport cost savings are passed on to the producers. Fifth, animal husbandry in Rajasthan is an important activity and this increased in villages which gained better transportation facilities because of better access to animal medicare and to markets. Sixth, new forest roads have led to a greater and more economic exploitation of forest resources. The forests of Kotra, Kumbhalgarh, Khairwara and Phalasia tehsils are, however, still underutilized due to the transport problem. Seventh, rural industries have developed in villages with good transport facilities, and their development have been negligible where transport is poor. In addition, education, health and other conditions have improved in areas with a good transport link. Thus, according to Tripathi, "rural transport is bound to occupy the key position" in any scheme of economic develoment in Rajasthan.[80]

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[80] Ibid., p.22.

Studying the role of transport in the context of Indian agriculture and rural development, Wilfred Owen suggests that transport is one of the prerequisites of development whose inadequacy acts as an obstacle to agricultural productivity.[81]

This study is directed to a rural area where eight percent of the village population are poor with one out of three villages being located more than five miles away from any improved road. The rural people move on foot over tracks, and transportation of goods is mainly by headloading or by bullock carts. Owen points out that the national target to increase food production requires the timely supply of inputs, implements irrigation, extension services and marketing facilities, all of which demand an efficient transport system.

According to Owen, poor transport is an obstacle to agricultural production inasmuch as a two-way marketing process is required. Inputs need to be supplied from the manufacturing sector, and crops marketed to the urban sector. Clay surfaces of rural roads get so slippery during the few months of the monsoon that the people cannot walk on them, let alone move vehicles. In this situation, it is hard to produce a commercial items such as fruits, vegetables and milk. Villages are limited to production for household

[81] Wilfred Owen, Distance and Development, (Washington: The Brookings Institution, 1968).

needs and cannot specialize in production. Owen provided examples of inter-regional productivity differentials which suggested lower productivity and higher deficits in areas having higher productivity potential but pooer transport than that in area of lower productivity potential but better transport. The reason is the different availablity of irrigation and other inputs which, according to Owen, varied directly with the transport facility. Thus, "in areas where the transportation is poor, supply problems have severely limited agricultural production."[82]

In the village of Wazirpur in the Gargoan district "significant changes" have been brought about by a 12-foot tarred road. Prior to the road, villagers could sell vegetables outside only twice a year, and now they can sell daily for cash. The rate of return in vegetable production is greater as well. This higher agricultural income is aided by an increase in the production and sale of milk. Fertilizer and other inputs became cheaper due to cost savings. The operation of a high school in the village has become possible, because the teachers can come from the nearest town riding bicycles. Women teachers are employed for the first time and student attendance has increased because of the easy mobility provided by the road. In addition, it has become possible to establish a dispensary in the village for medical care. The house construction industry has also been

[82] Ibid., p.56

supported and benefited by easy transportation of raw materials, for example, the transport cost of bricks by trucks is only one-tenth of the cost by animal. Owen provided other examples of such benefits of transport changes in Indian villages.

Thus, according to Owen, while poor transport severely affects agricultural and rural development, its improvement positively contributes to their development. He, however, suggests that the transport project should be integrated with the overall development effort to realize the fullest potential of transport improvements.

Laurence Hewes argues that the inadequacy of transport in LDCs limits the introduction of technological change in agriculture by impeding the regular and timely supply of inputs required for improved technology.[83] In addition, an efficient marketing system is important for rural development, and, therefore, the government is required to establish, operate and regulate rural markets. But, ".... in the LDCs the really critical impediment is the lack of infrastructure."[84] Roads and road improvements are necessary in order to make product movements possible for the farmers.

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[83] Laurence Hewes, <u>Rural Development: World Frontiers</u>, (Iowa: Iowa State University Press, 1974).

[84] Ibid., p.88

Hewes explains why there is so much intersectoral disparily between rural and urban areas of a country. According to him, it is not the difference in development potential but rather the deliberate policies of government through the provision of different magnitude of infrastructure facilities which makes the difference. Government allocation of funds for the provision of electric service, transport, roads, markets, storage and communication usually favor urban and industrial areas and facilitate their development. On the other hand, "It is partially in the failure to provide adequate infrastructure that rural areas have suffered general deprivation ... it is highly probable that the development potential of rural areas is much higher."[85]

Thus in Hewes's view, rural transport, which is an important element of infrastructure, is a critical factor for the introduction of technological change in agriculture, for the marketing of agricultural products, and for overall rural development. It is not the lack of growth potential that limits the development of rural areas, rather it is the deprivation of infrastructure.

In a study of rural development in Kenya, Hayer et al analyses the problems and prospects of an overall rural development of Kenya.[86] They have found that the efficient

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[85] Ibid., p.85

[86] Judith Hayer, Dunstan Ireri and John Moris, Rural Development in Kenya, (Nairobi: East African Publishing House,

provision of extension services, the introduction and development of new crops, and the provision of adequate marketing transport facilities are the important factors for developing the rural areas.

The size of the government staff for the provision of agricultural extension services in Kenya is adequate and financed by an expenditure equal to about 17 percent of the total value of agricultural output. These services cannot, however, be rendered efficiently because of transport problems. The transport infrastructure is inadequate and the petrol allowance for the extention staff is limited. As a consequence, "staff whose jobs should keep them out in the field most of the time are kept in their offices because they have no means of transport for their field work."[87] The "extension break through" is not, however, sufficient for agricultural development in all rural areas, rather some areas need the introduction of new crops appropriate for their soil.

According to Hayer et al, marketing faces two problems. First, the institutional problem which arises from the lack of flexibility in the publicly-organised marketing system which limits interdistrict trade and the size of market. Second, there is a transport problem.

1971), see in particular pp.1-14,103,107,108-109,114.

[87] Ibid., p.103.

Describing the state of transport infrastructure the authors point out, "the roads that exist are in danger of disappearing in many areas, and new roads need developing to meet the needs of changing pattern."[88] Emphasising the need for transport development, they posit "all efforts to increase production depend critically on communications and the ability to transport products efficiently all through the year."[89] In their recommendations they include the following transport related recommendations.

> We strongly recommend a more generous transport vote, coupled with effective control mechanism to ensure its economical use. We also recommend action on roads themselves.[90] Detailed proposals on roads and communications must form part of each and every pilot programme.[91]

Wharton divides agricultural infrastructure into two major groups:[92] (1) capital-intensive infrastructure which refers to services that "heavily involve reproducible capital for the provision of the service" and includes (a) irrigation and public water facilities, (b) transport facilities, (c)storage facilities, (d) processing facilities and

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[88] Ibid., p.114

[89] Ibid.,P.114.

[90] Ibid., p.103.

[91] Ibid., p.114.

[92] Clifton R. Wharton, Jr., "The Infrastructure for Agricultural Growth", in Herman M. Southworth, and Bruce F. Johnston, ed., Agricultural Development and Economic Growth pp.107-142.

(e) utilities; and (2) capital-extensive infrastructure which refers to services which require less capital and includes (a) extension education services, (b) agriculture research, (c) crop and animal protection, (d) social conservation service, (e) credit and (f) education and health facilities.

Transport facilities thus stand second in the capital-intensive agricultural infrastructure. According to Wharton, agricultural infrastructure is not functioning in a situation where farming is a subsistence activity meant for home consumption and not for marketing. But as soon as a transition takes place from subsistence to commercial farming, it is "inevitably linked with the developement of agricultural infrastructure", since market penetration by a farmer needs infrastructural services. When he enters the market, he requires "a path or a road on which to carry his production even if he carries it on his head or his back, and even if he only barters it with a few neighbouring villagers." In the early stages of development, infrastructure improvement accompanies market development which again accompanies a trend towards division of labor, specialization and commercialization of production.

The variables are interdependent and the direction of any causation is unclear. For instance, it is difficult to move perishable agricultural items to urban areas without adequate transport facilities. But there are also instances where transport improvements in an area with surplus producing potential has not generated higher marketed surplus. It is, however, known that without some minimum level of infrastructure, attempts to "stimulate more rapid increases in agricultural output will be frustrated", although the minimum level is unknown.

In short, according to Wharton, some undefined mininum level of transport infrastructure is necessary which stimulates increases in agricultural output beyond which the stimulus is uncertain.

Martin has suggested a strategy for agricultural development in Thailand where, according to him, there exists "an almost unique set of opportunities" for the development of agriculture.[93] Large increases in output can be achieved from two sources. First, by opening up and bringing additional land of approximately 20 million rai under cultivation. Second, by increasing land productivity.

In his suggested strategy to utilize the opportunities of developing agriculture, Martin recommended programs in order of priority. The first priority is effective agricultural research and extension programs. This includes applied and adaptive research for the improvement of agricultural activ-

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[93] Lee R. Martin, A Strategy for Agricultural Development in Thailand and its Manpower Requirements, (University of Minnesota, Staff Paper, 1974), pp.74-75.

ities, and an efficient agricultural extension service for the dissemination of technological change based on research findings and for providing required assistance while introducing them by farmers. The second priority is the provision of infrastructure. The function of infrastructure is to ensure the supply of required inputs "at the right place at the right time at the right price", storage, and a transport and an efficient marketing system which is "a prime prerequisite for specialization". The third priority is irrigation and the fourth priority is structural changes in the agricultural institutions of Thailand. The final priority is land development.

Thus, according to Martin, infrastructure and transport stand second in the priority list for the development of agriculture in Thailand, which is a definite and very high ranking of transport in a development program.

The Overseas Development Group (ODG) of the University of East Anglia and the Planning Commission of the Government of Bangladesh have jointly carried out the study of rural transport in Bangladesh mentioned earlier.[94] The two sides of the study team differ in their conclusions on the role of rural transport in the development of rural Bangladesh. This report will be critically analysed in the following chapter because of its basic relevance to this work.

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[94] Bangladesh Rural Transport Study.

2.4 A CRITIQUE

There are many factors which contribute to economic growth and development. It is sometimes observed that some writers, while arguing for one of them, tend sometimes to overemphasise its role and some others, while arguing against it, tend sometimes to underestimate its probable contribution. An unbiased analysis should take all factors with their strengths and weaknesses into consideration.

In his discussion of rural development, Tripathi seems to have emphasised transport too heavily. There may be additional factors other than transport which are important if the full benefits of transport changes are to be realized. In fact, other factors might have contributed in important ways to the development of the villages mentioned by Tripathi and Owen. The benefits of transport changes may be greatly limited if not supplemented by other complementary investments. For instance, if a very good transport network is provided, but the supply of agricultural inputs is limited, agricultural development will not take place as desired or planned. One should be careful in singling out one factor like transport for supporting or stimulating economic development.

A similar trend may be noticed in Hewes's analysis of rural transport. Apparently he holds both a supportive and positive view of the role of transport. His analysis of the differential growth of rural and urban areas appears to imply a positive role of transport in the sense that its provision or improvement along with other infrastructural facilities lead to the rapid growth and development of urban areas, despite the higher growth potential of rural areas. On the other hand, his position that the inadequacy of transport imposes a serious obstacle to rural development is supportive.

There may be small towns even in developed countries where the infrastructure is well-developed with growth rates far less than that of big cities. This implies that there may exist other important factors which are mainly responsible for the speed of urban growth. The location of governement offices and of industrial establishments are among those which may be determined by both infrastructural and other considerations. Therefore, the differential growth of infrastructure including transport may not be singled out as the determinant of differential growth and development of rural and urban areas. Also, the growth rate of agriculture cannot compete with the industrial growth rate as soon as some of the obstacles of traditional economies are removed. This growth differential seems to be a reflection of differences in inherent growth potential. While it is not denied that the inadequacy of physical infrastructure may impede rural development, it seems an overemphasis for Hewes to say something which implies that rural areas could have been developed at a faster rate than the urban areas if an equal amount of physical infrastructure were provided.

Wharton includes a variety of services in the definition of infrastructure, but drastically narrows it down in his analysis. Transport dominates his discussion of rural infrastructure. According to Wharton, infrastructure is important for commercial farming since it provides marketing facilities that are lacking in subsistence farming. This implies a lack of understanding of the role of rural transport. Rural transport is not only important for the attainment of commercial farming practices, it can also contribute to the development of subsistence farming. In LDCs, the majority of the population in rural areas are underfed and poorly sheltered due to lower agricultural production caused by the limited ownership of cultivable land, and by the lack of modern inputs and extension services. Agriculture should be developed even for subsistence to which rural transport may make its own contribution.

Priorities of the development program for Thailand have been established by Martin with transport as the second priority. This seems to be the only definite priority ranking of transport in a development program advocated in the literature dealing with development problems of rural areas. As indicated by Martin, there exists a great growth potential in the opening of new areas in Thailand for cultivation. He has not, however, provided any explanation why these are presently uncultivated and how those can be brought under cultivation. In a lengthy paper, he has given a detailed analysis of the different elements in the five priorities, but has failed to indicate the interrelationship or complementarity among them.

In brief, these are the major strengths and limitations of existing literature. Of special interest is the evaluation of rural transport in Bangladesh; the study now turns to the critical analysis of the Bangladesh Rural Transport Study.

Chapter III

CRITICAL ANALYSIS OF BANGLADESH RURAL TRANSPORT STUDY

The Bangladesh Rural Transport Study, described briefly in the Chapter 1, is the first systematic inquiry into rural transport issues in Bangladesh. It bringins the rural aspect of the Bangladesh transport system into formal economic analysis, finding related facts, and raising controversy as to the role of rural transport in the development of rural Bangladesh and the distribution of income.

The most interesting part of the study is that the two components of the study team, the ODG and BTS, have come up with a separate set of 'Summary and Recommendations' after having completed the study jointly and having agreed on the content of the text of the report. The ODG does not see in the existing condition of rural transport a major constraint on the development of rural sector of Bangladesh economy while the BTS does. constraint to rural development.

It is important to examine this study critically and in some detail before proceeding to further research for several reasons: to avoid any duplication of work; to enable one to see the strengths and weaknesses of the study, which might have affected its findings, conclusions and recommendations; and to identify those issues ommitted from or perhaps dealt with inadequately in this work. Several aspects of the study will therefore be critically examined: (1) the key issues, (2) the methodology, (3) the evaluation of rural transport improvements, (4) the role of rural transport in the integrated rural development, (5) the conclusions, (6) the two sets of summaries and recommendations, and (7) the summary and concluding remarks.

3.1 KEY ISSUES AND QUESTIONS

It is clear that the 'Bangladesh Rural Transport Study' is intended to investigate the issue of rural transport in Bangladesh. There is some confusion, however, about the particular questions to be investigated and goals to be reached. The "Preamble" announces that

> This project was devised to find out the present methods of rural transport, their costs, their capacities to absorb the increased traffic consequent upon development programmes, the variation within the country and between the seasons in rural transport methods, and how the agricultural commodities get from the farm gate to the arterial transport system.[95]

In addition, this study is designed to examine "the extent to which rural transport is a constraint upon rural development",[96] and to make public policy recommendations as to the incorporation of rural transport matters in the programs of

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[95] Bangladesh Rural Transport Study, p.1.

[96] Ibid., p.2.

planned development. In Section 2 ("Terms and References"), however, a somewhat different set of objectives is listed:

> 1 .To establish present and likely future method of rural transport and how this feeds into the arterial network which was the concern of Bangladesh Transport Survey.
> 2. To establish an appropriate methodology by which rural transport considerations can be included within overall rural development planning.
> 3. To make recommendation concerning the future staffing and training of the Transport Survey Section of the Planning Commission.[97]

In order to reach these objectives, the study is said to fall into four parts: (1) examination of different government departments "to establish the extent to which rural transport is considered in present development planning"[98] selection of the study area, and determination of the size and nature of the study; (2) collection of as much data as possible on current and planned development programs of each sample area in order to investigate the probable effects of them on demand for transport; (3) examination of the rural transport situation in representative areas of Bangladesh, the capacity of existing modes, their costs and potential for absorbing the increased demand for transport required for greater movement of inputs, estimation of the resulting costs, examination of "the extent to which the present methods of rural transport is a constraint on development",[99]

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[97] Ibid., p.5

[98] Ibid., pp.5-7.

[99] Ibid., p.6.

and the likely effects of other development programs on rural transport, evaluation of any necessary changes in the methods of rural transport, examination of the possibility of more economical use of existing rural roads, and investigation of the expected distribution of costs and benefits of transport changes; and (4) recommendations on the basis of findings. Raising such a broad range of issues obscures the key issues to be investigated.

The set of objectives listed at the beginning of Section 3, "Methodology," has been shortened and greatly narrowed. According to this list, surveys are designed to collect information on the movement and costs of movements of goods in rural Bangladesh, the method of collecting and distributing inputs and outputs below the interdistrict arterial system, and the movement of goods between farmers and traders, and to collect basic data on the transport infrastructure with special reference to the existence and state of roads and waterways. "The local level transport information was related to a wider development context through the collection of information at both thana and district levels on agricultural production, population, irrigation, fertilizer used, HYV seeds, etc."[100] It is not clear whether these are the objectives of the study, or the objectives of surveys.

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[100] Ibid., p.8.

In Section 4, "Evaluation of Rural Transport Improvement," a "conventional analysis" is first employed to evaluate the effects of rural transport improvements and its inappropriateness is indicated. As a result, the study proposes a broader approach which emphasises the need to examine following issues:

a) the distribution of transport cost savings (among producers, truckers, traders and other parties affected by the road);
b) the probable response of producers to any resulting output and/or input price changes;
c) the existence of other constraints, particularly obstacles to increased agricultural output, which may prevent the full developmental impact of the road from materializing.[101]

Thus each of the first four sections of the study raises a whole list of issues for investigation. Although they are inter-related, no well-defined set of key issues is specified for the study. A very extensive study would be required to do justice to such a variety of issues.

A comment on the coverage and adequacy of issues for the evaluation of rural transport improvement is in order. Conventional analysis bases such an evaluation on user cost savings but by now it is well-established that this kind of analysis is not appropriate for evaluating low-traffic rural transport, the developmental benefits of which may be far greater than user cost savings.[102] The inappropriateness of

[101] Ibid., pp.29-30. pp.29-30.

[102] See, for example, R. T. Brown, et al, Highway Research Record No. 115, p.29.

conventional analysis has also been indicated by the study in question, but for a different reason: "... it is not sufficient for us to be satisfied that value added in a region is increased, but we need also to consider the distribution and composition of that value added, as well as the likely potential for increase in the value added in the future."[103] The study's approach extends the "orthodox" analysis by including the issues of distribution of user cost savings and of obstacles which may impede the developmental effect of user cost savings.

The proposed approach is more inclusive of issues, since it includes distributional aspects in the analysis. But it is less inclusive in another respect. While the traditional approach includes only a part of the benefit (user cost savings) and ignores all developmental benefits, the proposed approach casts doubt on the realization of even user cost savings and neglects developmental benefits. Therefore, the study's inclusion and coverage of issues for the evaluation of rural transport provision or improvements in the study does not appear to be adequate.

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[103] Bangladesh Rural Transport Study, p.28.

3.2 METHODOLOGY

The study is empirical in nature. Relevant data are collected from both primary and secondary sources. The thana is chosen as the basic unit of the field survey and five out of 485 thana of Bangladesh are selected to represent the geographical differences of rural Bangladesh. Secondary sources include district and thana level offices of the government of Bangladesh.

Because the analysis of other issues depends on the quality of information collected, the selection of thana for the field survey should be as free as possible from selection bias. For convenience of transportation and accommodation, such thana are selected which are more or less close to main roads, while those which are located at considerable distance from main roads are not selected: "... only in exceptional circumstances was it possible to include areas of the country at considerable distances from the main roads."[104] The only such thana selected (Sulla thana) is a riverine haor[105] area which is extremely low, and hence unrepresentative of rural Bangladesh. The study describes it as a "special haor area deeply flooded for much of year."[106] Except

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[104] Ibid., p.8.

[105] A haor is a very low area which remains under water fairly a long time of the year and is vulnerable to frequent flooding.

[106] Ibid., p.11.

for this special case, the other selected thana are more accessible than non-selected ones and hence again are non-representative of rural areas in Bangladesh.

This probable selection bias may have affected the evaluation of rural transport changes. The very fact of selecting thana close to main roads for the convenience of transport indicates that the selected areas are superior to other areas in transport facilities, accessibility and mobility. The evaluation of rural transport in a selected thana may be different from the evaluation of a thana not selected because of its inaccessibility. For instance, let us address one issue raised by the study : whether the existing capacity of transport modes has the potentiality of absorbing increased demand for transport consequent upon development programs. It seems quite legitimate to expect that data collected from the former (selected thana) would lead to a positive answer, while data collected from the latter (non-selected thana) may well be negative because of its present inaccessibility. In other words, the relevant data may call for the provision of rural transport in the latter, and not in the former, because initial transport provision in an inaccessible area is expected to be promotional, while further improvement may be simply supportive.[107] Thus the selection bias might have affected the analytical results.

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[107] See, for example, B.H. Hoyle, "Transport and Economic Deveopment : The Case of East Africa" in B.H. Hoyle, ed., op. cit., pp.208-230.

The selection of households for interview within the selected thana may be another source of bias. On the average, interviews were conducted in 180 households from each thana area, with an equal number taken from each of the following size groups of land holdings : 0-4, 4-10 and 10+ acres, which are termed as small, medium and large farms respectively. The equal proportions indicate a bias toward large farmers, who are less common in Bangladesh.[108] Furthermore, the farmers were asked to be available at the Union Council office on a specified day.[109] This is again a source of bias in favor of large farmers in each size group. This bias has been recognized by the study as well[110]

The method of conducting market surveys[111] similarly calls for careful attention, because much of the evaluation rests on information collected by these surveys: the volume and kind of commodities moving through different markets of

[108] The land ownership and hence size distribution of farm land holding is highly skewed in rural Bangladesh. The number of landless and small farmers is by far greater than that of large framers. In 1978, the percentage of small, medium and large farmers was respectively 88, 9 and 3, whereas they owned respectively 44%, 31% and 25% of area with 15% landless owning no land. See F. T. Jannuzi, and James T. Peach, The Agrarian Structure of Bangledesh : An Impediment to Development, (Colorado: Westview Press, 1980), p.19.

[109] See Bangladesh Rural Transport Study, p.14. (Administratively, a few villages constitute a "Union" and few "Unions" constitute a "thana").

[110] See ibid., p.14.

[111] This is mentioned in the study as 'hat survey'. 'Hat' is the local Bengali name of 'market'.

the thana area, the origin and destination of these commodities, the modes of transport used for the shipment, the cost of transportation, etc.

The study divides rural markets into three size categories and calls them primary, secondary and tertiary markets. It does not, however, provide any definition of these categories. Seven to eight markets of each thana have been selected for surveys on the basis of location and size. Each market has several entrance points. Two enumerators were appointed to each of these entrance points. One of them was supposed to record the arrival of paddy, rice, jute, and vegetables by the following modes: head loading, shoulder loading, bullock cart, country boat, pedal rickshaws, autorickshaws and truck. He was required to record not only the commodities shipped, but also the volume of those shipped by different modes.[112]

Another enumerator was assigned to collect from every tenth shipper more detailed information on the volume and origin of each type of commodity carried by the different modes. In particular, he was supposed to record information on the occupation of the transporting person (e.g. loading wage labor, reseller etc.), mode of transport used, distance travelled, cost of transport, and origin of the commodity (collection points of goods), and to determine whether the

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[112] Ibid., p.13.

commodities are being carried out for reselling or to be sold for the first time by the owner producer.

In order to be able to comment on this data collection method, one should know about the usual condition of markets in rural Bangladesh. Rural markets in most areas meet twice a week in the evening. In most cases, rural people go to the market in the late afternoon and come back home soon after sunset; thus the peak marketing period is only a few hours. During this peak marketing period, there is a tremendous flow of people and cargo shipment of different volumes through the markets' entry points. It is difficult to understand how one person can record volumes, types, and origins of all cargo shipment to a market. It also seems impossible to interview in detail every tenth shipper, since it is difficult to hold a shipper for interview when he is approaching the market, or if it is possible, to complete the interview before the next tenth shipper escapes enumeration.

The claim that nine or ten persons are sufficient for a market survey is also questionable. There is a very limited number of roads connecting markets with villages, but people do not drive their cars or trucks to markets, and so do not have to follow standard roads. Instead, the people of the densely populated rural areas use any earth track and even the dividing lines of two pieces of cropped land to travel to the market, so that one can find people arriving from almost every side. The recording of information may become even more difficult if any market has any large water entrance. During the peak marketing period in such markets, a large number of small and big country boats continues to arrive and leave with cargo shipments.

The puzzle gets more serious when one considers the manpower of the survey team and the number of markets they surveyed. The survey team consisted of 14 persons with "little or no experience". They surveyed at both market and farm levels in five thana, taking about 180 household and seven or eight markets in each thana. The survey was not broadly distributed over time; for instance, they surveyed Nalchiti, Rangamati, and Chandina thana in a period of two months, March and April.[113] This suggests that the members of the survey team were dispersed and could not concentrate in one area, or in one market while making surveys. It is therefore doubtful how reliably information has been collected through field surveys.

In addition, the enumerators were responsible for interviewing shopkeepers and traders at the end of each market in order to record the volume of goods going out of the area. Two problems may arise in doing this. First, if any trader has purchased the desired volume of goods before the end of

[113] Rangamati and Chandina were revisited again in July and June respectively.

the market, which the traders coming from longer distance attempt to do since most of them have to travel on foot through the earth tracks or roads in the darkness of night, he does not postpone his return journey until the end of the market. Thus many of the traders who have left before the end of the market may escape enumeration. Secondly, it is difficult for a small number of enumerators to get the required information from even those traders who remain until the end of the market, because big markets are divided into small sub-markets for different products and the traders of each good in respective sub-markets at that time are ready to leave for their destinations quickly. The collection of information from shopkeepers with established stores is easier only if there is a sufficient number of enumerators, because it may be difficult to keep the shopkeepers waiting for the purpose of interview after a tiring business day. The ability of such a small survey team to do the job seems questionable.

These weaknesses are likely to lead to serious underrecording of the required information, which will obviously affect the evaluation of rural transport improvement and the examination of all related issues. In particular, when the user cost savings are considered to be the sole benefits of transport improvements, whose size depends significantly on the magnitude of commodities shipped, the underestimation of freight shipment will produce an underestimation of the benefits to be derived from transport changes.

There is, however, one possibility of overrecording which is mentioned in the study report. Sometimes the accumulating traders buy goods from primary markets to sell them in a big market for profit. If both small and big markets are covered by the surveys, reselling by such traders will lead to overrecording.

Information on population, crops, land use pattern, and so on was collected from district and thana level offices. The methods of collecting these data and their reliability in Bangladesh like any other developing country are well-known. However, the study team does not have control over it.

Information on the transport network was collected by infrastructural survey and from thana level government offices. The difficulties of the kind mentioned above in the process of enumeration of shipment do not apply to the transport network survey, which is therefore more reliable. In addition, results of the survey were counter-checked by the thana records. Although the thana maps and records need to be updated, they correspond fairly well to the existing reality, since Union chairmen and members frequently provide information on transport network to the thana level offices.

Except for this information on infrastructure, the quality of survey data is highly questionable. The biases in the procedure of selecting areas for field surveys and the high probability of the inaccurate recording of information from these surveys pose serious questions as to the reliability of the data collected for the investigation of rural transport issues in Bangladesh. A comment in the report acknowledges the inaccuracies in the data: "the data collected by questionnaire, at least in the early stages, showed some inconsistencies and some were so unreliable as to be useless."[114] Since the examination of other questions is based on these data, the quality of the rest of the work depends greatly on its reliability. If this is questionable, one may legitimately be skeptic about the quality of the rest.

3.3 EVALUATION OF RURAL TRANSPORT IMPROVEMENT

Two different methods have been mentioned for the evaluation of rural transport improvement: first, 'the conventional analysis of rural transport improvement', as it is called in the study, and secondly, a 'broader' analysis of the study's 'proposed approach'.

The conventional method is to measure the costs and benefits of rural transport improvements and examine whether the discounted present value of benefit is equal to, greater than, or smaller than the discounted present value of costs. If the former is greater than the latter, the transport project is recommended, otherwise it is not recommended.

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[114] Ibid., p. 16.

The calculation of costs is said to be easier. The government department in charge of rural transport can provide cost figures for the construction and maintenance of different types of roads and of other modes of rural transport which can be converted to their present value equivalents by discounting them at a given rate of interest.

The calculation of benefits is more complicated. When any transport facility is newly provided or improved, the costs of transportation of passengers and/or cargo fall. This reduction in transport costs constitutes the benefit of rural transport improvements, which may arise from three sources. These are as follows.

(1) Benefit to normal traffic. This is the benefit to traffic that has been using the route before the transport project is constructed, because transport charges are now reduced due to transport improvement. The benefit to normal traffic is calculated by subtracting the cost of transportation with improvement from the costs without it.

(2) Benefit to diverted traffic. When a route is newly provided or improved, some traffic may be diverted to it from alternative routes and thus some transportation cost may be saved. The benefit to this diverted traffic is the cost while using the alternative route minus the cost incurred on the newly improved one.

(3) Benefit to the generated traffic. Reduction in transport charges may stimulate the growth of output in the area served by the improved transport network. The benefit to the generated traffic is estimated "directly from the increase in value added resulting from the reduction in transport charge."[115]

If these three benefits can be estimated, they can be added to estimate the total benefit stream over the life of the transport project. This can then be discounted to derive the present value of benefits, and then compared with the present value of costs. If the discounted present value of benefits net of the discounted present value of costs is positive, the transport project is beneficial.

As mentioned earlier, "the benefits to generated traffic", according to the approach, are estimated directly from the "increase in value added", which results "from the reduction in transport charge". This procedure, however, underestimates the size of generated traffic, since the value added does not result only from the fall in transport cost. It may arise through other effects resulting from greater accessibility and mobility. These will be analysed in Chapter IV.

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[115] Ibid., p.17.

In addition to this non-inclusion problem, the traditional analysis does not consider the distributional aspect of any change in rural transport. Even if the traditional analysis shows higher benefits than costs, it does not explain how benefits will be distributed among different groups of rural people. If benefits are so distributed that the existing village poor become poorer and the large farmers become richer because of transport changes, the welfare effect may be questionable. The policy, however, will depend on the ideological values followed by different countries. In Bangladesh, both growth and equity in distribution are considered desirable. Therefore, the traditional approach is not appropriate for evaluating rural transport in Bangladesh, since it cannot properly consider all benefits of transport changes and discards the distributional aspect altogether.

This approach was, however, applied in the study and later supplemented by a "broader approach". Let us now consider the study's application of the traditional approach.

The costs of upgrading or constructing rural roads and of improving waterways, and their probable benefits were considered for comparision. First, let us take up the costs and benefits of rural roads. There are several ways of developing rural roads, four of which were considered in the study: (1) Improvement to earth road. (2) Improvement to brick soling. (3) Improvement to concrete. (4) Improvement to bitumen pavement.

The summary of the capital and maintenance costs is provided in the following table, where capital costs per mile of road are shown as an annual cost at 15% interest rate per annum and then added to the maintenance cost per annum.

TABLE 4

Construction and Maintenance Costs

Road type (single lane)	Capital Cost			Maintenance taka (in 000)	Total taka pa (in 000)
	Taka (in 000)	Life (year)	Taka pa at 15% pa (in 000)		
Earth	12- 20	20	2- 3	3- 5	5- 8
Brick	300-350	20	48- 56	7-10	55- 66
Concrete	500-650	20	80-104	5	85-109
Bitumen	400-600	20	64- 80	13	77- 93

Source: Bangladesh Rural Transport Study, p. 20.

In addition, the costs of land and of bridges and culverts were added to these costs. An additional annual cost of Tk. 12,000 for land was estimated to improve a road up to the standard of wheeled transport, on the assumption that an extra width of 25' would be required to convert a road suitable for head loading shipment to one suitable for wheeled vehicles; and an additional annual cost of Tk.15,000-20,000 for bridges and culverts was estimated for this purpose, on the assumption that some bridges and culverts do already exist for head and shoulder loading.

Thus the total annual costs, including the annual cost of land, bridges and culverts for each type of rural road per mile, are as follows : 32-40 thousand taka for earth road, 82-98 thousand taka for brick road, 112-141 thousand taka for concrete road, and 104-125 thousand taka for bitumen road.

As an illustration of benefits, transport costs savings in Chandina thana have been calculated. The range of transport charges per maund/mile in this thana is recorded to be (in Taka) : head and shoulder loading 0.8-1.5, pedal rickshaw 0.3-0.8, and trucks 0.05-0.3. Charges within these ranges depend on the quality of road surface, the length of the trip, and the probability of a return trip.

The volume of trade in Chandina thana and probable benefits to normal traffic of improving transport are presented in two tables, which are reproduced below in Tables 5 and 6 respectively for the convenience of reference in comments on their estimation and use of data for the purpose of evaluation.

The authors estimated from Table 5 that the main routes into primary, secondary and tertiary markets will carry about 250, 1,000, and between 3,000-4,000 tons per annum respectively; these figures, along with the transport charges, are used to compute Table 6.

TABLE 5

Volume of Trade in the Markets of Chandina Thana

Market Type	Volume (Tons) traded per household per annum	Average number of households per market (000)	Average volume traded in each market (000)
Primary	0.5	1.2	0.6
Primary and secondary	0.8	3.2	2.5
Primary, secondary and tertiary	1.1	6.4	7.0

Source: Bangladesh Rural Transport Study, p. 23.

TABLE 6

Benefits to Normal Traffic of Upgrading of Transport Routes

Upgrading and market served		Existing mode	New mode	Saving in Tk/Mile/Ton	Tonnage (000) P.A.	Savings Tk/Mile/ P.A. (000)
From pedestrian track to earth (single lane) road serving primary market		Head or shoulder loading	Pedal ricksh-aw	15-20	0.25	4-5
From earth road to brick, concerete or bitumen road serving:	Sdcondary market	Pedal rickshaw	Truck	7-15	1.0	7-14
	Tertiry mar	Pedal rickshaw	Truck	7-14	3-4.0	21-56

Source: Bangladesh Rural Transport Study, p. 23.

Thus, while the annual costs of earth, brick, concrete and bitumen roads suitable for wheeled transport are 32-40, 82-98, 112-141 and 104-125 thousands taka respectively, the benefits of upgrading roads from pedestrian track to single-lane earth road, and from earth road to brick/concrete/bitumen road serving secondary and tertiary markets are 4-5, 7-14 and 21-56 thousand taka respectively. Therefore, benefits to normal traffic in the form of user cost savings do not justify improvement of rural roads.

According to the authors, benefits to generated traffic which can result from an increase in agricultural production are likely to be small, since the transport cost constitutes only a small proportion of the market price of products and that of fertilizer, unless new land is opened up or cropping intensity can be improved satisfactorily.

Having described the cost and benefit analysis, we now turn to make some critical comments on it. The cost analysis is taken up first. The cost calculations do not provide some details necessary to check the accuracy of the estimates reached. For example, a single lane is considered for calculating costs in Table 4, but the width of this lane is not mentioned. This information is needed for several reasons: to know land requirement and earth-filling volume, and especially to estimate how much more land is required for wheeled transport suitability. The study mentions that the single lane road requires an extra width of 25' to make it suitable for wheeled transport, without noting the kind of wheeled transport considered, an important point, because there are significant variations in size of different kinds of wheeled vehicles.[116] A pedal rickshaw, which is cheap and suitable for rural areas, requires less than half the road-space of a truck. It is doubtful whether an extra 25' width of road surface needs to be added to a single lane road for rickshaw movement. In addition, what most of the rural areas need is either a road provided where one does not exist presently, or a road converted to a walkable condition with some earthfilling, culverting and surfacing, not a road made suitable for even rickshaw movement.

In addition, an extra annual cost of Tk. 15,000-20,000 per mile road is added, while some bridging and culverting is already assumed for a earth track suitable for head/shoulder loading. The authors should have mentioned how many culverts and bridges they are considering in a mile. Moreover, the life of all types of roads is assumed to be 20 years, while the life of an earth track in an area of heavy rain in Bangladesh may not be equal to that of a concrete road. In this case, the costs of a concrete road will be spread over more years, and thus its annual cost will be

[116] The government of Bangladesh determined the specification of rural roads which would vary from 12'-0" to 16'-0" (crest width), and that of feeder roads which would lie 22'-0" (crest width). See Planning Commission, GOB, Second Five Year Plan (1980-85),p.xv-21.

less.

Another question arises when a high maintenance cost is being spent every year : will the road disappear completely after 20 years ? Or will there remain a repairable road and if it does, what is the value of it ? And if nothing remains, what will be the value of land used for road construction at that time? Land value is appreciating over time. Allowance should be made for remaining land value in cost calculations being made during construction.

There is some confusion as well in the calculation of benefits. Column 3 of Table 9 in the study report (p. A16) suggests that the average volume traded of fertilizer per minor (primary) market is 0.6 thousand ton in Chandina thana, whereas column 4 of Table 5 above suggests that the same figure includes all traded goods, not fertilizer only. The volume of chemical fertilizer per medium (secondary) market in the thana report becomes the cumulative figure of all traded goods in both primary and secondary markets in Table 5 above. The same is true for major markets. In particular, the thana report suggests that average volumes of chemical fertilizer per medium (secondary) and major (tertiary) market are 2.5 and 7.0 thousand tons per annum respectively, whereas Table 5 above shows that the cumulative volume of all traded goods in primary, secondary and tertiary markets is on the average 7.0 thousand tons. An individual figure and a cumulative figure cannot be same, however, if other figures are not zero; the volume of one insignificant item (fertilizer) cannot be equal to that of all significant items.

The authors use the figures from the Chandina thana survey as an example. Table 5 above suggests that the average volume traded in each primary market is 600 tons. It is not clear, however, how they estimate from this data that "the main routes into primary hats (markets) will each carry about 250 tons per annum."[117] The same problem occurs with the use of figures from secondary and tertiary markets to calculate user cost savings in Table 6 (column 5): less than 42% of the traded volume as enumuated by the field surveyors is used to calculate benefits in the form of user cost saving, not to mention the underrecorded volume of trade and of other benefits created by accessibility.

The calculation of user cost savings is affected by three additional factors. First, although it is mentioned in the Chandina thana report that the volume of goods is double that the amount traded, since goods are transported once in and again out, only one-way movement is considered for benefit calculation. Therefore, the benefits should be double that appear in Table 6. Secondly, the annual movement of 10,000 tons of goods to and from pick-up points is not con-

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[117] Bangladesh Rural Rural Transport Study, p.23.

sidered. Thirdly, the benefits to passenger traffic are ignored altogether. In addition, allowance should be made for probable underrecording by the enumerators.

We now intend to calculate benefits from whatever data are available in the Chandina report for comparison. Tables 7 and 10 (p.A14 and A18) of the study suggest that the average volumes entering primary, secondary and tertiary markets are 135, 854 and 2,483 maunds per market day respectively which total annually 14,640, 64,050 and 1,86,225 respectively. In tonnage, the average volume entering each of the primary, secondary and tertiary markets are respectively 514, 2,346 and 6,821 tons per annum. This total is based on the authors' assumption that there are 104 market days in the case of primary markets, and 75 for secondary and tertiary markets.

In the cases of the secondary and tertiary markets, the benefits of upgrading an earth road to brick/bitumen/concrete are calculated by considering a shift from rickshaw to truck. But the Chandina report (p.A18) suggests that 68.5 and 90 percent of goods are shipped by head loading into tertiary and secondary markets respectively. Therefore, benefits to normal traffic will be the savings derived by shipping these volumes of goods by trucks instead of head/shoulder loading, not instead of shipping by rickshaw. Taking this factor into consideration, the benefits to normal traffic appear as follows.

TABLE 7

Benefits to Normal Traffic of Upgrading Roads (Revised)

<table>
<tr><th colspan="2">Upgrading and Market Served</th><th>New Mode</th><th>Existing Mode</th><th>Saving Tk/ton/ mile</th><th>Modewise Tonnage p.a. (000)</th><th>Total Savings Per Mile p.a. (one way)</th><th>Total Savings Per Mile p.a. (both ways)</th></tr>
<tr><td colspan="2">From pedestrian track to earth road (single lane) serving primary market</td><td>Pedal rickshaw</td><td>Head or shoulder loading</td><td>15-20</td><td>0.514</td><td>8-10</td><td>16-20</td></tr>
<tr><td rowspan="4">From earth road to brick, bitumen and concrete road serving</td><td rowspan="2">Secondary market</td><td rowspan="2">Truck</td><td>Head or shoulder loading</td><td>20-33</td><td>2.111</td><td rowspan="2">44-73</td><td rowspan="2">88-146</td></tr>
<tr><td>Pedal rickshaw</td><td>7-14</td><td>0.235</td></tr>
<tr><td rowspan="2">Tertiary market</td><td rowspan="2">Truck</td><td>Head or shoulder loading</td><td>20-33</td><td>4.672</td><td rowspan="2">108-184</td><td rowspan="2">216-368</td></tr>
<tr><td>Pedal rickshaw</td><td>7-14</td><td>2.149*</td></tr>
</table>

* The movement of 68.5%, 22.5% and 9% of goods into tertiary markets was reported to be by head/shoulder loading, pedal rickshaw, and other modes respectively. For simplicity of calculation, the 9% by other modes has been included in shipment by pedal rickshaw.

In addition, 10,000 tons are traded annually through pick-up points (or 20,000 tons considering both ways). These points are usually located in villages where head or shoulder loading is the major mode of transport. If roads are upgraded to facilitate pedal rickshaw movement, the saving per ton/mile will be between 15 and 20 taka. Thus the annual saving will be between 300 and 400 thousand taka.

Moreover, one may expect that the reduction in transport charge will not be limited to the movement of goods only. It is most likely that the transport cost of passenger traffic will also fall, and that these savings may not be less than those to goods movement. If they are equally significant, then the benefits figures in the last column of Table 7 will be doubled. Besides, allowance should be made for the underrecording of trade volumes in market surveys by an insufficient number of enumerators.

The real benefit figures may thus be more than double those appearing in Table 7. Now let us compare the benefits with the cost figures. Without making any allowance for the underestimation of benefits mentioned above, and considering the benefits to goods movement calculated on the basis of information recorded by enumerators, the annual benefits of upgrading an earth road to a brick/concrete/bitumen road serving secondary and tertiary markets are 88-146 and 216-368 thousand taka respectively, whereas the annual costs of construction and maintenance are 82-98 to 104-125 thousand taka respectively. Benefits are higher than costs. The benefits of upgrading a pedestrian track to an earth road serving a primary market are, however, less than its costs, because upgrading of a road suitable for rickshaw movement is said to require a width of road and bridges suitable for truck movement. As indicated above, this results in an overestimation of the cost of construction. The cost of improving a road suitable for rickshaw movement will be 18-24 thousand taka per mile, whereas the benefits are 16-20 thousand taka per annum. This excludes benefits to passenger traffic and other benefits as indicated above which, if included, may raise the total benefits well over costs.

Furthermore, the Chandina thana is " well developed" compared to other rural areas of Bangladesh. As the authors mention (p.22), transport charges vary inversely with the quality of roads, so that when roads are improved in a less developed area, the transport charges for head/shoulder loading are expected to be more than those in a more developed area like the Chandina thana. Therefore the difference between the charges of head loading and truck shipment will be greater than that in the Chandina survey, and thus the benefit figures will be higher even for the same volume of shipment. This concerns only user cost savings, which are not considered very important for rural areas. What is more important is access to agricultural services, inputs, credit, healthcare and the like. The authors say, in relation to these benefits, that, since transport cost is a small proportion of commodity and fertilizer prices, transport improvement will not have much effect on agricultural production. This conclusion, however, ignores such important developmental benefits of transport changes as access to institutional credit, which reduces the cost of production, and to pesticides, which will protect crops from damage. Such effects (which will be taken up later) cannot be disregarded. Therefore, the authors' comments on the benefit to generated traffic seem to be incomplete.

The study presents no cost estimates for the improvement of waterways except to say that it is "likely to be costly" and will depend on the hydrological conditions. A few cost figures are presented from secondary sources in a confused way. The cost of mechanising a country boat of a 500 maund capacity at 1973 prices is as follows:[118]

<u>Engine</u>

Annual Commercial cost (taka)	3,654	5,121	12,975
Annual economic cost (taka)	2,716	3,795	9,629

Thus three different figures have been presented for each of the annual commercial and economic costs, without mentioning which is related to what.

The relationship between transport charges and the distance travelled by waterways is presented in a diagram which suggests an inverse relationship between the two variables. The authors argue that, because charges for short trips are higher, the shortening of distances by waterways improvement will not lead to transport cost savings; that the use of waterways instead of richshaws will not save cost since they have almost the same costs; and that mechanisation is expensive and will reduce employment among those who operate country boats.

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[118] Ibid., p.26.

However, if speed is essential for producers, there may be a justification for mechanisation. For example, perishable crops (pineapples and bananas) are damaged due to transportation problems and a vast area suitable for their cultivation remains uncultivated because of transportation difficulties. The authors suggest that mechanisation is justified in such cases.

Although the cost-benefit analysis of waterways is of an a priori nature and unsupported by data, the comments seem to correspond to reality. Even though rural Bangladesh is criss-crossed by small canals and low muddy land, waterways navigable in all weather are rare, except in some southern riverine districts. In most parts of the country's rural areas, rural roads appear to be the best alternative to waterways in terms of costs and benefits. Boats are essential to derive benefits from waterways, whereas roads can be used for travel even without a vehicle, and hence very small farmers and the landless poor can also benefit from road improvements.

In summary, this traditional approach for the evaluation of rural transport improvement was criticized in the study because it could not consider the distribution and the composition of benefits. The authors have presented instead their own 'proposed approach', which, as mentioned earlier, is meant to examine: (a) how transport cost savings are distributed among agricultural producers, transport operators, traders and any other party affected by transport changes, (b) how the agriculturists will respond to changes in farm gate prices of agricultural produce, and (c) whether any other obstacle exists which may prevent the developmental effects of rural transport improvement from being realized.

In other words, the proposed approach recognizes that the developmental effects of improving rural transport depend on the extent to which transport cost savings are passed on to farmers in the form of higher farm gate prices of agricultural produce and lower input prices, on the relation of such transport cost savings to the overall costs of production, and on the extent to which farmers can respond to such price incentives.

The ways in which the user cost savings may be distributed among different groups of beneficiaries and the obstacles to passing on these savings to the producers have been explained in a diagram which may be translated into words as follows. An improvement in transport facility will lead to a reduction in transport charges, which in turn will lead to higher profits for transport operators. Higher profits may attract new entries into the transport industry resulting in competition among the operators, or there may be a cartel agreement among them. In the latter case, all the profits may be retained by transport operators, and hence the benefits of transport improvement will have no effect on agricultural production. If, however, there exists competition in the commodity market, the transport cost savings will be reflected in the form of higher farm gate prices of agricultual commodities and in lower input prices, which will lead to higher profits for farmers. This increase in profits may lead to increased agricultural production from more intensive cultivation of the existing crops or from a switch to more profitable crops. If new land is made available by transport improvements, employment and output will increase further.

This is the main theme of the proposed approach as opposed to the traditional approach to the evaluation of rural transport changes. In the report, however, the only evidence of a rural transport evaluation along the lines of the proposed approach appears in some comments in 'Conclusions and Recommendations'.

While these conclusions and recommendations will be taken up later, it seems appropriate to mention a few of them which are related to the proposed approach. Regarding the structure of commodity markets, the authors say:

> The amount of data which we were able to collect on this topic was limited but it is clear that most farmers are in the hands of a very limited number of traders when selling in primary hats. These traders advance money to buy inputs and food before harvest in return for a share of the paddy at harvest time. This share is bought at a price that ensures a very high interest rate to the trader. ... Access to government credit is time

> consuming and difficult. Credit agencies are often at a considerable distance and making these journeys may absorb up to 25% of the credit applied for. ... Many rural areas remain isolated from banking facilities through which loans will be made available.[119]

While the text presents no supporting data, the Sulla thana report, which is placed in the Appendix, provides some evidence for the statement that "most farmers" in rural Bangladesh are tied up with conditional loans from traders. The main survey indicates that farmers are tied to conditional loans, but "relatively little detailed information" was collected. A separate survey was, therefore, made with a sample of eleven farmers, which reported that:

> the rate of interest being charged for a loan taken out in January or February and repaid in April or May was of the order of 50%. This represents an annual rate of interest of approximately 400%. The farmers interviewed suggested that indebtedness was widespread in the area and virtually universal amongst small farmers.[120]

It is not mentioned whether only indebted farmers were later interviewed or a sample was taken at random, whether all of the eleven interviewees are indebted, how much credit is taken by each and why, what percentage of other farmers are indebted in their views, and so on. The omission of such relevant information and supporting data from any of the other four thana surveyed cast some doubt on the conclusion that "it is clear that most farmers" throughout Bangladesh

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[119] Ibid., pp.48-49.

[120] Ibid., p.A132.

are tied up with such conditional loans.

In our view, although some conditional indebtedness may reasonably be suspected in rural areas, it is most likely not as widespread and sizeable as to affect market structure. However, there is no study available to support either view. Because some conditional indebtedness is due, as mentioned by the authors, to the distant location of banking services from the villages and the isolation of villages, connecting villages by a fast transport system with places where banking facilities are located could affect the market structure. If greater mobility is provided, travelling to banks will require shorter absences from the farm. With this saving of time, the cost of receiving credit will fall, which in turn is expected to reduce indebtedness to local money lenders. The effect is the reduction of market power and an increase in the degree of competion in the informal money market, and also in the commodity market if it is presently less than perfectly competitive.

The authors agree on this point with some reservations. "It is possible that opening up the small markets to traders by transport improvements will mean increased competition among traders to both buy goods and provide credit on better terms to the small farmers".[121] This possibility may however be affected by two things: trader penetration to small mar-

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[121] Ibid., p.50.

kets may be low, since the volumes in those markets are low, and farmers may not be free to sell in markets because they are tied up with conditional loans.

The authors conclude, regarding market structure in transport industry, that

> The possibilities of cartelisation of transport and credit will thus be reduced through competition. This might be particularly true for improvement of roads within the thana so that they become suitable for rickshaws. Because the costs of entry for rickshaw are small it is possible that more traders will be able to use them to reach primary markets.

This seems to contend that transport improvement is expected to make the transport industry more competitive. As explained in the proposed approach, market power in transport and commodity markets is the probable obstacle in passing the benefit of user cost savings on to the farmers. This obstacle does not seem to be strong and may be expected to be weakened by transport improvements.

The text of the report, then, does not apply the proposed approach objectively to the evaluation of rural transport in Bangladesh. Neither has such an approach been applied in the individual thana reports (Appendix B) on which the conclusions and recommendation of the text seem to have been based; it is evident only in the description of some relating data and in some comments under headings such as 'Transport charges and transport as a constraint' (Chandina thana, p.A19), 'Some likely effects of transport improvement' (Nalchiti thana, p.A57), 'Transport charges and transport as a constraint' (Ranisankail thana, P.A110), and 'Transport implications' and 'Transport improvements' (Sulla thana, pp.A134, A141). of Sulla thana.

Thus, although a broader approach was proposed because of the inappropriateness of the traditional one, we do not find an objective and serious application of the approach for the evaluation of rural transport in the study. Instead, the description of the proposed approach is immediately followed by a separate section which describes the historical nature of the integrated rural development program in Bangladesh with some a priori comments on the role of rural transport in this program, and this is followed by 'conclusions and recommendations'. Before considering these conclusions, we will briefly examine the suggested role of rural transport in integrated rural development.

3.4 THE ROLE OF RURAL TRANSPORT IN INTEGRATED RURAL DEVELOPMENT

The historical development of the rural development program in Bangladesh has been described in three out of five sub-sections (excluding conclusion) in the study report. Two main points have been emphasised. First, the lion's share of the benefits from the developmental effects of increased agricultural inputs (irrigation, fuel, fertilizer, pesticides and credit) is received by large farmers, which leads to inequality in the distribution of rural income. Second, there is a lack of co-ordination between different organisations meant for rural development, although there exists one organisation, the IRDP (Integrated Rural Development Program), established mainly to integrate all rural development programs.

The essence of transport-related analysis is as follows. (1) The role of transport should be considered in terms of its role in the integrated rural development program. (2) Transport improvements are not necessary for transporting irrigation equipments to sites, since this shipment is required only once. (3) "Without substantial government intervention in the form of land reform or major taxation changes", large farmers will benefit from irrigation, higher yields and transport improvements. (4) Although the distribution of agricultural inputs (irrigation pumps, fertilizer, pesticids, fuel, credit etc.) is "adversely effected" by inadequate rural transport, limitations are more likely to result from problems in the arterial transport system and administrative bureaucracies.

There is not much disagreement on these points. However, the net distributional effect of transport changes is not very clear, since it may result in forces which alter existing distribution in both directions. In any event, government should take measures to reduce or eliminate any adverse distributional effect. It is emphasized in the fourth conclusion that transport inadequacy provides a bottleneck to agricultural development by adversely affecting distribution of inputs, but this is not the only obstacle.

Discussions on rural industries appear next. These industries are emphasised for providing employment to the rural landless and poor. The authors, however, remarked:

> It seems to us highly unlikely that in the foreseeable future such rural industries will be established at below the level of the thana headquarters, ... This will not provide any justification for road or transport improvements below this level...[122]

Because the authors did not define 'rural industries', it is difficult to understand the kind and scale of industries they are talking about. Probably they do not mean large scale manufacturing industries, since these are neither labor-intensive nor feasible in all rural areas. Most probably they have small and cottage industries in mind. Then the above quotation implies that small and cottage industries are now non-existent and are 'highly unlikely' to be established in the 'foreseeable future' below thana level.

However, cottage and small industries do presently exist throughout rural areas of Bangladesh below thana headquarters. There are 197,280 handloom establishments in Bangladesh, most located in rural areas, with a total of 437,015

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[122] Ibid., p.41.

handlooms.[123]

These industries are, however, facing problems: (1) an irregular supply of inputs and raw materials, and their high prices; (2) problems of marketing; (3) a shortage of credit and capital; and (4) some competition from the manufacturing sector.

These facts suggest that, contrary to the authors' statement, although rural transport can not be expected to solve the problems totally, improvements to rural transport will help solve the first three problems mentioned above. Furthermore, there is little danger of intensifying competition by improvements to rural transport because, for example, saree produced in cottage industries has a price advantage over synthetic saree which is particularly important in rural areas. The rural poor cannot afford synthetic saree, the price of which ranges from Tk.700 to Tk.17,00, as against that of cottage industry saree which varies usually from Tk.50 to Tk. 300.

The survey next takes up the questions of health, education, family planning and other government programs, which require access to rural areas and thus demand good rural transport. The authors suggested an interesting alternative

[123] BBS, GOB, Statistical Pocket book of Bangladesh 1980, p.318. For further evidence, see Raihan Sharif, M. Habibullah, A.R. Khan, M.A. Mia and A.H.M. Sadeq, Small/Cottage Industry Development Potentiality Study, (Dhaka: Department of Finance, University of Dacca, 1979).

to rural transport :

> Ideally, the lack of fast transport might be considered to be an incentive to develop local facilities and thereby prevent the concentration of such services in the major centres which involves the rural population in long journeys to obtain benefits.[124]

The authors do not mention, however, who will receive the incentives to develop these facilities locally. Do they have in mind the rural population, most of whom are presently below subsistence level ? Most cannot afford to pay a physician's fees, or to buy medicine. The rural poor cannot send their children to schools, because they cannot bear the educational expenses, and because children have to help their parents in work.

Government provision of these facilities at village level in rural Bangldesh seems not to be feasible. Let us take an example of medical services. The government cannot yet provide one qualified medical doctor for each thana of rural Bangladesh to serve an average population of 185062.[125] More than 95% of the villages do not have even primary health facilities.[126] The authors also point to another obstacle, the shortage of manpower with required skill. One alternative

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[124] Bangladesh Rural Transport Study, p.41.

[125] The population of a thana is on the average 185062. See Bangladesh Bureau of Statisfices, Govt. of Bangladesh Statistical Pocket Book of Bangladesh 1980, p.81.

[126] BBS,GOB, Socio-Economic Indicators of Bangladesh, (Dhaka: BBS, 1981), p. 106.

suggested is to form district-based medical teams which will travel around and provide medical services. According to the authors, this will necessitate a good transport system whose benefits, although they cannot be quantified, are of considerable importance since "they all concern access into the rural areas and not access for goods moving outwards to large urban centres".[127] This program, however, may also not be feasible. For district-based medical teams to travel up to 5,089 square miles[128] in order to serve a population of up to 7,612,000, as in the Dhaka district,[129] would require a very good road system and very high-speed vehicles, or helicopters, which are not feasible for obvious reasons. What seems feasible is to develop medical facilities at the thana level and to provide improved rural or feeder transport; these steps will facilitate access not only to medical services, but also to services like institutional credits, agricultural inputs and extension services, education, markets, etc.

The authors' conclusion to this section may now be considered. It has been emphasized that transport should be considered part of an integrated plan for rural development. "It appears almost certain" "that rural transport improvement is not at present a bottleneck to agricultural develop-

[127] Bangladesh Rural Transport Study, p.42.

[128] Chittagong H.T.district has an area of 5,089 sq. miles.

[129] Ibid., p.42.

ment for the majority of population" and that it may lead to further inequality in the distribution of rural income. However, "other aspects of rural development" which cannot be evaluated in money terms require "reasonable transport".

The conclusion does not seem to be all-inclusive as is evident from above discussion. In addition, while most of the conclusion seems consistent, the statement that transport is not a bottleneck to agricultural development does not reflect the analysis in this section.

3.5 COMMENTS ON CONCLUSIONS

As indicated earlier, the conclusions and recommendations related to the evaluation of transport improvements are not based on, or preceded by, any objective analysis along the lines of the study's proposed approach. They appear to be based instead on the individual thana reports which are placed in Appendix B.

The study concludes that small farmers need to market small quantities right after harvest due to indebtedness and the shortage of storage facilities. Providing improved storage will reduce 'the strain on rural transport' during peak demand for it and facilitate the marketing of a genuine surplus.

The evidence of only the Nalchiti thana has been presented; this is said to show that between 30 and 40 percent of the paddy is sold within two weeks after harvest. We could not find any basis for this figure in the Nalchiti report, which actually reveals that small farmers sell only 6.5% of their paddy within 2 weeks of harvest. If all size groups are taken together, the total sale within 2 weeks after harvest amounts to 9.4%.[130]

Let us examine other thana reports for the relevant information. In the Rangamati thana, small farmers do not sell anything within two weeks of harvest or in the rest of the year (see Table 9, p.A76). None of the other three thana reports contain any information on paddy sale within two weeks or shortly after harvest. It is difficult to understand why this information has been excluded from these thana reports, since the authors base their first two conclusions on it, and the thanas have been surveyed by using a standard questionnaire.

The authors suggest two reasons for sale 'shortly after harvest': (1) shortage of credit and (2) lack of storage facilities. They did not, however, provide evidence to support them. Only the Sulla thana report, in Appendix B, provides some incomplete information on the shortage of credit (see P.A132); it simply suggests that some farmers

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[130] Ibid., p. A48.

have borrowed money at very high rates of interest. Even if it is fair to argue from this suggestion that these farmers are required to sell paddy shortly after harvest to repay loans, no evidence has been provided on how much is sold shortly after harvest. No information is presented on the indebtedness of the rural people in any of other thanas surveyed.

The only reference made in the text concerning the storage problem is to Sulla thana. The Sulla thana report does not give any data on the state of storage except for a descriptive report of its condition:

> Generally, storage facilities in the farms were relatively crude and undesirable for long term storage of large quantities of paddy. Consequently, the farmers had to dispose of their crop soon after harvesting. ... Furthermore, it is not usually possible for the farmer to store his crop until the wet season when transport is easier and when it might be possible to market the paddy himself in nearby hats.[131]

No evidence or data have been provided on which these qualitative statements can be based and so they do not carry much weight in an empirical study.

Some detailed data on storage have however been provided for the Rangamati thana in the Appendix. The average capacity of storage per farm of small, medium and large farmers are 27, 32 and 87 maunds respectively.[132] On the other hand,

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[131] Ibid., p.A136.

[132] Ibid., p.A81.

average paddy production per farm of small, medium and large farmers is 39, 42 and 73 maunds.[133] These data imply that each of the large farmers have, on the average, an excess storage capacity of 14 maunds, while each of the medium and small farmers an average capacity shortage respectively for 10 and 12 maunds respectively. If the shortage of storage capacity is responsible for paddy sale shortly after harvest, then big farmers of that thana would not sell anything within two weeks after harvest, while medium and small farmers would do so. But the study itself shows that small farmers do not sell anything at any time of the year, and that medium farmers sell one maund per farm, while each large farm sells on the average three maunds within two weeks after harvest.[134] This suggests that sale after harvest does not depend on a shortage of storage. If storage is in any way related to sale after harvest, the relationship is positive since high storage capacity is related to high sale after harvest and vice versa.

Besides, storage does not seem generally to be seriously inadequate in rural Bangladesh. This is supported by the Chandina thana study:

> Most farmers have good storage facilities. ... In general, it seems that it is not lack of storage that forces farmers to sell and buy paddy, but the need for cash.[135]

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[133] Ibid., p.A75.

[134] Ibid., p.A76.

Evidence contained in the study itself establishes, therefore, that the "lack of suitable storage" does not constitute one of "the main reasons" for selling paddy shortly after harvest.

It is, however, true that farmers sell crops and buy again later for their consumption due to various reasons. First, agriculture is the main source of income for most farmers. They sell crops to buy other necessities throughout the year. At the end, nothing remains for consumption, and hence they buy again. During this buying period they usually postpone almost everything that is not necessary for survival, like clothes and shoes. Once the harvest is gathered, they try to buy the postponed things and hence some crops are sold after harvest. Second, harvest time is the traditional period of social visits. All relations will visit each other and stay a few nights. The hosts, who have to provide feasts, must raise money from sales. Third, some farmers sell some produce to repay loans. Finally, in some cases, storage problems may also cause some disposal by sale.

The first two reasons seem to be the major causes of sale after harvest. Storage facilities have little to do with them, and it does not seem feasible to provide enough credit for these purposes. Improved storage and more accessible

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[135] Ibid., p.A25.

credit can help only in the last two cases which are not, however, the main causes of sale after harvest.

The storage solution raises several additional questions. What kind of storage will be provided? Will an independent store be constructed in each small or big farm, or will there be a common godown in each village for the inhabitants? If a common storage facility, what will be the costs of construction, management, security measures, devices to protect crops, and movement to and from the godown? Who will bear its large fixed and regular costs? Will the storage have any complementary effects, since improved rural transport, which is to be replaced by this plan, has many other functions besides marketing paddy after harvest?

On the other hand, if a separate godown is proposed for each farm, its cost may not be feasible. Apart from this, such a proposal may solve very little of the problem. Storage cannot act as a substitute for rural transport in meeting demands for accessibilty to education, health, family planning, agricultural extension services, etc.

The study concludes that people are dissatisfied about the state of rural transport not mainly because of the inadequacy of the transport infrastructure, but at least partly due to the shortage of vehicles. Because of this shortage, small farmers are tied to small local markets.

Let examine the thana reports to find out the people's actual response. In the Nalchiti thana, existing transport was viewed as inadequate/very poor by 88, 92 and 69 percent of small, medium and large farmers respectively, and as adequate/reasonable by 12, 8 and 31 percent of small, medium and large farmers respectively.[136] In Rangamati, the present state of transport was viewed as inadequate/very poor by about 62, 64 and 43 percent of small, medium and large farmers respectively, and as adequate/reasonable by the rest.[137] In the Chandina thana, present transport was viewed as inadequate/very poor by 78, 87 and 96 percent respectively of small, medium and large farmers, and as adequate/reasonable by the rest.[138] In the Ranisankail thana, the views of traders instead of those of farmers are presented. About 88 percent of the traders interviewed consider the present transport as very bad/bad/ inadequate.[139]

In the Sulla thana report, this information is dropped for reasons unknown to us. However, some idea about the adequacy of transport can be drawn from the authors' own statement : "It is a remote area about 40 miles from the nearest good road and accessible only by water trans-

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[136] Ibid., p.A50.

[137] Ibid., p.A81.

[138] Ibid., p.A21.

[139] Ibid., p.A111.

port".[140] The all-weather water route, however, is very limited.

Considering the response of farmers in three thanas, we find that on the average 76, 81 and 69 percent of small, medium and large farmers consider the existing state of rural transport as inadequate or very poor. All size groups taken together, 75% of farmers think it inadequate or very poor. About 88 percent of traders in Ranisankail thana consider the present state of rural transport inadequate, bad, or very bad.

This is the evidence for which an explanation is given in the conclusions without reporting the finding. The explanation is that dissatisfaction with the existing state of rural transport in Bangladesh is due to the lack of vehicles, but the evidence provided in the study itself seems to contradict this position. For instance, in the Nalchiti thana, 36% and 76% respectively of small and large farmers own boats, whereas 88% and 69% of them respectively consider present transport to be inadequate or very poor. What percentage of medium farmers own boats is not reported. It may however be expected to be between 36% and 76%, that is, about 55%.[141] Now, if only those who do not own vehicles or boats are to express dissatisfaction, then only 24% instead

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[140] Ibid., P. A123.

[141] Ibid., p.A49.

of 69% of large farmers, 55% instead of 92% of medium farmers and 64% instead of 88% of small farmers should express dissatisfaction with the present condition of transport in rural Bangladesh. Thus the lack of vehicles or boats does not seem to be an important cause of dissatisfaction.

The study concludes that fertilizer distribution benefits large farmers, because they can travel to distribution centres located at distant markets, and can give bribes (bakshish) to get it. The first of these two causes involves problems in rural transport, and thus transport improvements are likely to help reduce this inequality in the distribution of fertilizer. For example, if the road transport network is improved so that a farmer does not have to walk along a difficult path or through paddy fields, and does not have to pass across unbridged canals and low muddy lands, he can move fast even without any vehicle. This may make fertilizer more accessible to small farmers.

An alternative solution may be to appoint a large number of dealers in fertilizer so that it can be distributed at village levels. Distribution of fertilizer through extensive dealership outside the direct control or supervision of thana level officers may, however, create another problem in the form of bribery, which will increase the cost of fertilizer.

Thana reports do not provide any evidence for the second cause of inequitable fertilizer distribution. While nobody can rule out the possibility of bribes in fertilizer distribution, the probability may not be very high. If it is found to be an important factor, though, then one solution would be to eliminate dealership in fertilizer distribution and to distribute it directly under the supervision of thana level officers. In that case, thana headquarters should be well-connected with villages so that farmers can easily travel to pick it up, or thana level officers can make frequent pre-notified visits to villages for fertilizer distribution. This would require transport improvement.

The study concludes that the benefits of irrigation are also restricted to large farmers. We could find no related information in thana reports except for that from the Sulla thana, the evidence of which contradicts this conclusion. In the Sulla thana, the irrigated acreage of small farmers is reported to be higher than that of large farmers. Land irrigated per acre of small farmers is 0.21 and that of large farmers is 0.20.[142] In addition, small farmers have a higher productivity per acre of HYV paddy, which is usually produced in irrigated land, than medium and large farmers.[143]

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[142] Ibid., p. A131.

[143] Ibid., p. A130.

A conclusion is drawn about the role of traders, credit, and indebtedness. Institutional credits are located at distant places necessitating expensive journeys which may absorb 'up to 25% of the credit applied for', and hence small farmers are tied to conditional high-interest credits from traders. Although no supporting data are available in thana reports, except for some incomplete information from the Sulla thana, this conclusion appears to reflect the reality that most farmers obtain credit from money lenders at very high interest rates, and some of them resort to conditional loans as well. We could not, however, find any evidence which would support a conclusion on the degree of competition as strong as this : "... it is clear that most farmers are in the hands of a very limited number of traders when selling in primary hats".[144] In the Sulla thana, a survey of 11 farmers suggests that local credits have been obtained at very high rate of interest. The state of conditional loans may be reflected in the different prices for paddy sold by small and large farmers,[145] but this difference could also be the result of a bad transport system and of the considerable distance of market locations.

It is also concluded that the government rice procurement program (GRPP) favors traders and large farmers. We could not find evidence in any of the five thana reports to sup-

[144] Ibid., p.48.

[145] Ibid., p. A132.

port this conclusion. The authors have talked about breaking the monopoly in this market, but the government procurement is such a small fraction of total marketed rice that it is no more than an insignificant buyer in a competitive market.[146] However, if the benefits of the GRPP are to be made available to small farmers, however insignificant they might be, the GRPP centres should be made accessible to small farmers. This has transport implications, since procurement at the village level will be highly expensive.

It is emphasized that all investment and development work should be considered in an integrated way by considering the effects of each on the other. This comment is valuable and there is no disagreement on that.

Rural transport is evaluated in the study by measuring the benefits obtainable in the process of shipping food grains out of local areas; movement of non-food items and even of food grains into the area are excluded. Movement of passenger traffic is not considered at all, nor are benefits other than transport cost savings in the form of accessibility to education, health care, agricultural extension services, timely supply of inputs and pesticides, family plan-

[146] For instance, the total production of foodgrains was 13132400 tons in Bangladesh in 1978-79, whereas the government procurement varied from 14000 to 355000 tons from 1973 to 1979. The government procurement varied roughly from 0.1% to 2.7% of total production. See Bangladesh BBS, GOB, Thana Statistics, (Dhaka: BBS, 1981), p.1; also by the same author, Bangladesh Economic Survey, 1981-82, p.315.

ning, institutional credits and so on. It will require a serious empirical study to show exactly what fraction of the total obtainable benefits is considered here for the evaluation.

We have shown in our comments on traditional cost-benefit analysis that its calculations are erroneous. A corrected analysis shows that benefits in the form of user cost savings in shipping food grains are higher than the costs of upgrading roads, even if benefits to passenger traffic are not considered and no allowance is made for other factors. If the developmental effects of road improvement are included, the benefits are expected to be significantly greater than costs.

Costs and benefits are calculated, although erroneously, for improvements to rural roads, but not for waterways; instead an analysis of an almost a priori nature is made. In our view, the latter analysis is incomplete as a basis for any conclusions. A complete analysis of costs and probable benefits is necessary for a proper evaluation. In addition, it seems to us apparent that rural roads rather than waterways are the appropriate candidates for improvement from costs, benefit and distribution considerations. Even the landless poor can get benefits from road improvements, whereas no benefits can be derived from waterways without a boat.

Another conclusion is drawn that the distribution effect of transport improvements will be uneven: transport changes will benefit traders and large farmers and so adversely affect the relative position of small farmers. Traders are benefited since they own vehicles which can be used for faster movement to primary, medium and tertiary markets at cheaper costs. Large farmers also own vehicles. They can reach large markets quickly and cheaply, and get higher prices for their products.

On the other hand, the small farmers do not own vehicles, nor can they hire vehicles for the small quantity they sell; in addition, they cannot leave their farms during harvest time. No competition among the traders and transport operators is expected to benefit small farmers, because the trade volume at local markets is small and the farmers are tied to conditional loans.

The net effect of rural transport changes is to increase the inequality in the distribution of rural income as a result of transport improvements.

This conclusion is concerned with the transport cost savings only, and excludes other benefits. In addition, a vehicle is not a necessary condition for faster movement. If a farmer can walk to a market on a hard-surface road instead of walking in ankle-deep mud, through knee-deep water, or across paddy fields without any earth track, or instead of following a diverted road due to bridgeless deep water, then he can move fast and reach large markets more easily and sooner. In fact, even traders and large farmers in rural Bangladesh rarely use vehicles unless on a waterway; instead headloading is widely used. Large farmers have the advantage of spare time because they can hire labor for farm care during their absences. A small farmer, who cannot afford to hire labor, cannot travel to large markets. If travel time becomes less due to transport improvement, a small farmer could also reach a large market. In addition, the distribution of other developmental benefits, which we will see later, may well be equitable. Therefore, the ownership of vehicles does not seem to be a very significant factor in the distribution of benefits from transport changes.

If small farmers can reach large markets, new trader entry into local commodity markets is not necessary, although it is not valueless. In addition, the conclusion mentions the possibility of the entry into the transport industry of a low-cost pedal rickshaw. In that case even the small farmers could hire rickshaw service to reach larger markets to get the benefit of high price differential.[147]

Some concluding remarks are made in the study on the integrated rural development program (IRDP) which have implications for rural transport. In order to develop a rural

[147] The distributional effects of transport changes will be analysed in Chapter V.

area in an integrated way, access should be provided for different agricultural inputs, for health and family planning officers, for education, and for other programs. "After consideration of all factors of development in a rural area it may be advisable to make some improvement to the transport positions".[148] Accordingly, some priorities have been suggested to improve rural transport up to the standard of rickshaw movement.[149]

3.6 TWO SETS OF "SUMMARY AND RECOMMENDATIONS" OF ODG AND TSS

As mentioned earlier, the study was carried out jointly by the Overseas Development Group and the Transport Survey Section (TSS) of the Government of Bangladesh. The field surveys were carried and the report written by four overseas advisors of ODG and one Research Officer of the TSS.[150] The two sides of the study team agreed on the main text, including the "Conclusions and Recommendations" as they appear in the text. They could not agree, however, on the "Summary and Recommendations", and hence two sets of them appear in the study report, those of the TSS appearing in the beginning of the report and the ones of the ODG in the Appendix.

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[148] Ibid., p. 51.

[149] Other administrative and management related recommendations are not of our concern and therefore are not commented.

[150] Ibid., p. A173-A174.

The report presents the disagreement as follows:

> unfortunately, the Bangladesh side and their overseas advisors reached different conclusions. So it has not been possible to agree to a single set of recommendations.[151]

The "Summary and Recommendations" of the Bangladesh side contains some findings and recommendations on the need for, and benefits of, rural transport improvement. The substance is as follows. The inadequacy of transport facilities is a constraint on agricultural development: "Rural transport at present provides positive constraint to agricultural development and social upliftment",[152] because present transport is extremely slow, and hence "Transport development ... is a must ... to break through the 'vicious circle' of poverty and for striding towards a higher level of equilibrium."[153] Transport improvement will increase the radius of sub-urban areas, which will reduce pressure on urban areas. It will provide employment to the unemployed during construction and extend the job market after construction. The user cost saving criterion is not appropriate for the evaluation of rural transport changes, because most benefits, which also include polical considerations, internal law and order, and external defence, are not included. The justification of rural transport development may come from the Food for Work

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[151] Ibid., p.iii.

[152] Ibid., p.v.

[153] Ibid., p.v-vi.

Program and self-help schemes in which case the programs should be co-ordinated. Since the gestation period of improvements to the transport infrastructure is longer than that of other improvements, "... transport improvements may have to precede developments of other inputs/facilities as a part of an overall development package"[154] ; but if they are completed well before others, income inequality, which however can be handled with fiscal measures, may be created. Further justification for improving rural transport will come from an increase in cropping ratio where it is presently low, or from improved accessibility .

These arguments in favor of rural transport improvements imply that the study has already established the positive developmental effects of transport changes. It is, however, difficult for a careful reader to accept them as conclusions derived from the report since the study has consistently, and apparently deliberately, argued against transport improvements.

The main theme of the study, though, is reflected in some other findings and recommendations, the substance of which is as follows. The marketable surplus in agriculture is small, but seasonal marketing is high due to a shortage of storage and indebtedness. Therefore, transport problems can be attacked by providing credits and storage facilities.[155]

[154] Ibid., p.ix.

Here lies the contradiction. Most of the "arguments", rather than findings or conclusions, in this summary attempt to establish that the inadequacy of rural transport is a constraint on agricultural development, and hence improvement is needed and should reasonably precede other development programs.[156] But it is said elswhere that transport problems arise from seasonal marketing caused by indebtedness and storage inadequacy. This can be dealt with by providing credit and storage. This implies that transport is not a real constraint on development.

A further contradiction is evident in points 8 and 12 of the summary part of "Summary and Recommendations". The former says that the user cost savings criterion, which has been used in the study for the evaluation of transport changes, is not appropriate for rural transport evaluation, whereas the latter states that the "Methodology for rural transport survey and techniques for identification of transport projects have been established through the present study"[157] and "it would be highly desirable that the TSS repeats similar studies in other case of Bangladesh."[158]

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[155] See points 1 and 2 of the summary part of the "Summary and Recommendations". Ibid., p.v.

[156] See point 3,4,7,8,9,10,11 and 13 of the summary part of "Summary and Recommendations", ibid., p. v-ix.

[157] Ibid., p.viii

[158] Ibid., p.viii.

We now turn to the "Summary and Recommendations" of the ODG. The advisory team of the ODG does not see the difficulty of rural transport in Bangladesh as the major constraint on agricultural development; instead the constraints, according to them, are "associated with unequal access to resources and tied marketing arrangements with traders where competition is limited".[159] They argue that transport improvements will provide a greater advantage to traders and large farmers. Although transport changes will increase employment during construction, employment will decrease in the long run. The seasonal marketing of agricultural products can be reduced by providing credit and storage facilities. However, a justification of transport changes may come from the need for movement of scarce skilled manpower. Transport matters should be considered only as a part of a package development program. The Food for Work Program may include a transport aspect.

These recommendations seem to reflect the views expressed throughout the study, although they are sometimes unsupported by facts. Comments on them have already been made.

The ODG experts see "little need" for further studies of a similar type unless the circumstances of any area are very different from those of the areas included in the study.

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[159] Ibid., P.A175.

This contradicts the TSS view that such studies should be repeated. In this author's view, the approach applied to evaluate rural transport changes is inadequate, because it cannot take all probable benefits into consideration. In addition, even the user cost savings are not considered fully and the surveys are subject to a high risk of biases. This type of study cannot make a proper evaluation of rural transport improvement. Hence, the need for such an evaluation is not finished, as the ODG implies; and the continution of similar work will not help, as TSS suggests.

3.7 SUMMARY AND CONCLUDING REMARKS ON BRTS

1. The Bangladesh Rural Transport Study is the first systematic inquiry into rural transport in Bangladesh which subjects it to formal analysis and initiates a controvery as to the role of rural transport improvement in agricultural and rural development.

2. The study does not specify any well-defined set of key questions and issues to be investigated; instead a whole list of issues is raised in several sections under different heads.

3. The study is empirical in nature, and relevant data are collected from both primary and secondary sources. A thana is chosen as the basic unit of the survey, and five out of the 586 thana of Bangladesh are surveyed.

4. The survey findings appear to have been affected by biases in selecting thana for surveys and households for interviews. These biases might have affected evaluations and conclusions.

5. One of the most important kinds of information collected from market surveys is about the movement of goods, along with other related data, on which the whole evaluation is based. It seems likely that a serious underrecording of trade volume led to the underestimation of trade volume and benefits, and thus affected the evaluation of rural transport improvement and conclusions.

6. To evaluate transport changes, the study compares the costs of construction with benefits to be obtained in the form of cost savings. Cost estimates seem to be arbitrary. The study does not provide any detailed breakdown of cost figures, nor is any basis indicated.

7. The benefit calculations appear to be erroneous and arbitrary as well. The only benefits considered are the user cost savings, which are merely a part of benefits, and even these are seriously underestimated. Although five thana are surveyed for the purpose of evaluation, only one of them is used for evaluation. Because of such errors and shortcomings, along with probable underrecording of trade volumes and failure to include the developmental benefits, cost savings appear to be less than road construction costs.

8. Being unable to check cost calculations for road construction, because a detailed breakdown of costs is not provided, we could check benefits only by calculating them from information contained in the Chandina thana report. Without considering cost savings to passenger traffic and that to shipment to and from pick-up points, the user cost savings derived from upgrading an earth road to brick/concrete/bitumen road serving secondary and tertiary markets exceed the costs of its construction and maintenance. The cost savings of upgrading a padestrian track to an earth road serving a primary market appear to be less than costs, when the earth road suitable for rickshaw movement is said to require the width of a truck road. But when allowance is made for the appropriate width requirement cost savings are just sufficient to cover the costs. This again excludes the savings to passenger traffic and other benefits, including savings to goods movement which are traded through pick-up points. Further allowance shall have to be made for developmental benefits, for the probable underrecording of trade volumes, for the biases in the field survey and so on.

9. The evaluation of waterways is very deficient. Costs and benefit calculations are not made; instead an attempt is made by arguments of a priori nature to show that the benefits do not justify waterways improvements.

10. The transport cost savings criterion, which is used to evaluate rural transport, is later criticized on the ground that it cannot take the distributional aspect into consideration. Hence a broader approach is proposed in order to concentrate on the distribution of cost savings among different affected groups and on other obstacles which may adversely affect the materialization of cost savings in the form of agricultural development. While the user cost savings do not appear to be the only, or even the major, benefits of transport changes in rural areas, the study is skeptical about the realization of even these savings in the form of agricultural development, and does not speak of other developmental effects of transport changes. Therefore the proposed approach does not appear to be appropriate for objective evaluation.

11. Although a broader approach, however inadequate and inappropriate it might be, is proposed, its data collection method explained and five thana surveyed for the purpose, it is not applied objectively in the text of the report, except for some concluding comments some of which are unsupported by survey data and others of which even contradict the evidence.

12. A few examples of the improper use of thana information are as follows. It is said that between 30 and 40 percent of the paddy is sold within two weeks after harvest in Nal-

chiti thana, whereas the Nalchiti thana report suggests it to be only 9.4 percent. The reasons are said to be conditional in debtedness and storage inadequacy. There is no strong evidence of conditional indebtednesas in any of the thana reports, and storage facility is found to be positively related to sale after harvest, which contradicts the study conclusion. Dissatisfaction with the existing condition of rural transport is said to depend on the lack of vehicle ownership, whereas evidence to the contrary is available in thana report. It is said that large farmers derive a greater advantage from agricultural development due to uneven access to inputs and that this equality will be reinforced by transport improvements. This argument is of a priori nature, except for the supporting fact that the large farmers of some areas own relatively more vehicles. Although large farmers may be expected to receive more benefits in this way, transport improvement may also open up some ways in which small farmers will be more benefited. These are ignored in the study.[160] It is mentioned that rural industries are important to create employment for the abundant labor force, but there is no hope of their establishment in the foreseeable future at below thana level. This statement is contradicted by the fact that rural industries already exist in rural Bangladesh at below thana level.

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[160] The distributional implications of transport changes will be analysed later.

13. It is, however, agreed in the study that rural transport is important to provide accessibility to rural areas for the limited amount of skilled manpower, and that accessibility justifies transport changes.

14. Although the ODG and TSS reach a cosensus in the report, they differ in summary and recommendation, and hence two sets of them are presented. The TSS summary and conclusions do not seem to reflect the conclusions of the report's text, and even contradict each other. Attempts are made by the TSS establish that the inadequacy of transport provides a constraint to rural development. Elsewhere, however, it is said that transport improvement is not really necessary, because the problems are created by indebtedness and storage shortage which can be solved by the provision of credits and storage facilities. In addition, the criterion of user cost savings for the evaluation of rural transport improvements is considered inappropriate, but it is latter agreed that the TSS should repeat such studies by following the established methodology. The ODG, however, argues consistently against transport improvement, and concludes that no further study is required for evaluation, except in special cases. Its approach, however, is inadequate to consider all probable benefits from transport changes and hence is inappropriate.

15. Overall, the mainstream of the study argues althrough consistently against rural transport changes in Bangladesh. All the errors in the use of thana information indicated above seem to be directed to support this position.

16. Since the user cost savings criterion is inappropriate to evaluate rural transport because of its low traffic density, rural transport should be evaluated in a comprehensive way which must include all potential benefits. Similarly, such an evaluation should consider all distributional effects in both directions. Such an approach will be applied for the present work.

Chapter IV

THE ROLE OF RURAL TRANSPORT IN ECONOMIC DEVELOPMENT: THE GROWTH EFFECTS

Because less developed countries (LDCs) in general, and Bangladesh in particular, are based on agricultural economies with the vast majority of their population living in rural areas, the development of agriculture, rural industries, and rural areas is important to their economic growth. This chapter will examine the mechanism by which rural transport may contribute to the growth of agriculture and rural industries, and to rural development in general; it will also analyze the importance of complementary investment.

It is important to differentiate between initial transport provision and transport improvement. By initial transport provision is meant the provision of a transport infrastructure in an area where no formal transport network exists. In Bangladesh, such areas fall into two categories. First, there are areas which are so isolated that human settlement and/or economic activities do not presently exist there because of linkage problem. Such areas, though rare, are not non-existent in Bangladesh. Secondly, there are areas where both human settlement and economic activities such as agriculture and small/cottage industries exist where there is no formal transport network for passenger and cargo movement. Two terms need explanation here : 'formal transport network' and 'movement'. By a formal transport network we do not mean any particular standard of road, but rather those roads and waterways which are under the jurisdiction of government offices or departments such as the Roads and Highways Department, Inland Water Transport Department, Bangladesh Railways, District Council, Thana Council, or Union Council. Rural transport usually comes under the jurisdiction of a Thana Council. Sometimes there are roads constructed and/or maintained by a Union Council but, effectively, they fall under the jurisdiction of Thana Council. The term "movement" does not imply merely transportation by vehicles but also includes walking and head/shoulder loading.

Transport improvement means the upgrading of an existing formal transport network, however bad its condition. Upgrading may take different forms depending on the condition of the formal transport network to be improved.

Bangladesh's rural transport network is generally in poor condition. Rural roads are usually meant for pedestrian movement and head/shoulder loading, rather than for vehicular movement, and hence their construction standard is low. In most areas the construction of roads requires earthfilling or embankment which is partially washed out by heavy rainfalls during the rainy season; some roads are impassable even on foot during the rainy season. Thus repair to the existing facility appears to be necessary in most cases where a formal transport network exists. Elsewhere, where roads are in better condition, improvements would involve (i) making the road embankment higher for all-weather movement, (ii) widening the existing facility, (iii) raising the standard of the road to make it suitable for vehicular movement such as push-carts, bullock carts, or rickshaw and (iv) construction of culverts or bridges.

Where there is no formal transport network, pedestrian passenger movement and head/shoulder loading of goods is done via the sidewalks and lawns of residential houses, crop fields, low-water canals and low-land, and jungles. To walk through crop fields, the dividing lines of different pieces of cropped land are used as footpaths; normally these lines are 6 to 10 inches wide. Since the pieces of cropped land usually vary in size from 0.07 to 0.5 acre, the dividing lines of these pieces of land do not provide a straight footpath and hence a pedestrian has to move circuitously to cross a small distance.

Provition of transport where no formal network exists will, of course, have more dramatic effects than will the improvement of existing networks; it will lead to human settlement and economic activities in the area, agricultural and/or non-agricultural.[161] Both effects are, however, important.

The growth effects of transport changes will now be analyzed in several categories: the effects on the size of cultivable land; the introduction of modern inputs and the diffusion of technological change in agriculture; provision of access to institutional credits; changes in crop composition; and market expansion and development of rural industries. In addition, the role of complementary investment will be analysed.

4.1 TRANSPORT AND THE AREA OF CULTIVABLE LAND

Land has important quantitative and qualitative effects on agricultural production; transport has implications for both. The qualitative aspect, which involves the application of modern agricultural inputs and the diffusion of technological change, will be dealt with later. Quantitative effects are produced in those areas of Bangladesh which cannot be brought under fruitful cultivation due to the shortage of transport linkage.[162] For example, a vast area in Rangamati, where about 75% percent of the land is suitable for growing valuable fruits like pineapples and banan-

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[161] See, for example, ibid., p.A90.

[162] Ibid., p.A90.

as, remains uncultivated.

In principle, there may be several transport related reasons for this. First, the absence of a transport network increases the cost of transporting products to market. Second, delays in shipment cause perishables to spoil.[163] Third, a shortage of transport results in an irregular supply of agricultural inputs which affects production adversely and increases the per unit cost of products. These additional costs are sufficient to make production in some areas not economically viable, and consequently such areas remain uncultivated.

Transport provision can be instrumental in bringing such land under cultivation beneficially with favorable direct effects on growth. For graphical illustration, we take a case similar to that of Rangamati, where perishables can profitably be produced but are not, because delays in shipment would lead to spoilage during marketing; shortage of transport linkage thus turns the potentially beneficial activity into an economically non-viable operation.[164]

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[163] The spoilage problem due to the inadequacies of transport facilities has been recognized as a problem limiting agricultural production and marketing. See Laurence Hewes, Rural Development : World Frontiers, (Iowa: The Iowa State University Press, 1974), P.48.

[164] Throughout this work, the technique of partial equilibrium analysis and the theory of firm are applied for graphical illustrations, and perfect competition is assumed which is usually valid in agricultural market, since the conditions of a perfectly competitive market more or less exist and hence the price is given to a

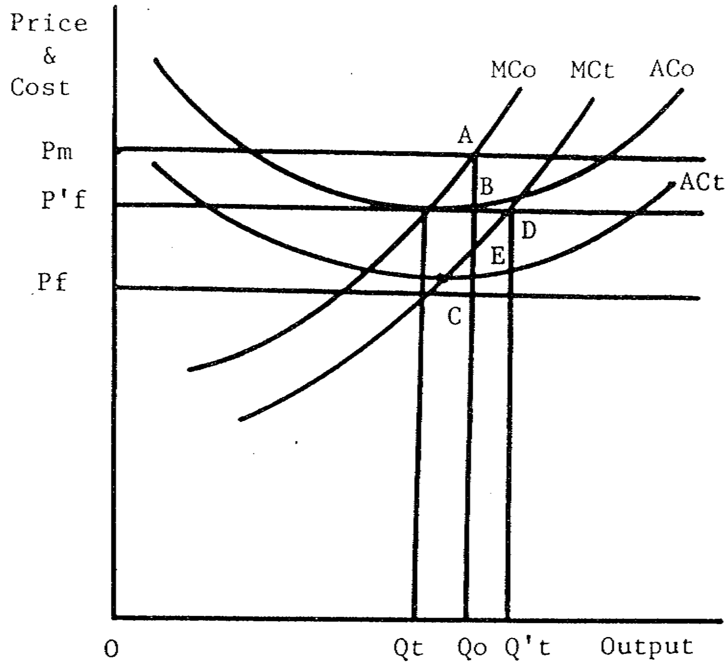

Figure 1: Transport Linkage and Production in New Area

In Figure 1, the pre-transport average and marginal costs of production are given by ACo and MCo respectively. The market price of the product, say pineapples, is Pm, while Pf indicates the farmgate price, which is defined as the market price minus per unit transport and spoilage costs. If there is no cost for transportation and spoilage, Pm and Pf coincide, Pm=Pf, and equilibrium production is (OQo) at which MCo=MR(=Pm). The positive net revenue is equal to

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farmer. In addition, it is assumed that the farmers are rational who respond to price changes. Subject to the qualification of residual effects in analysing the complex behavior of agricultural production, the analysis will provide an approximation of farmer response to new opportunities.

$$[(0Qo)(QoA)]-[(0Qo)(QoB)]=[(0Qo)(AB)]$$

There are, however, high transport and spoilage costs because of the absence of any transport network. At this level of output the area [(OQo)(AC)] gives these costs, which eliminate all profits and reduce sale proceeds further to cause a loss equivalent to an area of

$$[(0Qo)(QoA)]-[\{(0Qo)(QoB)\}+\{(0Qo)(AC)\}]=[(0Qo)(BC)].$$

Thus high transport and spoilage costs turn potential positive benefits into losses and hence production is not undertaken in such areas. Providing a transport network will reduce transport costs and eliminate or significantly reduce spoilage costs, and can be expected to increase the farmgate price of pineapples from Pf to, say, P'f. This implies a per unit reduction of transport and spoilage costs by PfP'f when the entire cost savings are passed on to producers or by less than PfP'f when a part is retained by transport operators.

The producers will consider the farmgate price, P'f, in production decisions and thus the production of pineapple will be carried out to (OQt) at which MCo = MR (=P'f). The producers just break-even at this level of output. Thus initial transport provision in this area increases output from zero to (OQt).

But that is not the end of the matter. A transport network is expected to reduce production costs further because of the easy, timely, and less expensive supply of agricultural inputs and implements it facilitates. As a result, production cost curves will shift downwards from ACo and MCo to, say, ACt and MCt respectively. The new equilibrium output is (OQ't) at which MCt=MR (=P'f). The producer's revenue net of cost is equivalent to the area

$$[(OQ't)(Q't.D)]-[(OQ't)(Q't.E)]=[(OQ't)(DE)].$$

Thus transport provision in this situation turns effective losses into a situation of breakeven operation without any reduction of production costs, so that production increases from zero to (OQt), and into one of positive net revenue with production cost reductions so that production increases, in total, from zero to (OQ't), where (OQt) is due to the fall in transport and spoilage costs of the product and (QtQ't) is due to the reduction in production costs.

This benefit of initial transport provision is obtained in one crop season. In order to determine total benefits, the potential benefits of every season of every year for the entire life of the transport network would have to be added and compared with costs. The current value of the benefit stream can then be compared with the discounted present value of construction and maintenance cost of the transport infrastructure to determine the economic viability of transport provision.

4.2 TRANSPORT, INPUTS AND TECHNOLOGICAL CHANGE IN AGRICULTURE

The size of land is an important aspect of agriculture, but the relative importance of land area falls as development in the agricultural sector takes place and as technological change, both biological and technical, alters the composition and combination of farm imputs.[165] Given the quantity of land under cultivation, agricultural production is a function of land quality, which is in turn a function of modern inputs and technological change.

A change in factor proportions towards better factor combinations is necessary in Bangladesh for several reasons. First, there is a low land-man ratio. Consequently, a higher production per unit of land is required to feed the existing and growing population. Second, in the earlier stages of any country's development, industrial growth and overall economic development may significantly benefit from agricultural development. Higher agricultural productivity depends not only on the natural but also on the artificial fertility of land, brought about by technological change and better input composition. The experience of most of the LDCs, including Bangladesh, in this context has been dis-

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[165] J. N. Lewis, , "The Changing Importance of Land As a Factor of Production in Farming", in the Proceedings of the Twelfth International Conference of Agricultural Economics, (Madison: Oxford University Press, 1966), p.421.

couraging.[166]

Agriculture in Bangladesh is primitive in nature.[167] The farmers are illiterate and untrained; most do not know the benefits of fertilizer and other modern inputs and some even consider these inputs harmful for land and for produce taste. Farmers still use local low yielding varieties of seeds although high-yielding varieties (HYV), which increase production are available. Crop damage by plant disease and insects is widespread and frequent. Farmers are uninformed about pesticides and entomological services. Even if the government has provided for such services, they are not accessible to farmers.

In addition, irrigation facilities are important for the development of agriculture in Bangladesh. There are two agricultural seasons, rainy and dry. Since Bangladesh has a high risk of floods, rainy season crops, and particularly rainy season paddy, are subject to a very high risk of natural calamities in the form of floods, cyclones and tornados which are mainly responsible for paddy damage and fam-

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[166] For example, the percentage of cultivable area irrigated is only 11.15 in 1977, and crops under improved seeds as percentage of the total crop area is only 19%, see Bangladesh Bureau of statistics, Socio-Economic Indicators of Bangladesh, pp.148,164

[167] The cultivation of land is done by wooden plough and land levelling by a bamboo-made instrument called moi both of which are driven by animal. The weeding is done by hand.

ines.[168] On the other hand, although dry season crops are free from flood risks, they are subject to the risk of drought. In addition, the dry season cannot be used for extensive cultivation because of the shortage of water. While it is very difficult, even impossible, to control floods, drought is controllable if irrigation facilities can be provided.

The productivity of low yielding varieties (LYV) of seeds is very low. A several fold increase in productivity can be achieved by introducing HYV seeds along with modern inputs. This is confirmed by the Bangladesh experience with paddy production.[169] The HYV seed, however, requires a whole seed-irrigation-fertilizer package: it needs continuous water and the application of fertilizer and pesticides.

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[168] Out of 486 thana of Bangladesh, 306 are subject to the risk of flush flood, and 158 are subject to the risk of normal flooding. See BBS, GOB, Thana Statistics, p.1; and "One of the inherent problems facing Bangladesh agriculture is a unique environment prone to natural disaster such as severe monsoon season flooding on vast tracks of land, periodic cyclones and droughts". Government of Bangladesh, Second Five Year Plan, (1980-85), p.xii-4.

[169] For example, the productivity of LYV rice is 9.78 maunds per acre whereas that of HYV rice is on the average 48.28 maunds per acre. See Bangladesh Engineering Consultants, Feasibility Study : Fulchari Thana, a report prepared for the Ministry of Local Government, Rural Development and Co-operatives, Government of Bangladesh,(Dhaka: MLGRD, n. d.) pp. F-21,22.

There are several reasons why the diffusion of this technology and the introduction of modern agricultural inputs have been limited in Bangladesh. First, there is the information gap: farmers are uninformed about the benefits and availability of improved technology. Several factors are again responsible for the information gap : (1) the low literacy rate, which limits access to any printed information source[170] (2) the isolation of villages and the limited contact of villagers with the outside and with thana level agricultural offices; (3) the inaccessibility of broadcasting and telecasting information media to the farmers due to financial constraints; (4)the limited effectiveness of the most effective information source, the agricultural extension services, because of the shortage of skilled service personnel and the limited mobility of available personnel due to the transport problem. Second, even if the farmers of any village do learn about the technology available, inadequate transport imposes a barrier to its introduction. The distribution authority usually selects more accessible areas to receive irrigation facilities.[171] Fertilizers and pesticides are distributed by the government mainly through

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[170] In 1974 census, the literacy rate of the population of Bangladesh as a whole is 19.3% (the rate for rural population is expectedly lower). See BBS, GOB, Statistical Pocket Book of Bangladesh 1980, p.143.

[171] See, for example, USAID (Dhaka), Project Paper : Zilla Road Maintenance and Improvement, (Dhaka: USAID, 1981) p.35; and Louis Buger Inc., Rural Roads Study, vol.1, p.IV-3.

thana level offices, which cover an area of up to 180 square miles. These inputs are required during the period of peak cultivation and, as a result, small farmers cannot afford to make long and time consuming journeys leaving livestock, including ploughing animals, unfed and farms uncared for, nor can they hire labor either to take care of the farm or to go to obtain inputs from distant locations.[172] The time cost during seasonal peaks and the information gap may be among the important reasons why small farmers cannot use modern inputs. The introduction of both product and process innovations appears to be adversely affected by the inaccessibility of required inputs and by failure to provide them, both resulting, among others, from transportation problems.[173] The third obstacle is financial constraint. Except for a very few, Bangladesh farmers are poor and hence it is difficult for them to apply inputs and to introduce other kinds of technological change in agriculture.

There is no simple solution to this problem. Given the institutional framework of the land tenure system, there may be several factors which can reduce the severity of the con-

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[172] See Bangladesh Rural Transport Study, p.50.

[173] A World Bank study suggests that farmers refrain from adopting crops the supply of whose inputs cannot be assured due to the problem of accessibility to the marketing network "which is closely related to the status of transportation infrastructure". See World Bank, Adoption of Agricultural Innovations in Developing Countries, World Bank Staff Working Paper No.444,(Washington: IBRD, February 1981), p.19.

straints outlined above. Rural transport is clearly one of them, but the relative contribution of different factors is controversial.

Rural transport can help reduce the information gap. It has been found that rural transport changes help spread education in rural areas through the establishment of schools, encouragement of higher enrolments, reduction of drop-out rates, introduction of female education, and so on.[174] The effect of rural transport on education and rural literacy seems, however, to be an indirect and long term phenomenon. In addition, the inadequacy of transport does not appear to be the major cause of illiteracy; village poverty, the use of child labor, and an inability to afford educational expenses are probably the major factors. If, however, rural transport can contribute to income growth, it will contribute further, although again indirectly, to education. Rural development requires an immediate reduction in the information gap, but the impact of transport on such development through its effect on literacy is less clear.

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[174] See, for example, Wilfred Owen, Distance and Development, F. E. Okada, Rural Works Project Padat Karya Gaya Baru : Socio-Economic Assessment, report prepared for USAID/Indonesia, March 1978; M. W. Ward, The Rigo Road : A Study of the Economic Effects of New Road Construction, (The Australian National University, New Guinea Research Bulletin NO.33, New Guinea Research Unit, 1970).

Improvements to rural transport can, however, eliminate or reduce the second and fourth causes of the information gap listed above. If the transport infrastructure is developed to provide fast movement, the mobility of isolated villagers is expected to increase.[175] They can carry their saleable goods even to big markets instead of selling through middlemen. More frequent visits to markets, relatives, thana headquarters, and urban and sub-urban areas will expose them to relatively developed areas and facilitate the exchange of ideas through contacts. All these changes will help disseminate ideas and information.

The most important source of information however is the agricultural extension services.[176] It is very difficult for

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[175] There is a possibility of rural-to-rural and/or rural-urban migration in search of job. The inter-regional migration in rural areas may help even out regional imbalance in the demand and supply conditions of rural employment. The rural-urban migration is not desired, because there already exists a huge slum area constituted of the people migrated from rural areas for livelihood. However, the probability of such migration does not seem to be very high. First, rural transport is meant for providing transport linkage mainly from farm to market and trade centres, and it does not necessarily connect villalges with urban centres. Second, if transport is supplemented by complementary investments, their effects on agriculture and rural industries are expected to create additional employment opportunities in areas served.

[176] Extension work includes the following services. First, the provision of information on better technology, HYV seed and other inputs, the ways to apply them, their benefits, and on the availabitity of institutional credits, etc. This is a kind of non-formal education through channels other than formal schooling. Second, motivation and persuation of farmers to be recieptive to new ideas and methods. Third, help them become capable

a limited number of extension personnel to visit the vast area of a thana in rural Bangladesh on foot since the transport system is usually very poor in rural Bangladesh.[177] Rural transport changes can obviously help remove or reduce this constraint on the mobility of extension personel and thus play an important role in providing information to farmers on the availability and benefits of inputs and improved technology and helping diffuse technological change in agriculture.

Another factor which limits the diffusion of technological change is the distance of distributing centres. Transport changes can reduce this barrier. If a journey back and forth can be made within a few hours instead of two days, one going and one coming back, and the journey is less expensive, the reduction of time and financial costs is expected to facilitate widespread application of modern inputs. Transport cannot, however, directly reduce financial

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of applying new techniques. Fourth, supervisory services during introduction of new methods by extending advisory and technical assistance. Fifth, demonstrating the effectiveness and benefits of new methods by model farms for the quick diffusion of technological change. Sixth, help farmers avail new technology and modern inputs.

[177] The problems associated with the provision of extension services are as follows. First, shortage of skilled manpower, and of resources on the part of the Government to appoint more personnel even if available. Second, the immobility of the limited number of extension personnel caused by transport shortage. The agricultural offices are located at thana headquarters to serve 100 to 350 villages which are densely populated and the population is more or less evenly distributed.

constraints; its role is an indirect one in its developmental effects on rural income, agricultural and non-agricultural.

Thus the provision or improvement of rural transport will increase the efficiency and effectiveness of agricultural extension services, and will facilitate the diffusion of ideas, the application of modern inputs and the introduction of technological change in agriculture. All these factors will together change the production function. Geometrically, this will lead to a downward shift in the cost curves of a farm, since the per unit cost of production at each level of output will be less than before.

In Fig.2, the initial average and marginal cost curves are given by ACo and MCo. Given product price P, equibibrium production is (OQo) at which the farmer just breaks even. Changes in the transport infrastructure will bring about, among others, the following effects : increases in the effectiveness of agricultural extension services, easier diffusion of ideas, and introduction of modern inputs and technological change. These effects will change the whole production function, ceteris paribus, so that the cost curves shift, say, to ACt and MCt. Other things being equal, a new equlibrium will be established at a higher level of production, OQt. The representative farmer is earning positive revenues net of costs which are given by the area

[(OQt)(Qt.B)]-[(OQt)(Qt.C)]=[(OQt)(BC)]

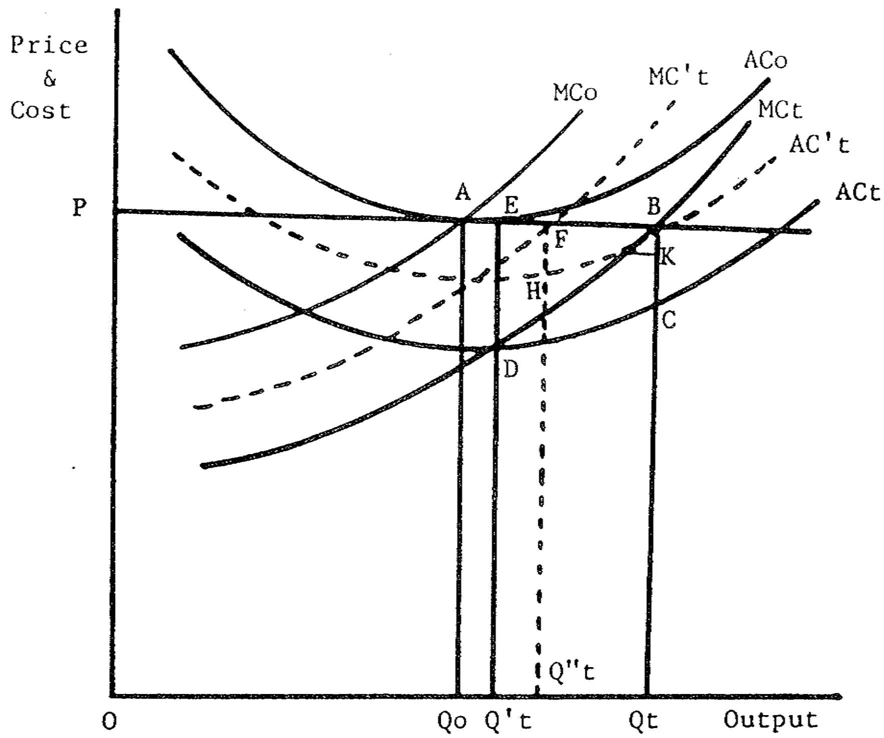

Figure 2: Transport, Technological Change and Agricultural Production

The ceteris paribus conditions may not necessarily hold true. For example, if the production function changes for every farmer, which is quite possible, the market supply curve may shift to the right and hence the price will fall. In that case, the increase in production of the representative farmer will be less, but still higher than before, and the positive revenue earned by the farmer will be b(DE) times the new quantity where $0 \leq b \leq 1$, with production in between (OQ't) and (OQt), on the assumption that the new price Pn is such that (DQ't) $\leq$ Pn $\leq$(EQ't). Consumers will also be benefited when Pn < (EQ't).

On the other hand, the direction of price change for a farmer may be different when the market price and farmgate price do not coincide and transport cost savings are passed on to farmers. At the one extreme, when the previous change due to supply shift is zero and the later price change is positive, the growth effect will be reinforced and the new output, say Qn, will be higher than (OQt) so that (OQn) > (OQt) with Pn > (Q't.E). On the other extreme, as explained above, (OQ't) $\leq$ (OQn) $\leq$ (OQt). The net effect will depend on the relative strength of the two forces. In any case, production is expected to be higher than before for the representative farm and the total production of the area served by the transport network is expected to be unambiguously greater than before.

4.3 TRANSPORT AND INSTITUTIONAL CREDIT

Farmers of LDCs are poor. In particular, the farmers of Bangladesh are among the poorest in the world and even the largest farmers in Bangladesh may be considered poor by world standards. This poverty necessitates credits both for agricultural production and for consumption. Most farmers do not produce crops for the full year and hence need credits for consumption, without which they cannot survive, not to mention further agricultural production and efficiency.

There are two main sources of credits in rural Bangladesh: local money lenders, the most important source of loans, and banks and financial institutions. The lowest level financial institutions are located at the thana level, except for a few thana where bank branches may be available at the sub-thana level in big markets or trade centres. Interest rates charged for credits from local money-lending sources are extremely high and many times higher than those charged by institutional sources. A study finds that the interest rates charged on loans from informal source vary up to 400% per annum,[178] whereas interest rates on agricultural credits from institutional sources vary from 11 to 12% per annum.[179]

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[178] See Bangladesh Rural Transport Study, P. A132.

[179] The interest rates on agricultural credits from institutional sources are as follows.

Instituions		Interest rate (%) since July, 1974.
Bangladesh Samabaya Bank (to Central co-op. Banks)		7
Central Co-op. Banks (to primary societies)		9
Primary societies (to farmers etc.)		12
Bangladesh Krishi Bank	short term	11
	long term	11.5

See World Bank, Bangladesh : Current Trends and Development Issues, p.90.

The villagers in general, and small farmers and the landless poor in particular, rely on informal local money lending source for borrowing. Their access to institutional credit is very limited.[180] No single reason can be suggested for this phenomenon, but there are two sets of causes, one responsible for the villagers' failure to avail themselves of institutional credits, and the other for credit institutions' reluctance to advance loans to villagers.

The villagers are unable to enjoy the facility for the following reasons. First, there is again an information gap; most of the villagers, and almost all of the village poor in particular, are unaware of the existence of such a facility. The reasons for this information gap are illiteracy, the isolation of villages which limits farmers' contacts and interaction with outside and trading centers including thana headquarters, inaccessibility of extension services, and so on. Second, the distant location of credit institutions along with the difficulty, expense and time needed for travel, imposes high financial and time costs, while sometimes the dishonesty of distribution personnel causes additional cost in the form of bribery.[181]

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[180] Share of rural areas, where over 90% of the population live, in total loans advanced by institutional agencies was 9.8 percent in Bangladesh during 1978-79. See BBS, GOB, Socio-Economic Indicators of Bangladesh, p.157.

[181] A study suggests that such time and financial costs may absorb upto 25% of the amount of credit applied for. See Bangladesh Rural Transport Study, p.48.

As well, credit institutions are reluctant to extend loans to villagers. These are as follows. First, most of the lending institutions require some sort of security or collateral against loans advanced which most of the villagers cannot provide. Second, fluctuations in farmers' income, due to factors such as natural calamities leading to crop failure and bad harvest, fluctuations in demand for agricultural items, and etc., cause fluctuations in their loan-repaying capacity. Third, the isolated villagers, because of their ignorance and unfamiliarity with commercial banking practice think that the repayment of loads is escapable. While money lenders' loans are fully paid even if land and assets must be sold, those of banks often remain unpaid even after a good harvest because of this attitude. Fourth, because of the second and third reasons, bad debts in rural lending are high, and banks are required to maintain a higher liquidity balance for meeting day-to-day cash withdrawals by customers; both of these facts limit bank profitability. Finally, because the rural transport network is poor, the communication system poor, and farmers both geographically scattered over a vast area and in need of small loans, credit administration and management become complicated and expensive, with an adverse effect on bank profitability.[182]

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[182] A World Bank study found a similar cause of farmer inaccessibility to institutional credits in rural areas of LDCs. See World Bank, The Political Economy of specialized Farm Credit Institution in Low-Income countries,

To the extent that rural transport has effects on these problems , the severity of the problems outlined above will be related positively to transport shortage and negatively to transport improvements. The mechanism through which transport can help reduce or remove constraints on the widespread distribution of institutional credits in rural areas is fairly clear. The immediate and direct effect of transport provision/improvements on the information gap will be through a fast, easy,and inexpensive transport linkage with the outside and particularly with trade centres where credit institutions are located; this linkage will facilitate frequent visits and outside contacts, and allow information dissemination by extension personnel. This will also reduce the cost of borrowing, which includes transport and time costs.

Rural transport provision/improvement is also expected to improve rural credit management and administration on the part of credit institutions. Improvements in this area will have effects on repayment and credit worthiness, and may thus, along with increased contacts with agricultural extension services, change the farmers' attitude towards institiutional credits. Effects on other constraints are expected to be indirect. For example, fluctuations in agricultural income which adversely affect credit worthiness will be re-

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World Bank Working paper No. 446, (Washington: IBRD, 1981).

duced by minimizing the risk of natural calamities through the intensive cultivation of safe-period crops, as analysed earlier, and by reducing price fluctuations partly through evening out demand variations with better marketing facilities. In addition, to the extent that rural transport may lead to higher agricultural production by facilitating the introduction of technological change, providing access to extension services and the like, it will have positive effects on credit worthiness. Thus, although there are several variables of different importance, rural transport does have a role to play in removing constraints on the distribution of institutional credits in rural areas.

Following the political independence of Bangladesh in 1971, all financial institutions were nationalized. Subsequently, the Bangladesh government has controlled credit management through these nationalized institutions in an attempt to provide access to a part of institutional credits for agricultural development. For example, the nationalized banks are asked to advance ten million (100 crores) taka under the 100-crore Agricultural Credit Program to the farmers, without any collateral required and irrespective of farm size or of tenurial status, owner or sharecropper, for the development of agriculture. Obstacles to financial credit on the part of credit-advancing institutions have thus been withdrawn, but the effectiveness of this program has still been limited because of the first set of constraints.

In fact, this program has not been sufficiently publicized, and consequently most of the farmers are unaware of it. The causes of the information gap, which have transport implications, are already analysed above. In addition, even if this credit is advanced without a credit-worthiness test, some formalities must be fulfilled including a certificate from the local Union Council office or any other important person. The whole operation of receiving loans is expected to involve several journeys which include visits to the location of credit institutions to ask about the necessary formalities, visits to submit the certificate and, if accepted, to make the formal application, and frequent visits to inquire whether bank formalities and file-work procedures are complete. It is this writer's experience that many difficult journeys on foot, over a distance of about five miles had to be made over a period of several months to obtain a loan of TK. 25,000 (US $1100 approx.) for the farmers of Pirpur Irrigation Project, a village in the district of Dhaka. This loan was, furthermore, easier to obtain than most because a person with good connections was involved in its procurement.

Thus, even if the credit-worthiness criterion for loan disbursement is withdrawn from a particular credit program, its performance is poor, first, because of the information gap and, second, because of barriers presented by distance and transport problems. These are aggravated by the inefficient procedure of banking services, which imposes many difficult, expensive and time consuming visits back and forth. The problem is thus not only transport-related; transport provision or improvement will, however, alleviate the difficulty of such journeys and reduce the information gap, and thus increase the accessibility of institutional credits to farmers.

One important characteristic of informal local money lending is that sometimes money is lent on the condition that the borrowers will sell crops to the lenders during harvest at a price far below the market price. Thus a very high interest is paid as borrowers sacrifice a part of produce price. The interest rate thus varies inversely with the product price received from lender traders.[183] One interesting consequence of this phenomenon is that although some credits are for non-agricultural purposes, for instance, for consumption or social occasions including marriages of daughters and sons, this form of interest payment still affects production adversely.

This situation can be illustrated geometrically. The implied assumptions are that there exist two credit markets, informal and formal; that the size of the formal credit market and hence its credit supply are greater than those of the informel one; and that transport and the accessibility

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[183] See <u>Bangladesh Rural Transport Study</u>, p.48.

of credit to farmers are directly related to each other for reasons analysed above.

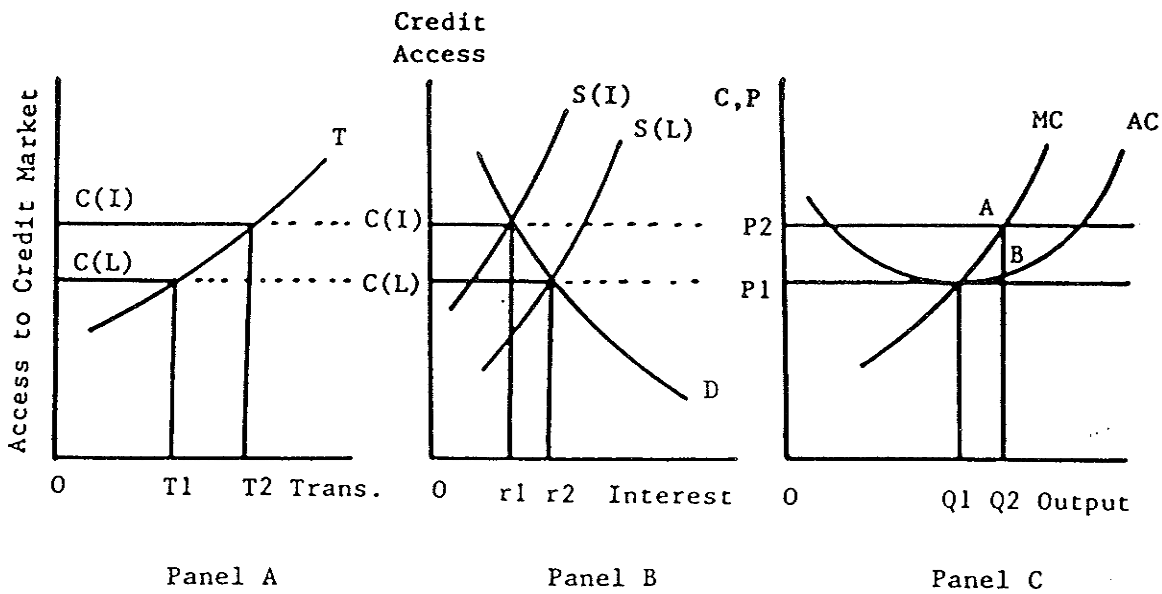

Figure 3: Transport, Credit and Agricultural Production

As shown in panel A of Figure 3, credit accessibility is positively related to transport availability. Transport T1 hinders access to institutional credit market C(I), and hence the affected people resort to local money lending market C(L) for borrowing. Transport availability T2 provides access to institutional credit market C(I). When money is borrowed from local money lenders C(L) with limited transport facility T1, the interest rate is high r2 in panel B which is given by the intersection of credit demand curve D and local market money supply curve S(L). The higher interest r2 corresponds to a lower product price P1 in panel C, which, given the average and marginal revenue curves, AC and MC, leads to an equilibrium output (OQ1) so that the farmer is just breaking even.

If transport facilities are increased from T1 to T2 in panel A of Figure 3, the farmer's access to credits increases from the local market C(L) to the institutional credit market C(I) along the curve T which represents the relationship between transport availability and access to credit market. The credit supply in C(I) is higher S(I) in panel B, so that the resulting interset rate is lower r1. This lower interest rate r1 corresponds to a higher produce price P2 in panel C for a representative farmer. The new equilibrium production is established at (OQ2). The output of the representative farmer is increased from (OQ1) to (OQ2,) ceteris paribus, and his revenues net of costs are increased form zero to

$$[(OQ2)(Q2.A)]-[(OQ2)(Q2.B)]=[(OQ2)(AB)].$$

Thus higher production may be achieved by a more intensive cultivation of land and a higher application of inputs and technological change due in part to the availability of cheap credit. A general effect of this type may lead to a higher market supply of the product. In any case, agricultural production is expected to increase and thus the growth effect is positive.

4.4 TRANSPORT AND CROP COMPOSITION

An appropriate crop composition based on land suitability is important for an efficient allocation of resources. If crop composition is determined instead by such factors as inadequate marketing and transportation facilities, the choice may well be inefficient.

If producing certain goods is made economically non-viable by some factors, producers refrain from these products even if they are potentially more remunerative than the goods produced instead. This is especially true of transport-intensive and perishable products. If marketing facilities are poor, in part because of the transportation problem, farmers in an isolated non-market village economy are discouraged from selecting those crops for production which have high market values but are perishable, or which are transport intensive and bulky but profitable. For instance, fruits, vegetables, and diary products yield a high return but are perishable.[184] Similarly, bulky crops like sugercane may be potentially profitable but their profitability may be eliminated or reduced by the difficulties and costs of

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[184] A study shows that transport inadequacy limits production of perishables in Bangladesh villages. See Louis Berger Inc., op. cit., p.IV-3.

The same study suggests that the provision and/or improvement of transport will facilitate production of perishables such as vegetables, eggs, milk and fish in the villages of Faridpur district of Bangladesh which have great demand in urban centres. Ibid., p.IV-8.

transportation. Thus inadequate transport dictates the selection of crops which are less perishable and less transport-intensive, and more remunerative items are sacrificed because of delays and costs of transportation and the resulting marketing problems. Crop composition may also be affected by the supply conditions of complementary inputs. Some cash crops may require particular inputs the availability of which may be affected by factors sometimes related to transportation.

The information gap also plays a role in inefficient crop composition: the illiterate and uninformed villagers do not know the benefits of alternative crops and hence stick to traditional selections. If, as has already been established, transport changes can increase the efficiency and effectiveness of agricultural extension services, extension workers may advise farmers on appropriate crop composition.

Crop composition may also be made more efficient by the introduction of new crops. This may be enhanced by importing new ideas, supplying new inputs, and providing adequate marketing facilities, in all of which transport has a role to play.[185]

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[185] In a village of Rajasthan, India, sugercane was introduced as a consequence of rural transport improvements. See Owen, Wilfred, Distance and Development.

In short, transport changes can help in the choice of appropriate crops for cultivation. If transport cost is reduced, bulky crops can be produced and marketed for higher return. Similarly, perishable crops can be transported quickly to consumer centres. The importation of ideas may lead to the introduction of new cash crops. As well, the cultivation of particular crops can be facilitated if necessary inputs are supplied inexpensively and quickly. Thus an appropriate crop composition in favor of cash crops for higher return is a function, among others, of crop size, perishability of crops, marketing facilities, supply of inputs, agricultural extension services, and new ideas.[186] Functionally,

$$PCC=f(Pr,B,M,I,E,NI,A) \qquad \ldots\ldots\ldots\ldots\ldots(1)$$

with $f'(pr)$, $f'(b) < 0$; $f'(m)$, $f'(i)$, $f'(e)$, $f'(ni) > 0$

since,

$$P=g(Pr,B,M,A) \qquad \ldots\ldots\ldots\ldots\ldots(2)$$

with $g'(pr)$, $g'(b) < 0$; $g'(m) > 0$

and

$$Pr,B,M,I,E,NI = h(T,A) \qquad \ldots\ldots\ldots\ldots\ldots(3)$$

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[186] In the Philippines, over a period of two years after rural road improvements, the production of several marketable crops increased by 40%. See USAID/Philippines Government, Rural Roads Evaluation Project, (Philippines: USAID, 1978). Similarly, more sugercane and bananas were produced in Bolivia after road improvements. See Wennergren, E.B., and Whitaker, M.D., "Investment in Access Roads and Spontaneous Colonization", Land Economics, 52 (1976).

with h'(pr) ,h'(b) < 0 ; h'(m), h'(i), h'(e), h'(ni) > 0

where PCC=production of cash crops, Pr=cost of perishability (damage), B=cost of bulkiness, M=marketing facilities, I=supply of inputs, E=extension services, NI=new ideas, P=profitability, T=transport changes and A's=other factors held constant which are less relevant for present analysis.

Because of (3), lower transport changes cause higher profitability in (2), which along with (3) leads to the selection and hence higher production of cash crops in (1).[187]

4.5 RURAL TRANSPORT AND MARKETING

Markets are segmented in most of the rural areas of Bangladesh, mainly because of inadequate transport facilities. There are local markets where small loads are traded, and big markets at relatively distant places. These two categories of markets are segmented by transport barriers and hence two different sets of commodity prices prevail in them. Most big traders do not enter local markets because of transport problems, transport costs and, more importantly, the both physical hardship in traveling along muddy

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[187] Ndulu observed in Tanzania that the degree of commercialization of agriculture was inversely related to transport costs to secondary markets, and that the agricultural supply of cash crops responded positively to reductions in transport costs. See Benno Joseph Ndulu, "The Role of Transportation in Agricultural Product: The Case of Tanzania" (Ph. D. Thesis, Northwestern University, 1979).

paths and occasionally through the knee-deep water of a canal or through mud. As a consequence, the lower prices in local markets are justified not only by differences in transport charges. The situation does not, however, imply imperfect competition in local markets. No individual seller or buyer appears to be able to affect the price in local markets and hence perfect competition may be assumed to prevail in these markets.[188]

If transport is provided or improved, more traders are expected to enter local markets. Since a competitive market is assumed, the trader penetration does not imply any change in the elasticity of demand for agricultural commodities, but rather a shift outward in the market demand curve. This shift will lead to an increase in the price and consequently in the volume of agricultural items traded in local markets. An individual farmer will face a given higher price even in local markets. This will lead to higher return and consequently to higher production for an individual farmer. This situation can be explained by the help of a diagram.

Panels A and B of Figure 4 pertain respectively to a local market and a representative farm, which have different horizontal, but the same vertical scales. The letters with zero subscripts denote situations without transport facili-

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[188] Although this assumption seems to be justified in agriculture, it is not necessary for the analysis, and, realistically, the result is not expected to be significantly affected if the assumption is relaxed.

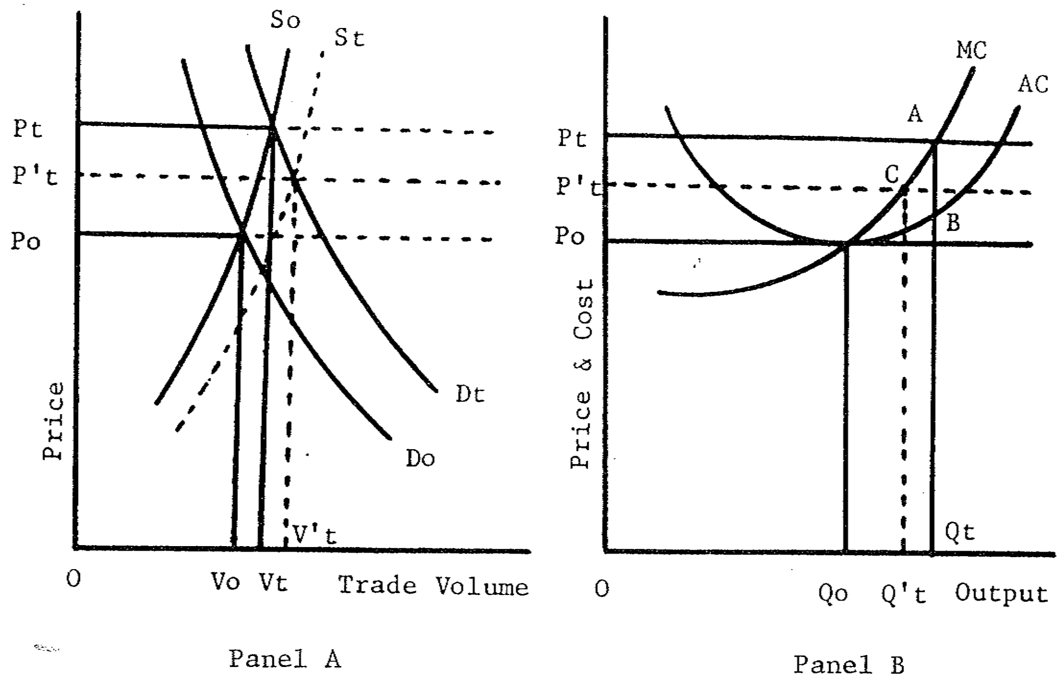

Figure 4: Transport, Marketing and Agricultural Production

ties or changes, and those with subscript t denote situations with transport facilities or changes.

The market demand and supply curves without transport changes are Do and So respectively in panel A of Figure 4; they determine a market price, Po, so that Vo is traded in the local market. This price Po is given to the representative farm facing average and marginal costs as depicted by AC and MC respectively in panel B. At price Po, the representative farm produces Qo output and just breaks even.

After transport changes, Do shifts to Dt in panel A of Figure 4 because of the higher demand created by the newly penetraded traders, while the supply curve remains the same in the beginning, and thus a new price Pt is established in the market which is given to the representative farm in panel B.[189] At this price Pt, its equilibrium production is Qt, ceteris paribus. The revenues net of costs are given by the area

$$\{(0Qt)(Qt.A)\}-\{(0Qt)(Qt.B)\}=\{(0Qt)(AB)\}$$

An increase in the production of individual farms is expected to lead to higher aggregate production in the area served by the transport changes so that the market supply curve will shift to the right in panel A of Figure 4, implying a fall in product price. This adjustment process will continue until a new equilibrium price-quantity solution is obtained. For simplicity, one may assume that, after such adjustments, the new supply curve consequent upon transport changes is St, determining a market price P't, which is given to the representative farm; accordingly, his new equilibrium output is Q't, at which he is still earning a positive net revenue.

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[189] This is expected to happen particularly in a project area presently served by small and local markets. The shift in the demand curve is probably such that the price will be close to that established in a big market. If all rural areas are provided with better transport infrastructure, there will be shifts in both demand and supply curves which will establish a whole new equilibrium with a different combination of price and quantity.

Rural transport changes can increase not only trader penetration into the local markets but also farmers' access to big markets. Even if local markets become more accessible to traders, big traders coming from distant places by train or waterways may still prefer to rely on big markets for their purchases, leaving the local markets to small traders. Thus the demand curve for any product in a large market is expected to be still higher than that in a local market implying a higher price of the product in the large market which cannot be explained in terms of transport cost differential. In this case, it will be beneficial for farmers to transport their products to big markets.

There may, however, be some skepticism about the materialization of such growth effects of transport changes. First, higher trader penetration into the local markets seems unlikely because the volume of trade in local markets is low. In addition, small farmers tied up with local loans contingent on the sale of crops during harvest to lenders will be unable to sell products to other traders even if trader penetration occurs. Second, if there is any barrier to entry into the transport industry, market power in the transport industry will restrict any transport charge reduction so that the benefits of transport changes cannot be passed on to farmers for higher production or to the traders.

Such skepticism is not necessarily valid. Because of the low prices for agricultural commodities in local markets under existing transport conditions, large farmers usually manage to transport their marketable items to big markets for higher prices. If the price gap is narrowed down reasonably by transport changes, big farmers may choose to sell some of their products in local markets, particularly when they sell in small quantities, and thus the traded volume in local markets may increase.[190] The volume needs not, however, increase up to the level of a big market, since the number of traders in big markets is expected to be higher than that of small markets anyways. On the other hand, even if trader penetration is low in local markets, farmers will be able to transport their crops to big markets on the improved or new transport network. Second, there is little evidence on widespread tied marketing arrangements in rural Bangladesh, although such arrangements do exist to some extent. Therefore, this will probably not restrict significantly the benefits of the rural transport changes to be passed on to farmers. Transport changes may also contribute to breaking the system of such tied marketing arrangement by increasing accessibility to institutional credits.

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[190] This process may involve shifts in demand and supply curves, which will establish a new price-quantity solution.

In addition, there is no regulation in Bangladesh restricting entry into the rural transport industry. In fact, co-operative financing encourages entry. Moverover, the pedal rickshaw, suitable for low-standard rural roads, is a cheap vehicle made mainly of local materials, and hence requires a nominal capital. The vehicle can carry man, goods, or both, and is labor-intensive. In this situation, it is not clear why potential entrepreneurs and operators should hesitate to enter the transport industry when opportunities are created and rural unemployment is high. Even ignoring cargo shipment, passenger movement in a densely populated rural area is high which adds to transport demand.

There is also skepticism about price response in agriculture. Since agricultural land is limited and fixed, and there is a limit to the intensive use of land, price incentives may not lead to higher agricultural production. In principle, this seems to be valid where all possible inputs have already been used for intensive cultivation according to existing technological knowledge. But the situation may be changed when a technological change that provokes a positive price response occurs. In Bangladesh, agriculture is still primitive and so there exists a tremendous potential to develop it through the introduction of modern technology. Therefore, if price incentives are complemented by the adequate and timely supply of modern inputs, credits, irrigation, agricultural extension services, and adequate marketing facilities, there is no reason why price incentives should not work in agriculture.

Therefore, even if it is possible that some potential obstacles may restrict the growth effect of transport changes from materializing, the possibility seems slight.

4.6 RURAL TRANSPORT AND NON-FARM ACTIVITIES

Rural transport can potentially contribute to the development of non-farm rural activities. Although rural households in LDCs are mainly involved in subsistence agriculture, they also have some non-farm activities at village level including handicrafts, artisan activities, cottage and small scale industries. These activities are important for several reasons.

First, they provide additional employment for the unemployed or partially employed rural poor and thus add to their income. Rapid population growth has been increasing the already high population density in Bangladesh. Although it is expected that much of the growing labor will be absorbed in agriculture, non-farm jobs will be the goal of an increasing proportion of the labor force "roughly two out of every three job seekers over the next 25 years".[191] In Bangladesh, one-third of the rural workers remain unem-

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[191] World Bank, Employment and Development of Small Enterprises, (Washington: IBRD, 1978), p.11.

ployed.[192] Another micro-study suggests that unemployed man-days are 32% of the total man-days available in a village without technological change in agriculture.[193]

Given the extent of unemployment in rural areas, it is difficult to reduce poverty only by developing agriculture. In Taiwan, for example, real income in rural areas fell even when agricultural productivity increased as a result of post-war land reform and developmental policies, and the rural income rose only when rural industries developed to provide gainful employment to the landless and the unemployed.[194]

Agricultural development is important, but it is not sufficient to change a state of rural poverty in which population growth appears to supercede agricultural growth. This phenomenon requires the creation of ample non-farm employment opportunities. Since it is not feasible for the manufacturing sector to provide the required opportunities in the near future, due to the shortage of capital, entrepreneurship, marketing facilities, etc., it is necessary that

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[192] Government of Bangladesh, Second Five Year Plan (1980-85), p.VIII-3.

[193] A. H. M. Sadeq, "Agricultural Finance: Strategy of Mechanized Irrigation and Implications- A Case Study," (Dhaka: University of Dhaka, 1979), (mimeographed).

[194] Dennis L. Chinn, "Rural Poverty and the Structure of Farm Household Income in Developing Countries: Evidence from Taiwan," Economic Development and Cultural Change 27(1978-1979): 283-301.

most of the unemployed labor force be absorbed in cottage or small-scale rural industries as well as in agriculture.

Second, a significant part of high unemployment in rural areas is seasonal in nature. Seasonally unemployed workers cannot migrate to the urban areas permanently, for they are needed in agricultural activities during ploughing, planting and harvesting seasons. Instead of remaining unemployed for fairly long periods of the year, they can be fruitfully employed in small scale or cottage-type industries. This kind of supplementary employment opportunity is important to reduce rural poverty.

Third, production cost will be low if such industries are located in rural areas. Because of high rural unemployment and the low cost of living in rural areas, wage demands are usually lower in rural than in urban areas for the same work. In addition, capital outlays for land and building are expected to be relatively low in rural areas. Therefore the cost of production in these industries is expected to be low. The low production cost and the resulting lower product prices may have positive effects on the demand for commodities produced by these industries, and thus on production, employment and income.

Fourth, a sizeable part of the demand for small or cottage industrial products is rural based, because (i) more than 90% of the population of Bangladesh live in rural areas, and (ii) these products are usually not of high quality and hence are cheaper so that the rural poor can afford them. These low-cost products include lungi, gamsa, and saree in Bangladesh.

Fifth, rural industries will discourage migration of unskilled workers from rural areas to the already over-burdened urban areas to search for jobs.[195] This trend of migration has been causing rapid growth of urban slums, congestion, housing shortages, health hazards, and industrial unrest.

Sixth, the growth of some small scale and cottage industries will increase these industries' demand for intermediate goods like yarn for handloom industries, equipment for weaving units, and so on. This will encourage the growth of manufacturing industries which produce intermediate goods for small and cottage industries.

Finally, and probably most important, is the gradual transformation effect. Employment in the small cottage industrial enterprises, agricultural production for the market because of good marketing facilities, and higher rural income are all expected to contribute to a change in the pro-

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[195] In India, about 10 percent of regular farm and non-farm workers, and 56 percent of casual workers are willing to migrate to urban centers for full-time wage employment. See World Bank, Rural Unemployment - A Survey of Concept and Estimates for India, World Bank Staff Working Paper No.234, (Washington: IBRD, 1976), p.iii.

duction outlook from subsistence motive to commercial rationality. Similarly, these factors are expected to change the consumption pattern by increasing demand for manufacturing goods. Such a change may result in an expansion of the manufacturing sector and thus a gradual transformation of the economy from a traditional nature to a modern stage.

There are, however, obstacles which limit the development of rural industries in LDCs, including Bangladesh. Rural transport can play a role in removing some of the obstacles and thus facilitate the growth and development of rural industries.

One of the limiting factors is related to the marketing of goods produced in small/cottage industries. There may be several different kinds of markets. First, the village market covers mainly the village in which it is located; items produced and marketed locally include small furniture and agricultural implements like wooden ploughs and moi (land levelling tool). Second, a slightly wider market covers a few villages around a local market, and sometimes spreads, up to the area of a thana. The small/cottage industries producing goods and services mainly for this market include pottery, animal driven oil crushing, rice threshing, blacksmithy, goldsmithy, and so on. Third, the nationwide market is spread throughout the country; items produced for such a wide market include clothing like lungi, gamsa, saree, chadar (a winter cloth), and woolen garments, simple household utensils, and so on. In addition, there is a great and unexplored potential for some nationwide consumption of such items as canned mango and pineapple products.[196] Fourth, the market for handicrafts, which is mainly constituted of the urban rich and middle class population. These products have significant export potential as well. Bangladesh has already been exporting handicrafts to the world market.[197] Fifth, there is a sub-contracting market in which goods or intermediate goods are produced on a contract basis so that demand for them is predetermined and ensured.

Rural transport has an important role to play in the marketing and shipment of these products to and from these different kinds of markets. Only in the first case does marketing not involve much movement and shipment, while in the last case, because the outlet is ensured and definite, the benefits of transport changes will consist mainly of transport cost savings. An additional benefit may be obtained, however, when transport changes help spread sub-contracting activities to the presently inactive and remote villages. This kind of sub-contracting at the village level probably

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[196] See, for example, M. Raihan Sharif et al, op. cit., and Bangladesh Rural Transport Study.

[197] Bangladesh has exported handicrafts of worth TK. 51 million during 1981-82. See Government of Bangladesh, Bangladesh Economic Survey, 1981-82, p.160.

does not exist at present in Bangladesh. One of the reasons may well be the present state of the transport system and hence the access problem.

In all other cases, marketing may involve considerable cargo movement, and markets have to be explored by the owners of these industrial units. One important phenomenon of such enterprises in Bangladesh is that the owner himself is usually the buyer of raw materials, operator of tools and machineries, and seller of products. In small enterprises there is no division of work between management, operation, marketing, etc.; for example, the owner of a handloom industrial unit is required to visit markets to buy raw materials, design clothes to be produced, operate hand driven tools, and then sell the products during market days. Those who can afford to establish several weaving units employ labor for the operation of additional units while one of them is usually operated by the owner himself.

If the transport system is inadequate and difficult, these operator-owners cannot explore distant and potentially profitable markets. Therefore, the middleman, who buys cloths from households or local markets to sell in big markets, and thus make a good profit, comes into the picture. If this benefit can be retained by the enterpreneurs themselves, industries are expected to expand and develop.

The marketing problem is especially acute in handicrafts and some cottage industrial products of Bangladesh. In a study of the potential for small/cottage industry in the rural areas of Rajshahi district of Bangladesh the absence of adequate markets was found to be one of the most important limiting factors.[198] While other factors, including the lack of a promotional system, play a role in the marketing problem, the inadequacy of transport linkage is clearly very important. In fact, the inadequacy of transport facilities is one of the major factors limiting the location of industrial enterprises in rural areas.[199] Such inadequacy seems to be a common phenomenon limiting the development of small/cottage industries in almost all LDCs. A study in African small industries suggests, "Almost universally, the market system serving small enterprise development in Africa is severely limited because adequate communication and distribution networks are not available.[200]

There is some skepticism about the beneficial effects of improvements in the transport infrastructure, which may facilitate the entry of manufactured substitutes into rural areas, so that rural industries will face competition from

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[198] See M. Raihan Sharif et al, op. cit.

[199] Duraid Yawer, Rural Industrialization for Developing countries, (Delhi: Chetana Publications, 1978), pp. 47-48.

[200] Phillip A. Neck, ed., Small Enterprise Development : Policies and Programmes (Geneva: ILO, 1977), p.199.

the modern sector.[201] The manufacturing industries are in a better position to compete, because of government support programs in the form of subsidies, tax holidays, and protection and because of the economies of scale. Such competition may not, however, be as threatening in Bangladesh. Some products, like handicrafts, pottery, goldsmith items, etc., are not suitable for manufacturing industries. A few items of rural industries may however face competition from outside, for example, clothes produced in rural weaving industries, and particularly lungi, saree and gamsa. Gamsa is widely used in rural Bangladesh, where almost every male person has a gamsa and a lungi, and every woman has sarees. Due to reasons unknown to us, the manufacturing industries have never tried to produce gamsa and so the rural sector enjoys a monopoly in its production. The manufacturing sector has been trying to compete with the rural sector in the production of lungi and saree, but it seems to have failed to capture the markets for these commonly used items. People prefer lungis and sarees produced in the handloom industries, and these lungis are widely used in both rural and urban areas. The saree market has faced some effective competition in urban centres, but from synthetic saree imported from abroad rather than from manufactured sarees. Only the rich can afford imported sarees, and the others still depend on rurally produced sarees. Therefore, it does not seem

[201] World Bank, Rural Enterprise and Non-farm Employment, (Washington: IBRD, 1978), p.39.

likely that competition consequent upon transport changes will severely affect rural industries.

An adequate transport network is not needed only for marketing facilities. Production costs may increase, and the smooth functioning of rural industries be disturbed, when the supply of raw materials is affected by transport shortage. Visits to distant markets on difficult roads for supplies involve both financial and time costs which increase per unit price of the product. Sometimes production is severely disturbed when raw materials cannot reach distributing market places because of transport problems, especially during the bad weather days of wet seasons. A hard surface road, instead of a mud road, may help solve this problem.

One of the pressing needs of small industries is for credit. The villagers are generally poor, and while a few surplus farmers do exist, many of them do prefer not to invest in these industries. The ownership and operation of many cottage industries, such as weaving or pottery, are considered to lower social status and hence large farmers seem usually to refrain from such involvement. It is mainly the rural poor, unable to get support themsleves from agriculture, who resort to these socially degrading, but economically profitable and socially desirable activities. They need credit to operate these industries but the inaccessibility of institutional credits makes them rely on informal money lending sources which charge very high rates of interest. Although several factors are responsible for this inaccessibility, transport changes can help remove some of the obstacles in ways analysed earlier, and thus can contribute to the development of rural based industries.

In view of the importance of small enterprises in rural areas, it has been suggested that extension services be provided to potential entrepreneurs and to existing establishments at the village level.[202] These services would include training for operational skill, providing designs, acquainting villagers with new techniques and presenting some basic instruction in marketing, management and business methods. Formal training schools and institutions are usually located at urban areas beyond the reach of village dwellers. On the other hand, it is not very feasible to create training facilities at the village level. Therefore, informal education can usefully be provided through extension workers.

The importance of extension services for the development of rural industries has led some LDCs to provide them. For example, in India, a program has recently been established to provide extension services to small rural enterprises.[203] Under this program, private consultants are being sent to

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[202] J. Mouly and E. Costa, Employment Policies in Developing Countries, (London: George Allen and Unwin, 1974), p.94.

[203] R. V. Rao, Rural Industrialization in India, (Delhi: Concept Publishing Co., 1978), p.35.

small enterprises in the countryside to extend technical consultancy services. The service is free for the backward areas, while in relatively developed areas the small enterprises bear 25 percent of the cost.

A practical alternative may be to integrate this service with other development programs. For instance, in Bangladesh, development services are available down to the thana level where assistance in agriculture, family planning, health, and institutional credits is located. If technical and advisory services for small enterprises are integrated with these other development programs, their costs will be low, and administrative and infrastructural problems can be handled in an integrated way.

This policy will have significant transport implications because it will require frequent movement of potential entrepreneurs to thana headquarters or of extension officers/workers to villages and thus will depend on adequate transport facilities. In particular, given the scarcity of skilled manpower in Bangladesh, if extension officers/workers are to visit villages, the efficiency and success of the program will depend significantly on the adequacy of rural transport.

Thus rural transport can potentially contribute to the development of non-farm small/cottage industries in rural areas by widening markets, helping in adequate and timely supply of raw materials and neccesary inputs, providing access to institutional credits, and by increasing the efficiency of extension services. This non-farm activity is an important means of increasing income and reducing rural poverty and is thus important to economic growth. World Bank and ILO studies suggest that transport improvements are required for the development of non-farm enterprises to

> widen their markets, and improve their access to raw materials, labor, public utilities, and commercial and marketing services .... The existence of a growing non-farm sector in developing agricultural regions adds to the demands placed on rural infrastructure, and is an important factor to be considered when investment programs for infrastructure are being drawn up.[204] The lack of "hardware" infrastructure, such as roads, handicaps small enterprises.[205]

These studies suggest that rural transport is conducive to the expansion and development of non-farm rural industries, while inadequate rural transport limits their development and expansion.[206]

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[204] World Bank, Rural Enterprise and Non-farm Employment, p.40.

[205] ILO, Small Enterprise Development : Policies and Programs, (Geneva: ILO, 1977), p.200.

[206] If rural transport helps increase income in the traditional sector of the economy, it has forward linkages with the expansionary effect on the modern sector of the economy. These secondary effects are not analysed in this study. Anybody inetrested to look at them may see, for example, Gerald M. Meier, Leading Issues in Economic Development, (Madison: Oxford University Press, 1976); Bruce F. Johnston, "The Role of Agriculture in Economic Development" American Economic Review (1961), pp.571-81; T.H. Lee, "Stragies for Transferring Agricultural Surplus", in Gerald M. Meier, ed., op. cit.; J. Mouly and E. Costa, Employment Policies in Developing Countries, (London: George Allen and Unwin, 1974).

4.7 ROLE OF COMPLEMENTARY INVESTMENTS

Rural transport can potentially contribute to income growth in the traditional sector of the economy of LDCs and in the expansion of rural industries, the mechanism of which has been analysed earlier. The inadequacy of transport is not the only constraint on rural development: rural transport is only one of many components that deserve development and that may as well have different degrees of potentialities to contribute in the process of development. Our analysis above describes the development potential of rural transport only in absolute terms; it does not relate or compare trarnsport to the growth potentialities of other components in rural development. If complementary investments occur, and thus other constraints are removed as transport changes are made, the developmental effects of rural transport can be accelerated greatly. It is therefore not proper to single out transport for rural development by ignoring other constraints: it is important to understand the role of other factors to arrive at a comprehensive plan for rural development.

The factors that can contribute to rural development, the inadequacy of which can be considered as constraints on it, may be broadly divided into two groups: directly productive components and support components. These are not totally independent categories since each complements the other but they are classified here according to the nature of their primary roles.

Directly productive components are those which affect production directly, rather than facilitating or supporting productive activities. For instance, the introduction of technological change through the provision of irrigation and modern inputs will directly increase agricultural production and hence is a direcly productive component.

On the other hand, support components are those whose main functions are to support directly productive activities. For instance, the improvement of marketing facilities for farm products encourages commercial farming and higher production.

Some components may, however, be considered as both directly productive and support components depending on time, space, and situation. The agricultural extension services and rural transport are support components because the usual functions of the former are educational and those of the latter are supportive, but both components sometimes can lead directly to increased production. For example, when rural transport opens up potentially cultivable new areas, it produces a direct increase in production; if extension workers give practical help in the use of fertilizers and pesticides, thus preventing crop damage, their help will have a direct effect on production. Hence both may be regarded as directly productive components in the particular cases.

The directly productive components include: (1) irrigation, (2) drainage, (3) agricultural implements, (4) high yielding variety seed, (5) fertilizer and pesticides, (6) opening up of new land, and (7) tools, machineries and raw materials for small/cottage industries.

The support components include: (1) extension services, (2) credit, (3) rural transport, (4) education, (5) health care, (6) family planning, (7) repair and maintenance of farm implements, (8) storage for inputs and output, (9) agricultural price support and marketing facilities, and (10) marketing and sales promotion of small/cottage industrial products.

Since the major role of rural transport is supportive, it will usually support other directly productive activities, rather than initiate them. It should not be expected that the provision of a support component will produce all desired results. Rural transport changes can contribute to economic development, particularly to rural development, mainly by removing constraints on development. The contrbution of these changes will vary directly with the availability of other complementary development components. For example, irrigation technology is needed to solve the problem of low productivity and crop damage through flooding and to facilitate the introduction of HYV seeds and cultivation in a flood-free winter season. In this situation, if an area lacks facilities for irrigation and modern inputs like fertilizer and pesticides, transport improvements may produce an incentive for growth but cannot enable producers to realize that potential.

The important point here is the comprehensiveness and simultaneity of all components, both productive and supportive, which not only complement each other but also depend on each other to the extent that, if one component is missing, it may disturb the functioning of the others. For example, if HYV seed is available, but not irrigation, the yield may be less than that of even the traditional variety, since HYV seed needs continuous watering. On the other hand, irrigation without improved seed or inputs is less fruitful because traditional varieties have some biological limits to their growing capacity. Similarly, if a limited number of workers or officers are employed to provide extension services, as is done in Bangladesh at the thana level, and a supporting transport network is not available, it will be very difficult to provide the required services, and thus the expenditure on such extension personnel will be a less productive investment. Similarly, the complementarity of family planning programs and health services, and of the propagation of the importance of birth control and the availability of birth control devices, is obvious.

This characteristic of complementarity among the productive and support components of rural development calls for a comprehensive program which will provide all facilities in an appropriate proportion. Such a program should not only be comprehensive; it should as well provide these facilities simultaneously.

This may seem to be a utopian suggestion for an LDC whose limited resources restrict developmental efforts. The suggestion should not be taken as a policy recommendation in the strict sense; however, its objective is to provide an ideal standard for development efforts and to suggest that the phenomenon of complementarity should not be overlooked in policy matters. As much as possible, complementary components should be provided in an appropriate proportion to achieve the desired goal.

Because provision of all facilities in an appropriate proportion is seldom unfeasible in an LDC, programs should be formulated according to certain priorities. The determination of such priorities at the national level may sometimes be misleading and inefficient and, therefore, priorities should instead be based on individual cases. For instance, if irrigation is considered the first national priority, a decision which may be appropriate for many areas of Bangladesh, and therefore is provided in areas like Rangamati of Chittagong district, the project will be an unproductive investment until some transport link is established since the lack of transport facilities is responsible for the present uncultivated state of the area. On the other hand, if the transport system is improved in an area where HYV crops cannot be introduced because of water shortages, the investment in transport is inappropriate since irrigation seems to have a higher priority in this area.

Thus development programs may be selected most efficiently on the basis of priorities established in individual cases. It does not seem to be a difficult task. In Bangladesh, all public agencies responsible for rural development have offices at the thana level where the officers acquire practical knowledge of the area's problems and priorities. Thana level officers should be trained to understand the importance of this aspect of their work and tentative proposals based on an area's priorities should originate from them. They should do this by consultation with Union Council members and chairmen, and with local leaders, and by visits for some farm level interviews. They should also understand the productive and support components of rural development and the nature of their complementarity.

After initial proposals are obtained from thana level offices, projects should be evaluated by a comprehensive technique, which should incorporate both growth and distributional effects and determine the viability of projects and their priority ranking. A model will be developed for this purpose in Chapter VI.

Chapter V

RURAL TRANSPORT AND THE EQUITY PROBLEM : DISTRIBUTION EFFECTS

5.1 REALITIES OF INCOME DISTRIBUTION IN RURAL BANGLADESH

While transport changes have the potential to contribute to economic growth, the benefits will be ambiguous for the welfare of Bangladesh if it increases inequality in the distribution of income. In order to examine the distribution implications of rural transport changes, it is useful to describe briefly the existing pattern of income distribution in rural Bangladesh. Since there is no adequate and appropriate information on income distribution, information on the distribution of land ownership may be used as a proxy. Land distribution in rural Bangladesh, as revealed in Table 8, is skewed.

The great majority of rural households are headed by small farmers or landless wage earners. Only about eight percent of households can be categorized as large farmers; those own about 48 percent of cultivated land. Although land is unevenly distributed, all but a few farmers can be considered small farmers by international standards; even those who own more than the existing legal limit of 33 acres per household would not be regarded in many countries as large or even as medium farmers.

TABLE 8

Distribution of Land Ownership in Bangladesh (1978)

Size Group (in acres)	Percent of households	Percent of area
0-3.00	83.27	33.39
3.01-5.00	8.24	18.22
5.01 & above	8.49	48.39

Source: Jannuzi, F.T., J.T. Peach, The Agrarian Structrue of Bangladesh: An Impediment to Development, Westview Press, Colorado, 1980, p.19. (Abridged).

Very small farmers generally do not produce enough to feed their family members. Some of the small farmers produce enough for the subsistence of the family, though generally they do not produce any surplus over food requirement. Some of the medium and almost all large farmers have a food surplus, the amount of which depends on the size and quality of land and family size. The surplus is used to buy clothing and items such as kerosine, salt, and spices, and to meet the expenses of house repair, medical care, social and religious occasions and agricultural cultivation. Some marginally large farmers cannot even meet all non-food basic necessities, not to mention the case of medium or small farmers.

In short, the income levels of the village people in Bangladesh are such that, except for a very few, not even large farmers are rich by world standards. It is not, therefore, the higher absolute income of any particular group in the agricultural sector which is of great concern, but the relative income position of the rural population. Policy changes or developmental efforts, including transport changes, should not weaken the position of the lower income group.

One important point is that large farmers and some of the surplus farmers in the medium size category generally manage to oversee agricultural activities on their farms. They usually use hired labor along with their own, and some of them depend solely on hired labor. As a consequence they have leisure time at their disposal and can frequently visit thana headquarters and other trade centers. Some of them act as brokers for the villagers. Because of such outside contacts and connections, developmental services, which small farmers are deprived of, are accessible to them.

This is, in brief, the existing distribution of rural income in Bangladesh. We now turn to examine how the probable benefits of rural transport changes, as analysed in the preceding chapter, are expected to be distributed among the affected people, and what the resultant relative distribution of income is anticipated to be.

5.2 RURAL TRANSPORT AND INCOME DISTRIBUTION

The opening up of new areas or provision of new transport linkages brings potential agricultural land under productive cultivation. This leads to an increase in agricultural production, the mechanism of which has been analysed earlier. The benefit is the net revenue equivalent to the area [(OQ't)(DE)] in Figure 5.

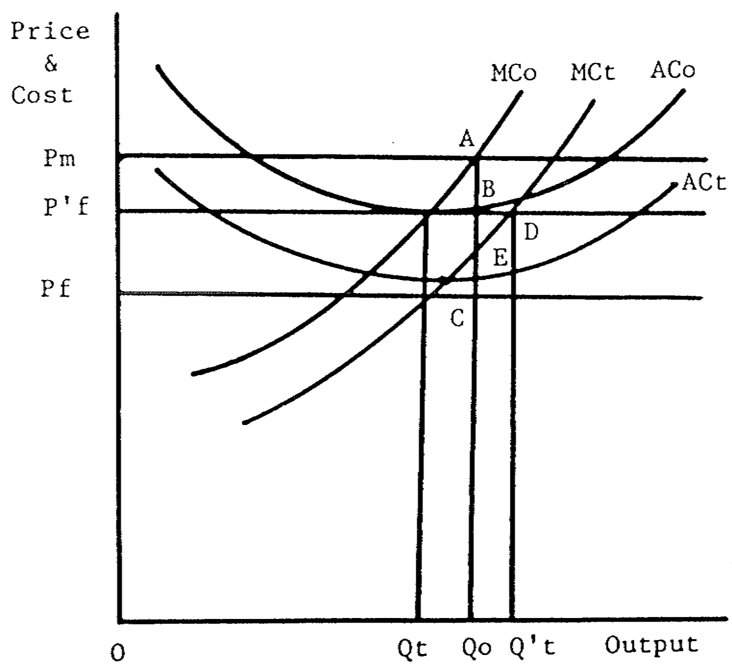

Figure 5: Transport, New Areas and Benefit Distribution

The distribution of this benefit will depend on several factors. If this kind of land is owned by the state, which is most likely in case of unused, barren, and waste land, benefit distribution will depend on how this land is allocated for settlement and cultivation after transport linkage. If this land is sold through markets, most probably the existing large farmers will be able to acquire it. In this case, or in case where this land is already owned by large farmers, large farmers will recieve the entire benefit. The landless or small farmers will however get some benefits in the form of wage income through higher employment. In Figure 5, the benefits of a new agricultural operation given by the area [(OQ't).(DE)] will be retained by large farmers, and only a part of [(OQ't)(Q't.E)] will be retained by small or landless farmers in the form of wage income. On the other hand, if public policy emphasises the equity objective, the new land will most likely be distributed to small or landless farmers.[207] In this case the entire benefit of higher production, [(OQ't)(DE)], will be received by small farmers, and a part of [(OQ't)(Q'tE)] will go to wage laborers, and thus income distribution will be more equitable. If policy is consistent with the policy objective of achieving equity with growth, this distribution effect seems to be most likely.

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[207] Both growth and equity in the distribution of income are officially accepted policy objectives of Bangladesh. See the Government of Bangladesh, Second Five Year Plan, (1980-85).

It is more likely that waste and fallow land is owned by the state. And because equity is officially accepted as an objective of developmental efforts in Bangladesh, consistency of behavior requires that such waste or fallow land be distributed among small or landless farmers. Thus both growth and equity can be achieved simultaneously.

As analysed earlier, agriculture can be developed significantly by the diffusion of technological change and through the introduction of complementary modern inputs. Transport changes can reduce or remove some constraints on the widespread application of improved technology, biological, chemical and/or mechanical. The distribution of benefits derived through this channel will depend on the extent to which different income categories are affected by technological change. If transport changes remove or reduce the constraints on small farmers' application of modern technology to a greater extent than those on large farmers, small farmers are naturally expected to benefit more than large farmers, and vice versa.

Let us therefore examine the probable effects on different income groups. Small farmers seem to be more seriously affected presently by the major constraints on the application of modern inputs and the diffusion of technological change: the information gap,[208] inaccessibility to inputs,

[208] To recall, the large information gap is caused, among others, by illiteracy, the isolation of villages and im-

and financial constraints. The illiteracy rate seems to be directly related to farm size in Bangladesh villages. The education of the children of large farmers is encouraged and facilitated because their labor is not required in livestock and farm care, large farmers can afford educational expenses, and outside contacts have raised expectations and aspirations. As a consequence, the literacy rate is much higher among large than small farmers. To the extent that transport changes affect the level of education in a village favorably, small farmers may benefit disproportionately. Large farmers can already afford to send their children to distant schools and even to towns for education. Small farmers cannot think of this.

As already indicated, large farmers' outside contacts act as an information source for them. This source of information is however extremely limited for small farmers. Therefore, transport changes are expected to increase outside contacts more for small farmers which may cause a disproportionate increase in the ideas and information they receive.

In addition, since the agricultural extension personnel, being unable to cover the whole area, usually limit their visits and services to large farmers, any increase in the efficiency of their services in terms of coverage and quali-

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mobility of the villagers limiting outside and thana level contacts, and the poor performance of agricultural extension services.

ty is expected to benefit small farmers more than large ones. The former is expected to receive (a) extension services instead of no service and (b) better quality services because of the higher efficiency of the service personnel, whereas the latter will be benefited only by (b), and obviously [(a)+(b)] >(b).

Thus transport changes are expected to reduce the constraint produced by an information gap on the diffusion of technological change for small farmers to a greater extent than for large ones. And to the extent that reduction in the information gap favors the application of modern technology in agriculture, small farmers will be benefited more than their better-off counterparts.

The second constraint is the inaccessibility to modern inputs and technology. Agricultural inputs and implements such as fertilizer, pesticides, and irrigation equipment, are distributed by the government through the thana level offices of appropriate ministries. To recall, the distant location of distribution centres along with inadequate transport imposes a constraint on the diffusion of technological change. This constraint is less severe for large farmers than for small ones, because of the large farmer's leisure time and financial ability. Transport changes will reduce both time and financial costs of passenger movement and cargo shipment. Since the large farmers have leisure time, which does not have an alternative economic use, their time costs may be considered as neglegible and can be ignored. The benefits of transport changes to the small farmers in this context are the saving of both time and financial cost which is obviously greater than the saving merely of financial cost enjoyed by large farmers. Thus, while transport changes will make modern inputs more accessible to farmers in general, the benefits to small farmers seem to be greater than those to large farmers.

The diffusion of technological change will cause a downward shift in the average and marginal cost curves of a representative farm. Since, as analysed above, small farmers are expected to benefit more than large farmers, the relevant shift in cost curves will not be same for them.
If the representative farmer is a small one, let us assume that the shifts are from ACo and MCo (without project) to ACt and MCt (with project) so that the small farmer is earning a net revenue equivalent to the area [(OQt) (BC)] in Figure 6. If, however, the farmer is a large one, the shifts will be less, say, to AC't and MC't . The net revenue now is

$$[\ (OQ"t)(Q"t.F)\ ]-[\ OQ"t)(Q"t.H)\ ]=[\ (OQ"t)(FH)\ ]$$

so that the net revenue obtained by the small farmer is greater than that of large farmer by an amount of

$$[\ (OQt)(CK)\ ] + [\ (Q"t.Qt)(BK)\ ]$$

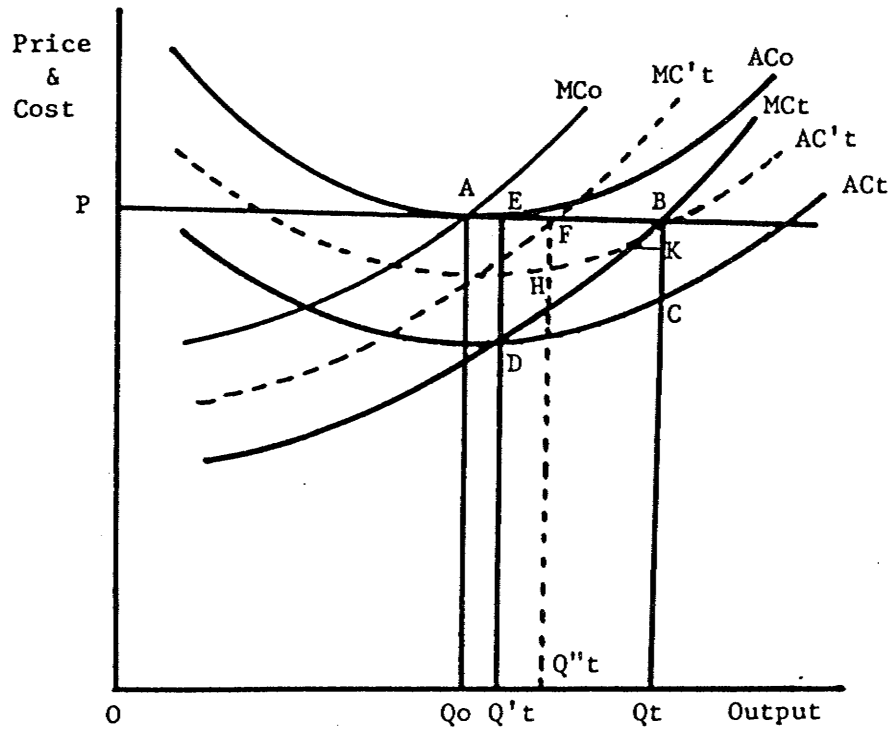

Figure 6: Transport, Technological Change and Benefit Distribution

and the growth effect for the small farmer is greater than that for the large farmer by (Q"t.Qt). Thus the diffusion of technological change along with the introduction of modern inputs, both biological and chemical, as a result of transport changes, appears to be more equitable.

There is however a general belief that the irrigation technology in the production of HYV rice, which comes in an irrigation-seed-fertilizer package, reinforces the existing inequality in the distribution of rural income by improving the relative income position of large farmers.[209] Two types

[209] Rizwanul Islam, "What Has Been Happening to Rural Income

of arguments are usually advanced: (1) small size is not economically viable for irrigation technology, and (2) there has been a trend towards land concentration in rural areas of LDCs.

The arguments are not as strong as they appear to be. The first argument is of an a priori nature, and does not have empirical validity, particularly in Bangladesh. It has been found that irrigation technology in rural Bangladesh is size-neutral.[210] It is practically impossible for a large farmer to irrigate only his land and to exclude the neighbouring land of small farmers. The land in Bangladesh is highly fragmented and no large farmer has all his land concentrated together in one boundary; instead it is scattered throughout one or more fields. It is practically impossible and not economically viable to build a drainage system which covers one person's tiny and scattered pieces of land to the

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Distribution in Bangladesh?," Development and Change 10(1979).

[210] Available evidence suggests that small farmers in Bangladesh have been disproportionately more benefited from irrigation technology. In the Sulla thana, small farmers have 21 percent of their land irrigated, whereas the medium and large farmers have brought respectively 17 and 20 percent of their land under irrigation. In addition, small farmers have a higher productivity per acre of HYV paddy, which is produced in irrigated land, than medium and large farmers. In the Rangamati thana, small farmers have disproportionately more land under HYV rice cultivation than large farmers as well as higher productivity per acre. In the Nalchiti thana, however, the percentage of paddy land under HYV for large farmers is higher than for small farmers, which is partly counterbalanced by productivity difference in favor of small farmers. See Bangladesh Rural Transport Study.

exclusion of others'. The agricultural distributing department (BADC) requires those who wish to receive an allotment of irrigation pumps or tubewells to show a reasonably sizeable amount of land to be brought under irrigation. This requirement implicitly demands that all possible neighbouring and connecting land should be covered by irrigation, irrespective of the ownership size. In practice, this is generally taking place in Bangladesh as well as, apparently, in India.[211]

The argument based on land concentration is indirect, and is valid only if it can be proved that ownership concentration is taking place only in irrigated and not in non-irrigated areas, or that the trend of ownership concentration is greater in irrigated than in non-irrigated areas. Unfortunately such controlled studies are rarely available in LDCs, and non-existent in Bangladesh. Some Indian experience however suggests that irrigation technology reduces ownership concentration of land.[212]

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[211] Sen and Rao have found that the small farmers in many parts of rural India have been applying irrigation technology to a disproportionately larger proportion of their land than the large farmers. See B. Sen, "Opportunities in the Green Revolution", Economic and Political Weekly Review of Agriculture, 28(March 1970); and C. H. H. Rao, Agricultural Production Functions, Costs and Returns in India, (Delhi: Asia Publishing House, 1965).

[212] See, for example, V. M. Rao, "Land Transfers in Rural Communities : Some Findings in a Ryotwari Region," Economic and Political Weekly Review of Agriculture, 30(September 1972); and M. S. Radlawa, Green Revolution, (Delhi: Vikas Publishing House, 1974), p.168.

Therefore, it cannot be said that the introduction of irrigation technology, facilitated by transport changes, leads unambigiously to inequality in the distribution of income in rural Bangladesh. The relative coverage of land by irrigation facilities depends on the proportion of land owned by different size categories in the project area. If these categories have an equal proportion of land, irrigation coverage is expected to be proportional, and vice versa. There is no reason to argue a priori that large farmers will have disportionately more land under an irrigation project, or vice versa.

The evidence, however, suggests that small farmers will receive more benefits even if an equal proportionate land is covered by irrigation facilities, for several reasons. First, the per acre yield of HYV rice grown in irrigated land is in general higher for small farmers than for large farmers, because the former can take more intensive care of their small land holdings. Second, landless and small farmers will likely get more land from large farmers for share cropping, because the latter will most probably be unable to cultivate all of their land holdings since the HYV requires greater farm care and supervision. In this case, the area operated will be more equitably distributed, even though the distribution of ownership is unchanged. Third, most of the income of lower-range small farmers and landless households is derived from non-crop enterprises, in the form of wage bills for their work for large farmers. In general, the introduction of irrigation technology increases cropping intensity and hence the labor required per unit of land. This leads to an increase in employment and probably wages.[213] Thus, even if the percentage of land brought under irrigation technology is proportionate for all size categories and not significantly high for the better-off farmers, it is possible that the resulting income distribution will be more nearly equitable.[214]

The favorable distribution effects may be expected across regions as well as across households. At present, those thana which are isolated and possess poorer internal transport systems are disadvantaged in terms of developmental ac-

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[213] Transport changes will reduce employment in a different way. The introduction of vehicles, if any, will reduce employment in headloading shipment. This may however be compensated by generating employment elsewhere. First, the construction of roads and their regular maintenance will create some jobs. Second, employment opportunity will be created in the transport industry for operating labor-intensive vehicles like rickshaws, pushcarts and bullockcarts, and in transport related industry like repairing workshops along roads. Third, the expansion of rural industries consequent upon transport changes will generate employment for the unemployed. Finally, higher mobility and the resulting improved information on the inter-regional employment situation will help even out the seasonal nature of employment in agriculture.

[214] In this context, the conclusion of C.H.H. Rao after a careful consideration of the distribution of gains out of technological change in Indian agriculture is worth noting: "..... the available evidence suggests that for the country as a whole, the net impact of technological changes and the changes in the distribution of area operated is a decline in the relative share of large incomes (nominal) and in income disparities in the rural

tivities.[215] Efficient and qualified development officers do not want to accept postings in thana with bad transport networks or, if posted, manage to be transferred from them.[216] Such thanas are usually bypassed in selecting sites for comprehensive development programs[217] because of difficulties in transporting required materials, in the mobility of staff members, and in maintaining supervisory and administrative contact with the sub-divisional or district level offices of the concerned ministries.

Within a thana, development efforts are usually concentrated in villages which have a relatively good rural transport system and are better linked with thana headquarter.[218] Since transport is normally very poor in rural Bangladesh, thana level officers in virtually all departments generally concentrate their activities in villages which are closer to

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sector." "On balance, the distribution of income in the rural sector in the country as a whole has become less unequal during the last decade". See C.H.H. Rao, Technological Change and Distribution of Gains In Indian Agriculture, (Delhi: The Macmillan Company of India Limited, 1980).

[215] Most of the government departments which are responsible for rural development in different ways have their lowest level offices at thana headquarters which are supposed to serve 100 to 350 villages. These offices are authorized to distribute inputs like fertilizer, pesticides, HYV seeds, irrigation equipments, and to provide extension services.

[216] See Louis Berger Inc., Rural Roads Study, vol. 1, p.IV-3.

[217] Ibid., P.IV-3.

[218] Ibid., P.IV-4.

thana headquarters. Visits of agricultural extension staff and other field level employees are also thus limited to nearby villages. Not only do farmers from distant villages not receive these services, they cannot avail themselves of such services for two reasons. First, because of their isolation, most of the villagers do not know about such services. Second, journeys are time-consuming and difficult.[219] Thus people in relatively distant villages are deprived of developmental services.

Although the transport problem is not the only factor limiting the effectiveness of developmental efforts, it seems at least to be one of the major constraints on such activities. If rural transport is provided where it does not exist and improved where it barely exists, development workers of different departments will be able to make frequent visits, supplies will be easily accessible, and villagers will also be able to make visits to thana headquarters when necessary. Thus developmental efforts, it is hoped, will be distributed regionally and favorably affect regional income distribution.

A more nearly equitable distribution of the benefits of transport changes seems likely to occur through the provision of accessibility to institutional credits. As analysed

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[219] A study suggests that the isolated villagess of Bangladesh cannot afford to visit thana headquarters where all low-level government services are located. Ibid., p. IV-4.

in the preceding chapter, Bangladesh farmers require credits both for consumption and production. Small farmers do not have access to institutional credits and consequently resort to local money-lending sources which charge exorbitantly high rates of interest. Since large farmers have at least some access to credits from institutional sources, which charge much lower rates, the most severely affected people are the village poor, landless and small farmers, who rely on informal sources of credits. Borrowing from informal sources, and hence the severity of the debt burden, seem to vary directly with farm size.[220]

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[220] Studies indicate that the access to institutional credit in rural Bangladesh varies directly with farm size and thus the cost of credit is inversely related to size. See M. Hossain, Farm Size, Tenancy and Land Productivity : An Analysis of Farm Level Data, referred to in Rizwan-ul Islam, "What Has Been Happening to Rural Income distribution in Bangladesh?", op. cit. p.401. Similar evidence is available in India. In rural India, the percentage of the amount from co-operatives to total borrowing varies positively and disproportionately with farm size, and among different areas, the concentration of co-operative credit is higher wherever the concentration of assets is higher. See Reserve Bank of India, Report of the All India Credit Review Committee, 1969. In addition agricultural credits disbursed by public sector banks in India increase disproportionately with farm size in the case of medium and long term loans; short term loans also increase with farm size, but not disproportionately. See Reserve Bank of India, "Agricultural Advances of Public Sector Banks : An Analysis", Reserve Bank of India Bulletin, April 1964, pp. 643-46. It should be noted that transport is inadequate in most of the rural areas of India. See P.C. Tripathi, op. cit. and Wilfred Owen, Distance and Development.

Transport changes can help reduce dependence on expensive informal sources of loans by increasing farmer's access to institutional credits. The distribution of resulting benefits will depend on the relative reliance on informal credit sources of different size categories and is expected to be inversely related to farm size. The larger the farmer, the lower his dependence on informal sources of credit, and hence the lower the benefit. The smaller the farmer, the higher his reliance on local money lending sources, and thus the higher the benefit. Therefore, transport changes will reduce the debt burden equitably by increasing access to institutional sources of credit.

As analysed earlier, transport changes can, through increasing accessibility to institutional credits, reduce the debt burden of conditional loans with a resulting effect on farm production.[221] For instance, transport provision or improvement from T1 to T2 reduces the farmer's dependence on local credit sources, C(L), and increase his access to the institutional credit market, C(I), in panel A of Figure 7, so that the interest rate falls from r1 to r2 in panel B. The product price thus increases from P1 to P2 , and equilibrium output from Q1 to Q2 in panel C.

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[221] To recall, some money lenders advance loans to the poor and to the small farmers on the condition that the borrowers will repay the loan in kind during harvest at a price of the crop way below market price. This implies a very high rate of interest paid by sacrificing a part of the product price and thus affects production.

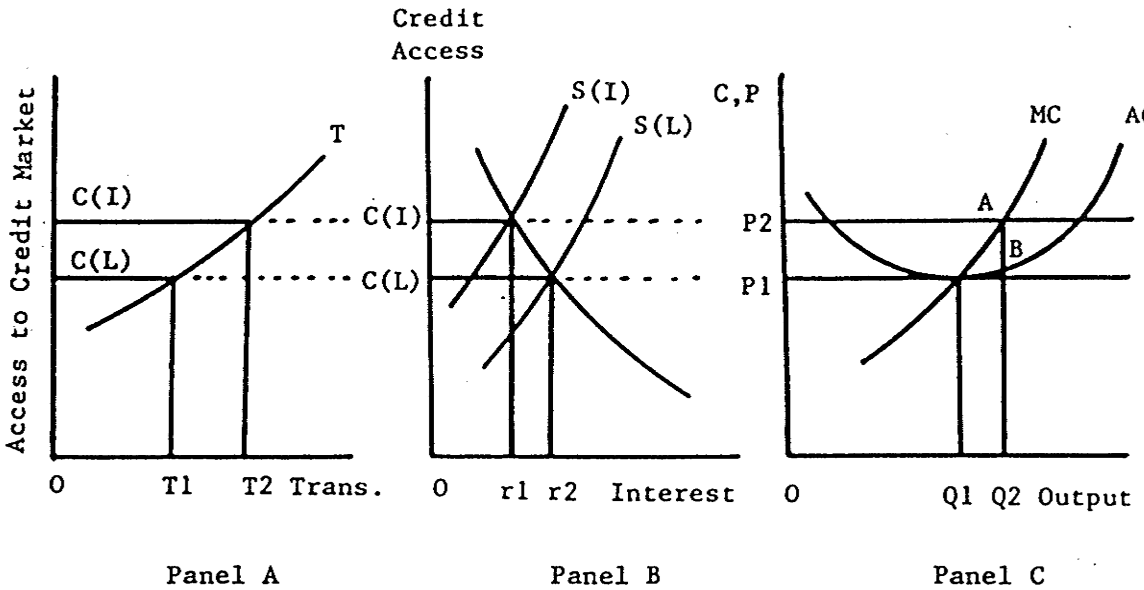

Figure 7: Transport, Credit and Benefit Distribution

The distribution of benefits will again depend on the relative incidence of debt at present. Since it is usually the village poor and the small farmers who resort to this kind of conditional loan, they will naturally receive the major benefits of reducing this severe debt burden.[222] The

[222] The institutional credits are relatively more accessible to large farmers for several reasons. First, the information gap is less for them because they have contact with trade centres through their visits for selling surplus and buying industrial consumption goods, and for availing themselves of recreational facilities. Second, the opportunity cost of time spent in making visits for loans is less, since being able to hire labor when necessary for farm care, they can afford to enjoy leisure. In addition, they can adjust visits for loan with usual visits for shoping and recreation. Third, they pass credit worthiness test to recieve credits from even formal banking sources beyond the specialized 100-crore Agricultural Credit Program.

The institutional credits are almost beyond the reach of small farmers or tenant agriculturists, because of higher production Q1.Q2 is obtainable mainly by small farmers who take such loans.

In general, large farmers will also be benefited as a result of transport improvements and resulting credit cost reductions, but their benefits are expected to be lower than those of small farmers because the later are benefited in two ways, through accessibility to institutional credits and transport cost reductions, while large farmers are benefited mainly through transport cost reductions. Thus this effect of transport changes appears unambigiously to improve the position of small farmers as compared to that of large farmers, and hence to contribute to a reduction of inequality in the distribution of rural income.

There is another side effect of this phenomenon. The informal local money-lending sources consist of the village rich : large farmers and traders. Access to institutional credits will reduce the demand for local credits which earns

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both the first and the second set of constraints analysed earlier, since the severity of these constraints varies inversely with the farm size and directly with poverty. In particular, the time cost of making several journeys, even if other constraints are reduced, is very high for small agriculturalists. Their agricultural activities are based on family labor which has to take constant care of the livestock raised for ploughing and milking along with the requirement of farmcare. In particular, the time cost is extremely high when credits are mostly needed for inputs and seeds during the peak cultivation period. Restricted by such constraints, small agriculturists rely on local money lending source for borrowing, which charges very high rates of interest, and thus are deprived of relatively cheaper institutional credits.

a high income for the lenders. A decline in, or elimination of, demand for these credits will reduce or eliminate a sizeable amount of interest income of the relatively well-off villagers. This detrimental effect on the rich will improve the relative income position of the poor, and reinforce the equitable distribution of rural income consequent upon transport changes.

Transport changes facilitate an appropriate composition of crops which increases farm efficiency. The benefit distribution in this case will depend on factors affecting crop composition. The introduction of bulky and perishable crops made possible by fast movement and transport cost reductions, may benefit all size groups of farmers equally. It will probably lead to a parallel shift in the income level of all people affected, the distribution of benefit being neither equitable nor inequitable.

If, however, appropriate crop composition does not involve perishable or bulky crops, but is instead facilitated by more efficient supply of inputs and of advisory services of agricultural extension personnel, small farmers will probably benefit more from the new situation as they gain access to facilities large farmers already have. Therefore, to the extent that these improvements in service and supply conditions encourage better crop composition, the small farmers are expected to benefit more than the large farmers.

The phenomenon of market segmentation due to the transport barrier and the relevant growth effect of transport changes has been analysed earlier. A demand curve shift in local markets due to trader penetration into local markets as a consequence of of transport changes causes an increase in the product price in panel A of Figure 8, which leads to higher production of the representative farm by (Qo.Q't) with a positive net revenue in panel B. The question arises: who is the beneficiary of this increased production? The answer lies in the answer to another question: who are the people making use of local markets ? The people who usually sell in local markets are logically expected to be the benificiaries of higher prices resulting from transport changes.

Large farmers manage even in the present condition to transport their products to large and distant markets for higher prices.[223] Since the small and some medium farmers usually use local markets, they are the ones who will benefit more than others by higher product prices at local markets. Therefore transport changes in this case are expected to improve the relative position of small farmers.

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[223] The reasons are as follows. First, they have free time to make time consuming journeys. Second, some of them own vehicles for shipment. Finally, they can hire additional labor for help in cargo movement by head/shoulder loading as well. Being unable to afford such journeys and shipment, small and some medium farmers usually sell their commodities at local markets.

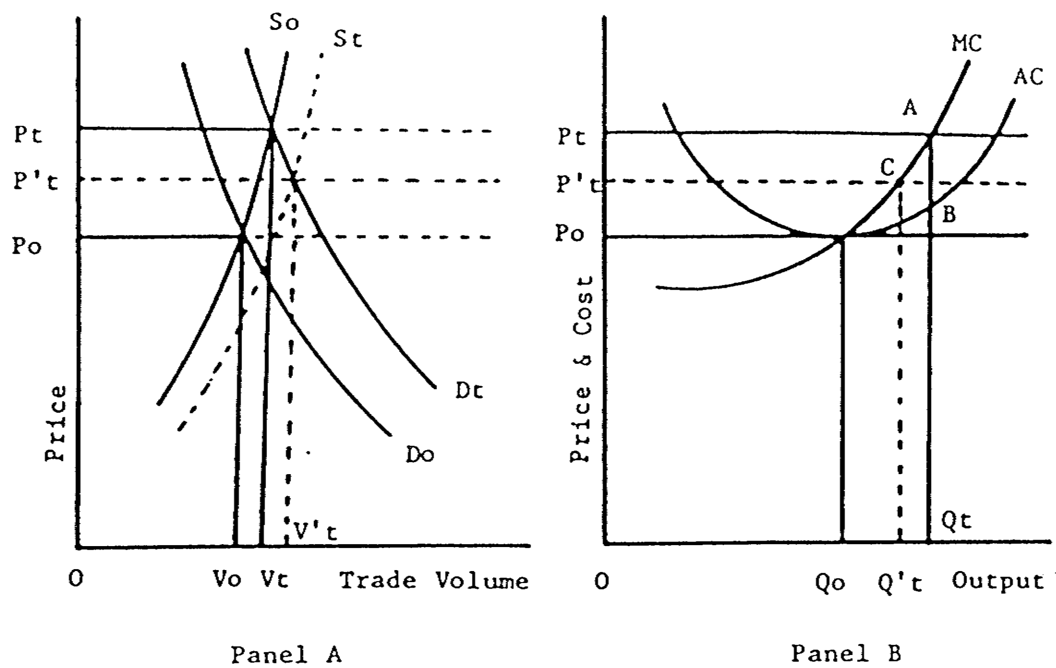

Figure 8: Transport, Trader Penetration and Distribution of Benefits

Transport changes reduce both the time and financial costs of movement and thus increase the accessibility to large markets. The resulting higher production and positive net revenues are expected to benefit small farmers disproportionately, for, while transport cost savings benefit both groups, the time cost savings benefit small farmers more than large ones.[224] This is illustrated diagramatically in Figure 9.

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[224] A study in the villages of Faridpur district of Bangladesh has found that time cost savings are "more valuable to the small farmer (and even the landless) than to the larger farmer, since the former does the physical labor by his own hand and often can not spare time to visit distant markets for higher prices." See Louis Berger Inc. Rural Roads Study, vol.1, 1979, p. IV-9.

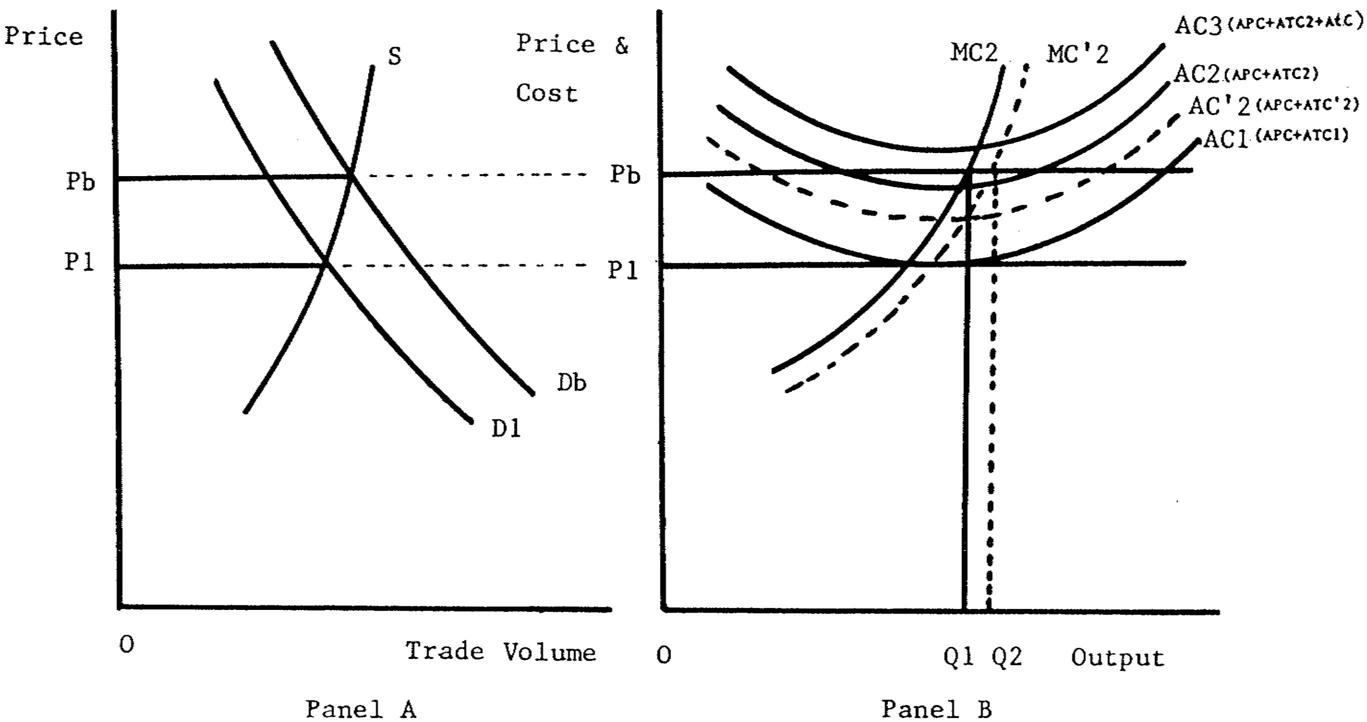

Figure 9: Transport, Market Access and Benefit Distribution

In panel A of Figure 9, the local and large market demand curves, Dl and Db respectively, are superimposed, and a supply curve S is assumed in both, for simplicity. Equilibrium prices Pl and Pb are established in local and large markets respectively, which are given to individual farms.

Panel B of Figure 9 illustrates a representative farm which can represent alternatively the conditions of a small or a large farm. ACl through AC3 are average cost curves which include the average production and transport costs, and average time cost involved in the transport of commodities. The notations APC, ATCl, ATC2 and AtC depict average production cost, average transport cost for local market, average transport cost for large market and average time cost for small farms respectively; and ATC'2 is AtC2 minus reductions in unit transport cost to large markets consequent upon transport changes.

Let us first consider that the representative farm is that of a small farmer. His unit cost when goods are transported to a local market is AC1 which includes unit costs of production and of transportation to a local market, APC and ATC1. When goods are shipped to a large market, the relevant average cost curve is AC3, which is the sum of the unit production cost and the unit costs involved in shipment to large markets both in the form of transport charges, ATC2, and time cost, AtC. Given Pb, the small farmer cannot ship his goods to a large market profitably, since AC3 is greater than Pb at every level of output. He can, however, sell at the local market at the point at which Pl equals AC1 so that he is just breaking even. Accordingly, small farmers cannot beneficially use the facilities of large markets even if prices are higher there.

Now assume the representative farm to be a large one. The average cost curve relevant to a local market is the same AC1, but that relevant to a large market is now AC2 instead of AC3. The difference is explained by the time cost, AtC, involved for small farmers but not for a large farmer, because the opportunity cost of his leisure time spent in shipment is negligible and can be ignored. The large farmer can profitably sell his output at a large market, since Pb is greater than AC2 at the equilibrium level of output Q1, and thus earns a positive net revenue even without transport changes.

Let us now introduce into the model transport changes which will reduce the financial and time costs involved in transporting of commoditites. In the case of a representative large farmer, ATC2 shifts, say, to ATC'2 so that AC2 shifts to AC'2. As a consequence, output increases from Q1 to Q2 and a greater net revenue is earned. On the other hand, if the representative farmer is a small one, AC3 shifts to AC'2, since transport cost is reduced from ATC2 to ATC'2, and additionally, the time cost AtC disappears or becomes negligible because of the possibility of fast movement. Small farmers can now penetrate large markets profitably . In this case, the representative small farmer is not only entering large markets, he is earning a positive net revenue, so the benefit to him is thus higher than to a large farmer.

Transport changes will involve changes and shifts in other curves including AC1 and D1. This will establish a new set of equilibrium values of different variables after all possible adjustments. Such adjustments are ignored here because they are not necessary to arrive at the prediction, and because the prediction is not expected to be significantly affected by these adjustments.

The phenomenon can alternatively be represented mathematically.

$$AC = Cp + Ct \quad \ldots \ldots \ldots \ldots \quad (5.1)$$

$$\text{with} \quad Ct = M + bt \quad \ldots \ldots \ldots \quad (5.2)$$

where AC=average total cost, Cp=average production cost, Ct=average cost of transportation, M and t = average money and time costs of transportation, and b = the individual valuation of time.

For a local market t is insignificant and can be ignored; hence AC is

$$AC = Cp + M \quad \ldots \ldots \quad (5.3)$$

In the case of a large market, the value of t is high, but b is insignificant for a large farmer and therefore bt may be ignored. His average total cost is thus given by (5.3).

On the other hand, the value of b is high for a small farmer and consequently b is significant. The resulting average cost for a small farmer is therefore

$$AC = Cp + M + bt \quad \ldots \ldots \ldots \quad (5.4)$$

In panel B of Fig.5, AC2 and AC3 correspond to equations (5.3) and (5.4) respectively, so that AC3 > AC2 by an amount of the term bt. When transport is provided or improved, t is reduced so that bt can be ignored for both small and large farmers. The new AC for both small and large farmers is

$$AC' = Cp + M' \quad \ldots \quad \ldots \quad \ldots \quad (5.5)$$

where M > M' because of financial transport cost savings. Equation (5.5) corresponds to AC'2 in panel B of Fig.5. Since equations (5.4) > (5.3) > (5.5), that is , AC3 > AC2 > AC'2, small farmers receive a disproportionately larger benefit than large farmers.

There has been much discussion in transport literature regarding the distribution of this benefit among the affected parties.[225] Some have argued about transport cost savings that the extent of shift in the average cost curve will not be the same for large and small farmers; instead the shift for the former will be higher than that for the latter.[226] Large farmers, it is argued, own vehicles which give them an additional advantage in reducing transport costs, while small farmers, who do not own vehicles, receive a smaller cost reduction. Consequently, large farmers will benefit more than small farmers.

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[225] See, for example, A.A. Walters, The Economics of Road User Charges, (Baltimore: John Hopkins University Press, 1968); J.L. Hine, The Appraisal of Rural 'Feeder' Roads, (London: Planning and Transport Research and Computation, 1975); and Bangladesh Rural Transport Study.

[226] See, for example, Bangladesh Rural Transport Study, p.50.

This position is not as strong as it appears to be. First, the proponents of this view ignore average time cost AtC, and thus ignore the shift from AC3 to AC'2 for small farmers. They rather consider only the shift from AC2 to AC'2 and say that this shift will not be the same for all size groups. We have argued that the shift for the small farmers, AC3 to AC'2, will be larger than that for the large farmers, AC2 to AC'2. Second, existing evidence on the higher vehicular ownership of large farmers in Bangladesh suggests that the vehicles are usually country boats for waterways.[227] The waterways are not very important for rural transport analysis, because the possibility of improvements to all-weather waterways is limited; when they do become important in wet seasons, all of Bangladesh is flooded, and there is no need to improve waterways for wet season transportation. Therefore, mainly rural roads appear to be important for rural transportation policy. The appropriate vehicles for rural roads are low-cost pedal rickshaws and bullock-carts. Large farmers in Bangladesh do not usually operate rickshaws or bullock-carts because they require hard manual labor, which is considered work of the poor. Whenever large farmers or the village rich own any of these vehicles, they usually rent them out on a daily rental basis; thus ownership of these vehicles is considered a business investment, rather than a means of transport. Therefore, when

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[227] Ibid.,p. A135.

large farmers owning such vehicles require movement, they have to hire rickshaw or bullock-cart services as does any other person irrespective of income level, occupation or vehicle ownership.

In the case of rural roads, vehicle ownership does not seem to have much of a discriminatory effect on cost reduction for the owner as a result of transport changes. Consequently, large farmers do not appear to be in a more advantageous position due to their ownership of vehicles than the small ones. The financial transport cost savings consequent upon transport changes will probably be the same for all, both small and large farmers, whereas time cost savings will be economically more significant for the small farmers, so that the relative position of the latter is expected to be improved disproportionately more than the latter. If, however, one is inclined to assign greater financial transport cost savings to large farmers, this may be somewhat cancelled out by the greater time cost savings of small farmers.

On the other hand, boat ownership seems to be different. Boats are operated by owners,[228] and except for rental boats, the relative distribution implications of improving

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[228] In areas where all-weather waterways are available and in some of the other rural areas during wet seasons, farm care and mobility requires the help of a boat. Hence anyone can afford one, buys it and operates it by himself most of the times irrespective of farm size.

waterways will probably be different. If waterways are developed for all-weather navigation, large farmers may be expected to benefit more than small farmers. However, the landless wage laborers who operate rental boats will also benefit, probably more than large farmers, since the rental boats are operated full time, whereas the large farmers operate their boats occasionally when needed. In brief, the large as well as the landless professional transport operators will probably be benefited disproportionately to small farmers who neither own boats nor leave their farms to operate rental boats. Such small farmers will, however, benefit by reductions in both financial and time cost savings after road transport changes. Thus, while all size groups will benefit in absolute terms, the relative benefits will depend upon the relative size of these benefits, which cannot definitely be determined a priori.

A number of points need to be considered in evaluating the distribution of benefits arising from growth of non-farm activities which results from such improvements as transport changes. First, relatively well-to-do households in rural Bangladesh consider most non-farming activities degrading. Hence, although large farmers are financially able to start such enterprises as weaving, pottery, or tailoring, in part through their greater access to credits and institutional support, they usually prefer to confine themselves to farming activities. Some members of the families of marginal farmers and landless workers, on the other hand, choose to work at non-farming activities as apprentices, and later for wages in these activities. Those workers who have entrepreneurial potential sometimes try to establish one such unit in their households by using saved and/or borrowed money, since a small unit of non-farm activity, for example, a weaving tools, does not require much capital.[229]

Second, when large farmers do establish a non-degrading activity like a rice mill, they usually do not operate tools and machines themselves. Their enterprises are relatively large and their involvement is mainly managerial and promotional.

Third, the creation of favorable conditions for these industries by providing greater access to markets, extension services and institutional credits is expected to affect poor and disadvantaged entrepreneurs more favorably, because the rich farmer's financial position and leisure time have already given him some access to these facilities.

These considerations, except for the second, suggest that poorer potential entrepreneurs may benefit more from the development of non-farm rural activities consequent upon transport changes. In the second case, the major benefit in the form of profits will be retained by the owners, and the

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[229] This happens only in the handloom industry. Empirical study is not however available to show the evidence.

poor will receive a share of this benefit only through higher employment in the new activities. The net effect will depend on the proportion of the entrepreneurial class emerging from groups of large and small farmers and from the landless wage laborers.

There is some evidence to indicate that the development of non-farm rural activities improve the relative position of the village poor. A study in Taiwan suggests that the average income level of the smallest farm size class, without non-farm opportunities, would have been 33 per cent lower than the actual level found, while that of the largest farm size class would have been only 6 per cent lower than their actual income, and "Thus, the expansion of non-farm opportunities had the effect of reducing relative inequality in the rural areas."[230]

5.3 SOME OTHER DISTRIBUTION EFFECTS AND CONCLUDING REMARKS

The benefits of transport changes may arise in a different way. The construction or improvement of the physical infrastructure will create investment opportunities in the transport industry. Investments in road vehicles or boats will be possible for the relatively well-to-do households. Some of the large farmers and the village rich are expected to buy vehicles to be operated by others on a rental basis

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[230] Dennis L. Cinn, op. cit., p.299.

and probably sometimes by hired labor. Small farmers and the village poor cannot afford to invest in this trade and hence this benefit will most likely be retained by the wealthier members of the village. Those who rent vehicles to operate or are hired will, however, get a share of benefits from this investment opportunity either as wage income or as residual income after rent payment; income per unit of labor in either form is expected to be much higher than that in head/shoulder loading work because of the higher efficiency provided by transport changes. Therefore the relative income position of transport operators will be higher than that of those who are still engaged in head/shoulder loading. Benefits to the large farmers or the village rich who invest in this trade are expected to be higher than to the operators, vehicular or manual.

The problem of a benefit differential between owners and operators can, however, be dealt with by organising co-operative agencies. The agencies will buy rickshaws, pushcarts, baby taxis or boats for the poor who will operate them and pay a part of their daily or weekly income to the cooperative as part payment of the vehicle price. After a specified time when the full price, probably with interest, is paid, the operators will own the vehicles. This practice has been successful in the Comilla Co-operative of Bangladesh and can usefully be extended by thana level co-operative agencies of other areas of the country where transport changes will take place. Thus the village poor, instead of the rich, will eventually receive benefits both as operators and investors. This will contribute to the equitable distribution of rural income..

An important phenomenon of relatively isolated villages is that a few well-off people, the large farmers of the area,[231] emerge as brokers to the outside for other villagers. The brokers have contacts and connections with thana level and sometimes higher level offices, and hence village visits by development officers/workers are usually arranged to be made to their farms. Thus the brokers have control over outside facilities. These connections give prestige and honor in the eyes of the illiterate village poor. In order to maintain such a status quo, and to maintain their vested interest, for example, in the form of money lending, brokers exercise their power so as to monopolize outside facilities.

One way in which this monopoly power may be broken is by breaking the isolation of the remote villages. Although the elimination of such a monopoly depends on several factors like income level and education, rural transport changes are expected to increase outside visits, contacts and connec-

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[231] It has been found that such brokery system existed in the rural areas of Faridpur district of Bangladesh. See USAID, DHAKA, Project Paper : Zilla Roads Maintenance and Improvements, (Dhaka: USAID, 1981), p.35, and also see Louis Berger Inc., Rural Roads Study, pp.IV-4.

tions by villagers and thus help reduce brokery power.[232] In addition, transport changes are expected to contribute to income growth and education which will further reduce brokery power.

If rural transport makes any contribution in this direction, as is likely, it will be to the relative advantage of small farmers and the poor, and to the disadvantage of the large farmers who act as brokers in an isolated village. The distributive impact of this effect will, of course, be equitable.

So far we have analysed the probable distribution of benefits and rural income generated by examining the effects of transport changes among different income categories presently dwelling in rural Bangladesh. The villagers have been considered mainly as producers of goods and services. Questions may arise about the welfare distribution between producers and consumers,[233] but this independent field of in-

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[232] The USAID while analysing the broker system of rural Faridpur maintained, " With improvement of transport and communication, the monopoly of these "brokers" is often broken, as the costs of travel decreases and the frequency of meetings increase ... ". See USAID, Project Paper : Zilla Road Maintenance and Improvement, Dhaka, op. cit., p.35.

[233] In Bangladesh, it is difficult to seperate and distinguish between the producers and consumers of agricultural items, because most of the 90% of the population who live in rural areas are both producers and consumers. Only 10% urban dwellers can be exclusively considered as consumers of these items. If they are affected adversely, it will produce a favorable effect on income diastribution.

vestigation is not an objective in this study.[234]

In sum, rural transport changes demonstrate good growth potential. It cannot be expected that the distibution of benefits consequent upon transport changes will remove the present inequities in the distribution of rural income in Bangladesh. Economic analysis indicates, however, that most forces are likely to contribute to the reduction of this inequality, although some forces will also tend to increase it. On balance, one may expect that the relative income position of the the worse off will probably be improved as a consequence of transport changes, or at least, that the distribution of rural income consequent upon transport changes will probably not be so inequitable as to leave the villages in their present state of isolation and immobility.

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[234] However, a few comments are in order. When transport changes lead to higher crops prices in local markets, those who are exclusively consumers in the local area will be affected. Additionally, goods movement may be diverted from some areas not served by an improved transport network to ones served by it so that the prices in the former will rise which will naturally affect the welfare of the consumers in the respective areas. If improved marketability leads to the interregional specialization in the crops enjoying comparative advantage, and the regions import and export from each other, the welfare loss in exporting regions may be balanced by welfare gain through cheaper imports from other regions.

Chapter VI

A MODEL FOR EVALUATING COMPREHENSIVE RURAL TRANSPORT PROJECTS

6.1 INTRODUCTION

The objective of this chapter is to develop a model which will incorporate both growth and distribution effects into its system. This is important for several reasons. First, it will provide an operational technique for the objective evaluation of comprehensive rural transport projects. Second, if a number of projects appear to merit implementation, some sort of priorizing will be necessary, especially in view of the resource constraints in less developed countries such as Bangladesh. In this context, the evaluation capacity of this model can assist in ranking of the proposed projects. Finally, the model performs an integrating role in the policy and decision making process.

It is worthy of note that the model is sufficiently general to be applicable to the evaluation and the priorization of projects beyond the type that is specific to this thesis. Such applications would require adjustment of the variables used in the evaluation of growth effects.

In the context of this study, the growth effect is essentially the benefits expected from the implementation of a rural transport project. This includes, in addition to the measurement of transport user-cost savings, the development effects on agriculture and non-farm rural activities, the income growth of transport traders and, possibly, other variables that appear to be important to policy makers. The distribution effect will reflect the impact on relative income distribution of the people in the area affected by the project. The relative influence of distribution effect will, however, depend on the normative value judgement placed on it in the planning process. Both components of growth and distribution are set in the model so that each of them will have its own effect in the evaluation of any project. The evaluation process necessarily involves both positive (what is) and normative (what should be) elements and the model facilitates their systematic treatment.

6.2 THE MODEL

There are three ratios in the model : the objective ratio (R), the benefit ratio (B), and the distribution ratio (D). The objective ratio, which acts as the policy variable in the model, is the weighted value of the benefit and distribution ratios and reflects the combined effects of growth and distribution in terms of the distribution norms in use. The benefit ratio is the ratio of economic gains to costs and an indicator of the growth of income. It is more inclusive and comprehensive than traditional benefit-cost ratios applied to the evaluation of transport projects. The distribution ratio, to which we shall return, is an indicator of the distribution implications of the project under consideration. In addition, the model contains a constant (c) which is a weight given to the distribution of benefits derived from the project: this is a normative and subjective element in the model to be integrated with the two positive elements B and D.

The functional relationship among the three ratios is expressed as[235]

$$R = B\,D^{c} \quad \ldots\ \ldots\ \ldots\ \ldots\ \ldots \quad (6.01)$$

The desirability of projects will depend positively on the value of R. The higher the value of R, the more desirable the project is, and vice versa. As the formulation suggests, the value of R will depend on the values of B and D and on the normative value judgement reflected in c. Given B, a higher value of D and/or c will reinforce R. Thus, once the values of R's of proposed projects are derived, the priority ranking can be determined in descending order of the values of R.

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[235] This functional form which incorporates both growth and distribution effects is operationally simple and seems to be free from some undesirable features detected in some other formulations of the form $R=B^{a}D^{c}$.

Two different but related and important elements in the evaluation process are addressed in this model: (1) the positive, rather than normative, element which involves the estimation of B and D, and (2) the political element which involves the determination of the value of c, which depends on the (normative) value judgement of the policy makers.

As already indicated, the value judgement of the policy makers plays an important role in this model. The policy makers will have to decide and agree in principle on how much weight is to be given to distribution, and thus agree on a definite value of c. This should be done prior to project evaluation, openly and deliberately, to avoid any possibility of manipulating priorities through manipulation of the value of c. Once this is decided and agreed upon, the model can be used for the evaluation of all projects under consideration. Given the estimated values of B and D, the value of c will determine the relative importance of distribution in the evaluation and planning process. This will be reflected in the value of R which will help determine priority ranking of the projects.

As an illustrative example, let us consider six hypothetical projects, P(i), with different estimated values of B and D, and examine how the values of R and, accordingly, the priority ranking change as the normative value judgement and hence the weights assigned to distribution change. Let the projects be as in Table 9 with the normative value judgement reflected in the values of c that appear in the last column.

TABLE 9

Several Projects with Different Value Judgement

Project	B	D	Assumed Values of c to evaluate each project.
P1	2.0	1.2	0.0
P2	1.5	1.5	0.5
P3	3.0	1.1	1.0
P4	3.5	1.0	2.0
P5	1.75	1.5	
P6	1.25	1.75	

Given these values of B, D and c, the projects can be evaluated by using the model $R=B\,D^c$. The evaluation result can be summarized in Table 10. The values of R of the projects P(i) appear in columns 2, 4, 6 and 8; and the priority ranking for different norms are presented in columns 3, 5, 7 and 9. As the table shows, the values of R and, accordingly, the priority ranking of the projects changes when there is a significant change in normative values with respect to distribution. For instance, project P4 ranks first when c= 0, c=0.5 and c=1.0, and fourth when c=2. In other words, the people with more inclination to growth will rank P4 first, whereas the people more concerned about equity and welfare will rank it fourth. The former will rank P6 sixth, whereas the latter will rank it second.

TABLE 10

Evaluation and Priority Ranking of Projects for Different Value Judgement

Project	c=0		c=0.5		c=1		c=2	
	R	Ranking	R	Ranking	R	Ranking	R	Ranking
P1	2.0	3	2.19	3	2.4	4	2.88	6
P2	1.5	5	1.84	5	2.25	5	3.37	5
P3	3.0	2	3.15	2	3.3	2	3.63	3
P4	3.5	1	3.5	1	3.5	1	3.5	4
P5	1.75	4	2.14	4	2.62	3	3.94	1
P6	1.25	6	1.65	6	2.19	6	3.82	2

Now we move on to the estimation of benefit ratio. It has been argued throughout this work that the user-cost savings are not the only benefits to be obtained from rural transport changes. Instead, the developmental effects may be more important in benefit calculation. It is, however, very difficult to estimate all the quantifiable and the non-quantifiable benefits. In addition, it has been argued that rural transport projects should be supplemented by complementary investment to achieve the maximum possible benefit out of scarce capital resources.

The comprehensiveness of the investment package may depend on individual circumstances. Given the condition of rural Bangladesh and its resource constraints, a minimal package of complementary investment may consist of the provision of improved cultivation technology, particularly through irrigation facilities for the introduction of high yielding seed varieties, and other necessary agricultural inputs and extension services. The package for the present purpose includes investment in transport infrastructure, irrigation facilities and extension services. The benefits to be included in the model consist of benefits obtained in farm and non-farm activities, transport cost savings to cargo and passenger traffic and to the transport operators. The model is, however, general and can incorporate any number of variables. For example, the benefit ratio is calculated as follows.

$$B = \frac{\sum_{j=1}^{a} \sum_{i=1}^{n} \delta_i B^A_{ij} + \sum_{k=1}^{\ell} \sum_{i=1}^{n} \delta_i B^S_{ik} + \sum_{i=1}^{n} \delta_i B^T + \delta_n B^{SV}}{\delta_1 C^f_t + \sum_{i=1}^{n} \delta_i C^m_t + \sum_{j=1}^{a} \sum_{i=1}^{n} \delta_i C^A_{ij} + \sum_{k=1}^{\ell} \sum_{i=1}^{n} \delta_i C^S_{ik} + \sum_{i=1}^{n} \delta_i C_g}$$

with $B^T = B^T_{c1} + B^T_{C2} + B^T_{C2}\ B^T_{P1} + B^T_{P2}$, $C_g = C^f_g + C^v_g$

and $i = 1, \ldots, n$
$j = 1, \ldots, a$
$k = 1, \ldots, \ell$

where,

B_{ij}^{A} = Benefit derived from the incremental output of jth agricultural product in the ith year.

B_{ik}^{S} = Benefit derived from the incremental output of kth small/cottage industry in the ith year.

B_{C1}^{T}, B_{P1}^{T} = Benefits to transport users, freight and passenger traffic respectively.

B_{C2}^{T}, B_{P2}^{T} = Benefits to transport traders, freight and passenger respectively.

B^{SV} = Salvage value of the project at the termination of the project life.

C_{t}^{f}, C_{t}^{m} = Fixed and maintenance cost of transport infrastructure respectively.

C_{ij}^{A} = Incremental cost of producing jth agricultural product in the ith year. This is simply the total production cost of jth crop without project minus that with project.

C_{ik}^{S} = Incremental cost of producing kth small/cottage industrial product in the ith year. This is calculated by subtracting total production cost of kth product with project from that without it.

C_{g}^{f} = Fixed complementary investment on the part of the government. For instance, the provision of irrigation facilities to the project area.

C_g^v = Variable complementary investment (e.g., Agricultural extension services) on the part of the government.

δ_i = Discount factor applied to calculate the present value of the benefit and cost of the ith year. If interest rates vary with purpose, regions and/or projects, the discount factor can vary across projects or even for different components of a project. Discounting has to be adjusted accordingly.

We now turn to the definition and estimation of D. The distribution ratio D is defined as the ratio of the income concentration ratio of the project region[236] Cr to the income concentration ratio of the present value of the incremental benefit stream over the project life, Cp.

$$D = \frac{Cr}{Cp}$$

While the precise form of the income concentration ratio is not specified here, as it requires recognition of the statistical material available and other statistical considerations, the measure must be sensitive to the relative importance of income shares.[237] The definition of D is general in

[236] If the concentration ratio of a region cannot be estimated due to data problem, the concentration ratio for the country can be applied for an approximation.

[237] The Gini measure, which is basic to income concentration measurement, is ambigious in this respect.

the sense that the policy makers can choose any appropriate concentration-ratio measure on the basis of data availabiliy and preference. Given Cr, which is fairly stable,[238] a project which has a favorable equity effect will reduce Cp so as to increase the value of D. The higher the value of D, the more desirable the project is; and the lower the value of D, the less attractive the project is on equity grounds, assuming c > 0. The distribution effect will, then, reinforce the evaluation of any project by affecting the value of R in $R = B D^{c}$. This influence will depend on the particular value of D and the weight c assigned to it.

As mentioned above, the definition of D is fairly general in the sense that any appropriate measure of concentration ratio can be used depending on data availability and the policy makers' preference. The calculation of a concentration ratio requires that the population in the area of the project be divided, for example, into quintiles (or deciles) in terms of income level to estimate the probable distribution of the present value of the incremental benefit stream over the project life. The present value of the annual benefits would then be distributed among the quintiles (or deciles) on the basis of expected distribution pattern and the share of each quintile or decile could be summed up to get the total share received by each group of the population

[238] The concentration ratio of a region/country is fairly stable unless a radical institutional change takes place in the country.

over the project life as in the following matrix.

TABLE 11

Matrix Showing the Distribution of the Present Value of the Incremental Benefits

$$
\begin{array}{ccc}
\sum_{a=1}^{\ell} b_1 & Q_{1,1} \cdot \cdot \cdot \cdot Q_{1,m} \\
\cdot & \cdot \quad\quad\quad \cdot \\
\cdot & \cdot \quad\quad\quad \cdot \\
\cdot & \cdot \quad\quad\quad \cdot \\
\sum_{a=1}^{\ell} b_n & Q_{n,1} \cdot \cdot \cdot \cdot Q_{n,m} \\
\sum_{i=1}^{n} \sum_{a=1}^{\ell} b & \sum_{i=1}^{n} Q_1 \cdot \cdot \cdot \cdot \sum_{i=1}^{n} Q_m
\end{array}
$$

where

b=present value of benefits derived from a'th economic activity in ith year.

Q=the mth quintile (or decile) group of population.

$a=1, \ldots, \ell$

$i=1, \ldots, n$

$m=1, \ldots, 5$ (or 10).

The last row in the matrix provides the total present value of the incremental benefits accrued to different income groups of the population over the project life. This can be used to derive Cp by any appropriate measure of concentration ratio. Once Cp is derived and the value of c is agreed upon, and Cr is available or estimated, the derivation of positive and normative components for equity consideration in the evalution process are complete. This along with the estimated B can now be used to get the value of R which will help evaluate projects and rank them in order of desirability, where desirability is a function of both growth and equity implications.

6.3 THE APPLICATION OF THE MODEL

Application of the model for the evaluation of a comprehensive rural transport project requires empirical study based on field surveys. Since this is not an objective of this work, an illustrative example of a comprehensive rural transport project in Bangladesh is provided below by taking data from different sources, using national average figures and by estimating others where necessary. This illustration should indicate the direction of the viability of rural transport projects in Bangladesh when both growth and distribution aspects are considered.

6.4 DATA SOURCE AND ESTIMATES

This illustrative example is based on the following basic assumptions.

1. The project life is twenty years.

2. No formal transport infrastructure exists presently in the project area.

3. The proposed rural road will be two miles long with 12' crest width and with 2:1 side slope and includes two 10' span concrete culverts.[239]

4. As a minimum complementary investment, the project includes only the installation of shallow tubewells (STW)[240] for the provision of irrigation water in order to facilitate introduction of HYV rice instead of low yielding variety (LYV) rice, (for simplicity, only one agricultural crop, rice, is considered (j=1)).

5. A half-mile on both sides of the road will be affected by the construction of the road so that the total affected area stands as two square miles.

6. One extension officer would be enough for the area when the road is constructed.

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[239] A standard of kutca (unpaved and earthen) road for rural Bangladesh is of 12' crest width and 2:1 side slope. See Bangladesh Engineering Consultants Ltd., Feasibility Study : Fulchari Thana, a report prepared for the Ministry of Local Government, Rural Development and Co-Operatives hereafter called MLGRD, (Dhaka: MLGRD, n. d.), p. M-24. And two 10' span culverts are assumed for a road of two miles lengh. It should be noted here that these assumptions are made, secondary data used and estimates done for an illustrative purpose. A real analysis would be based on the best appropriate estimates available.

[240] A STW is a low-power tubewell which is widely used in Bangladesh for ground water irrigation.

A rural transport project should be complemented by at least the provision of necessary ingredients of technological change in agriculture (mainly directly productive components). In an irrigation-seed-fertilizer package of HYV rice, for example, which is the major crop in Bangladesh agriculture, seed and fertilizer are more or less available. There is, however, a problem of supply and distribution which may hopefully be reduced to a reasonable extent by the improved mobility created by an efficient transport infrastructure. The irrigation equipment is included seperately in the project which is not available in the market and involves high cost. The cost of seed and fertilizer is included in the project in the form of cultivating HYV rice.

6.5 THE COST OF THE PROJECT

About 6 acres of land will be required for the construction of the road which will cost (CTL) about Tk.90,000[241] at the rate of Tk.1,500 per acre (Col.2,Table A.1).[242] The cost

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[241] The estimates and figures are presented in Bangladesh currency. The exchange rates between 1976-1978 were on the average as follows:
US$ 1.00= Tk. 15.467 during July 1976- June 1977.
US$ 1.00= Tk. 15.122 during July 1977- June 1978.
See World Bank, Bangladesh : Current Trends and Development Issues, p.(Currency Equivalents).

[242] A road with 12' crest width and 2:1 side slope and with 3' height means 24' base width. This will require 5.82 acres of land for two miles. The cost of land per acre is Tk. 1,500. See Bangladesh Engineering Consultants Ltd., p. D-22. [Cost and benefit figures are rounded and the resulting tables are placed in the Appendix].

of construction of the road (CTC) is about Tk.230,000, being Tk.86,000 for earth work and Tk.143,000 for two culverts (col.3,Table A.1).[243] The maintenance cost (CTM) of the road is assumed to be Tk.3000 per annum.[244] After every five year, an extra amount may be needed for occasional overhauling. Accordingly, Tk.5,000, instead of Tk.3,000, is assumed to be required in every fifth year after the first year of construction (col.4,Table A.1).

There are 1,280 acres in the project area of two square miles out of which about 700 acres are under cultivation.[245] It is difficult to separate the individual contribution made by the increased mobility of extension workers, more efficient supply and distribution, increased accessibility to credit, increased price incentives through better marketing facilities, complementary investments, etc. on agricultural production. It is, however, convenient to estimate the

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[243] The cost of earth work per 1,000 cft is Tk.150. And the cost of a 10' span culvert is Tk.71,234. See Development Consultancy Services, Ltd., Engineering and Socio-Economic Survey of Gouripur Thana, 1981, a report prepared for the MLGRD, (Dhaka: MLGRD, 1981), p.A-8 and A-11.

[244] The road is made of earth and is unpaved. The maintenance cost is meant mainly for repairing normal washouts caused by rain. Because of the low labor cost, the repairing cost may be assumed to be on the average Tk.3,000 per annum. While the average estimate seems to be more likely, the amount may vary regionally from Tk.500 to Tk.5,000.

[245] On the average 60% of land in Bangladesh is under cultivation. See BBS, GOB, Statistical Yearbook of Bangladesh 1980, pp.212-213 (calculated).

probable total effect on technological change in agriculture and productivity. Accordingly, it is assumed that the entire cultivable land will be covered by irrigation for the cultivation of HYV rice gradually in four years such that the cumulative percentage of land covered by irrigation are 50, 60, 65 and 70 in the first, second, third and fourth years respectively, while only 11.15% of cultivable land is presently irrigated which is assumed to remain same without the project.[246] Accordingly, the numbers of shallow tubewells required in four consecutive years are 15, 3, 1, and 1, and the unit cost of STW is about Tk. 35,000.[247] The life of a STW is ten years so that the STWs will have to be replaced in the 11th year. The cost of the STW (CIA) is provided in column 5 of Table A.1). The cost of maintenance (CAM) of the STWs is about Tk.9,000 which has to be incurred in the sixth year after installation (col.6,Table A.1). The cost of providing extension services (CAVWO) is about Tk.10,800 per annum, with Tk.9,600 as salary and Tk.1,200 transportation cost (col.8,Table A.1). The yearly transport cost savings of the extension officer will be roughly Tk.300, so that the yearly cost with project (CAVW) will be Tk.10,500 (col.7,Table A.1). The total cost of the project is

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[246] In 1977, area irrigated was 11.15% in Bangladesh, See BBS, GOB, Socio-Economic Indicators of Bangladesh, p.148.

[247] See Development Consultancy Services,Ltd., op. cit., p.A-6.

$$TCP = CTL + CTC + CTM + CIA + CAM + (CAVWO-CAVW)$$

which is presented in column 9 of Table A.1). In all the cost and benefit calculations, discount factors are calculated at the 15% rate of interest in order to derive the present values of costs and benefits streams over the period of twenty years. For simplicity, the interest rates for different components of the project are assumed the same.

6.6 COSTS AND BENEFITS TO AGRICULTURISTS

Since accurate data for land under HYV rice are not available, the area irrigated is taken as a proxy for HYV acreage. The areas under HYV and LYV rice without project (w/o) are 80 and 620 acres respectively.[248] They are assumed to remain same without project. The acreage under HYV rice will rise and that under LYV rice will fall with project (w) as assumed above[249] (Cols.2 and 3,Table A.2). The per acre costs of production of LYV and HYV rice are Tk.990 and about Tk.1,500 respectively.[250] The yields per acre of LYV and HYV rice are 9.78 and 48.28 maunds (about 362 and 1,786 kg.) respectively.[251] The cropping intensities with and without

[248] To recall, the area irrigated is presently 11.15% .

[249] That is, 50, 60, 65 and 70 percent of 700 wil be brought under HYV rice in the first , second, third and the fourth years respectively

[250] See Bangladesh Engineering Consultants Ltd., op. cit., P.B-29.

[251] The yield of HYV boro is 48.28 maunds per acre, and the

projects are 1.66 and 1.53 respectively.[252] Total output with project (TPW) in the respective year is calculated by the following formula

TYW=[(LLYV)(YLYV)(CIWO)]+[(LHYV)(YHYV)(CIW)]

where LLYV and LHYV are cultivable land under LYV and HYV rice respectively; YLYV and YHYV are respectively per acre yield of LYV and HYV rice; and CIW and CIWO are cropping intensities of land with and without project respectively (TYW is presented in col.7,Table 11).

Total output without the project (col.8,Table A.2) is calculated by using the same formula. The only difference is that LLYV and LHYV are different which variables with the project appear in column 2 and 3 respectively, whereas these values without the project are constant at LLYV=620 and HYV=80 acres. The incremental output (col.9, Table A.2) is simply the total output with the project minus the total output without it. The price of rice is considered to be about Tk.130 per maund.[253] The incremental revenue

average yield per acre of LYV rice 9.78 maunds. See Bangladesh Engineering consultants, op. cit.,pp. F-21-22.

[252] The cropping intensity is simply the total cropped area divided by net area sown. As mentioned earlier, the introduction of irrigation technology is found to increase cropping intensity from 1.5318 to 1.6626 by facilitating multiple cropping in Bangladesh.

[253] The harvest price of paddy is Tk.114.68 per maund (1977-80). But the annual retail price of cleaned rice in Dhaka is Tk.257.25 per maund (1979-80). The average price of paddy over the year may be assumed to be Tk.130 per maund. For the harvest price of paddy and retail

(col.10,Table A.2) is the incremental output multiplied by price.

6.7 COSTS AND BENEFITS TO NON-FARM ENTREPRENEURS

About 100 units of rural industries (URI)[254] are assumed to exist presently in the project area and are presumed to remain same without project. It was argued earlier that the implementation of the project is expected to lead to an expansion of rural industries. Since it is difficult to seperate the magnitude of individual effects, a particular expansion is assumed. The number of rural industries with project (URIW) is assumed to increase by 1% of that without it (URIWO) in the first year and by 5% in every subsequent year upto the end of the project life (col.2,Table A.3). The per unit operation cost of rural industries without project (CRIWO) is assumed to be about TK.12,000 per annum[255] which is assumed to fall by about TK.300 with project (CRIW)

price of rice, see BBS, GOB, Statistical Pocket Book of Bangladesh 1980, pp. 472,475.

[254] By rural industries, we mean the units of handloom operations, units of animal driven oil-crushing instruments etc. A firm may possess more than one such unit, although an one to one relation is usual. A village level micro-study observes that an area of 975 people has 36 of such RI units, and accordingly, the area in question with 3132 (see section 6.8) people may be roughly inferred to have 116 units of RI. For the study, see A.H.M.Sadeq , Agricultural Finance: Strategy of Mechanised Irrigation and Implications p.44,63.

[255] This includes the costs of inputs, labor and marketing. The major cost is however the cost of yarn in handloom industry.

because of the transport user cost savings and timely supply of inputs. Total cost of rural industries without project (TCRIWO) is derived by multiplying URIWO by CRIWO (col.4,Table A.3), and total cost of rural industries with project (TCRIW) is

$$[\{(URIW).(CRIW)\} + \{(URIW-URIWO).(CERI)\}]$$

where CERI is the cost of establishing a new industrial unit which is assumed to be about TK. 3000 (col.3,Table A.3).[256] The incremental cost of RI with project is simply TCRIW minus TCRIWO (col.5,Table A.3).

There are different kinds of RI which produce output of all different sizes and values. It is difficult to estimate them in a common unit of measure. While an empirical study for project evaluation can take all available RI into consideration, this study considers the resulting effect on revenue for simplicity. It has been argued that the efficiency of existing RI is expected to increase because of undisturbed input supply and of efficient marketing which may have positive effects on the volume of trade and price. Accordingly, the total revenue per URI with the project (RRIW) may be assumed to increase to, say, Tk.19,900 from that without the project (RRIWO) of Tk.19,200.[257] Total revenue

[256] The initial fixed cost of RI is not high. For instance, a unit of the handloom industry consists simply of a wooden weaving unit which is manually operated.

[257] This is estimated on the assumption of a marginally attractive remuneration for the entrepreneur. The per URI revenue over cost is considered to be Tk.7,200 per year

from rural industries with the project (TRRI) is simply URIW multiplied by (RRIW), (col.6,Table A.3); and total revenue from rural industries without the project (TRRIWO) is [(URIWO).(RRIWO)], (col.7,Table A.3). The incremental revenue is TRRIW minus TRIWO (col. 8,Table A.3).

6.8 COSTS AND BENEFITS TO PASSENGER TRAFFIC AND PASSENGER TRANSPORT OPERATORS

First, let us estimate the probable number of trips in different years of the project life. According to the 1974 census, 52% of the population of Bangladesh are adults,[258] and population density is 1,566 per square mile in Bangladesh.[259] Accordingly, there will be about 3,100 people with about 1,600 adults and 1,500 minors in the project area.

No information is available on the number of outside visits of the rural people. It is however expected that the improvement of transport facilities would lead to an increase in outside visits and the contacts of the rural peo-

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before project which amounts to Tk.19.73 per day for the entrpreneur, while a daily-wage laborer earns Tk.18 per day [see Development Consultancy Services Ltd., Engineering and Socio-Economic Survey of Phulpur Thana, prepared for the MLGRD, (Dhaka: MLGRD, 1981), p. A-14. This amount may increase to Tk.21.70 per day with project because of the project effect and thus the revenue over cost is Tk.7,920 per year per URI.

[258] See BBS, GOB, Statistical Yearbook of Bangladesh 1980, 1982, p.51.

[259] BBS, GOB, Statistical Pocket Book of Bangladesh, p.84.

ple.[260] It is therefore assumed that there will be five and one outside visits of two miles distance per month for adults and minors respectively along the constructed road after the implementation of the project. Each visit involves two trips, one going out and one coming back. For simplicity, the number of trips is assumed to grow at about 2.36%, since population grows at that rate.[261] When the road is constructed, about ten percent of the trips are assumed to be by rickshaw and the rest on foot. Thus the total number of trips by rickshaw (NOTR) and on foot (NOTF) every year is the respective number of trips in the previous year plus about 2.36% of it, starting in the first year with about 2,3000 and 208,000 trips by rickshaw and on foot respectively (cols. 2 and 3,Table A.4).

The cost and benefit estimates are made as follows. The travelling time on foot without project is assumed to be 30 minutes per mile. A trip by rickshaw is assumed to take 10 minutes per mile so that 40 minutes and hence TK.1.20 will be saved in a trip of two miles by rickshaw.[262] The rickshaw

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[260] Outside visits include visits to markets, trading centres, thana headquarters, houses of relatives, social gatherings and parties,etc.

[261] See BBS, GOB, _Statistical Pocket Book of Bangladesh 1980_, 1982, p.84.

[262] Per hour labor cost is TK.1.80. This is estimated from the fact that daily wage is TK.18.00 per day, where the worker works about 10 hours a day. For the wage rate, see Development Consultancy Services Ltd., _Engineering and Socio-Economic Survey of Phulpur Thana_ 1981, a report prepared for the MLGRD, p.A-14.

fare per mile is about Tk.1.50. But about 10% of the villagers are still expected to prefer to hire rickshaws for travelling. There may be two reasons for this. First, they are engaged in more remumerative work so that their time cost is more than Tk.1.80 per hour. Second, they value comfort and convenience positively so that they are ready to pay something rather than sacrifice comfort and convenience. Let us assume that they are prepared to pay Tk.0.10 rather than sacrifice a trip of two miles by rickshaw. That is, the value of transport service which helps save time and enjoy comfort and convenience is Tk.0.10 higher than the rickshaw charge. Thus the transport user cost savings per trip while travelling by rickshaw (USCP) is Tk.0.10. Total user cost savings for a rickshaw passenger (TUCSR) are [(NOTR).(UCSR)], (col.7,Table A.4).

If there is a formal and improved road, people can move fast even on foot. The travelling time on foot with the project is assumed to be 20 minutes, instead of 30 minutes without road, per mile so that the user cost savings on foot (UCSF) are about Tk.0.59 per trip, the value of 10 minutes saved. Thus the total user cost saving to passenger traffic on foot (TUCSF) is the number of trips on foot (NOTF) multiplied by UCSF (col. 6, Table A.4), and the total cost saving to passenger traffic is [(TUCSR)+(TUCSF)], (col. 8,Table A.4).

The rental charge of rickshaw is about Tk.15.00 for a period of 8 hours and the cost of labor time is, as before, Tk.1.80 per mile. Thus the total cost of a trip of 20 minutes (for two miles) to a transport operator is Tk.1.22, which includes both the labor cost and rickshaw rent for the time. The profit per trip to a transport operator is Tk.1.78. However, it cannot be expected that the operators would get enough demand for all their planned work time. If their actual employment is distributed over their planned work time, the benefit per trip-time may be assumed to be reduced to, say, Tk. 0.89. (col.4,Table A.4).[263] The total profit to transport operators is given by NOTR in the respective year multiplied by profit per trip (col. 5,Table A.4).

6.9 COSTS AND BENEFITS TO SHIPPERS AND CARGO TRANSPORT OPERATORS

Total output minus the amount consumed at home is considered to be the amount shipped. Total output with the project (TOW) is calculated as before (col.2,Table A.5). The rice requirement per adult is 16 ounces of rice or about 22.8 ounces of paddy per day.[264] If two minors are assumed to require on the average one adult equivalent paddy, the

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[263] This is on the assumtion that the transport service is demanded only for half of the time planned by the operators for work.

[264] See Bangladesh Engineering Consultants, op. cit., p. F-19. The rice-paddy ratio is about 28:40.

amount of consumption stands at about 15,000 maunds of paddy in the first year. On the assumption that the population's age distribution remains unchanged, the food requirement may be assumed to increase by 2.36% annually (col.3,Table A.5). If the freight shipment is done by rickshaw instead of head loading after the construction of the road, the benefit to the shipper is the transport cost saving of about Tk.1.2 per maund in a cargo shipment of two miles distance (col.5,Table A.5).[265] The benefit per maund to transport traders is about Tk. 2.00.[266] It is less likely that the operators will get enough demand for their services for all their planned time of work. Accordingly, the benefit per maund-time would be reduced to, say, Tk.1.00 (col.7, Table A.5).[267]

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[265] The average charges of cargo shipment by head/shoulder loading and by rickshaw per maund/mile are Tk.1.15 and Tk.0.55 respectively, see Bangladesh Rural Transport Study, p. 22. The savings in a two mile trip are thus Tk.1.2.

[266] In a trip of two miles, total cost to a rickshaw operator is Tk.1.22 which includes the labor cost for 20 minutes at the rate of Tk.1.8 per hour and rickshaw rental at the rate of Tk.15.0 per period of 8 hours. The rental revenue is Tk.3.30 on the assumption that a rickshaw can carry 3 maunds per trip at the rate of Tk.0.55 per maund/mile.

[267] This is on the assumtion that the transport service is demanded only for half of the time planned by the operators for work.

6.10 SALVAGE VALUE

The value of the land used for road construction is assumed to remain at least the same at the end of the project.[268] Because of maintenance, 10% value of earth work will remain at the end of the termination of the project life.

Based on these data and estimates, the cost and benefit calculations are made which are presented in the Appendix.

6.11 THE EVALUATION RESULT

The costs and benefits which are calculated in the Appendix can now be subtituted into (6.12) in order to get the value of B.

$$R = B\ D^{c} = 6\ D^{c}$$

Thus when calculated from national average and estimated data because of the non-availability of micro-level detailed data, the benefit ratio of a comprehensive rural transport project appears to be 6. It was argued earlier that the forces improving the relative position of lower income groups consequent upon transport changes are expected to be

[268] The need for a road will remain at the end of the project as long as there are people in the area served. The need may rather increase as a result of high population growth and the developmental activities. The same land can be used for the new construction instead of buying new land which is likely to cost more because of ever increasing land value in Bangladesh.

stronger than the forces affecting adversely their relative position. Accordingly, the value of Cp is expected to fall. Let us assume Cr=0.7 and Cp=0.65. Since equity with growth is highly emphasised in the development plan of Bangladesh, let us assume c=1.5. Therefore, we have

$$R = B\,D^{c}$$

$$R = 6(0.7/0.65)^{1.5}$$

$$= 7$$

Let us now compare this result with that of the traditional criterion for the evaluation of rural transport changes, that is, the criterion of user cost savings which was used by the BRTS team.[26] This measure gives the following result.

$$B = 2$$

It is obvious from this comparision that the same project evaluated with the same data is economically less viable when the traditional criterion used by the BRTS team is applied, and is more viable and desirable when the proposed general approach is employed. The difference in viability is so high that it is possible that a project might be non-viable if evaluated by the traditional approach, whereas it

[26] The criterion used by the BRTS team takes only user cost savings to shippers and benefits to transport traders into benefit and construction plus maintenance costs into cost considerations.

is quite viable from growth point of view and desirable on distribution grounds if evaluated by the the model developed in this thesis.

Chapter VII

CONCLUSION

7.1 CONCLUDING REMARKS

This thesis has investigated, in a planning perspective, the role of rural transport in the economic development of the rural sector of Bangladesh. The analysis has three major themes: (1) the implications of rural transport for economic growth, including both agriculture and non-farm rural activities; (2) rural transport and the equity problem, or the income distribution effects of transport changes; and (3) the development of a model which incorporates both growth and distribution effects for the evaluation of comprehensive rural transport projects. In addition, the role of complementary investments is also analysed.

The need for this analysis stems from two main sources. First, it has been a matter of general controversy whether transport, and in particular rural transport, can contribute to economic development. Second, there has been a controversy in a planning context about the role of rural transport in the development process of Bangladesh.

Treatment of the first element of controversy was handled through a literature review. A wide range of conclusions were revealed in this review and a critical analysis of the works indicated limitations which called for further research on this topic. Analysis of the Bangladesh Rural Transport Study showed that it is incomplete in its methodology and its application. The methodology needs augmentation through the inclusion of the full range of benefits from rural transport and strengthening by a more balanced consideration of distribution and growth effects.

The thesis is analytical and theoretical in nature, rather than empirical. It analyses the mechanism through which rural transport can contribute to economic growth and how the benefits are expected to be distributed. The analysis leads to the following conclusions: (1) the growth effect of transport changes has strong positive elements; and (2) the net distribution effects can be accepted in equity terms despite some balancing elements.

The growth analysis has a number of components. The opening up of new areas can turn potentially profitable, but presently unprofitable land (due transport charges and spoilage), into profitable operation. Our analysis shows how transport changes incease the farm gate prices of agricultural items and thus lead to positive, instead of zero, production. In the existing primitive situation of Bangladesh agriculture, where the efficiency of factors and services conducive to technological change is limited, transport changes can contribute positively to the diffusion of modern technology suitable to Bangladesh with important productivity impacts. Transport changes can increase the accessibility of the rural poor to institutional source of credit. The problem of conditional loans, which in effect reduce the already lower farm gate prices of agricultural products, is expected to be reduced as farmer accessibility to institutional credits increases.

Transport changes are also expected to facilitate a more efficient allocation of resources by providing factors favorable for an efficient crop composition and removing the limitation on factors associated with transport shortage. In the existing situation of the segmented marketing service of Bangladesh villages, transport changes can facilitate trader penetration into local markets with a positive effect on the prices of agricultural goods which in turn lead to higher production. Transport changes can also contribute to the growth of non-farm rural activities, which provide employment to the unemployed and add to the rural income, by reducing constraints on their development and creating factors conducive for their expansion.

In terms of distribution and equity, on balance, the resulting effects will probably improve the conditions of the worse off population relatively more than that of the prosperous. Factors imposing constraints on the growth of agriculture and rural industries are more severe for the poor and small farmers than for the rich and large farmers with their better access to the facilities. Greater mobility caused by transport changes should diminish the monopoly power of large farmers in terms of money lending, brokerage service, etc., and improve the relative position of the worse off population. Thus transport changes are expected to benefit all in absolute terms, while the distributive implications are expected to improve equity.

In planning rural development, the role of complementary investments is important, and the significance of the comprehensiveness and simultaneity of the provision of productive and support components should be emphasized. This element is necessary for the proper priority ranking of different components and consistent planning.

The model developed for the purpose of the evaluation of comprehensive rural transport projects incorporates the necessary components of investment and integrates both the growth and distribution effects. While the analysis of the growth and distribution implications of transport changes explains the direction of effects and the mechanism through which these are produced, the model provides an operational technique for evaluating and priorizing different projects proposed. The model contains three ratios, namely, the benefit ratio which is indicative of growth, the distribution ratio which is an indicator of distributive effects, and the objective ratio which is some weighted value of the two other ratios. The higher the value of the latter, the more desirable is the project. An important design feature of the model is its provision for the clear identification of positive and normative elements. The normative (value judgement) role of policy makers is made explicit.

For illustration, the model is applied to evaluate a hypothetical project in a Bangladesh village by taking available data from different sources and estimating the others. Although the result is not based on empirical research, it provides an analytical indication of the probable results of the evaluation of a comprehensive rural transport project in an isolated Bangladesh village. Where the combined effect of growth and distribution (the objective ratio) is positive, and significantly high, the project merits consideration. In view of the resource constraint of a country such as Bangladesh, the priority ranking of different projects is very important. This ranking depends on the relative magnitudes of growth, distribution and value judgement components.

The model has advantages over the one applied to evaluate rural transport changes in Bangladesh in the BRTS study, because the latter takes only a part of the benefits into benefit consideration and is incapable of incorporating the distribution implications into the model. In our illustration, when the same data are used to evaluate the project in question by applying both approaches for a comparision, the project appears significantly more beneficial in the comprehensive model than in the traditional one.

In summary, this study (a) indicates a probable positive growth effect from rural transport changes in the Bangladesh environment, (b) shows the nature of distributive effects from these changes (mainly favorable on equity grounds), (c) provides a critique of the BRTS study, and (d) develops a planning model which provides a more comprehensive basis for transport analysis.

7.2 FURTHER RESEARCH

The work done in this thesis prepares the way for further research of several types. First, research of a quantitive nature might usefully be done to provide more precise quantification of the relationships developed in the thesis. For this work to be done, improved data must be available; the thesis is useful as a guide for the provision and improvement of statistical data in Bangladesh.

On the basis of appropriate data, empirical tesing of the relationship between changes in transport in rural Bangladesh and economic development could be done. A number of sub-hypotheses basic to this relationship might also be tested, thereby providing better quantification of the effects of various growth components. For example, testing of the effects of transport changes on credit provision, on marketing, and on non-farm activities, might be done.

A second type research that would be useful is that which involves experimentation with and application of the planning model developed in the thesis. Here, work on income distribution treatment would be very useful.

Finally, the thesis raises research questions which range somewhat beyond the bound of this study. Work might be done on the implications of rural transport changes for labor migration and urbanization. The impact of transport on social aspects of life, such as family structure, health, and education might also be examined. Political research might address the nature of possible impacts of transport on national structure and on defence.

APPENDIX

COMPUTATION OF COSTS AND BENEFITS

TABLE A.1

Cost of Project

Year	Cost of Land for the Construction of Road	Cost of Construction of the road	Maintenance Cost of the Road	Cost of Complementary Investment	Maintenance Cost (Complementary Capital	Variable Cost (Complementary Investment) (W)	Variable Cost (Complementary Investment) (W/O)	Total Cost of the Project	Discount Factor	Present Value of the Total Project Cost
1	90000	230000	0	525000	0	10500	10800	844700	0.8696	734551
2	0	0	3000	280000	0	10500	10800	282700	0.7561	213749
3	0	0	3000	280000	0	10500	10800	282700	0.6575	185875
4	0	0	3000	140000	0	10500	10800	142700	0.5718	81595
5	0	0	3000	0	0	10500	10800	2700	0.4972	1342
6	0	0	5000	0	9000	10500	10800	13700	0.4323	5922
7	0	0	3000	0	0	10500	10800	2700	0.3759	1014
8	0	0	3000	0	0	10500	10800	2700	0.3269	882
9	0	0	3000	0	0	10500	10800	2700	0.2843	767
10	0	0	3000	0	0	10500	10800	2700	0.2472	667
11	0	0	5000	1400000	0	10500	10800	1404700	0.2149	301870
12	0	0	3000	0	0	10500	10800	2700	0.1869	504
13	0	0	3000	0	0	10500	10800	2700	0.1625	438
14	0	0	3000	0	0	10500	10800	2700	0.1413	381
15	0	0	3000	0	0	10500	10800	2700	0.1229	331
16	0	0	5000	0	9000	10500	10800	13700	0.1069	1464
17	0	0	3000	0	0	10500	10800	2700	0.0929	250
18	0	0	3000	0	0	10500	10800	2700	0.0808	218
19	0	0	3000	0	0	10500	10800	2700	0.0703	189
20	0	0	3000	0	0	10500	10800	2700	0.0611	164
										1532173

TABLE A.2

Costs and Benefits to Agriculturists

Year	Land Under LYV Rice (W)	Land Under HYV (W)	Total Cost of Production (W)	Total Cost of Production (W/O)	Incremental Cost (W)	Total Output (W)	Total Output (W/O)	Incremental Output (W)	Incremental Revenue (W)	Discount Factor	Present Value of Incremental Cost	Present Value of Incremental Revenue (W)
1	350	350	871500	733800	137700	33287	15688	17599	2287870	0.8696	119743	1989531
2	210	490	942900	733800	209100	42413	15688	26725	3474250	0.7561	158100	2626880
3	70	630	1014300	733800	280500	51538	15688	35850	4660500	0.6575	184428	3064278
4	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.5718	180803	3004059
5	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.4972	157214	2612134
6	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.4323	136693	2271170
7	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.3759	118859	1974861
8	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.3269	103365	1717431
9	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.2843	89895	1493624
10	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.2472	78164	1298712
11	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.2149	67951	1129018
12	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.1869	59097	981914
13	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.1625	51382	853724
14	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.1413	44679	742346
15	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.1229	38860	645678
16	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.1069	33801	561619
17	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.0929	29374	488067
18	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.0808	25548	424498
19	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.0703	22228	369334
20	0	700	1050000	733800	316200	56101	15688	40413	5253690	0.0611	19319	321000
											1719503	28569878

TABLE A.3

Costs and Benefits to Non-Farm Entrepreneurs

Year	Number of Rural Industries (W)	Total Cost of Rural Industries (W)	Total Cost of Rural Industries (W/O)	Incremental Cost	Total Revenue of Rural Industries (W)	Total Revenue of Rural Industries (W/O)	Incremental Revenue of Rural Industries (W)	Discount Factor	Present Value of Incremental Cost (W)	Present Value of Incremental Revenue (W)
1	101	1184700	1200000	-15300	2009900	1920000	89900	0.8696	-13304	78177
2	106	1255200	1200000	55200	2109400	1920000	189400	0.7561	41736	143205
3	111	1313700	1200000	113700	2208900	1920000	288900	0.6575	74757	189951
4	116	1372200	1200000	172200	2308400	1920000	388400	0.5718	98463	222087
5	121	1430700	1200000	230700	2407900	1920000	487900	0.4972	114704	242583
6	126	1489200	1200000	289200	2507400	1920000	587400	0.4323	125021	253933
7	131	1547700	1200000	347700	2606900	1920000	686900	0.3759	130700	258205
8	136	1606200	1200000	406200	2706400	1920000	786400	0.3269	132786	257074
9	141	1664700	1200000	464700	2805900	1920000	885900	0.2843	132114	251861
10	146	1723200	1200000	523200	2905400	1920000	985400	0.2472	129335	243590
11	151	1781700	1200000	581700	3004900	1920000	1084900	0.2149	125007	233145
12	156	1840200	1200000	640200	3104400	1920000	1184400	0.1869	119653	221364
13	161	1898700	1200000	698700	3203900	1920000	1283900	0.1625	113538	208633
14	166	1957200	1200000	757200	3303400	1920000	1383400	0.1413	106992	195474
15	171	2015700	1200000	815700	3402900	1920000	1482900	0.1229	100249	182248
16	176	2074200	1200000	874200	3502400	1920000	1582400	0.1069	93451	169158
17	181	2132700	1200000	932700	3601900	1920000	1681900	0.0929	86647	156248
18	186	2191200	1200000	991200	3701400	1920000	1781400	0.0808	80088	143937
19	191	2249700	1200000	1049700	3800900	1920000	1880900	0.0703	73793	132227
20	196	2308200	1200000	1108200	3900400	1920000	1980400	0.0611	67711	121002
									1933441	3904102

TABLE A.4

Cost Savings to Passenger Traffic and Benefits to Transport Traders

Year	Number of Trips by Rickshaw	Number of Trips on Foot	Cost Savings to Transport Traders	Total Savings to Trans. Traders	Total Cost Savings to Passenger Traffic(foot)	Total Savings to Passengers(rks)	Total Savings to Passengers (foot & rks)	Discount Factor	Present Value of Benefits to Passengers	Present Value of Benefits to Transporters
1	23000	208000	0.89	2300	122719	20469	125019	0.8696	108716	17799
2	23500	213000	0.89	2350	125669	20914	128019	0.7561	96795	15813
3	24000	218000	0.89	2400	128619	21359	131019	0.6575	86144	14043
4	24500	223000	0.89	2450	131569	21804	134019	0.5718	76632	12467
5	25000	228000	0.89	2500	134519	22249	137019	0.4972	68125	11062
6	25600	233000	0.89	2560	137469	22783	140029	0.4323	60534	9849
7	26000	238000	0.89	2600	140419	23139	143019	0.3759	53760	8697
8	26600	243000	0.89	2660	143369	23673	146029	0.3269	47736	7738
9	27000	248000	0.89	2700	146319	24029	149019	0.2843	42366	6831
10	27600	253000	0.89	2760	149269	24563	152029	0.2472	37581	6071
11	28200	258000	0.89	2820	152219	25097	155039	0.2149	33317	5393
12	28700	263000	0.89	2870	155169	25542	158039	0.1869	29537	4773
13	29000	268000	0.89	2900	158119	25809	161019	0.1625	26165	4193
14	29700	273000	0.89	2970	161069	26432	164039	0.1413	23178	3734
15	30400	278000	0.89	3040	164019	27055	167059	0.1229	20531	3325
16	31000	283000	0.89	3100	166969	27589	170069	0.1069	18180	2949
17	31700	288000	0.89	3170	169919	28212	173069	0.0929	16079	2620
18	32400	293000	0.89	3240	172869	28835	176109	0.0808	14229	2329
19	33000	298000	0.89	3300	175819	29369	179119	0.0703	12592	2064
20	33700	303000	0.89	3370	178769	29992	182139	0.0611	11128	1832
									883325	143582

TABLE A.5

Benefits to Shippers and Transport Operators (Cargo)

Year	Total Agricultural Output (W)	Home Consumption	Amount Shipped	Transport Cost Saving Per Maund	Total Cost Savings	Benefit to Transport Trader Per Maund	Total Benefits to Transport Traders	Discount Factor	Present Value of Savings to Shippers	Present Value of Benefits to Transport Traders
1	33287	15000	18287	1.20	21944	1.00	18287	0.8696	19082	15902
2	42413	15400	27013	1.20	32415	1.00	27013	0.7561	24508	20424
3	51538	15700	35838	1.20	43005	1.00	35838	0.6575	28275	23563
4	56101	16100	40001	1.20	48001	1.00	40001	0.5718	27446	22872
5	56101	16500	39601	1.20	47521	1.00	39601	0.4972	23627	19689
6	56101	16900	39201	1.20	47041	1.00	39201	0.4323	20335	16946
7	56101	17300	38801	1.20	46561	1.00	38801	0.3759	17502	14585
8	56101	17700	38401	1.20	46081	1.00	38401	0.3269	15063	12553
9	56101	18100	38001	1.20	45601	1.00	38001	0.2843	12964	10803
10	56101	18500	37601	1.20	45121	1.00	37601	0.2472	11153	9294
11	56101	18900	37201	1.20	44641	1.00	37201	0.2149	9593	7994
12	56101	19300	36801	1.20	44161	1.00	36801	0.1869	8253	6878
13	56101	19700	36401	1.20	43681	1.00	36401	0.1625	7098	5915
14	56101	20200	35901	1.20	43081	1.00	35901	0.1413	6087	5072
15	56101	20700	35401	1.20	42481	1.00	35401	0.1229	5220	4350
16	56101	21200	34901	1.20	41881	1.00	34901	0.1069	4477	3730
17	56101	21700	34401	1.20	41281	1.00	34401	0.0929	3835	3195
18	56101	22200	33901	1.20	40681	1.00	33901	0.0808	3287	2739
19	56101	22700	33401	1.20	40081	1.00	33401	0.0703	2817	2348
20	56101	23200	32901	1.20	39481	1.00	32901	0.0611	2412	2010
									253034	210862

GLOSSARY

Taka (Tk.):	Bangladesh currency. The exchange rate is about US$1 = Tk.22 (1983).
Rickshaw:	A three-wheeled pedal rickshaw which can carry passengers and/or goods. The capacity is two persons or passenger/goods combination. (See photograph 6).
Bullock-cart:	A wooden vehicle drawn, usually, by two bullocks. This is used mainly for short-haul cargo shipment. (See photograph 3).
Push-cart:	A wooden vehicle for short-haul cargo movemet. It is pushed and pulled by two men simaltaneously from the two ends of the vehicle.
Head-loading:	movement of goods by human head . (See photograph 2).
Shoulder-loading:	Carrying goods by human shoulder. (See photograph 1).
Country boat:	A small boat used as a water transportation vehicle. This is used in the khal and beel (see below) of rural areas. This is also seen in rivers as shown in photograph 9.
Khal:	Natural channels.
Beel	A small lake, swamp or body of year-round water created by rains or flooding.
Boro:	Rice planted in winter and harvested during April and June.
Aman:	Rice planted before or during the monsoon season and harvested in November or December.

IRRI:	High yielding variety (HYV) of rice named after its innovator the International Rice Research Institute, Philippines.
Paddy:	Unhusked rice.
Saree:	Female dress cloth widely used in both urban and rural areas. This is a single piece of cloth, about 16' long.
Gamsa:	A piece of cloth, about 5' long and 3' wide, which is the main dress for the poor in rural areas. This used to cover the bottom part of the body. It is also used as a wash-room towel by the middle class population.
Village:	A small geographical unit, without any administrative status, which constitutes a community of households with an average population of 1000.
Union:	A unit of local self-government. There are about 20 villages in a Union with about 20,000 people.
Thana:	The smallest administrative unit of Bangladesh covered by a police station. On the average, there are 9 Unions in a Thana with a population of about 1,80,000.
Sub-Division:	A number of Thana (on the average 7) constitutes a Sub-Division.
District:	A few Sub-Divisions (on the average 3.5) constitute a district. (A few districts make a Division, and there are 4 Divisions in Bangladesh).
1 lakh=	10,000.
1 crore =	10,000,000.
1 mile =	1.609 km.
1 seer =	0.9325 kg.
1 maund =	40 seers (37.3 kg.).

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