CHAPTER 2
SOCIAL CONCEPTS

2–1 OUTLINE OF THE PEOPLE'S REPUBLIC OF BANGLADESH

(1) Natural Conditions

The People's Republic of Bangladesh is situated at the eastern end of the Indian Subcontinent at lat. 20° 75' to 25° 75' N, and long. 88° 30' to 92° 75', and has a total land area of 44,000 Sq. km. The greater part of the country consists of the largest alluvial plain in the world formed by Ganges, Jamuna and Meghna rivers, and their tributaries.

In this country, many rivers, small and large, criss-cross each other. Except for the Chittagong hilly district, almost all the land is flat and is less than 10 m above sea level. The highest part is only 30 m above sea level.

The climate is tropical because it is influenced by the monsoon from the Indian Ocean. There are three seasons; winter (November to February), summer (March to May) and the monsoon season (June to October). Generally, the climate of Bangladesh is very hot with high humidity. There is a great difference in the amount of rain during the rainy season and the dry season (winter). More than 80% of the rain folls during the rainy season, but during the dry season there is almost none. This is one of the climatic characterrisitics of the country, and in the dry season, there is a shortage of water which means that the agriculture of the country cannot rely upon rainwater.

(2) Outline of Economic Conditions

With respect to the industrial structure of Bangladesh, the agricultural sector accounts for approximately 60% of the whole in terms of the composition ratio of the gross domestic product (GDP) (56.8% in fiscal years 1977 and 1978), and approximately 80% of the whole in terms of the composition ratio of the labor force; thus, agriculture is the nucleus of the country's economics. (See Table 1-11)

Of the imported items, foodstuffs account approximately 15 to 40% though this percentage varies year by year depending on the domestic production.

Moreover, agriculture has a big effect on the fluctuations in the prices of commodities in this country. Particulary, the fluctuations in the production of rice, on which the people of Bangladesh live, have a big effect on the prices.

As stated above, the economy of Bangladesh is mainly composed of agriculture, so it is indispensable for economic progress that agricultural development be carried out.

Table 2-1 Composition Ratio of Gross Domestic Production by Sector (1969/70 to 1978/79)[1)]

(Firm prices in 1972/73)

	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79[2)]
Agriculture	61.4	62.1	64.4	60.1	61.1	58.7	58.8	56.8	56.7	55.5
Manufacturing industries	8.3	7.4	4.7	7.3	7.6	7.4	7.6	8.2	8.4	8.7
Large scale	5.1	4.8	3.0	4.6	4.9	4.7	4.9	5.4	5.6	5.8
Small scale	3.2	2.6	1.7	2.7	2.7	2.7	2.7	2.8	2.8	2.9
Construction	4.6	3.4	1.9	3.2	1.5	3.5	3.5	4.1	4.4	4.9
Electric power & gas	0.2	0.2	0.2	0.4	0.5	0.5	0.6	0.6	0.7	0.7
Transportation & communication	4.6	4.5	4.4	5.3	5.3	5.2	5.3	5.6	5.3	5.4
Trade	7.5	7.4	7.4	7.8	7.9	7.8	7.7	7.4	7.4	7.5
Banking & insurance	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
Housing	4.4	4.8	5.6	5.2	4.9	4.9	4.7	4.8	4.6	4.6
Administration	2.4	3.1	3.9	2.9	3.9	4.9	5.0	5.3	5.5	5.8
Other services	6.1	6.5	6.8	7.1	6.6	6.5	6.1	6.4	6.2	6.1
Gross domestic product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source) IBRD: Bangladesh; Current Trends and Development Issues, Dec. 1978 PP. 76.
Govt. of Bangladesh, Planning Commission : Memorandum for the Bangladesh Aid Group, 1979/80, Dec. 1978, PP. 43.

(Note) 1) According to the estimated figures and factor costs of the Planning Commission
2) Preliminary figures

Table 2-2 Number of Employees by Industry and Added Value
(In case of only large-scale industries in 1972/73)

	Number of employees (persons)	Added value (Unit: a million taka)
Jute processing	77,391	299.3
Cotton textile	25,686	251.2
Tea	9,402	34.0
Paper & paper products	5,260	66.5
Tobacco & cigar	5,261	272.9
Match	752	3.5
Jute packing	1,269	34.6
Shipbuilding	584	2.7
Cosmetics & so forth	333	1.5
Medicines	3,857	59.7
Iron & steel	1,673	20.4
Fertilizer	742	6.5
Total (including others)	182,092	1,374.1

(Source) B. B. S. : Detailed Report on the Census of Manufacturing Industries in Bangladesh for 1972/73; Dacca, 1978, PP. 2 ∿ 11.

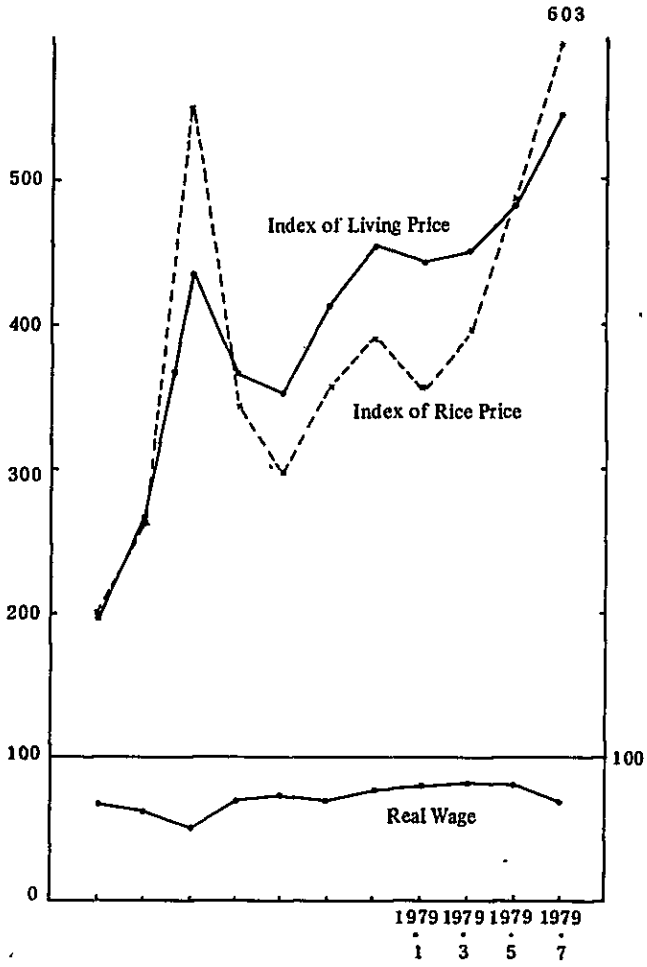
Table 2-3 Major Import and Export Items & Trade Balance

(Unit: a million taka)

	1974/75	1975/76	1976/77	1977/78	1978/79(Preliminary)	
Export	313.6	555.2	667.0	740.6	900.0	(100.0)(%)
Jute	75.8	163.4	184.0	145.4	231.0	(25.7)
Jute products	185.9	277.3	277.5	373.5	409.0	(45.4)
Tea	16.3	28.8	49.5	67.9	69.0	(7.7)
Hides & leather	19.0	50.5	86.2	69.3	75.0	(8.3)
Fishes & fish processed products	5.9	17.6	27.8	29.6	60.0	(6.7)
Paper & newsprint	5.5	4.0	3.3	11.0	11.7	(1.3)
Import	1,084.2	1,470.3	1,399.3	1,821.6	2,493.0	(100.0)
Foodstuffs (rice, wheat, etc.)	478.1	428.1	168.3	472.8	343.9	(13.8)
Raw materials excluding mineral oil	101.0	116.0	73.7	190.0	247.4	(9.9)
Mineral oil	92.8	185.4	333.4	266.5	397.5	(15.9)
Chemical products & medicines	98.0	181.8	101.3	124.1	286.2	(11.5)
Finished products	145.2	177.4	349.6	341.3	384.6	(15.4)
Machinery & transport equipment including materials	119.0	208.2	236.5	291.1	430.0	(17.2)
Trade balance	-770.6	-915.1	-732.3	-1,081.0	-1,593.0	

(Source) M. of Finance : Bangladesh Economic Survey, 1978/79. PP. 112 ∿ 124.

Fig. 2-1 Cost of Living Index, Rice Price Index and Real Wage Index (1969/70 = 100)



Source: B.B.S.: Economic Indicators of Bangladesh, Aug. 1979.
B.B.S.: Statistical Yearbook of Bangladesh, 1979.

(3) Population

The population of Bangladesh was 87 million as of 1978, and population density is high at approximately 600 persons sq. km throughout the country. The rate of increase in population is estimated at 2.9% each year on average (by the Planning Commission). If the present rate of increase continues, it is estimated that the population of Bangladesh will exceed 134 million persons in the year 2,000. (See Table 2-4)

Such a rapid increase in population will greatly affect the economy and society of Bangladesh, which will cause such problems as overpopulation. Especially, the shortage of foodstuffs is a serious problem. It is estimated that the production of foodstuffs in the years 1977/78 was 13.1 million tons and the shortfall was 1.5 million tons. According to the estimated population by the World Bank, the necessary amount of food to satisfy the demand of 16 ounces a day per capita (165.6kg per year) will be as much as 22.2 million tons in the year 2,000; this means that food production must be increased by an average of 3.2% each year.

In order to solve the various problems caused by the increase in population, it is a prerequisite to improve agricultural productivity which is the largest economic sector of Bangladesh.

Table 2-4 Estimated Future Population

	1975	1980	1985	1990	1995	2000
Estimate by World Bank[1)]						
Population at the beginning of year (unit: a million persons)	78.18	89.64	101.41	113.18	124.41	134.21
Birth Rate	47.8	42.2	37.2	32.5	27.5	21.9
Death Rate	19.2	16.4	14.1	12.3	10.7	9.4
Yearly increase rate (%)	2.86	2.58	2.31	2.02	1.68	1.24
Fertility rate	6.58	5.77	4.96	4.15	3.34	2.53
Average span of life						
Male	44.97	47.97	50.47	52.97	55.47	57.97
Female	44.50	47.50	50.00	52.50	55.00	57.50
Estimate by Planning Commission [2)]						
Population at the beginning of year (unit: a million persons)	78.18	89.12	98.91	106.70	113.38	121.14
Rate of birth	47.8	39.0	30.9	22.7	23.6	23.4
Rate of death	19.2	16.0	13.4	11.3	10.6	10.0
Yearly increase rate (%)	2.86	2.30	1.75	1.14	1.30	1.03
Fertility rate	6.56	5.29	4.01	2.72	2.62	2.53
Average span of life						
Male	44.97	47.97	50.47	52.97	55.47	57.97
Female	44.50	47.50	50.00	52.50	55.00	57.50
Estimate by Statistics Bureau						
Population at the beginning of year (unit: a million persons)	78.04	87.66	97.69	107.52	117.35	126.93
Rate of birth	39.7	35.9	32.7	30.5	28.5	-
Rate of death	16.5	14.2	13.7	13.0	12.6	-
Yearly increase rate (%)	2.6	2.3	2.2	1.9	1.8	1.6

(Source) Data of the World Bank

(Note) 1) The estimate on the basis that the net reproduction rate (NRR) will be 1 in 1990. NRR = 1 means that a woman of reproduction age will give birth to 1 female baby. The population 50 years and on after NRR = 1 is realized will be stabilized.

2) The estimate on the basis that the year when NRR = is realized will be in 1985.

2–2 OUTLINE OF AGRICULTURE

(1) Population Engaging in Agriculture

The importance of agriculture to the economy of Bangladesh is very great as described above; and this can also be said from the aspect of the structure of the labor force. The population employed in agriculture was 15.82 million as of 1974, which is 77.1% of the working population. The number of people absorbed into the agricultural sector is overwhelmingly large.

Table 2-5 Composition of Labor Force by Industry

(Unit: a million persons)

	Census in 1961	Census in 1974
Agriculture	15.00 (86.0)	15.82 (77.1)
Manufacturing industries	0.75 (4.3)	0.95 (4.6)
Electric power, gas & construction	0.10 (0.6)	0.04 (0.2)
Services	1.59 (9.1)	3.71 (18.1)
Total	17.44 (100.0)	20.52 (100.0)

(Note) B. B. S. : Statistical Yearbook of Bangladesh. 1979. PP. 84.

(2) Present State of Land Use

It is estimated that the total area of Bangladesh is 144,000 sq. km, of which rivers account for approximately 10,000 sq. km and the arable land is 66% of the total land area, or 94,000 km^2. 91,000 sq. km of this arable land was cultivated up to the years 1976/77, and the remaining land (11,000 sq. km) lies fallow. Accordingly, it can be said that if the above areas which are already cultivated or lying fallow are excluded, there is almost no possibility that more land may be extensively used for agriculture. In order to increase agricultural production, therefore, the yield per unit area must be increased by improving agricultural productivity, or by enhancing availability of arable land. With respect to the latter method, efforts have been made to grow two-or three-crops a year in some areas by expanding the irrigation area in the dry season.

Judging from the climatic conditions, if water can be controlled it is not impossible to realise three crops of rice, cereals, vegetables, etc. The present area of land used for these crols is approximately 50% of the present area of cultivated land, so that the availability of arable land can be increased to 200%.

The key to the above possibility is an expansion of the irrigable area; since the amount of rainfall is small in the dry season, it is impossible to grow crops without irrigation. The irrigated area in the years 1976/77, using of both modern and traditional techniques, was only 15% of the arable land and only 10% of the total planted areas. It is of the utmost importance for the technology in this field to be developed.

Table 2-6 State of Land Use

(unit: 1,000 acres)

	Single crop area	Two crops area	Three crops area	Area of arable land	Total planted area	Utilization rate of arable land(%)
1965/66	-	-	-	21,601	29,541	136.8
1969/70	12,028	8,392	1,343	21,763	32,841	150.9
1973/74	12,530	7,192	1,255	20,977	30,675	146.3
1974/75	12,481	6,799	1,279	20,559	29,916	145.5
1975/76	12,250	7,269	1,449	20,968	31,135	148.5
1976/77	11,911	7,072	1,462	20,445	30,441	148.9

(Source) B. B. S. : The Year Book of Agricultural Statistics of Bangladesh, 1976/77, Dacca, 1978, PP. 771 ∿ 790.

(3) Major Farm Products

Rice and jute are typical of the agriculture of Bangladesh. The areas for these two products account for 80 to 85% of the total planted area. Particularly, with respect to rice, priority is given to its production because the people have a strong preference for it. The area for producing rice accounts for 79.4% of the total planted area, and overwhelming importance is attached to the production of rice out of the gross production of crops. However, Bangladesh has failed to establish self-sufficiency in foodgrains, so that food shortage amount to 1 to 1.5 million tons per year. When the production of rice is depressed due to unseasonable weather, the shortage of rice exceeds 2 million tons. Therefore, it is of the utmost importance to increase rice production and other crops by spreading improved agricultural techniques.

Production of wheat in the years 1978/79 accounts for only 3.8% (480,000 tons) of the total rice production. However, wheat can be produced with a smaller amount of water than rice and its yield is increased as a result of the introduction of high yield plants and its price is rising, so that the planted area and wheat production are rapidly increasing. It is expected therefore that the present production level of crops can be doubled by producing more wheat.

There are other important farm products such as sugar cane, rape, etc. In recent years, the cultivation of vegetables in the dry season has been increased. Accordingly, attention is paid to utilizing the land for vegetables in the dry season.

On the whole, it will be very difficult, judging from the present production level, to meet the increased demand for foodgrains incidental to the increase in population and to improve the nutrition level only by

expanding rice production. Therefore, it is necessary to recognize about multi crop agriculture (such as vegetables, fruits, etc.). The solution of the food problem for Bangladesh in future can be said to depend upon multi crop agriculture.

Table 2-7 Planted Areas of Major Crops

(unit: 1 million acres)

	1949/50	(%)	1959/60	(%)	1969/70	(%)	1976/77	(%)	1977/78	(%)	1978/79[1]	(%)
Rice	19.53	(76)	21.15	(80)	25.48	(78)	24.42	(78)	24.78	(79)	25.00	(78)
Aus	4.67		5.95		8.46		7.95		7.82		8.00	
Aman	14.01		14.29		14.84		14.36		14.26		14.35	
Boro	0.85		0.91		2.18		2.11		2.70		2.65	
Wheat[2]	-		-		0.30		0.40		0.47		0.65	
Other cereals	0.45		0.34		0.28		0.22		0.22		0.19	
Pulses	0.99		0.79		0.91		0.82		0.83		0.84	
Oily seeds	0.72		0.88		0.78		0.69		0.74		0.75	
Jute	1.56	(6)	1.38	(5)	2.46	(7)	1.60	(5)	1.81	(6)	2.05	(6)
Sugar cane	0.23		0.28		0.40		0.36		0.38		0.38	
Potatoes	-		0.12		0.39		0.36		0.40		0.42	
Others	2.16		1.54		1.84		1.56		1.56		1.58	
Total	25.66	(100)	26.48	(100)	32.84	(100)	31.27	(100)	31.19	(100)	31.86	(100)
Area of arable land[3]	22.35		21.66		22.49		22.53		-		-	
Utilization rate rate of arable land	115		122		146		135		-		-	

(Source) Govt. of East Pakistan : Statistical Digest of East Pakistan, 1969, PP. 40 ∿ 57.
Data of the World Bank

(Note) 1) Preliminary figure
2) In the years 1949/50 and 1959/60, wheat is included in other cereals.
3) A short-term land lying fallow is included.

(4) Problems for Agricultural Development

As described above, the economy of Bangladesh greatly depends on agriculture. So it is no exaggeration to say that the economic development of the country means agricultural development. Here, the problems to be solved for the agricultural development and some of the policies are described.

- Agricultural facilities:
  In order to prepare the land base of Bangladesh, it is necessary to meet such different requirements as flood control and drainage in the rainy season and irrigation in the dry season. As for further extension of the agricultural land are limited in Bangladesh the preparation of land is of urgent necessity.

- Multi crop agriculture:
  The agricultural structure of Bangladesh consists mainly of the production of rice on a small scale so that multi crop production must be carried out to correspond to the increased population and to improve nutrition.

- Mechanization of agriculture:
  Bangladesh, where the size of farms is small, fields are irregularly shaped and dispersed, has a number of conditions which are not suitable for mechnized agriculture. In order to increase agricultural production in future and to improve the farmers' income, two or three crops per year must grown and agricultural work must become more efficient.

- Spread of techniques, experimentation and research;
  At present compulsory education is 5 years, and the percentage of adults who have attended school is estimated to be 23%. Therefore, it can be said that farmers would find it difficult to adopt new tech-

niques. In light of this fact it is considered that farmer's education should be improved and developed.

On the other hand, Bangladesh is short of agricultural technicians. At present, there are 4,000 union agricultural assistants, and it is hoped that in the future another 16,000 union agricultural assistants will be trained. There are only 2 national higher agricultural educational institutions at present. The number of the assistants to be added by 1987 is estimated at 2,200. Accordingly, it is necessary to increase the number of graduates from the institutes by 150 each year.

As stated above, the key to agricultural development is the education of agricultural technicians. In light of this consideration, this project will have a great effect on the agriculture of the country, and much is expected from it.

2–3 AGRICULTURAL EDUCATION

The first higher agricultural educational institute in this country was the Bengal Agricultural Institute established in 1938. (The present Bangladesh Agricultural Institute). Later, for the purpose of training agricultural technicians, several 2-year agricultural colleges were established under the control of the Ministry of Agriculture & Forests. In 1961, the need for higher agricultural education was recognized, and the agricultural research division was reorganized as an institute to train agricultural technicians; thus, the Agricultural Research Institute (ARI) (now called BARI) and BAU (Bangladesh Agricultural University) were established. Moreover, it was in the same year (1961) that an agricultural technical training institution or the Village Aid Training Institute (now called AETI: Agricultural Extension Training Institute) was established in various places. Thereafter, those educational institutions have been repeatedly expanded and reorganized until the present when the agricultural educational foundation of Bangladesh came into being.

The higher agricultural educational institutes of Bangladesh, or BAU and BAI, are described below.

(1) BAU (Bangladesh Agricultural University)

The BAU located in the suburbs of Mymensingh City about 160km to the north of Dacca is a university under the control of the Ministry of Education which was established in 1961 as a college of veterinary science and animal husbandry. At present, it consists of 6 facultys such as the Agriculture Department, Agricultural economics Department, etc. and Postgraduate School, and performs basic and applied studies of the science in agricultural science. In addition, the university has courses for training union agricultural assistants and for a short term training so that the university can act as a regional agricultural center to spread the results of its studies. The numbers of students, teaching staff and graduates from the departments of the University as of 1977 are 2,542, 320 and about 500 (yearly), respectively. Almost all of the graduates work as public employees, that is, middle class leaders of this country's agriculture in the fields of experiment and research, education and the like.

Table 2-8 Fuculty, Department and Number of Students of Bangladesh Agricultural University (Mymensingh) (1975 to 76)

Faculty	Number of students (persons)	Class	Department
Faculty of Agriculture	772	B.Sc.Ag (Hons)	Cultivation, soil, plant pathology, insectology, gardening, crops, heredity and breeding, agricultural chemistry, biochemistry and spread of agriculture
Faculty of Agricultural Economics	240	B.Sc.Ag. Econ. (Hons)	Agricultural economy, agricultural village society, spread of associations and distribution, agricultural statistics and agricultural finance
Faculty of Agricultural Engineering	271	B.Sc.Ag. Engg.(Hons)	Agricultural Machinery, prime mover, farm products processing and agricultural industry, and irrigation and utilization of water
Faculty of Fisheries	201	B.Sc.F (Hons)	Aquatics and limnology, hydrophonics and control, and fisheries engineering
Faculty of Veterinary Science (6-year system)	415	DVM, B.Sc(Vet. Sc. & A. H) Condenged	Anatomy and histology, physiology and parmacology, medicine and surgery, phathology, parasitology, and microbiology and hygienics
Faculty of Animal Husbandry	274	B.Sc.A.H. (Hons)	Zoology, animal breeding and heredity, rearing, poultry and dairy farming
Master's Course of Postgraduate School	417	M.Sc.	
Doctor's Course	2	Ph.D.	
Total	2,542		

Data: Data of the University as above.

(2) BAI (Bangladesh Agricultural Institute)

This University (the old Dacca Agricultural College) is the oldest agricultural educational institute in this country. However, as a result of the development of Dacca City, the BAI is now compelled to be scaled down year by year; its site which covered an area of 650 acres when it was first established is only 90 acres, so that the school buildings and farm are so small that the operation of BAI which aims at practical education is impeded. The BAI which is under the control of the Ministry of agriculture & Forests, consists of 12 departments and has no faculties. At present, there are 345 students (including 25 female students), 58 teachers and 1,188 graduates from BAI since 1943. 80% of these graduates enter public service, 10% find employment with financial agencies such as agricultural banks, and the remaining 10% find employment with various other enterprises.

Table 2-9 Department and Number of Professors of BAI

Composition of teachers / Department	Professors	Assistant -professors	Instructors	Total	Assigned hours per week (lectures, experiment and practice are included.)
Science of agriculture (agronomics)	1	3	3	7	26
Science of crops	1	2	2	5	20
Insectology and zoology	1	2	3	6	20
Heredity and breeding sciences	1	1	1	3	13
Agricultural chemistry and biochemistry	1	3	3	7	28
Science of gardening	1	1	2	4	12
Soil science	1	2	3	6	17
Plant pathology	1	1	2	4	14
Mathematics and statistics	1	2	1	4	17
Science of agricultural spread	1	1	1	3	10
Agricultural economics and agricultural village sociology	1	2	-	3	7
Science of animal husbandry	1	1	1	3	6
Agricultural mechanics	-	1	2	3	6

In addition to the above educational institutes, social education and other institutes have been established in Bangladesh with aid from other countries for the purposes of spreading agricultural techniques and social development. They have had a great effect on the education in agricultural villages. Therefore, this is attracting attention as a new method of overseas technical assistance which meets the circumstances of Bangladesh.

2-4 BACKGROUND OF THE PROJECT

The Government of Bangladesh intends to realize (1) self-sufficiency in foodgrains, (2) increase in farmer's income, and (3) expansion of employment opportunities in the agricultural sector. To realize these objectives, the Government urges development of high yield plants, improvement of cultivation methods, usage of fertilizer and agricultural chemicals, and irrigation facilities, etc., and the government had pointed out, (1) expansion and intensification of the spread organization, (2) expansion of agricultural credit. The Government considers it is very important to improve agricultural productivity, carry out experiments and research into modern agricultural techniques and to spread their results. Of the agricultural policies, the spreading of knowledge is ranked highest in importance, so agricultural assistants are assigned to the respective regions stages such as (prefecture, country, union and village) to spread their knowledge.

However, one UAA (Union Agricultural Assistant) assigned to each union (village) and who gives direct guidance to farmers is in charge of 15 to 16 union, 1,500 to 2,000 farmhouses and 4,000 to 5,000 acres of planted area. Judging from this, the number of agricultural assistants is too low. Therefore, training and increasing these agricultural assistants is indispensable for agricultural development. In order to accomplish this, expansion of agricultural universities is urgently needed.

On the other hand, the Government of Bangladesh is excuting a plan to established a research and education town in Joydebpur about 30 km to the north of Dacca so that the agricultural research and experiment institutes will be in one town. The new agricultural college at the town will be established very soon, and the Govern-

ment intends that the newly establishment college should cooperate with BARI (Bangladesh Agricultural Research Institute), BRRI (Bangladesh Rice Research Institute), CERDI (Central Extension Resourse Development Institute), etc. to further spread education and also to educate agricultural technicians and teachers.

On top of this plan, and coupled with social requirements such as "development of agricultural techniques", "training of personnel", etc. as previously referred to, this project is to be promoted.

CHAPTER 3
ARCHITECTURAL PLANNING

3-1 NATURAL AND GEOGRAPHICAL CONDITIONS

In the design, the natural and geographical conditions of the construction site have a great effedt on the design and shape of buildings and the living environment.

It is necessary to develop the design, taking into consideration of various conditions such as design of living space, taking into consideration of outdoor temperatures and humidity, prompt drainage of rainfall and flood control, indoor ventilation to cope with shifts in the wind, protection and insulation against solar radiation, design of buildings to protect against excess sunshine, and protection against the lightening.

(1) Climate

Being affected by the tropical monsoons, the climate of Bangladesh is very hot, very humid with heavy rainfall, and cyclones occur often when the season change.

The seasons in a year can be classified into the following:

1) Winter (November to February)
   In this season, both temperature and humidity are at a medium level and there is little rainfall.

   Just before and after the winter season, cyclones occur often, and strong winds with rain blows from the Bay of Bengal to inland areas. Sometimes with a wind velocity of 70 meters/sec. is recorded. Especially, affected by cyclones is area which suffers frequently from high tide damage, and salt.

2) Summer (March to May)
   This is the hottest season of the year. Approximately 1/5 of the yearly rainfall is recorded in

this season and as a result, humidity is high.

Moreover, strong monsoons called "Nor' westers" accompanied by heavy thunderstorms occur quite often in this eason, centered on the northwest area.

3) Rains and monsoons season (June to October)
During this season, the temperature is high and a humidity reaches almost 100% in many months.

Approximately 4/5 of yearly rainfall is concentrated in this season. Cyclones seldom occur though a strong wind blows occasionally.

As mentioned above, there is a great difference between the rainy season and the dry season (winter). The average yearly rainfall is 2,100 mm which is one of the highest in the world. It is, therefore, necessary to take these conditions into full consideration regarding the construction schedule.

Fig. 3-1 Average of Yearly Rainfall

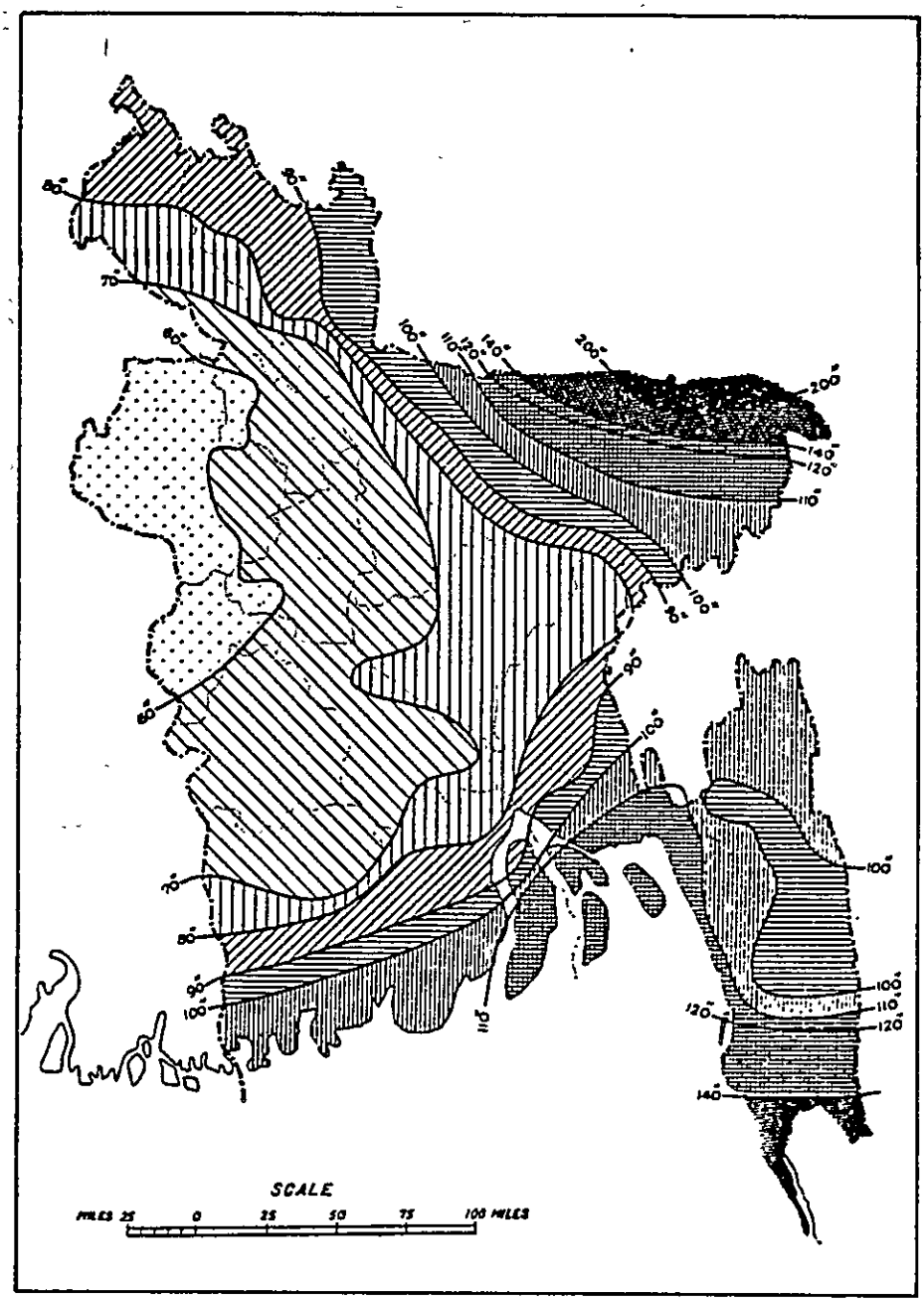


Table 3-1 Normal Temperature, Humidity and Rainfall in Dacca

Month	Max Temp. (°C)	Mini Temp. (°C)	Relative Humidity (%)			Rainfall (mm)
			00.00 GMT	03.00 GMT	12.00 GMT	
January	25.5	11.7	93	74	61	17.8
February	28.0	13.4	90	60	48	31.2
March	32.5	18.8	88	64	44	58.2
April	35.1	23.4	91	70	54	102.6
May	33.7	25.4	98	78	75	194.3
June	81.7	25.9	95	84	81	321.8
July	30.0	26.0	95	87	82	436.9
August	31.1	26.2	94	86	83	304.8
September	31.2	30.8	95	84	83	235.7
October	30.9	23.7	95	78	79	168.7
November	28.7	17.6	94	73	71	25.4
December	26.3	12.7	95	78	70	2.3

Notes: Base on data for 1931-1960

Source: Bangladesh Meteorological Dept.

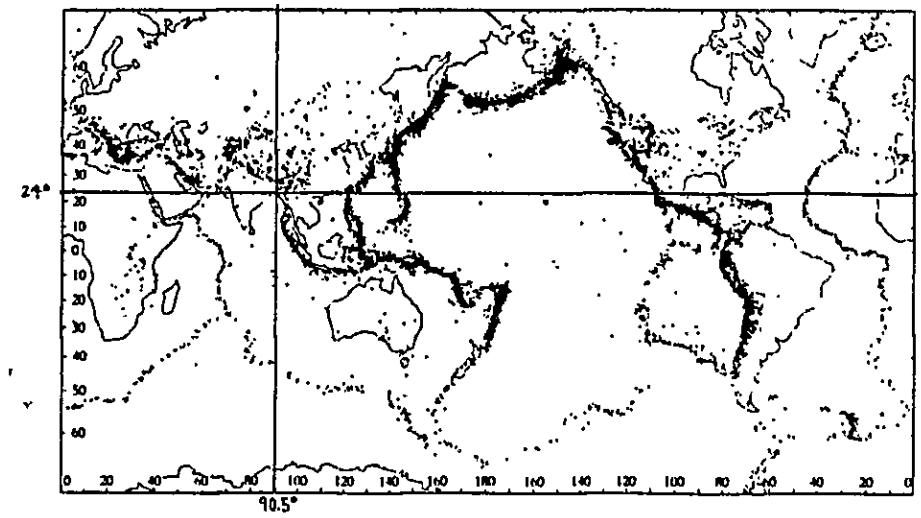
(2) Earthquakes

The northern area and part of the eastern area of Bangladesh are situated in the Eurasian earthquake belt. The site of this Project is located in the center of Bangladesh and no earthquake damage has been recorded in the past.

However, the effects of earthquakes cannot be neglected completely, and it may be necessary to take it into consideration for the structural design.

The figure below shows the earthquake belt in each area. The site of this Project is situated in lat. 24°N and long. 90.5° E.

Fig. 3-2 Earthquake Belt



3–2 SITE CONDITION

(1) Site Location

The construction site is located in the Joydebpur area, approximately 30 km to the north of Dacca. The site is in nearly square, extending approximately 900 meters to east and west and approximately 850 meters to south and north, and its area is approximately 75 ha.

The site used to be an inclined land thickly wooded with shrubs but approximately 1/3 of the whole area is now developed as a terraced paddy field.

The difference in the level of the land between east and west is approximately 5 meters, and it is anticipated that the amount of work to be done will change greatly depending on the layout of the buildings.

In addition, the site is scheduled to be surveyed for an accurate level and readjusted for construction by the Bangladesh side before commencement of construction.

(2) Water Supply and Drainage

At present, there are no water and drainage facilities in the site area. It is necessary, therefore, to provide a deep well at the site to secure a water supply. It is thought that the necessary amount of water can be secured approcimately 100 meters under ground.

(3) Electric Power

At present, a main serial cable is extended to a point near the beginning of the approach road to the site.

From this point, the cable will be extended to the entrance of site which stands back approximately 600 meters from the entrance of the approach road, by the Bangladesh site. The supply voltage is 11 kV and the frequency is 50 Hz. Generally, the working voltage is 3 phase 440 V for power equipment, and 3 phase 220 V

for electric lights.

However, the power supply situation is unstable due to frequent power suspension and voltage fluctuations, (especially, local factories in the northern area suffer from a poor power supply). For example, the suspension during the 9 months from July 1978 was 170 hours on average and it reached 1,150 hours in the worst area.

Moreover, the voltage fluctuates from 80 V to 270 V, causing damage to motors and electric lamps.

To design the electrical installator under such conditions, it is necessary to make a detailed design, for instance, to select locally available materials such as electric lamps which may need replacing.

(4) Gas

Natural gas is generally used. At the present time, however, the pipeline is laid only up to the trunk road which is 5 to 6 km away from the site.

It is also scheduled that the pipeline will be laid to the entrance of site by Bangladesh side as in the case of electric power.

Natural gas production is showing a steady growth. During 11 months in 1978/1979, output was 35,440 million cubic feet, showing a 3.3% increase over the output during the same period of the previous year.

Table 3-2 Natural Gas Output

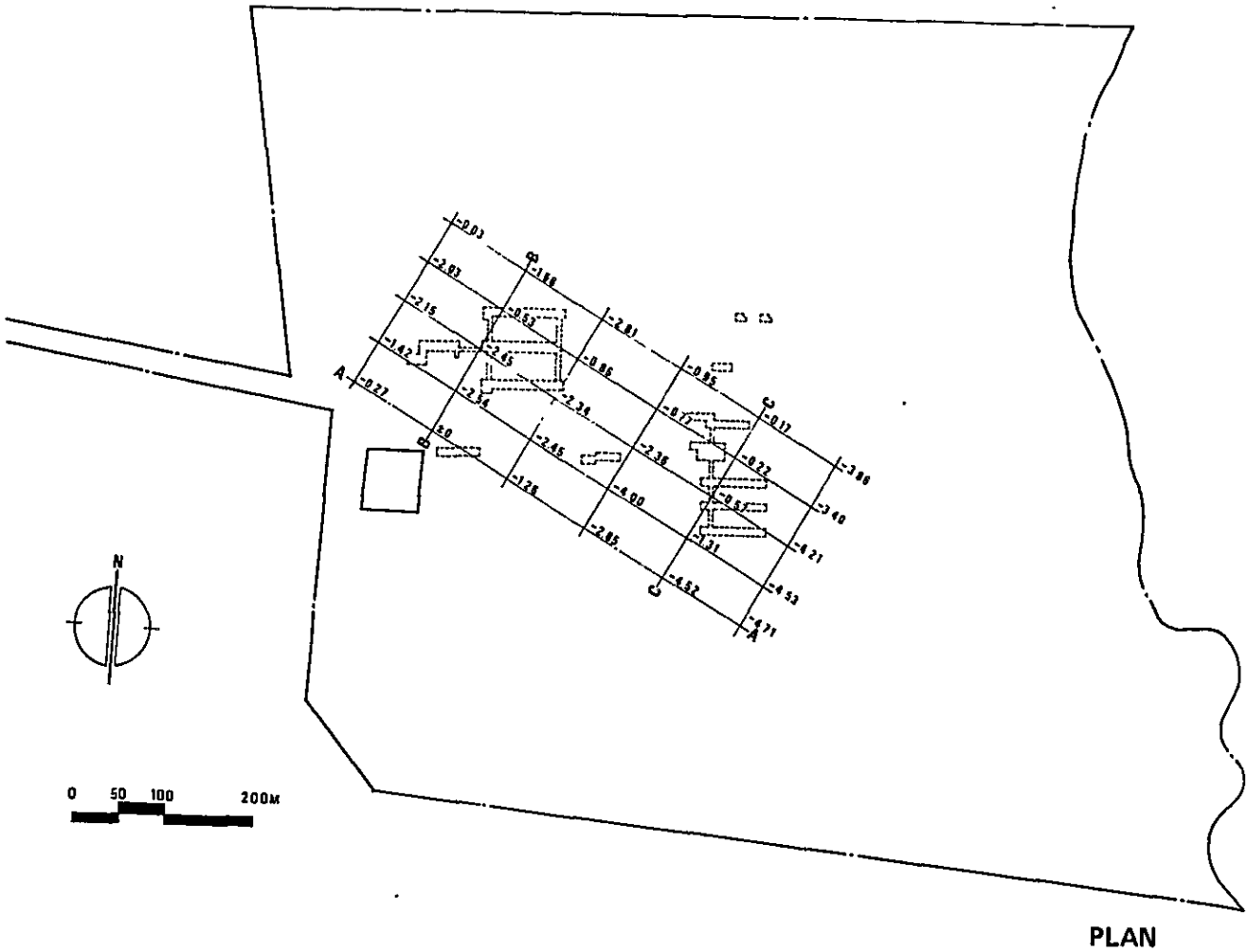
(Unit: Million cubic feet)

	Total	Titas	Habiganj	Sylhet	Chhatak
1973-74	27,124	19,761	2,721	4,063	579
1974-75	17,976	10,330	2,385	4,314	947
1975-76	27,357	19,047	2,172	4,978	1,160
1976-77	32,360	22,438	2,538	6,141	1,193
1977-78	34,294	22,953	3,892	5,912	1,537
1978-79	35,689	24,739	5,293	3,924	1,733

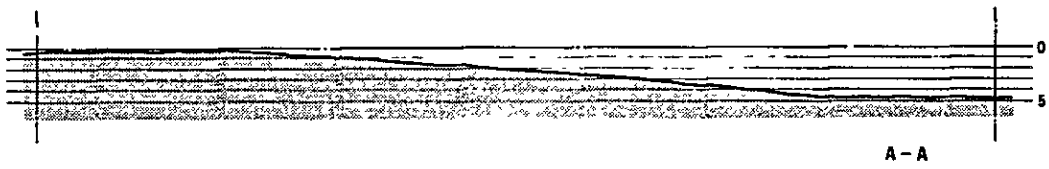
Note: 11 months from July 1978 to May 1979

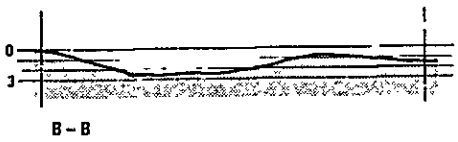
Source: Monthly Statistical Bulletin of Bangladesh, June 1979, Bangladesh Bureau of Statistics

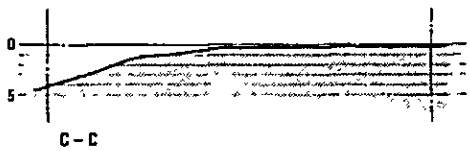
EXISTING SITE CONDITION



PLAN







SECTION

EXISTING LEVEL CONDITION

3-3 MARKET RESEARCH

(1) Construction Materials

It is necessary to use locally available construction materials as much as possible in order to reduce building costs. However, construction materials should be evaluated from aspects of both cost and quality, and imported materials should be used when they are found to be advantageous.

The main construction materials available in Bangladesh are:

- Cement

  There are one or two cement factories in Bangladesh. At present, however, their yearly output is too small to meet domestic demand.

  In addition, quality control is unsatisfactory so that defective products (hardened cement) are distributed on the market.

  Because of the supply and quality problems it would, therefore, be better to use imported cement for foundations and superstructures which accounts for 2/3 of total quantity, and use locally available cement for finishing which accounts for 1/3 of the total quantity.

- Coarse aggregate

  The coarse aggregate which is available is natural gravel, crushed stone and Jhama brick chips, etc.

  Of these materials, gravel and crushed stone take a long time to procure because their yearly production is limited, and they are expensive.

  Generally, the coarse aggregate mainly used in Bangladesh, is Jhama brick chips which are made by crushing overbacked bricks.

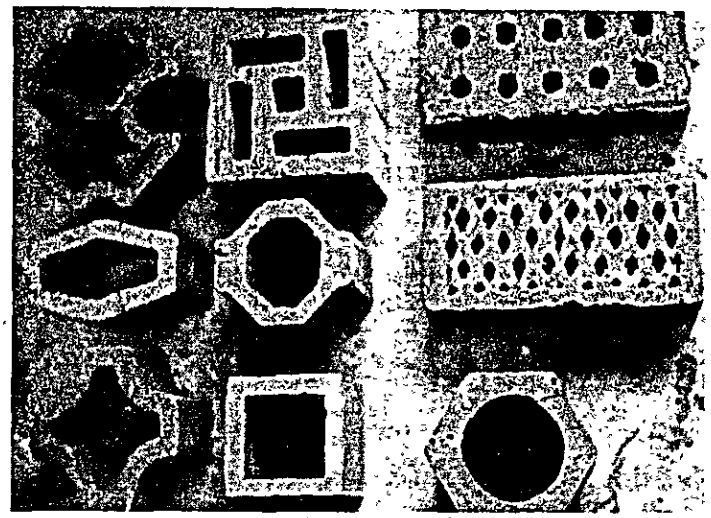
However it appears that concrete using Jhama brick chips shows some deviation in strength, that is, 180 to 230 kg/cm^2.

But these problems can be solved easily by taking them fully into consideration in the design and construction. It is considered best to use Jhama brick chips from the standpoint of building costs.

In addition, great care should be exercised in the design because the finished surface of concrete when this material is used is different in color from that of concrete when gravel or crushed stone is used.

° Bricks

Bricks are available in two kinds; machine-made bricks and hand-made bricks. The former is used for decorative applications such as outer walls, and is available in various forms. The latter is used for plastered walls and rubble, and varies greatly in quality and shape. Both bricks are manufactured in various districts in Bangladesh. However for the machine made factory bricks, only the best quality should be used.



Machine-made bricks

Sand

Good quality sand with a slightly large grain produced in the Sylhet district is used as fine aggregate for concrete. Locally available sand with a fine grain is used for back filling and brick beds.

Reinforcing bars

In Bangladesh, reinforcing bars are available, but kinds and quantities are limited. (Deformed bars are not available at all). As the quality and strength are quite poor and supplies unstable, imported products should be used.

Steel

Steel which can be used for structural material is not available at all, except angle which can be procured.

(2) Construction Prices

The prices of commodities in Bangladesh have been continuously increasing since 1977, reflecting that the country's general economic activities have become brisk and private investment encouraged.

Furthermore, on and after 1979, increases in the prices of commodities affected by the rise in food prices and petroleum prices posing serious problems.

The wages in all fields excluding the industrial field were raised greatly on and after 1978, showing a 20% increase over the previous year, and this tendency continues in 1981. For instance, the daily wage of agricultural laborers increased to 15 taka showing a 25% rise over the same month of the previous year. Construction laborers are earning the highest daily wage; 35 taka or more in the case of skilled construction laborers and 18 take even in the case of unskilled construction laborers.

In such a situation, the prices and wages related to construction are increasing continuously and rapidly and they are estimated to increase further in 1981 when the petroleum prices are scheduled to be raised. (Table 3-3)

Therefore, the increases in prices and wages cannot be neglected when mapping-out the building design, and it is necessary to take them fully into consideration.

Table 3-3 Wage Standard
(Average Daily Wage in Dacca)

(Unit: taka)

		June 1973	June 1974	June 1975	June 1976	June 1977	June 1978	June 1979
Agricultural laborer	Skilled laborer	6.27	9.00	10.00	10.50	10.00	12.00	15.00
	Unskilled laborer	5.22	7.25	9.30	8.00	8.12	10.00	12.00
Fishery laborer	Skilled laborer	6.50	9.00	11.33	10.75	11.50	13.00	16.00
	Unskilled laborer	5.50	7.12	10.45	8.12	9.00	11.00	11.00
Industrial laborer	Skilled laborer	9.49	10.58	13.00	14.46	14.17	17.50	19.25
	Unskilled laborer	6.74	7.93	9.75	10.93	17.50	11.48	12.58
Construction laborer	Skilled laborer	11.79	19.06	20.00	24.33	25.00	30.00	35.00
	Unskilled laborer	6.32	10.58	12.00	12.00	12.00	15.00	18.00

Source: Economic Indicators of Bangladesh, July 1979

Fig. 3-3

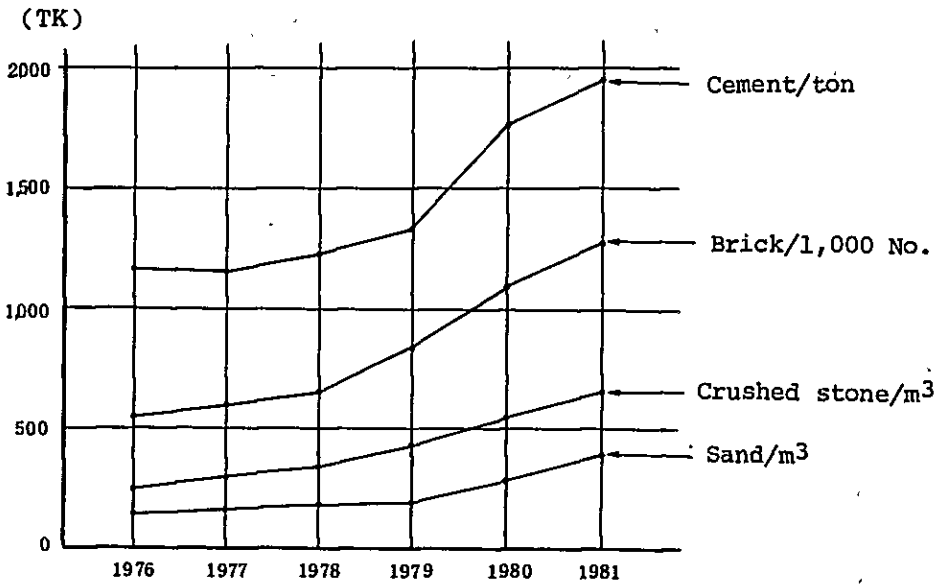
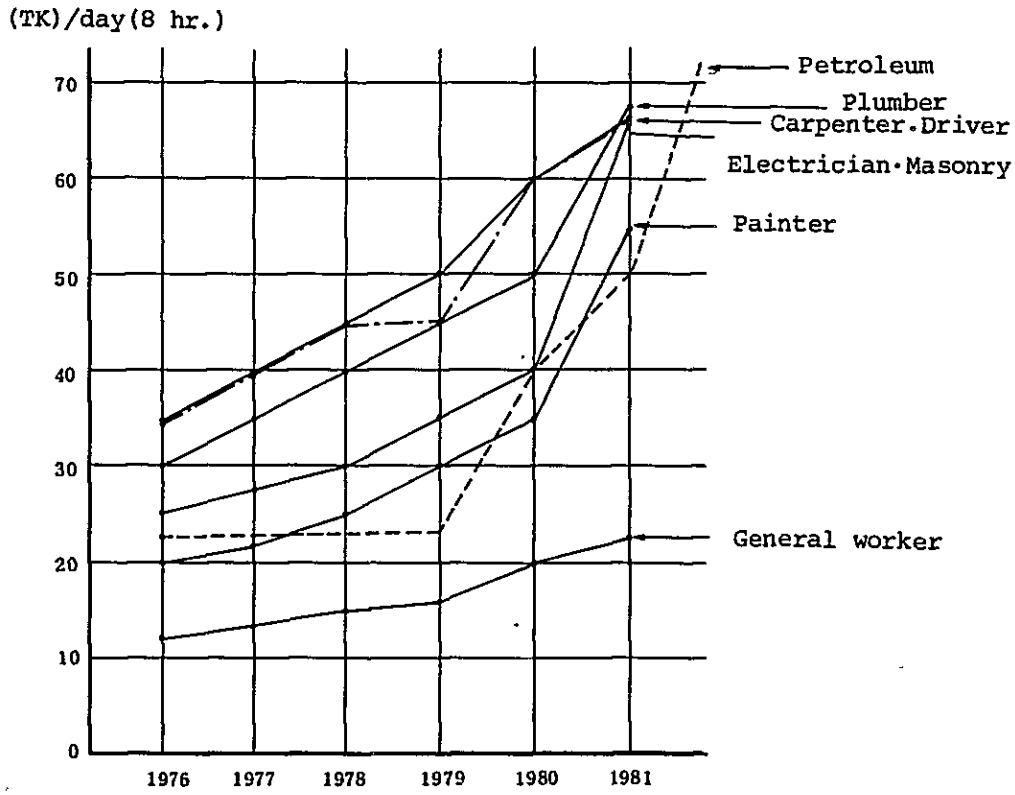

(TK)
2000
1,500
1,000
500
0
1976
1977
1978
1979
1980
1981
Cement/ton
Brick/1,000 No.
Crushed stone/m3
Sand/m3

Fig. 3-4


(TK)/day(8 hr.)
70
60
50
40
30
20
10
0
1976
1977
1978
1979
1980
1981
Petroleum
Plumber
Carpenter·Driver
Electrician·Masonry
Painter
General worker

(3) Material and Labor Unit Costs

The table below shows the local materials and labor costs related to construction, as of December 1980.

Needless to say, when the total construction costs of this plan are estimated, they will be greatly affected by each unit cost and also by future price rises.

Accordingly, careful consideration should be given to these point.

Table 3-4 Material Costs

ITEM / CEMENT	UNIT	COST
1. Portland Cement	TK/TON	2,190
2. White Cement	"	10,800
SAND		
1. For Concrete	TK/CU.M.	300
2. For Plaster	"	160
3. For Back Filling	"	80
BRICK		
1. 1st Class	TK/1,000 No.	1,100
WOOD		
1. Gamat Wood	TK/CU.M.	9,150
2. Garjan Wood	"	6,100
3. Teak Chambal	"	8,500
4. Telsur Wood	"	8,500
GLASS (t = 3mm)	TK/SQ.M.	120
PAINT		
1. Plastic Paint	TK/ℓ	100
2. Enamel Paint	"	110
WATER PROOFING		
1. Lime Terracing	TK/SQ.M.	170

Table 3-5 Labor Costs

(8 hr/day)

ITEM	UNIT	COST
1. Carpenter	TK/day	45
2. Mason	"	35
3. Reinforcing	"	"
4. Plumber	"	"
5. Plaster	"	"
6. Painter	"	"
7. Electrician	"	"
8. Mechanic	"	"
9. General Labor	"	18
10. Semi Skill Labor	"	25

(4) Material Transportation

The following transportation methods for materials can be considered in Bangladesh; (1) transportation by truck, (2) transportation by freight train and (3) transportation by barge.

It is important to map out the quickest and most economical transportation plan by combining the above methods effectively.

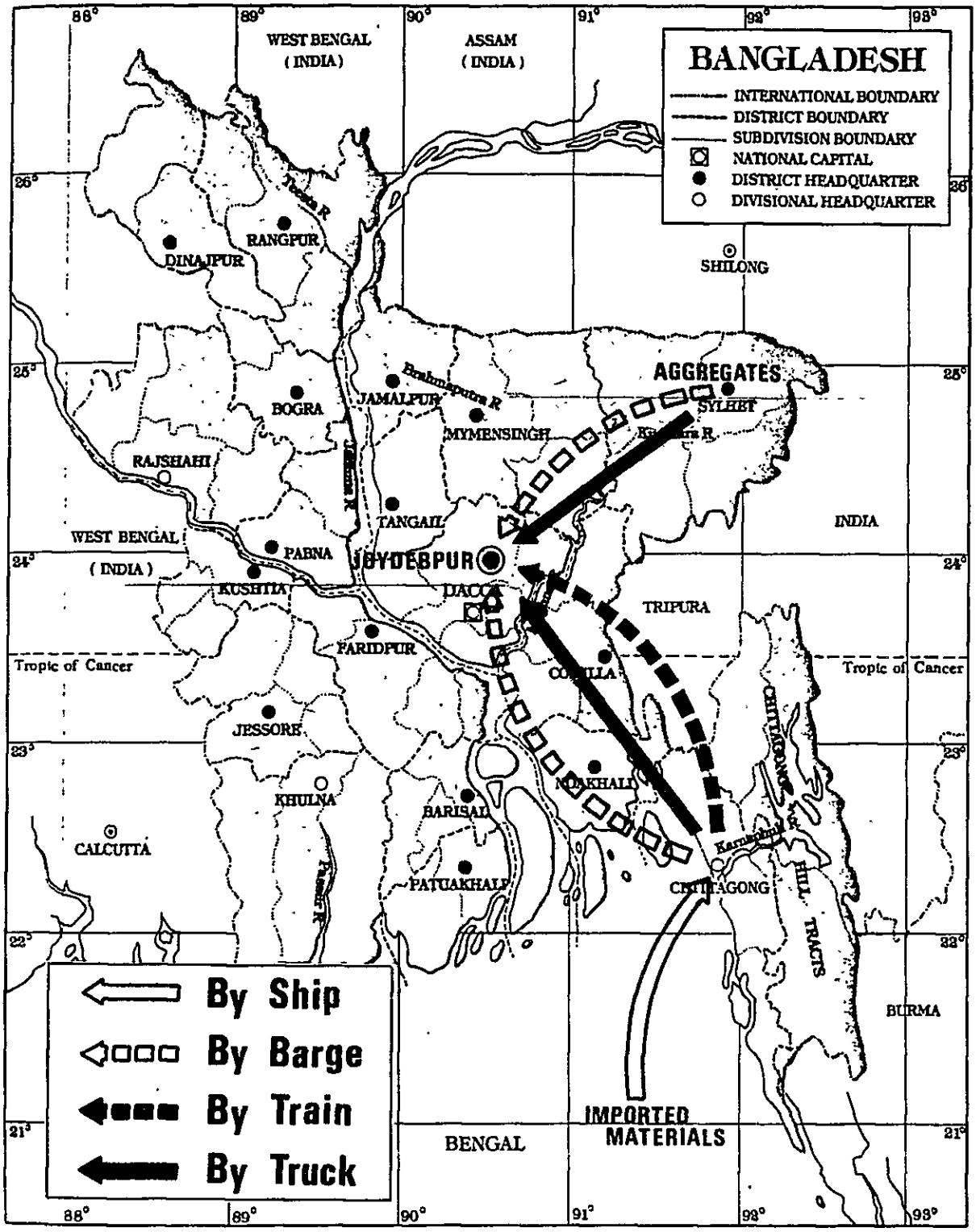
Judging from the location of the planned site, it is assumed that all imported materials will be landed at the Port of Chittagong which is approximately 300 km away from the site. On the other hand, Sylhet in which sand and crushed stone are produced, is approximately 180 km away from the site. Therefore, it is necessary to estimate the inland transportation costs in Bangladesh based on the above conditions in order to examine the effects of transportation costs on unit costs of materials.

For materials imported from Japan, it takes about 3 weeks by direct service from the Port of Yokohama to the Port of Chittagong, and assuming that it takes about one week for materials to arrive at the construction site after landing and customs clearance, it is estimated to take about one month for the materials to arrive at the construction site.

As the construction schedule is greatly affected by the transportation schedule of imported materials from Japan, it is a matter of course that a careful study should be made of the ordering and export schedule after the commencement of construction.

It is also desirable that the Bangladesh Government give smooth customs clearance and the like in Bangladesh.

Transportation Route of Materials to Planned Site



Local material transportation cost (including loading and unloading cost)

1. Transportation by truck: 4.0 TK/ton.mile
2. Transportation by barge: 4.0 TK/ton.mile

(5) Construction Industry

List of Construction Companies in Bangladesh

Name of company	Location	Business carrier
The Engineers Ltd.	48, Dilkusha Commercial Area, Dacca	° Hotel Purbani ° Hotel Sonargaon ° Food Storage
Concord Engineering & Construction Ltd.	29, Toyanbee Circular Rd. Motijheel, Dacca	° BRTC Workshop ° Shilpa Bank ° Bangladesh Naval Head Quarter BLDG.
Rana Construction Co. Ltd.	House No. 33 Road No. 14/A, Dhanmand, Dacca	° Pubali Bank Head Quarter BLDG. ° Bangladesh Univ. of Engineering & Tech. Auditorium ° BPI Factory BLDG
Nirman International		° New Airport BLDG