No. 4

BASIC DESIGN STUDY REPORT
ON
THE CONSTRUCTION PROJECT OF FOODGRAIN STORAGE
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH

SEPTEMBER, 1985

Japan International Cooperation Agency

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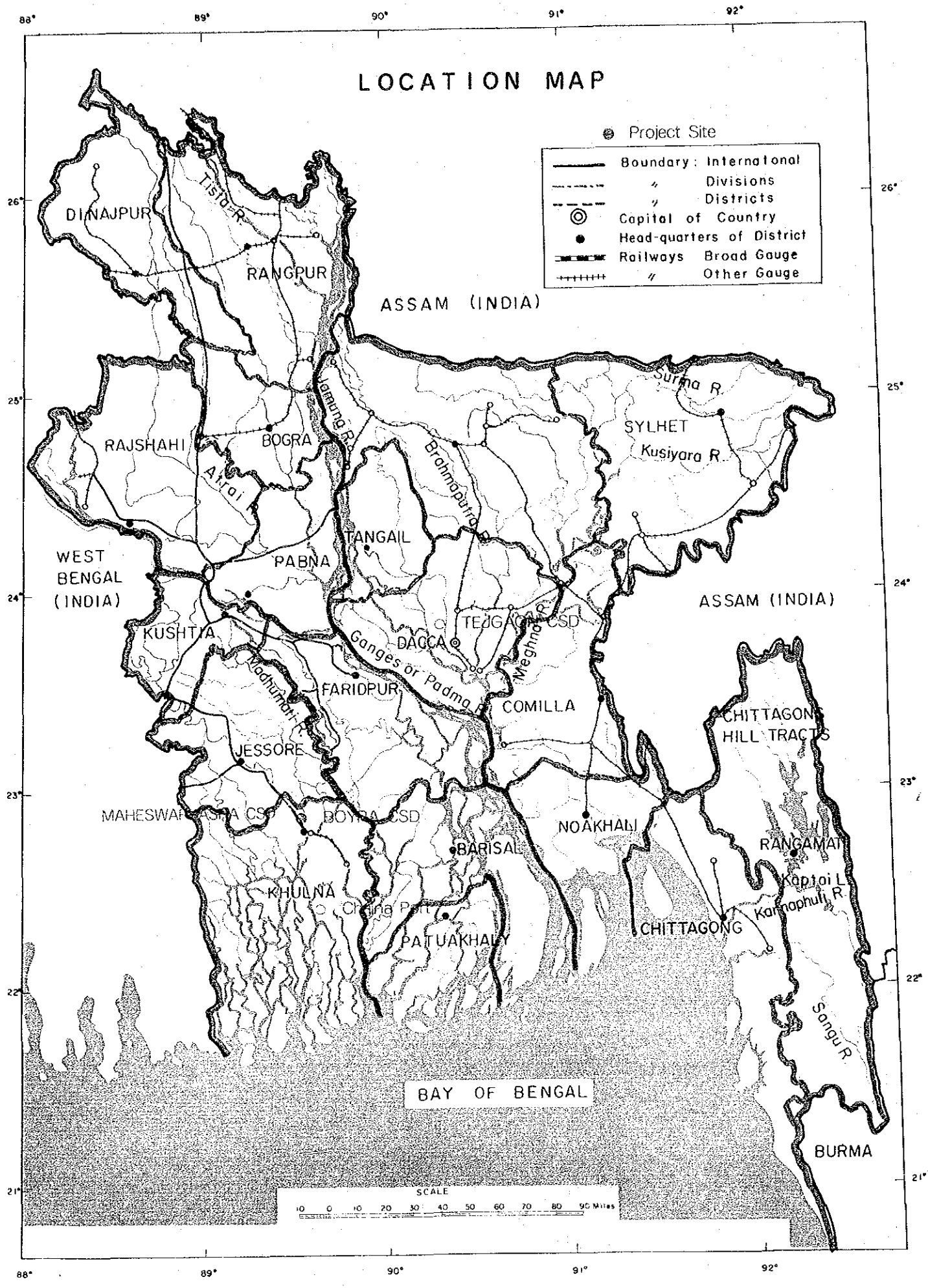
LOCATION MAP
Project Site
Boundary : International
Divisions
Districts
Capital of Country
Head-quarters of District
Railways Broad Gauge
Other Gauge
DINAJPUR
Tista R.
RANGPUR
ASSAM (INDIA)
Jamuna R.
Surma R.
SYLHET
Kusiyara R.
RAJSHAHI
BOGRA
Atrai R.
Brahmaputra R.
TANGAIL
PABNA
WEST BENGAL (INDIA)
ASSAM (INDIA)
KUSHTIA
DACCA
TEJGAON CSD
Ganges or Padma R.
Meghna R.
Madhumati R.
FARIDPUR
COMILLA
CHITTAGONG HILL TRACTS
JESSORE
MAHESWARDIA CSD
BOYRA CSD
NOAKHALI
BARISAL
RANGAMATI
Kaptai L.
Karnaphuli R.
KHULNA
Chalna Port
CHITTAGONG
PATUAKHALI
Sangu R.
BAY OF BENGAL
BURMA
SCALE
10 0 10 20 30 40 50 60 70 80 90 Miles
88°
89°
90°
91°
92°
26°
25°
24°
23°
22°
21°

P R E F A C E

In response to the request of the Government of the People's Republic of Bangladesh, the Government of Japan decided to conduct a Basic Design Study on the Construction Project of Foodgrain Storage and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Bangladesh a study team headed by Mr. Yoshimi OISHI, Deputy Director, Purchase Division, Operation Department, Food Agency, Ministry of Agriculture, Forestry and Fisheries, from July 4th to 17th, 1985.

The team had a series of discussions on the Project with the officials concerned of the Government of Bangladesh and conducted a field survey in Khulna District.

After the team returned to Japan, further studies were made and the present Report has been prepared.

I hope that this Report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the People's Republic of Bangladesh for their close cooperation extended to the team.

September, 1985

Keisuke Arita

Keisuke ARITA
President
Japan International Cooperation Agency

SUMMARY

Rice forms the main part of the agriculture of the People's Republic of Bangladesh. The country is adversely affected by geographic and weather conditions and with the population growing at such a high rate, Bangladesh is in a constant state of food shortage, which must be made good using imported foodgrain.

In these circumstances, the Government of Bangladesh has a policy of becoming self-supporting in foodgrain so as to stabilize its people's lives. For this purpose the Government of Bangladesh has enforced various policies to raise production. The Government has also established a rationing system for rice, wheat, etc. as a further policy for stabilizing people's lives through the smooth distribution of foodgrain to the people.

To establish the rationing system, Central Storage Depots (CSDs), are spread around the country in 12 places and Local Supply Depots (LSDs) at about 600 places. These perform an important role in procuring, storing, distributing and rationing domestic and imported foodgrain.

The Government of Bangladesh has requested the Government of Japan, the IDA, the ADB, the EC, etc. to assist with funds for the construction of foodgrain stores. According to the revised Second Five-Year Plan (1980/81-1984/85), at present, a foodgrain storage construction programme is being carried out and 1.90 million tons of the 2.25 million tons of required storage capacity were finished by the end of the 1984/85 fiscal year.

The remaining 0.35 million tons will be constructed in the Third Five-Year plan. It is likely that the foodgrain storage construction programme of the Government of Bangladesh will achieve the final target. The existing foodgrain storage of 1.90 million tons, however, includes quite a few out-of-date stores, which are unsuitable for storing foodgrain, and the reconstruction or rehabilitation of these stores has caused a new bottleneck. The request made by the Government of Bangladesh is to reconstruct these old stores at the Boyra CSD in the

South-western part of the country and the total number of stores proposed under this project is 35 units, with a capacity of 35,000 tons.

In response to the request from the Government of Bangladesh, the Government of Japan decided to conduct a Basic Design Study for Foodgrain Storage Construction Project and the Japan International Cooperation Agency dispatched a study team to Bangladesh from July 4 to 17, 1985.

The study team members had discussions on the contents of the request with officials of the Government of Bangladesh, conducted a field study, collected the necessary information and further studied after returned to Japan. As a result of the above study, it is found that:

Since World War II, the Boyra CSD, which is located by the Chalna International Trading Port, has been playing an important role as a supply base for imported foodgrain to the western part of the country which is divided into two parts by the Jamna River.

The Boyra CSD used to have a storage capacity of about 80,000 tons in Twin-Nissen Type stores. The Twin-Nissen Type stores, however, have become unsuitable for storing foodgrain since they were temporarily constructed in the 1940s. 35 years after they were built, the floor level is lower than the ground level, and the zinc-corrugated steel sheets used as finishing materials and the structural steel frames are badly corroded.

At present, the effective storage capacity of the Boyra CSD amounts to 28,000 tons thanks to the construction of new foodgrain stores using Japanese and EC assistance. Although the existing 52 old stores still remain, they are of no use and any partial reconstruction will have little effect on improving storage performance and capacity.

Since the functioning of the Boyra CSD is now restricted by a drop in its storage capacity, the distribution of foodgrain cannot be smoothly carried out, compelling ships to remain unnecessarily long and imported foodgrain has to remain stored on barges for a long period.

Further, deterioration of stock on barges, loss of foodgrain through theft, as well as loss of foreign currency through paying demurrage, have caused considerable trouble.

Recently, the role expected to be played by the Boyra CSD, has taken on more importance. It has become urgent that storage capacity be recovered for smooth foodgrain storage management.

As regards the scale of the foodgrain stores required, the 35,000 ton storage capacity requested by the Government of Bangladesh is thought fully adequate after analysing quantitative trends and the inflow-outgo ratio of imported foodgrain.

With respect to the design of the storage, the standard type of foodgrain stores worked out in the fourth phase of Japanese aid is recognized as being the most suitable for conditions. Therefore, the above-mentioned standard type will be adopted in this project, of which specifications are shown the next page.

A rough cost estimate of items to be carried out by the Government of Bangladesh would be ¥546,000,000 (banking expenses: ¥29,000,000 taxes: ¥517,000,000). Construction work for this project would take a full 20 months to complete.

The Ministry of Food, as the executing agency, is responsible for the operation, maintenance and management of the completed foodgrain stores. The employment of experienced management staff, the procurement of materials for maintaining storage buildings and electrification have to be carried out, and the annual expenses for these requirements have been estimated at about ¥4,500,000. Because of such particularities in the use of foodgrain stores such as heavy articles being stored and the frequent movement of contents, damage to these stores may occur sooner than to buildings put to other use. It is most important to carry out repairs before damage becomes serious and, for this purpose, painting and repairs have to be carried out every four or five years, at the latest. In the event that all work required for the maintenance and management of the completed foodgrain stores is not finished in the same year, annual expenses will amount to about ¥8,400,000.

The implementation of this project will recover the full storage capacity of the Boyra CSD, so that barges and trucks as means of transport of foodgrain will be more effectively used and a stable supply of foodgrain guaranteed. Therefore, it is judged that the implementation of this project will be helpful in increasing foodgrain production, securing foodgrain and balancing the supply and demand of foodgrain. The expenses for the operation and maintenance of the completed foodgrain stores will be minimized by the effective use of local techniques and materials (brick, cement, etc.) available in Bangladesh. Therefore, it is judged suitable for this project to be implemented under Japanese aid.

Finally, in implementing this project, our recommendations are as follows:

No periodic maintenance of the Twin-Nissen Type storage, as well as other types of stores, has been done, which has speeded up the deterioration of the foodgrain stores and caused the shortage of storage space. Periodic inspections must be conducted and damage repaired before it becomes serious. A maintenance programme as well as the employment of full-time maintenance staff must also be arranged as soon as possible.

Standard Type of Storage Adopted under Japanese Grant Aid

	Item	Specification
Dimention	Storage capacity	1,000 tons
	Floor area	30 m x 24 m
	Height: from the ground to the roof slab top	6.810 m
	(from the floor top to the roof slab bottom)	FL + 5.791m (19 ft)
	from the ground to the floor top	GL + 0.9 m
Structure	Main structure	Reinforced concrete
	Exterior wall	Brick masonry
	Foundation	Reinforced concrete continuous footing under wall
		Reinforced concrete independent footing under interior posts
Finish	Roof	Lime terracing
	Interior and exterior wall	Mortar, vinyl paint
	Floor	Trowelled concrete finish
	Ceiling	Concrete, vinyl paint
Storing performance	Floor damp proof	Polyethylene paper
	Ventitation	Natural ventilation through windows
	Dunnage	Wooden pallet
	Insect prevention	Mosquito net, screen door
	Roof heat insulation	Lime terracing

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ON

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IN

THE PEOPLE'S REPUBLIC OF BANGLADESH

Table of Contents

CHAPTER 1: INTRODUCTION

With agricultural production adversely affected by geographical and weather conditions and her rapidly growing population, the People's Republic of Bangladesh is constantly short of food. This shortage must be made up from imported foodgrain. Under these circumstances, the Government of Bangladesh has adopted a policy of becoming self-supporting in foodgrain in order to stabilize people's lives. The Government has, therefore, enforced improvements in the infrastructure for the distribution of foodgrain and has been promoting a foodgrain storage construction programme.

The foodgrain storage construction programme is being promoted mainly by the Ministry of Food, and at present, is being implemented based on the revised Second Five-Year Plan. A great deal of the programme has been realized thanks to the introduction of foreign aid funds. The Government of Japan had been extending aid to the foodgrain storage construction even before the Five-Year Plan came into effect. The aid from the Government of Japan was given for the construction of 80 stores (80,000 tons) in four phases since a grant was first extended for 15 stores in 1977. The request made to the Government of Japan on this occasion was for aid for the construction of foodgrain stores with a capacity of 35,000 tons, with Boyra CSD as the project site.

In response to the request made by the Government of Bangladesh, the Government of Japan decided to conduct a basic design study on this project, and the Japan International Cooperation Agency sent to Bangladesh a study team headed by Mr. Yoshimi Oishi, Deputy Director, Purchase Division, Operation Department, Food Agency from July 4 to 17, 1985.

The purposes of the study team are as follows:

1) Confirmation of the request from the Government of Bangladesh

2) Understanding of the contents of the foodgrain storage construction programme being promoted by the Government of Bangladesh, analysis

of the present state of foodgrain distribution and studying the justifications of this project. The study team, in particular, studied whether the requested site (Boyra CSD) would be suitable for construction, whether the storage capacity of 35,000 tons was needed, and whether the demolition of present aging foodgrain stores was necessary.

3) A study of how foodgrain stores are put to use in Bangladesh, including those constructed using Japanese aid, as well as a study of the present state of foodgrain storage construction and the proposing of the optimum storage design to suit the existing conditions.

4) A study of the requested project site, preparation of a project plan to suit the existing conditions of the site.

The study team engaged in collecting the necessary information related to foodgrain distribution and storage construction, reconnaissance of the requested site, and discussion with related parties from the Ministry of Food. Officials of the Government of Bangladesh and the team members discussed study results, mutually confirmed such matters as the purpose of the foodgrain construction programme, the contents of the final request, the requested project site, storage design conditions, and items to be undertaken by the Government of Bangladesh for the implementation of the project, and the two parties exchanged the minutes of discussions. The minutes of discussions, the formation of the basic design study team, the itinerary of the study and the list of interviewees are shown in APPENDIX.

This report has been prepared outlining a review of the study results and proposing the best project plan in view of local conditions.

CHAPTER 2: BACKGROUND OF THE PROJECT

2-1 Outline of Foodgrain Supply and Demand

2-1-1 Production of Foodgrain

The People's Republic of Bangladesh is an agricultural country centering on the cultivation of rice. However, since the country is in the subtropical zone, about 80% of the annual rainfall is concentrated in the June through October rainy season, while there is hardly any rainfall in the November through February dry season. Therefore, in the rainy season one third of the land, especially in the southern low marsh area, is under water due to the additional waters from upriver regions of the Ganges, Jamna and Megna Rivers in neighboring countries. In the dry season, the comparatively high regions are extremely dry, and rice is impossible to grow in either case. The areas where rice production is possible vary from year to year and with weather conditions.

Rice cultivation in Bangladesh is divided into three categories depending on the cultivation season, namely Boro (harvesting in April/May), Aus (harvesting in July/August) and Aman (harvesting in November/December). Aman is the main type of rice cultivation, and accounts for about 60% of the total. Therefore, the conditions of the Aman crop greatly affect foodgrain supply and demand in Bangladesh.

The annual average rice yield is about 1,285 kg/1 ha (based on 1978/79 - 1982/83 averages) which is an extremely low level of production. However, the areas under rice cultivation have gradually been increased year by year. Despite the fact that the rice production failed in the 1981/82 fiscal year due to drought, annual rice production has shown a slightly increasing tendency the weather having been comparatively favourable, and production for 1984/85 recorded 14.97 million tons.

On the other hand, as it requires less water than rice, wheat growing has been rapidly increasing in the northwestern region, but production

still only stands at about 10% of the rice crop. Wheat production in the 1984/85 fiscal year recorded 1.46 million tons.

Table 2-1 Production of Rice and Wheat

(Unit: Thousand Tons)

Year July - June	Rice	Wheat	Total
1975/76	12,561	215	12,776
1976/77	11,566	103	11,669
1977/78	12,764	343	13,107
1978/79	12,543	486	13,029
1979/80	12,150	1,200	13,350
1980/81	13,450	1,150	14,600
1981/82	13,350	950	14,300
1982/83	14,000	1,076	15,076
1983/84	14,279	1,195	15,474
1984/85	14,970	1,460	16,430

2-1-2 Demand and Importing of Foodgrain

The staple food of Bangladesh is rice just as in other South-East Asian countries. As mentioned above, rice production has recently been on the increase. The growth rate of rice production over the last ten years is 19.2% which is lower than the 29.2% growth in population. Therefore, as the rice requirements of about one hundred million people in Bangladesh cannot be covered by domestically produced rice, the shortage is made up from imported foodgrain. If the annual amount of

rice consumed per capita was an average of 166 kg before the independence of Bangladesh, the amount required for domestic consumption is estimated to be about 16.4 million tons in the 1984/85 fiscal year. The total amount produced of both rice and wheat amounts to 16.5 million tons. If the amount of rice and wheat either seed or lost through damage is deducted from this figure, the actual amount of the supply of rice and wheat would be about 14.9 million tons, which makes for a shortage of about 1.5 million tons. This shortage is made good through imported foodgrain. For the past 5 years, the amount of imported foodgrain has been increasing annually and in the 1984/85 fiscal year 2.6 million tons were imported.

Table 2-2 Trend of Foodgrain Supply/Demand

(Unit: Million Tons)

	1980/81	1981/82	1982/83	1983/84	1984/85
Population (Million persons)	90.0	92.0	94.1	96.1	98.7
Demand	14.9	15.3	15.6	16.0	16.4
Production					
Rice	13.4	13.4	14.0	14.3	15.0
Wheat	1.2	1.0	1.1	1.2	1.5
Total	14.6	14.4	15.1	15.5	16.5
Effective Supply (Production x 90%)	13.1	13.0	13.6	14.0	14.9
Deficit	1.8	2.3	2.0	2.0	1.5
Import Rice	0.2	0.2	0.3	0.2	0.7
Wheat	0.9	1.1	1.5	1.9	1.9
Total	1.1	1.3	1.8	2.1	2.6

Because of the low production of foodgrain plus the fact that the foodgrain production growth rate cannot catch up with that of the population, foodgrain is constantly short. Moreover, due to floods, drought and cyclones, etc., foodgrain production often drops suddenly. In these circumstances, it seems foodgrain will have to continue to be imported for the foreseeable future.

More than 50% of the amount of foodgrain imported is given as aid from abroad. Especially, in time of drought, the aid ratio increases to over 90%. Imported foodgrain given as aid is playing an extremely important role for Bangladesh given the poor conditions of the country's foreign currency reserves.

Table 2-3 Aid from Foreign Countries for Imported Foodgrain

(Unit: Thousand Tons)

	Aid (%)	Procurement (%)	Total
1980/81	751 (69.8)	325 (30.2)	1,076
1981/82	1,141 (90.9)	114 (9.1)	1,255
1982/83	976 (52.9)	868 (47.1)	1,844
1983/84	1,441 (70.1)	615 (29.9)	2,056
1984/85	1,305 (50.4)	1,285 (49.6)	2,590

Supply and consumption areas are apparently divided, with the supply area being concentrated in the northern region and the consumption area in the southern region (Patuakhali is the exception being a supply area in the southern region).

Table 2-4 Supply/Demand of Foodgrain by District (1981)

(Thousand Tons)

	Population (1981) Thousand persons	Demand	Production (Rice)	(Wheat)	Total	Effective Supply (Production x 90%)	Surplus/ Deficit
Chittagong	5,491	912	767	-	767	690	- 222
Chitt. H.T.	752	125	101	-	101	91	- 34
Comilla	6,881	1,142	975	119	1,094	985	- 157
Noakhali	3,816	633	588	1	589	530	- 103
Sylehet	5,656	939	1,150	8	1,158	1,042	+ 103
Total	22,595	3,751	3,581	128	3,709	3,338	- 413
Dhaka	10,014	1,662	410	74	484	436	-1,226
Faridpur	4,764	791	455	75	530	477	- 314
Jamalpur	2,452	407	460	10	470	423	+ 16
Mymensingh	6,568	1,090	1,553	22	1,575	1,418	+ 328
Tangail	2,444	406	496	36	532	479	+ 73
Total	26,242	4,356	3,374	217	3,591	3,233	-1,123
Barisal	4,667	775	648	3	651	586	- 189
Jessore	4,020	667	535	107	642	578	- 89
Khulna	4,327	718	552	-	552	496	- 222
Kushtia	2,292	380	202	74	276	248	- 132
Patuakhali	1,843	306	388	-	388	349	+ 43
Total	17,151	2,847	2,325	184	2,509	2,258	- 589
Bogra	2,758	453	578	48	626	564	+ 111
Dinajpur	3,200	531	630	129	759	683	+ 152
Pabna	3,424	568	466	74	540	486	- 82
Rajshahi	5,270	875	809	71	880	792	- 83
Rangpur	6,510	1,081	1,252	125	1,377	1,239	+ 158
Total	21,132	3,508	3,735	447	4,182	3,764	+ 256

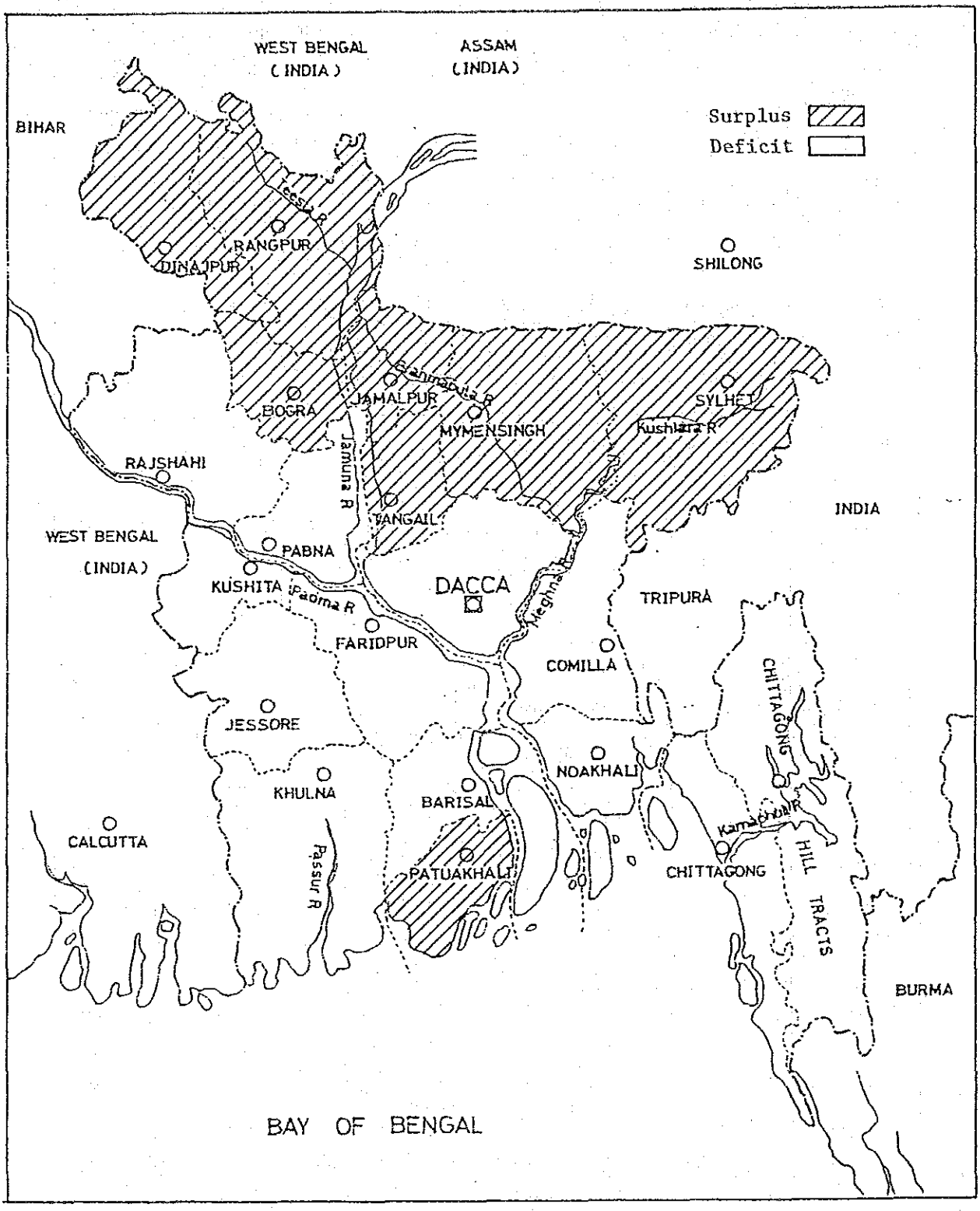


Fig. 2-1 Surplus and Deficit of Foodgrain by District (1981)

2-1-3 Procurement and Rationing of Foodgrain

The Government of Bangladesh procures and rations domestic rice and wheat using the following measures:

1) Supporting Fair Price for the Farmer;
   In order to become self-supporting in foodgrain, there is a need for improvements of such agricultural infrastructures as food plant breeding and irrigation, drainage, etc. as well as the need to encourage production by supporting fair prices paid to farmers.

2) Ajustment of Foodgrain Supply and Demand in each District;
   Since the supply and consumption areas are different as mentioned above, the supply and demand in each District has to be adjusted.

3) Stabilization of the Market Price of Foodgrain;
   The control of sudden rises in foodgrain prices because of such disasters as floods, etc., and due to speculation in nromal times.

4) Smuggling Foodgrain Prevention;
   In the western region, foodgrain is smuggled from Bangladesh to India. The Government of Bangladesh has therefore imposed duties on the sale of all freely - marketed rice procured by milling stations within 5 miles of the border in order to prevent smuggling.

Domestic foodgrain is mostly procured through inspection at LSDs. (Local Supply Depots) or TPCs (Temporary Purchasing Centres), to which nearby farmers bring in their products. Some amounts are bought through commission merchants or through CSDs (Central Storage Depots).

With respect to rationing, there are two kinds. One is the Statutory Rationing System covering the distribution of foodgrain in major cities and areas where there are inadequate supplies of foodgrain. The other is the Modified Rationing System for the poor in areas where foodgrain is rather more easily available, this is, farming villages.

The amount of food that the Government of Bangladesh must procure to carry out its rationing systems varies each year since the necessary

amount of foodgrain to be rationed in farming areas fluctuates annually depending on how much is produced. Generally, however, fixed consumption mainly in major cities such as Dhaka, Chittagong, Khulna, Rajshahi, etc. is estimated to exceed 1.5 million tons.

If this is added to the amount necessary for rationing in farming areas, the Government of Bangladesh needs an average of 2 million tons a year.

Among the amount that the Government of Bangladesh must procure for rationing, whatever cannot be covered by Government procurement (0.2 - 0.35 million tons) of domestic food must be imported from abroad.

Domestic foodgrain procured by the Government of Bangladesh is sent to the nearest CSD from LSD (or TPC) and either stored there collectively or sent to other CSDs. When necessary, foodgrain is distributed to the LSDs in the vicinity and is issued for rationing. (Unhulled rice is processed into parboiled rice or milled rice.) The distribution route for domestic foodgrain is shown in Fig. 2-2.

Imported foodgrain is unloaded from boats at the port of Chittagong and is temporarily stored in silos and transported to Dhaka and districts in the eastern region of Bangladesh. Grain unloaded at the port of Chalna is transported to districts in the western region by way of the CSDs in Khulna. The distribution route for imported foodgrain is illustrated in Fig. 2-3.

Railway, trucks and barges are available for the movement of this foodgrain and the most rational means of transportation is selected each time.

Sales for food rationing are conducted in CSDs or LSDs to licensed dealers who ultimately distribute food to consumers.

Table 2-5 Procurement and Rationing of Foodgrain

(Unit: Thousand Tons)

	1980/81	1981/82	1982/83	1983/84	1984/85
Opening Stocks	779	1,299	625	630	800
Domestic Production					
Rice	841	285	168	146	133
Wheat	176	13	24	121	216
Total	1,017	298	192	267	349
Imports	1,076	1,255	1,844	2,056	2,590
Domestic Procurement + Imports	2,093	1,553	2,036	2,323	2,939
Total	2,872	2,852	2,661	2,953	3,739
Rationing	1,467	2,126	1,941	2,053	not recorded
Losses	106	101	90	100	- do -
Others	-	-	-	-	- do -
Total	1,628	2,227	2,031	2,153	- do -
Closing Stocks	1,299	625	630	800	- do -

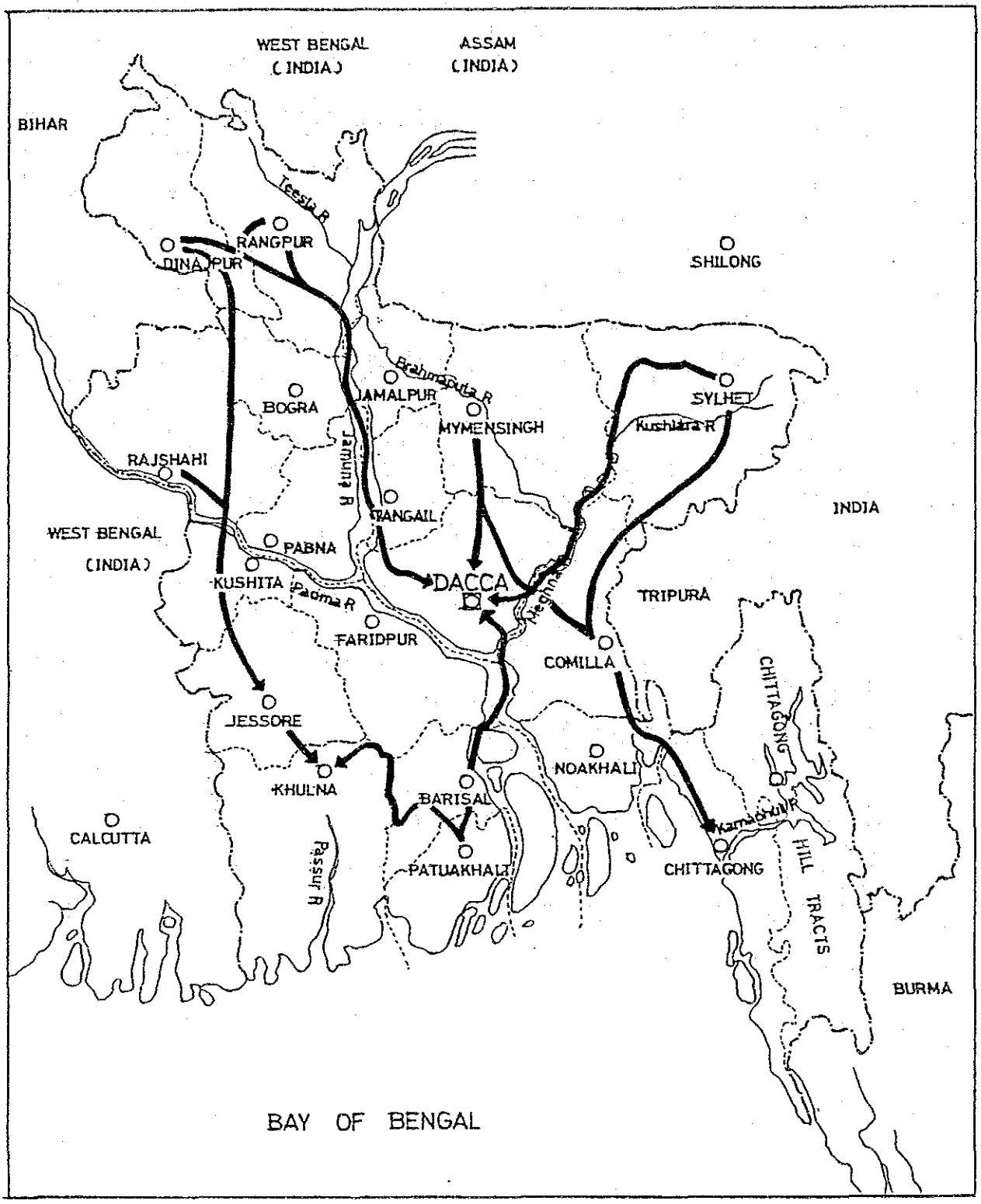


Fig. 2-2 Flow of Domestic Rice

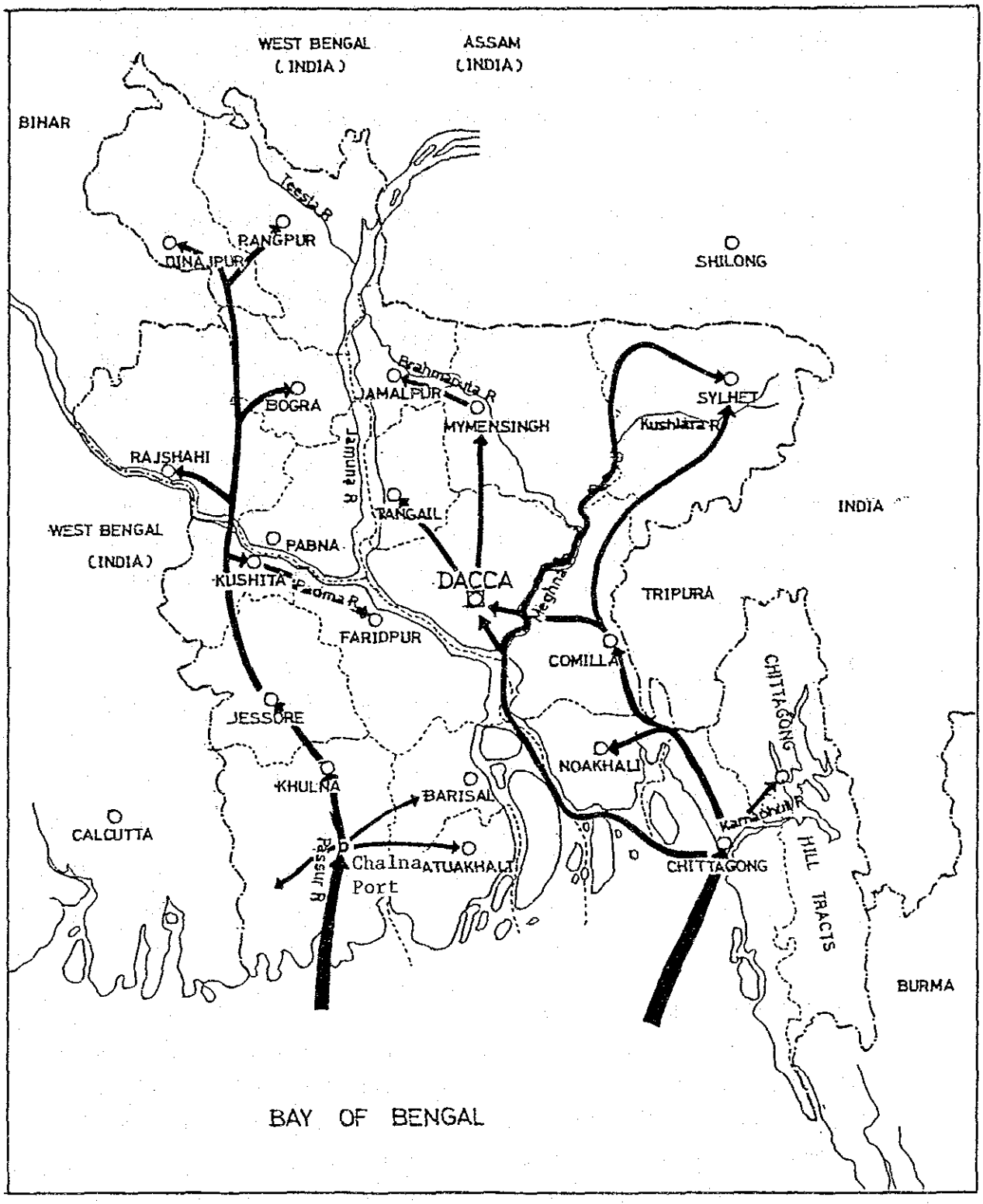


Fig. 2-3 Flow of Imported Foodgrain

2-1-4 Foodgrain Distribution Control System

Foodgrain stores play an important role in procuring, importing, transporting, storing and rationing foodgrain speedily and smoothly. In Bangladesh, all foodgrain stores belong to the Government and are divided by function into CSDs, LSDs, TPCs and silos.

1) CSDs

CSDs are established in foodgrain consumption areas or at key distribution and collection points. CSDs receive imported foodgrain and foodgrain from LSDs and other CSDs in neighboring areas, store and issue grain for rationing in the district and for transport to other CSDs and LSDs. CSDs also purchase (receive) foodgrain from farmers in the neighborhood.

2) LSDs

LSDs are located in foodgrain producing areas and receive domestically produced foodgrain procured from farmers and sent from TPCs, and send grain on to CSDs. LSDs also issue imported foodgrain received from CSDs for rationing.

3) TPCs

TPCs are only engaged in the temporary procurement of foodgrain. They can be established temporarily during procurement seasons, and the procured foodgrain is not stored but immediately sent out to CSDs and LSDs.

4) Silos

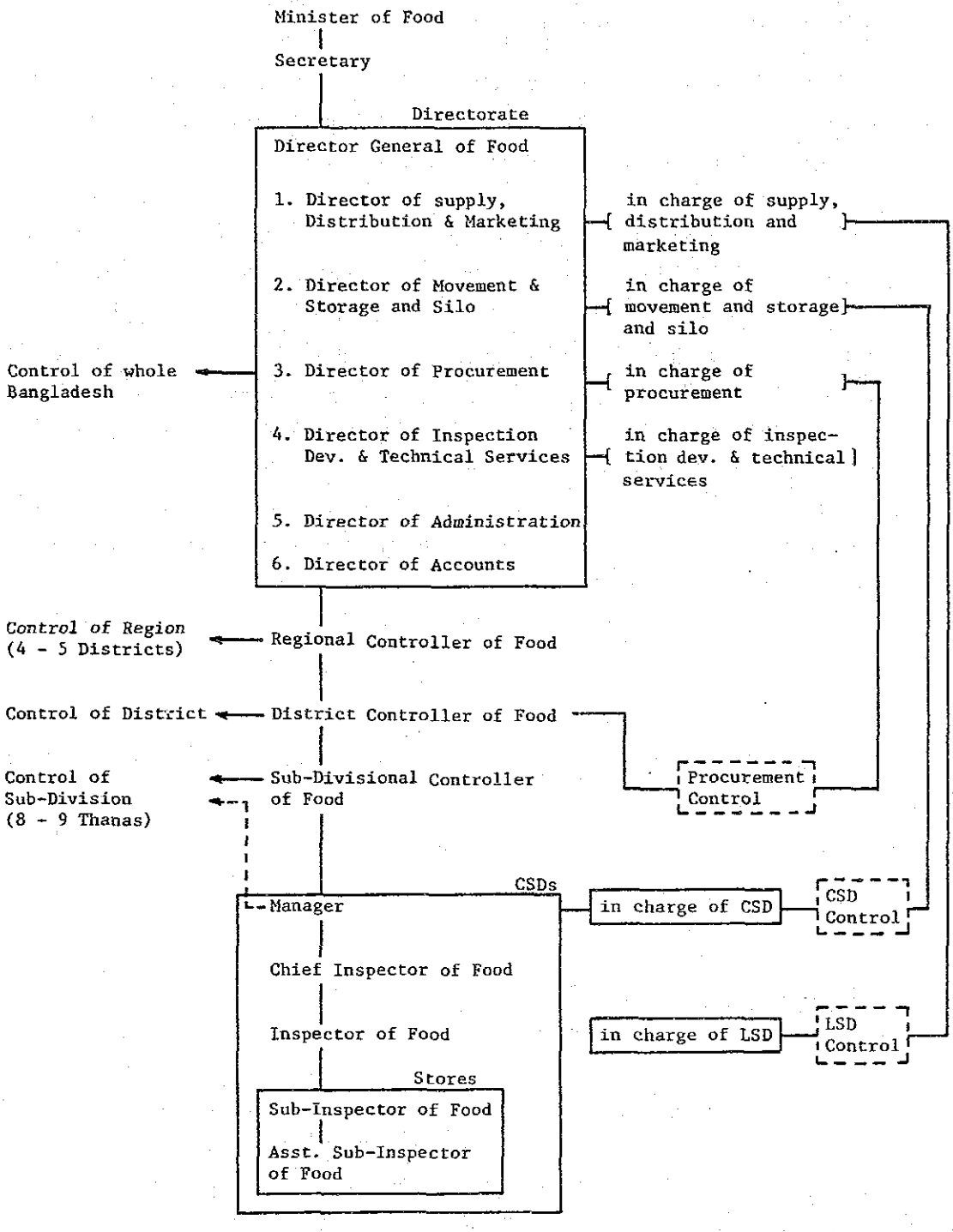
The role of silos is to receive and store imported unsacked foodgrain. They also distribute sacked foodgrain.

Fig. 2-4 shows that the organization chart for foodgrain stores and distribution. The Directorate of Food in the Ministry of Food controls all foodgrain stores and distribution. The Directorate of Food has six main duties: (1) Supply, Distribution and Marketing, (2) Movement, Storage & Silos, (3) Procurement, (4) Inspection, Development & Technical Services, (5) Administration, and (6) Accounts.

Procurement is controled by the Director of Procurement of the Directorate of Food. Actual procurement work is the responsibility of the District Controller of Food.

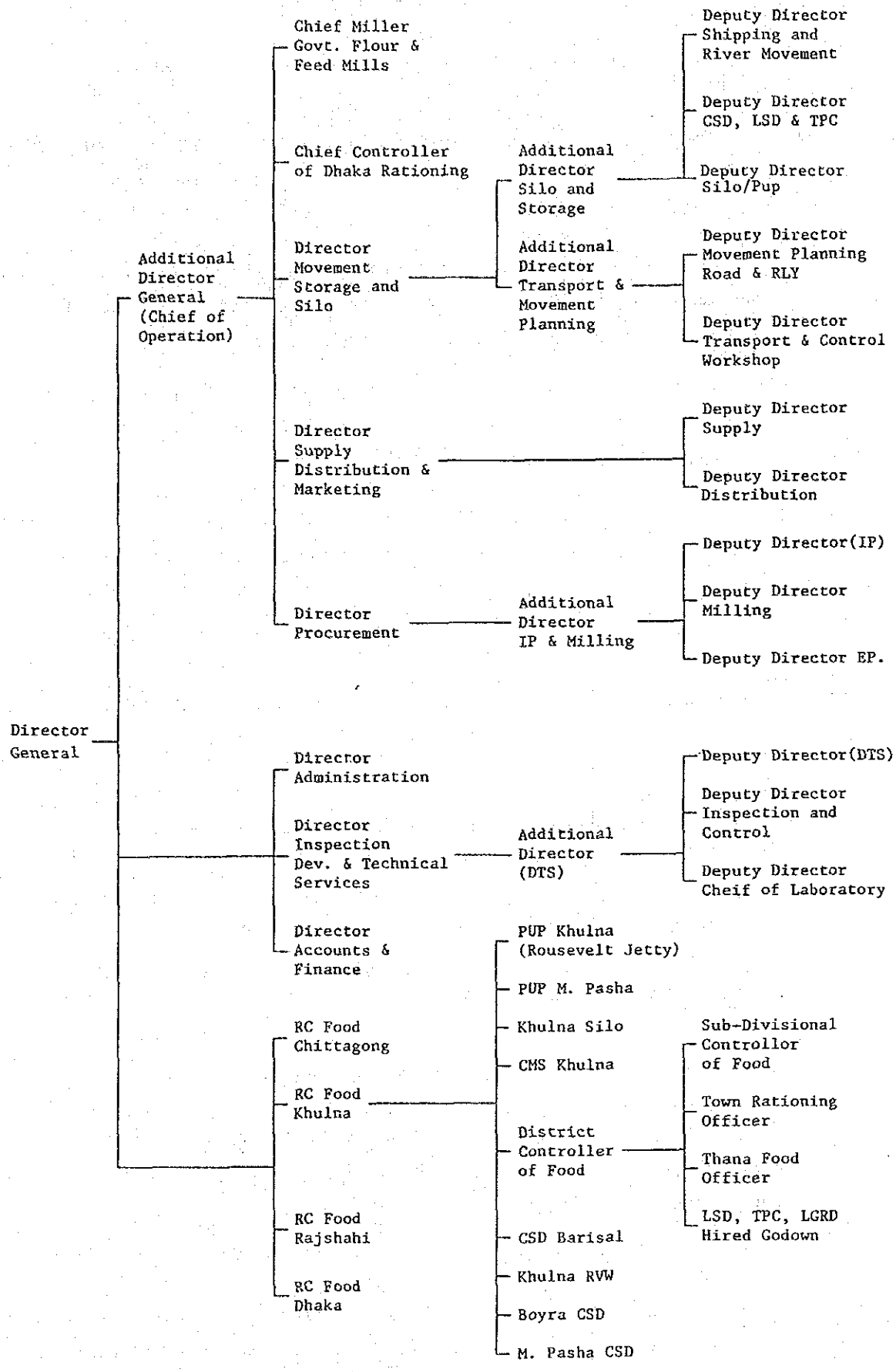
Officers of the central government directly inspect procured foodgrain under the management of the Director of Inspection, Development & Technical Services of the Directorate of Food.

For each operation, Procurement and Supply, Distribution and Rationing, Movement and Storage, a programme is prepared in each administrative area. Each Sub-Division (administrative area consists of 8 to 9 Thanas each of which is the smallest administrative area) is controlled by the Sub-Divisional Controller of Food, and the District (administrative area consisting of several Sub-Disvisions) is controlled by the District Controller of Food. Each Region's administrative area consists of 5 Districts controlled by the Regional Controller of Food. The Directorate of Food controls foodgrain distribution throughout the country.



Organization Chart for Control of CSDs

Fig. 2-4 Organization Chart



Organization Chart of Directorate of Food

2-2 Outline of the Foodgrain Storage Construction Programme

2-2-1 Foodgrain Storage Construction by the Government of Bangladesh

(1) Present State of Foodgrain Stores

The nominal storage capacity of foodgrain stores was 1.88 million tons as of June, 1984. The unit storage capacity of a CSD is about 39,000 tons and that of a LSD is about 2,000 tons.

Table 2-6 Nominal Storage Capacity of Foodgrain

	No. of Place	No. of Storage	Storage Capacity
LSD	603	2,226	1,107,970
CSD	12	576	466,230
SILO	4	7	226,500
Sub-total	619	2,809	1,800,700
LGRD (refer to NOTES)	266	266	66,443
Rented Storages	66	66	16,443
Total	951	3,141	1,883,586

NOTES: Foodgrain stores possessed by the Ministry of Local Government, Rural Development and Cooperatives.

The floor area and structure of existing foodgrain stores in Bangladesh vary in kind. The following are the 4 main types and the present state of each is as follows:

1) Shell Type

This type comes in various sizes. The posts and beams are made of reinforced concrete, the walls are brick masonry, the floor

is concrete and the roof is shell-shaped reinforced-concrete, a peculiarity in the design of which causes water to leak in.

2) Calcutta Type

This type is 150 ft deep x 40 ft wide x 16 ft high with a capacity of 750 tons. The posts and beams are made of reinforced concrete, the walls are brick masonry, the floor is concrete and the roof is truss covered with zinc-corrugated steel sheets. Storages ability due to the structure of the roof, air-tightness, and heat insulation is low, so this type is not suitable for storing foodgrain.

3) Twin-Nissen Type

This type is 83.6 ft deep x 64.5 ft wide x 18 ft high (from the floor to the top of the roof). The floor is made of concrete and the chord beams and posts are structural steel covered with semi-circular zinc-corrugated steel sheets. Since this type was constructed in the latter 1940s, the storing performance as regards air-tightness, and heat insulation are low, so they are not suitable for storing foodgrain at present.

4) Dhaka Type

This is the latest type and posts, beams, and roof are made of reinforced concrete. There are two of these Dhaka Types, one has a 500-ton capacity storage and is 100 ft deep x 40 ft wide x 16 ft high (from the floor to the bottom of the beams) and the other has a 1,000 ton capacity storage and is 100 ft deep x 40 ft wide x 16 ft high (from the floor to the bottom of the beams). This type of storage is the best of the many kinds of existing foodgrain stores, in respect of architectural technology such as structure and materials, and storage capacity. However, matters connected with architectural technology remain to be improved. It is this type that Bangladesh wishes to adopt as a standard type. However, some of the existing Dhaka Types already have a low storing performance due to shoddy construction.

It is said that of a nominal storage capacity of 1.88 million tons, about 0.30 million tons are unable to be used for foodgrain storage due to deterioration. (Interview from the Ministry of Food)

(2) Foodgrain Storage Construction Programme

In the Second Five-Year Plan (1980/81 - 1984/85 fiscal year) (the revised Second Five-Year Plan made in 1983) the foodgrain storage construction programme prepared by the Ministry of Food indicates that the Government of Bangladesh should have a 2.25 million ton stock of foodgrain in the country by the end of the 1984/85 fiscal year (June 30, 1985) in order to have the amount required for distribution and 1.5 million tons (refer to the World Bank Report) for food security.

The total storage capacity of existing foodgrain stores plus foodgrain stores to be constructed by the end of the 1984/85 fiscal year is scheduled to reach about 1.90 million tons in the whole country. A further foodgrain storage capacity of about 0.35 million tons is to be constructed in the Third Five-Year Plan. For some portions of the Plan, the Government of Bangladesh has a construction plan to attain its target using loans from the IDA and the ADB and aid from such foreign governments and organizations as the EC, the Netherlands and the CIDA, in addition to funds the Government of Bangladesh raises from its own budget.

2-2-2 Foodgrain Storage Construction through Foreign Aid

A part of the foodgrain storage construction funds are loans from the IDA and the ADB and aid from foreign governments and organizations. The following is a list of organizations of foreign countries offering amounts of aid for the foodgrain storage construction programme contained in the revised Second Five Year Plan.

IDA	165,000 tons	(Jul. 1, 1978 - Jun. 30, 1984)
ADB	62,000 tons	(Jul. 1, 1979 - Jun. 30, 1984)
EC	48,000 tons	(Jan. 1, 1981 - Jun. 30, 1985)
Neth.	11,500 tons	(Aug. 8, 1979 - Jan. 30, 1983)
CIDA	25,000 tons	(Jan. 1, 1981 - Mar. 31, 1985)
(JAPAN)	80,000 tons	(Oct. 1981 - Mar. 1984)
Sub-total	392,000 tons	
GOB	178,000 tons	(Jul. 1, 1980 - Jan. 30, 1985)
Total	570,000 tons	

Accordingly, foreign funds account for 68.8% of the total cost of the programme. Specific points of the foodgrain storage construction plan covered by foreign aid are as follows:

1) Some of the projects involve not only the construction of new stores but also the rehabilitation of existing facilities, the construction and improvement of ancillary facilities, and the supply of equipment and machinery.

2) The construction sites are LSDs which are scattered all over the country apart from the 5 stores constructed by the EC project at Boyra.

3) All the projects have been revised as they could not be completed within the original budget. Revision ratios are 33.6% in the case of the IDA, 55.8% for the ADB, 5-9% for the EC, 90.8% for the Netherlands, and 2.1% for the CIDA.

4) The ratio of foreign aid to the total amount of the project varies. It is 68% in the case of the IDA, 77.6% for the EC, 97.8% for the Netherlands and 89.6% for the CIDA, respectively.

5) The type of the storage to be constructed is the 500-ton type rather than the 1,000-ton Dhaka Type as used in the EC project.

Specific points of foodgrain storage construction using foreign aid are as follows:

1) Consultant:
   Engineering for all except the CIDA project Bangladesh consultants, in every project, are engaged in such areas as the tendering of documents, the preparation of and tender evaluations, etc.

2) Design and Specifications:
   In the CIDA project, the specifications are slightly different (in particular, the exterior wall is finished with exposed brick). Other projects are based on PWD (Public Works Department) specifications.

3) Construction Contractors:
   For all projects, all construction contractors are to be Bangladesh firms. A number of contractors for every project are engaged for different construction items and at different construction sites, etc.

4) Contract Type:
   For all projects, a number of contractors were selected through tenders, and awarded contracts. Therefore, none of the contracts is the turn-key type.

5) Procurement of Equipment and Materials:
   For all projects other than the IDA project, equipment and materials were also contracted through a number of firms through tenders for each item and for each construction site.

6) Construction Period:
   The construction period varies with the project. In almost all projects, construction work was delayed and plans were revised to later dates with additional construction costs.

7) Construction cost
   The construction cost of each project is calculated on the basis of the PWD estimate. However, since it is revised as a project progress, construction cost ends up over the cost estimate at the time of completion.

2-2-3 PWD Design and Specifications

The following outlines the PWD-type design and specifications that the Government of Bangladesh uses as a standard type of foodgrain store and which the Government uses not only for her own funds but also when obtaining foreign aid. The PWD Dhaka Type has two types, 500-ton and 1,000-ton capacity stores: (refer to Fig 2-5 for the design.)

1) *Dimentions*

Floor area		100 ft x 80 ft (about 743.2 m^2)
Height:	from the ground to the floor top	3 ft (about 0.914 m)
	from the floor top to the roof slab bottom	19 ft (about 5.789 m)
	from the ground to the roof slab top	22 ft & 4-1/2 inches (about 6.818 m)

2) Structure

Foundation	:	Reinforced concrete independent footing at the bottom of posts
		Reinforced concrete foundation beam
		Brick, independent-stepped wall footing
Post and beam	:	Reinforced concrete
Roof slab	:	Reinforced concrete
Floor slab	:	Reinforced concrete on ground
Wall	:	Brick

3) Finish

Roof	:	Lime terracing (3-7 inches thick)
Exterior wall	:	Mortar, water-soluble paint
Interior wall	:	- as above -
Floor	:	Trowelled concrete finish with expansion joints
Ceiling	:	Mortar, water-soluble paint

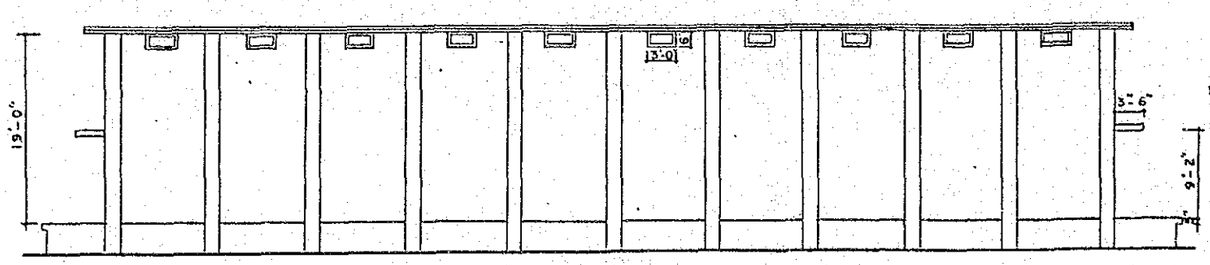
4) Quality Control

Damp-proofing	:	Polyethylene sheet under the floor slab
Ventilation	:	Window
Air-tight	:	The air-tightness of the window is not taken into consideration
Timber dunnage	:	Installed

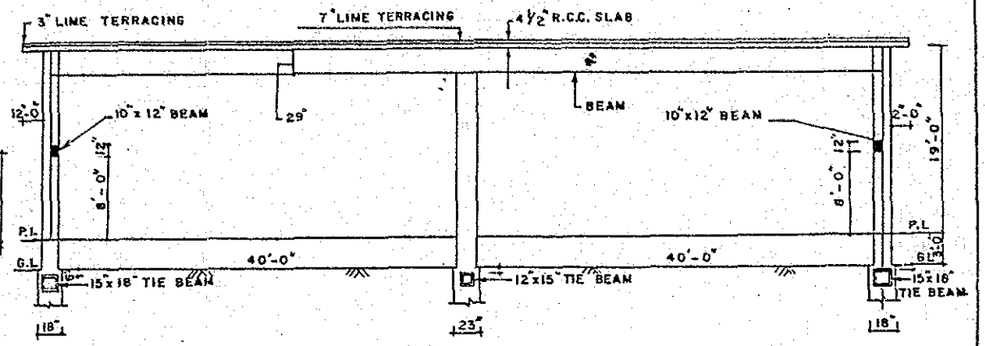
5) Criteria for Structural Analysis

Concrete compression strength (28 days)	:	fc = 2,000 psi (about 140 kg/cm^2)
Tensile strength of mild steel bar (MS)	:	fs = 18,000 psi (about 1,265 kg/cm^2)
Bearing capacity of soil	:	1,680 lbs/sft (about 8.2 $tons/m^2$)

The construction cost estimated by the PWD is usually used the basis for budgets for storage construction by the Ministry of Food. At the planning stage, construction cost is estimated to even out to some extent. At the actual construction stage, however, a tender is offered by contractors, suppliers of construction materials, transport agents, etc. for construction items and material items. Thereafter, the lowest tender for each item is awarded each contract. Since the PWD estimate is lower than the actual cost, tenders are not accepted at the estimated cost. It is usually the case that after being resubmitted, they are accepted at a rate higher than the estimated cost. As construction work is not done on a turn-key basis, contractors and suppliers are selected according to the construction schedule, or whenever something is needed. This is what causes the delays that escalate construction cost through the commodity price hikes. The result is that when a project is completed, the construction cost is much higher than the estimate cost.

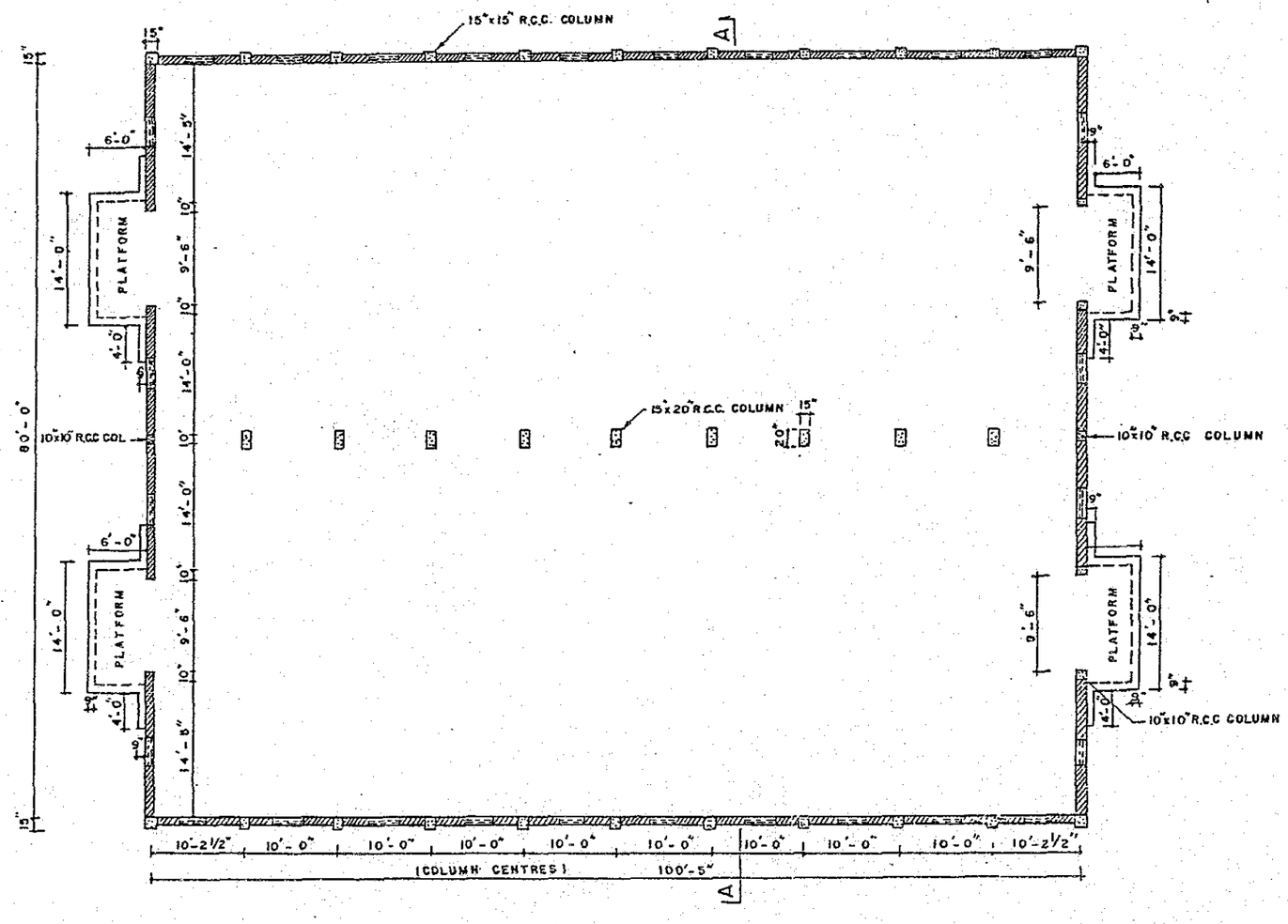


ELEVATION



SECTION A-A

SCALE; 1/8"= 1'-0"



PLAN

Fig. 2-5 PWD Design

OFFICE OF THE EXECUTIVE ENGINEER
P.W.D. DESIGN DIVISION II DACCA

SCALE AS SHOWN	DRAWING NO C.P.F.G/131/81	DATE 18-8-81	DRAWN BY MAHMUD ALI	TRACED BY MAHMUD ALI
SHEET NO 1	PROJECT TITLE:- MODIFIED 1000 TONS CAPACITY DACCA TYPE FOOD STORAGE GODOWN (HAVING 19'-0" PLINTH TO CEILING HEIGHT)			ARCHITECTS DRG. NO
	DRAWING TITLE:- PLAN, ELEVATION & SECTION			DATE

MD. NURUL ISLAM ASSISTANT ENGINEER P.W.D. DESIGN DIVISION II DACCA	S.M. RAHAN 18/8/81 EXECUTIVE ENGINEER P.W.D. DESIGN DIVISION II DACCA	MD. WALIUL ISLAM SUPERINTENDING ENGINEER P.W.D. DESIGN CIRCLE DACCA

2-2-4 Present State of Foodgrain Storage Built through Japanese Aid

(1) Short History of Storage Construction

Aid from the Government of Japan for foodgrain storage construction in Bangladesh started in 1977 and is briefly described below:

Table 2-7 Outline of Foodgrain Storage Construction under Japanese Aid

		1st phase	2nd phase	3rd phase	4th phase	Total
Year of Aid		1977	1979	1980	1982	
Period of Study in Bangladesh		6 - 19. 12,'76	13.11 - 9.12,'78	—	8 - 24. 4,'82	—
Period of Construction		10,'77 - 12,'78	9,'79 - 3,'81	9,'80 - 10,'81	12,'82 - 3,'84	—
Storage No.	Maheswarpasha	11				11
	Halishahar	2	5		4	11
	Dewanhat	2				2
	Santahar		5	6	6	17
	Boyra		13		10	23
	Tejgaon			6	6	12
	Mymensingh				4	4
Total Stores		15	23	12	30	80
Storage Capacity(tons)		15,000	23,000	12,000	30,000	80,000

In the fourth phase, there was a review of the foodgrain stores constructed during the first through the third phase, also a survey of the storage construction plan using foreign aid, and of the general state of construction work during the Basic Design Study taking into account the Government of Bangladesh's policy of standardizing types of storage. Consequently, the 1,000-ton type storage (hereinafter called the "Standard Japanese Type"), to be constructed with Japanese aid, had to be newly planned.

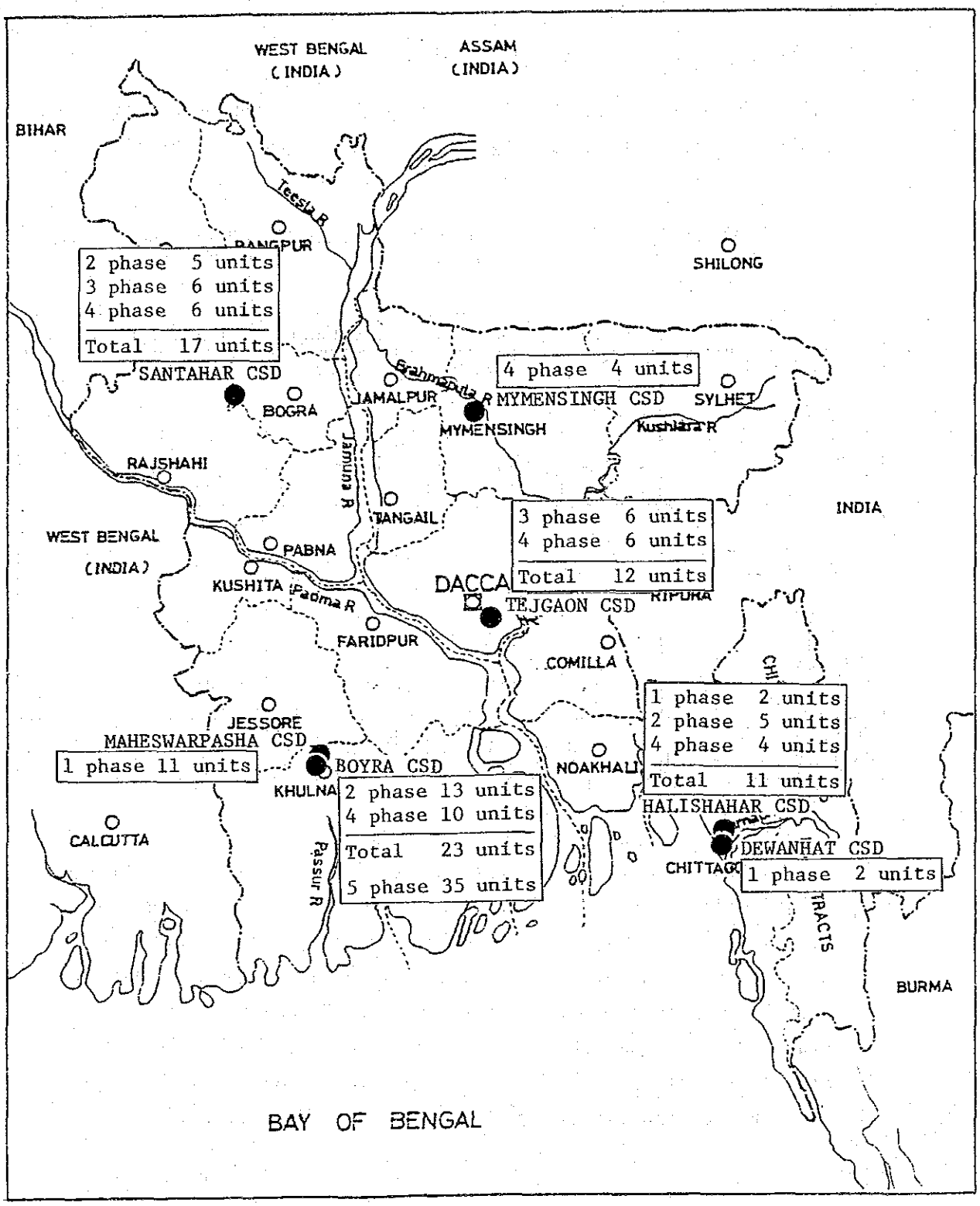


Fig. 2-6 Distribution of Foodgrain Stores Built through Japanese Aid

(2) How Foodgrain Storage is Used at Present

For examples of stores constructed with the aid of the Government of Japan, please refer Table 2-8 which shows stock items and the stock position at the Tejgaon CSD which uses Twin-Nissen Type, Dhaka Type and Japanese Type stores.

At the Tejgaon CSD, there are 46 stores (37,900 tons):

Twin-Nissen Type	4 units	3,200 tons
Dhaka Type	30 units	22,700 tons
Japanese Type	12 units	12,000 tons

Results of the study on each store show that the Japanese Type and Dhaka Type stores were used the most stock ratio of 102% (69% for the Twin Nissen Type stores). However, since the above stores contained salt, sugar, oil, etc., the Japanese Type stores would show the highest stock ratio of 91% in view of the fact that it stocked rice and wheat which particularly need good storage (the stock ratio of the Dhaka Type was 84%, neither rice nor wheat were stocked in the Twin-Nissen stores). It was found that the Japanese Type stores were able to minimize quality deterioration of foodgrain better than other types of foodgrain store. (from an interview with the Manager of the Tejgaon CSD)

Table 2-8 Utilizing Conditions of Foodgrain Stores at Tejigaon CSD (As of July 14, 1985)

(Unit: Ton)

	No. of Storage	Storage Capacity	Rice	Wheat	Butter Oil	Sugar	Salt	Oil	Total
Twin-Nissen Type	4	3,200	-	-	-	-	1,602	614	2,216
			-		69%				69%
Dhaka Type	30	22,700	18,382	711	84	2,119	1,352	597	23,245
			84%		18%				102%
Japanese Type	12	12,000	10,298	592	45	1,340	-	7	12,282
			91%		11%				102%

2-3 Outline of the Request

It seems that the Government of Bangladesh is achieving the final target of its foodgrain storage construction programme. However, as mentioned in 2-2, (1) - 1), quite a few stores are fairly old and are not adequate for storing foodgrain, which means they have to be either repaired or completely rebuilt .

In particular, the Twin-Nissen Type foodgrain store with its low floor, which was designed in the latter part of 1940s as a temporary measure, is now too old to properly function. This type of store was constructed when CSDs were first established and were set up in CSDs which were important distribution points. These foodgrain stores were set up in places where they could function very easily, such as facing the railways and roads.

The reconstruction of these old-fashioned foodgrain stores will improve the storage performance and minimize foodgrain loss when being stocked. Together, this will increase the amount actually available.

Meanwhile, the Boyra CSD, which is located by the port of Chalna, has become a supply base to the western part of the Jamna River for imported foodgrain. More than 90% of the foodgrain handled there is imported. Recently, the amount of imported foodgrain has been increasing and it is especially when crops are poor or in time of disaster that a greater amount of imported foodgrain is necessary. In Bangladesh, with its high occurrence of poor crops and disasters, food distribution conditions greatly effect the domestic economy and social order. Therefore, the Boyra CSD, which is a supply base for imported foodgrain, has been playing an extremely important role.

However, more than half of the existing stores at the Boyra CSD are the above-mentioned Twin-Nissen Type and their storage performance and the distribution of imported foodgrain has to be improved as soon as possible. The request from the Government of Bangladesh to the Government of Japan was made in the light of the above-explained background. The contents of the request are:

35 foodgrain stores (1,000-ton capacity per storage) and ancillary facilities to be constructed at the Boyra CSD in Khulna District in the south-western region of the country. Land, where the existing old foodgrain stores (52 Twin-Nissen stores: 41,600 tons) are to be demolished, will be used as a site for the project.

CHAPTER 3: OUTLINE OF THE PROJECT

3-1 Objectives

The Government of Bangladesh has promoted the foodgrain storage construction programme, which is a basic distribution infrastructure in order to establish a stable foodgrain supply to its people and indeed seems to be achieving its final target. However, quite a few old foodgrain stores, which are not efficiently functioning, are included in the number of existing stores. In particular, since more than half the total stores at the Boyra CSD are out-of-date, its function as a supply base for imported foodgrain to the western region has suffered considerable damage. The objective of this project is to construct 35 stores (1,000-ton capacity per unit) to increase the effective storage capacity and to secure a stable supply of foodgrain after doing away with the out-of-date stores.

3-2 Study and Examination of the Request

3-2-1 State of the Boyra CSD

The Boyra CSD is located in Khulna which is in the southwestern part of the country, and near to the International Trading Port of Chalna. The railway, starting from Khulna goes as far as the border with Nepal, running through Jessore and Santahar. Khulna is also connected with Rajshahi, Bogra and Rangpur by rail. Khulna is an important city that can be considered the centre of the western region, separated from the other part of the country by the Jamna River. Therefore, when sending foodgrain, trucks are mainly used and grain is mostly sent out by rail, trucks and barges.

In the Boyra CSD, there are 90 foodgrain stores, including 23 stores built with Japanese aid, together with office buildings and staff quarters, etc. on a site of about 65 acres, as shown in Fig. 3-1.

The nominal foodgrain storage capacity at the Boyra CSD is 75,100 tons.

Stores with a capacity of 47,100 tons, including 41,600 tons in 52 Twin-Nissen Type stores, are not suitable for storing foodgrain, and therefore, the effective storage capacity amounts to 28,000 tons.

Table 3-1 Storage Capacity at Boyra CSD

Type of Storage	No. of Storage	Capacity per storage (ton)	Total Storage Capacity (ton)	Storing Conditions
Japanese Type	23	1,000	23,000	
Dhaka Type (under EC aid)	5	1,000	5,000	
Dhaka Type	8	500	4,000	unsuitable for storing foodgrains due to deterioration
Twin Nissen Type	52	800	41,600	- do -
F.S. Type	2	750	1,500	- do -
Total	90		75,100	

Grain movement for the past 2 years is shown in Table 3-2.

Table 3-2 Receipt and Issue of Foodgrain at Boyra CSD

	Opening Stocks	Receipt	Total	Issue	Closing Stock
1983/84	3,650	58,571	62,221	51,840	10,381
1984/85	10,381	110,891	121,272	91,046	30,226

Further, the monthly amount of foodgrain handled is shown in Table 3-3.

Table 3-3 Monthly Amount of Foodgrain Handled at Boyra CSD (1984)

(unit: Ton)

	No. of Storage	Storage Capacity	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Remarks
Japanese Type (2nd Phase)	13	13,000	6,276	5,720	30,525	21,450	7,471	4,442	7,178	7,895	2,810	1,727	8,299	14,114	
Japanese Type (4th Phase)	10	10,000	-	-	2,002	10,630	7,284	2,989	3,391	6,343	1,958	1,609	4,161	9,820	
Dhaka Type	8	4,000	28	28	20	20	69	146	146	24	24	24	24	24	Foodgrain not good to eat
Twin-Nissen	52	41,600	4,125	4,084	4,148	2,522	2,358	2,208	2,538	2,151	1,945	1,979	1,791	1,737	
F.S. Type	2	1,500	13	102	15	265	502	435	286	319	311	26	26	623	used as a stock yard for bagged foodgrain

NOTES: 1) The construction of Japanese Type storage was completed in February, 1984

2) The construction of Dhaka Type storage (EC) was completed in December, 1984

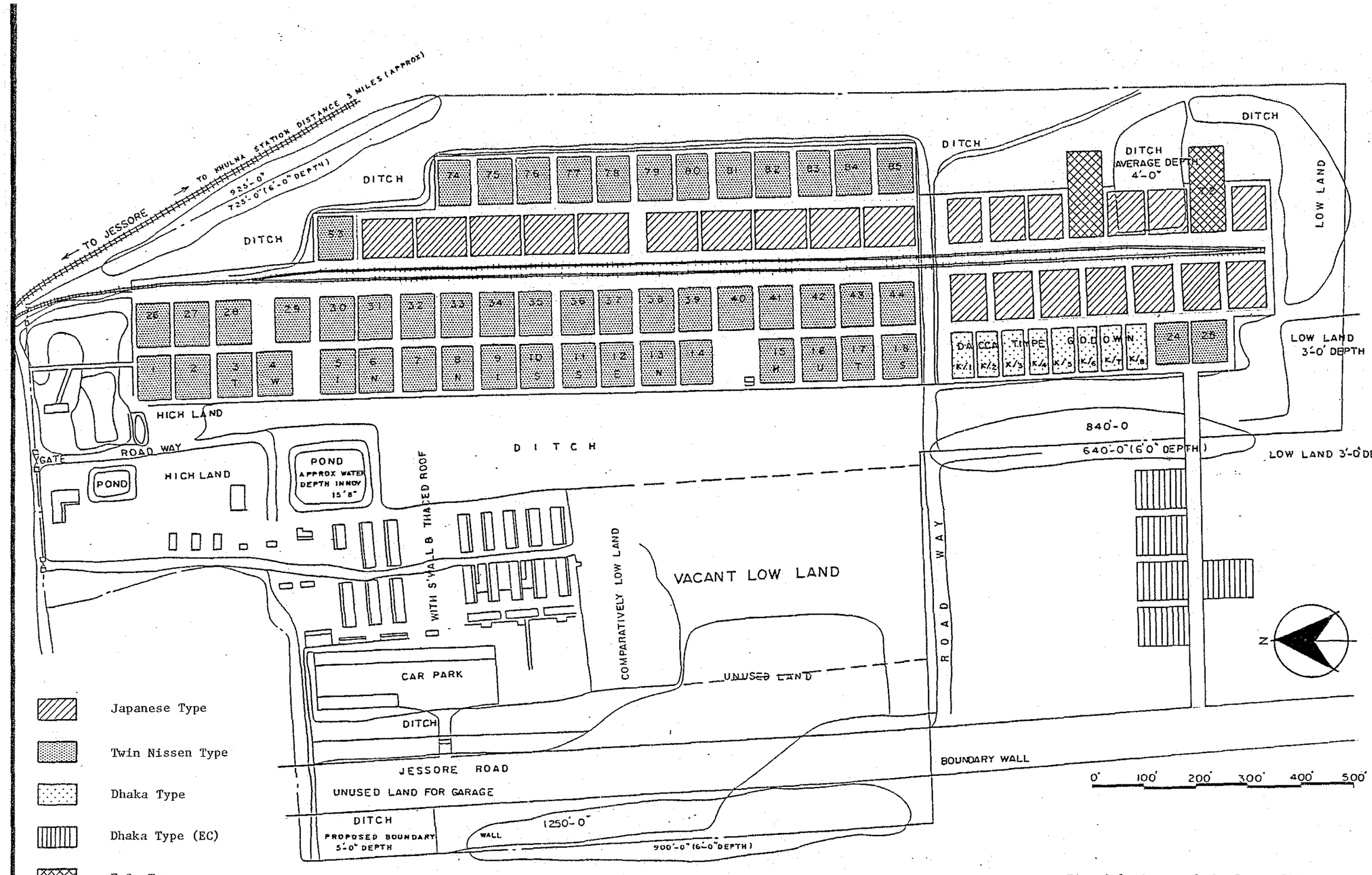


Fig. 3-1 State of the Boyra CSD

3-2-2 The Need for Foodgrain Storage Construction at the Boyra CSD

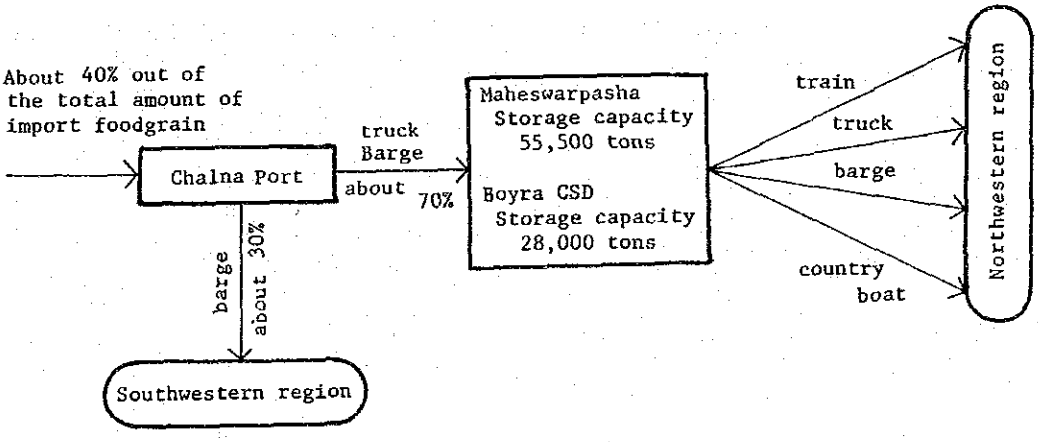
The Boyra CSD has been playing an important role as a supply base for imported foodgrain to the western part of the Jamna River, ranking with the Maheswarpasha CSD. At present, 60% of all imported foodgrain is unloaded at the Chittagong port and 40% at the Chalna port.

Table 3-4 Imports of Foodgrain from Chalna Port

(Unit: Thousand Tons)

	Rice	Wheat	Total
1980/81	68	330	398
1981/82	53	411	464
1982/83	117	565	682
1983/84	60	701	761
1984/85	255	703	958

The distribution route for imported foodgrain from the Chalna port is shown below:



958,000 tons of foodgrain were imported through the Chalna port in the last fiscal year (1984/85), of which 70% had to be distributed to the northwestern part of the country by way of the Boyra CSD or the Maheswarpasha CSD. The nominal storage capacities of the Boyra CSD and the Maheswarpasha CSD are 75,100 tons and 55,500 tons, respectively. Since the old stores make up a part of the site of the Boyra CSD, the effective storage capacity amounts to only 28,000 tons (refer to Table 3-1). Accordingly, the 670,000 tons (70% of 958,000 tons) of imported foodgrain have to be handled using both the storage capacity of the Boyra CSD and that of the Maheswarpasha CSD. The annual inflow and outgo cycle of imported foodgrain at the Boyra CSD is calculated 8, which is much higher than that of the Tejgaon CSD (5.2).

However, due to the limitations on transportation means, that is, the shortage of trains, trucks, barges (trains: approx. 60, trucks: 50, and barges: 60), there is a limit on how much inflow and outgo can be speeded up. The actual annual ratio for the Maheswarpasha CSD is 4.1 and that of the Boyra CSD is 4.3 (refer to Table 3-5). Imported foodgrain exceeding storage capacity has to be stored on barges. However, barge storage causes foodgrain to be lost through loss in quality due to poor storage conditions and theft. Further, due to a limited number of barges, as the amount of stock on the barges goes up, ships have to remain in port and therefore, the mooring results in an increasing loss of foreign currency.

In order to escape from this vicious circle, the storage capacity has to be increased. Considering the fact that there is no land to construct storage at the Maheswarpasha CSD, it would be more rational to recover effective storage space by reconstructing the old stores at the Boyra CSD.

Table 3-5 Storage Rotating Ratio

Name of CSD (District)	Storage Capacity	Annual Handling Amount	Storage Rotating Ratio	Remarks
Boyra (Khulna)	28,000	121,272	4.3	1984/85
Maheswarpasha (Khulna)	55,500	229,040	4.1	- do -
Tejigaon (Dhaka)	35,600	183,910	5.2	1982
Mymensingh (Mymensign)	22,000	58,457	2.7	- do -
Santahar (Bogra)	31,000	50,032	1.6	- do -
Halishahar (Chittagong)	69,700	111,615	1.6	- do -
Muladuli (Pabna)	32,500	40,398	1.3	- do -

3-2-3 Suitability of Demolishing Old Stores

At present, these remain 52 Twin-Nissen Type stores (capacity: 41,600 tons). They have been used for storing foodgrain which is no longer of use due to a drop in quality as the grain has remained in store since 1982.

The outline and the present state of the Twin-Nissen Type are shown in Table 3-6. Since the steel frames of the main structure as well as zinc-corrugated, it is necessary to replace everything. In the event of a partial reconstruction, not much improvement of storage conditions can be expected. Further, the height of floor is lower than ground level. In a marshy area such as the Boyra CSD, it is necessary to raise the floor up to 3 feet above ground level. In order to do this, the main structure has to be rebuilt.

Therefore, the Twin-Nissen Type stores at the Boyra CSD are not suitable for storing foodgrain and a partial reconstruction is not expected to improve storage performance. So as to more effectively use the land, it would be better to demolish the old stores and use the land to build new ones.

PHOTOGRAPH:

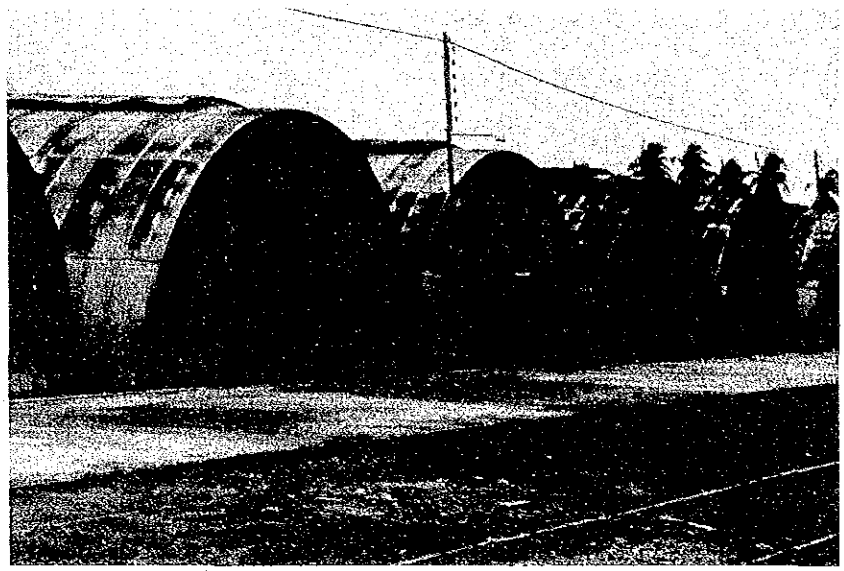
Present State of Twin-Nissen Type Stores

1. Outside View:
   Corrosion of the roof and outside walls have caused holes. The flour has sunk below ground level

2. Partial View:
   Corrosion is in particular noticeable around the bottom of the stores

3. Interior View:
   Rain has leaked in to form puddes and sunlight can be seen coming in through holes in the roof.

1



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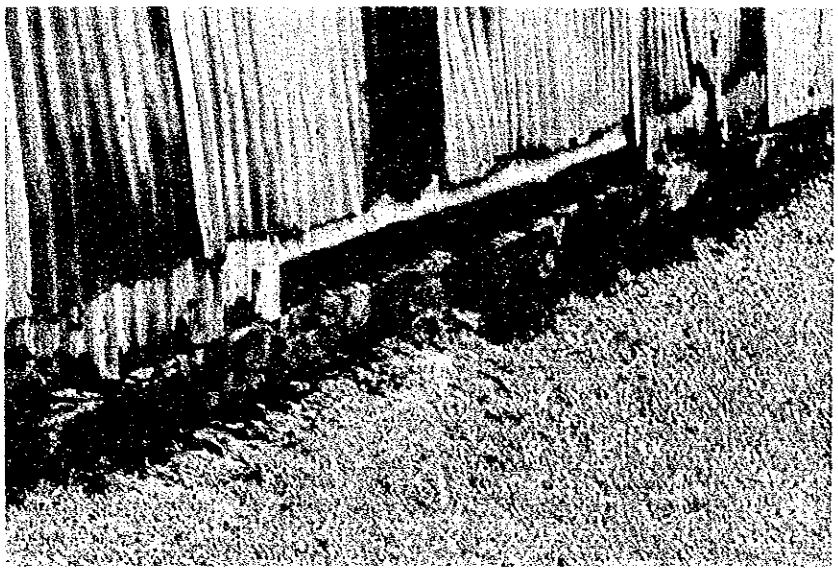

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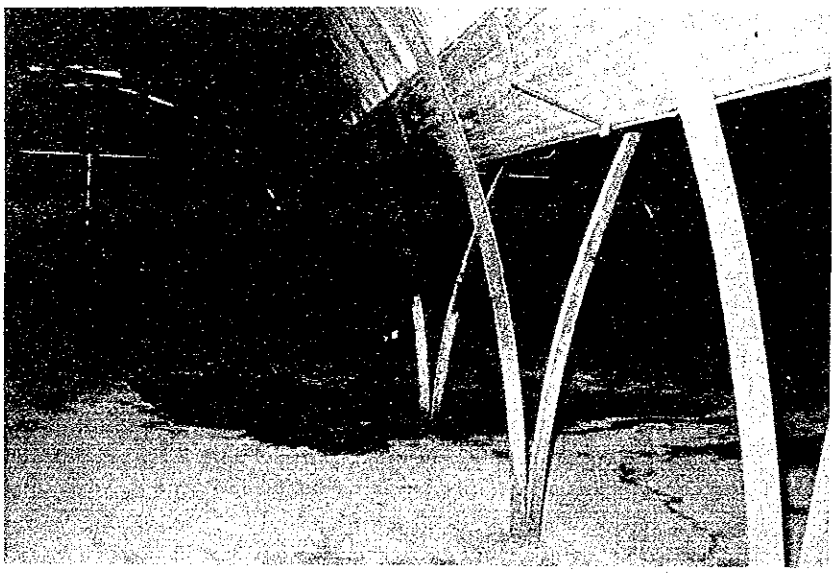


Table 3-6 Specifications and Present State of Twin-Nissen Type Storage

	Item	Outline	Existing Conditions
General	Storage capacity	800 tons	Since quite a few stores are not suitable for storing due to water leakage in roof, the effective storage capacity is much smaller.
	Floor	83.6 ft x 65.4 ft	
	Height of roof	18 ft.	
	Height of floor	GL ± 0m	Due to the cave-in for many years, it had been rather sunk down lower than the road surface level.
Structure	Main structure (arched beam, strut)	Structural steel	Since 30 years passed after completion and painting, etc. were poorly maintained, the corrosion has been rather developed.
Finish	Roof, interior and exterior, wall	Zinc-corrugated steel sheet	Some parts are found to be rapired. Holes are made on all over the roof, developing the corrosion.
	Floor	Trowelled concrete finish	Many cracks are made by corrosion although the floor is found to be repared.
	Door	Steel frame, zinc-corrugated steel sheet	Since steel frames have been much corroded, it hard to open.
Storing performance	Floor damp-proof		Since the floor level is lower than the ground level and polyethylene film is not laid.
	Ventilation		The open of the roof is the only ventilating window but it is kept close for avoiding water leakage in the roof.
	Air tight		Since holes are made all the roof over due to corrosion, no air tight is performed.
	Insect prevention		Since holes are made all the roof over due to corrosion, insects cannot be prevented.
	Heat control		Since the roof is finished with zinc-corrugated steel sheet without heat insullation material and there is no ventilating window, temperature sometimes goes up to 40°C.

3-3 Project Description

3-3-1 Executing Agency and Operational Structure

The Director of Inspection Development & Technical Services of Directorate of Food in the Ministry of Food will directly execute and manage this project.

The operation and maintenance of the completed foodgrain stores will be done by the Boyra CSD. A manager is to be responsible for running the whole CSD and under him, a Chief Inspector of Food (C.I.), Inspector of Food (I.F.), Sub-Inspector (S.I.) and Assistant Sub-Inspector (A.S.I.) are to be engaged in the management of the depot. The S.I. will takes charge of individual storage.

Personnel	No. of personnel
Manager	1
Chief Inspector	2
Inspector of Food	15
Sub-Inspector	47
Assistant Sub-Inspector	47
Upper Division Assistant	2
Lower Division Assistant cum Typist	6
Accountant	1
Technical Chief Inspector/ Chief Operator	1
Technical Inspector	1
Operator	1
Total	124

3-3-2 Setting up the Project Scale

In the Boyra CSD, which is the supply base for imported foodgrain to the western part of the country, each storing and distributing operation has to be done smoothly. For this purpose, it is rational to

think that effective storage capacity will be created by constructing new foodgrain stores after demolishing existing out-of-date stores which are no longer suitable for storing foodgrain. The amount of capacity requested by the Government of Bangladesh is 35,000 tons. The total storage capacity of CSDs in Khulna amounts to 118,500 tons, plus an extra 35,000 tons at the Boyra CSD. The annual foodgrain inflow and outgo cycle of 670,000 tons becomes 5.6 which is a ratio possible to maintain as long as the transportation networks are also maintained. Considering that the arrival of ships carrying foodgrain is very random, as well as the recently increasing imports of foodgrain, it is considered that 35,000 tons of extra storage will be necessary.

It has been found that regarding the scale of each store, the standard Japanese type worked out in the fourth phase seems suitable in view of the local method of storing in units of five bags.

3-3-3 Location and State of the Project Site

1) Location

The project site is located in Khulna which is the central city of the southeastern part of Bangladesh.

2) General Conditions

Khulna is the third largest town in Bangladesh with a population of about 520,000. The mean atmosphic temperature is higher than the national average, and rainfall is relatively low.

3) Topography

The whole area of the Boyra CSD is low marsh land. At present, the site of the present foodgrain stores has been levelled using soil from each side of the site, which means it is surrounded by reservoirs.

4) Geology

The levelled part of the site is composed of a silty, fine sand layer and a part of the reservoir is composed of the silty layer. The ground water level is affected by the water level in the

reservoirs. Flood accurs at 30 cm below the road surface in the rainy season.

5) Traffic

A railway leads into the site, which faces the main road to Jessore, although the entrance lies away from the road, the smaller road from the main road to the entrance is narrow and not yet paved.

6) Electricity

Electricity (11 kV - 50 Hz) is supplied to the area around Boyra and the Boyra CSD receives electricity (400 V/230 V).

7) Drainage

The drainage system is only seen in ditches on both sides of the road in Khulna and as yet there is no sewerage system. Water drains into the reservoirs. There are no drainage regulations or standards.

3-3-4 Facilities and Equipment

As the result of the study and examination of the request from the Government of Bangladesh, the following is judged to be required as facilities and equipment.

Building	:	Foodgrain storage (1,000-ton capacity) 35 units
Ancillary facilities	:	Access road finished with bituminous macadam on the site and concrete drainage
Equipment	:	Dial scale (1 No./storage), thermometer & hydrometer (1 No./storage)

The access roads to the stores, and drainage, are indispensable in order to effectively operate the stores.

Dial scales, thermometers and hydrometers are needed to check the amount of inflow, outflow and loss of foodgrain and to control the quality of foodgrain.

CHAPTER 4: BASIC DESIGN

4-1 Design Policy

The Government of Bangladesh intends to build as many stores as possible through reducing their construction cost. Therefore, the basic study team proposed a continuous type of store (2,000 ~ 6,000-ton capacity) instead of the standard Japanese type (Phase 4), bearing in mind the state of the site that all construction should be concentrated in one place. A table comparing each type is shown as table 4-1.

Construction costs will be reduced owing to the reduction of foundations and walls between stores. But ventilation also will be reduced as the wind only blows east and west.

The basic study team has made the proposal assuming that the reduced ventilation will cause no problem. As there were 23 stores constructed under Japanese aid, suitable for long-term storing, in the Boyra CSD, it seems possible to use such stores for both long and short term storage.

But the Government of Bangladesh's Ministry of Food insists that it is difficult to use stores properly for both long and short term storage because the storage period changes with foodgrain supply/demand and economic conditions such as the failure of crops and disasters which result in loss from the long-term point of view, even if the initial cost of the project was lower. So, both parties have agreed that the standard Japanese type of storage (Phase 4) shall be adopted in this plan, and storage performance shall be maintained.

Table 4-1 Comparison between Standard Type (4th Phase) and Continuous Type

	Item	Standard Type(4th Phase)	Continuous Type(Proposed)
General	Capacity	1,000 tons	6,000 tons
	Floor Area	30 m x 24 cm	30 m x 144 m
	Height: GL to roof slab top	6,810 m	same as left
	Floor to roof slab bottom	5,791 m	same as left
	Floor height	0.9 m	same as left
Structure	Main structure	Reinforced concrete	same as left
	Exterior wall	Brick masonry	same as left
	Partition wall	-	Brick masonry
	Foundation	Reinforced concrete continuous footing under wall. Reinforced concrete independent footing under interior posts	same as left
Finish	Roof	Lime terracing	same as left
	Exterior and interior wall	Mortar, vinyl paint	same as left
	Floor	Trowelled concrete finish with expansion joint	same as left
	Ceiling	Mortar, vinyl paint	same as left
Storing Performance	Damp proof	Polyethylene film	same as left
	Ventilation	Natural ventilation through windows	Decrease of the ventilating performance owing to the reduction of the window area
	Air tight	good	good
	Timber dunnage	Wooden pallet	same as left
	Insect prevention	Mosquito net, screen door	same as left
	Heat control(Roof)	Lime terracing	same as left
	Heat control(Wall)	none	Increase of the heat control performance owing to the reduction of the exterior wall area
Cost	Construction cost	-	Decrease of the cost owing to the reduction of the exterior wall and foundation
	Maintenance cost	-	Decrease of the cost owing to the reduction of the exterior wall area
Lay-out	Site area	-	Since a large site for stores as not required, it can be used effectively

4-2 Study and Examination of Design Criteria

The standard type storage constructed under Japanese aid used in this plan was made by the study during fourth phase.

1) Dimentions

The dimentions of the stores have been adopted to conform with the Dhaka type storage designed by the PWD in consideration of the desire standardize design by the Government of Bangladesh. Based on a review of the state of existing foodgrain storage in respect of their actual storage capacity and ease of control, this type of design has been determined to be the most appropriate as the standard type of storage for Bangladesh. There are two Dhaka types of storage, 500 tons and 1,000 tons. The 1,000-ton capacity storage has been adopted in this design since it is economical in construction costs and has higher storage control flexibility.

2) Structure

In the past, continuous footing was used, but in this design, both continuous and independent footing will be adopting in conformity with the Dhaka type storage, which employs independent footing. The bearing capacity of the subsoil used as a criteria for the structure analysis in this design is 6 tons/m^2 according to test results, though 8.2 tons/m^2 is used in the PWD design.

3) Storing Performance

Since the specifications of the Dhaka type storage are not sufficient to store foodgrain as regards air-tightness, insulation and ventilation, the storing performance specifications of the foodgrain stores constructed under Japanese aid in past are followed in this design.

4) Construction Cost

Construction materials, techniques, construction methods and Bangladesh laboures will be used as much as possible in order to reduce construction costs, because the Government of Bangladesh has requested the construction of as many stores as possible.

Therefore, lime terracing, which is a local construction method, has been used for heat insulation of the roof in place of styrofoam.

4-3 Basic Plan

4-3-1 Site and Layout Plan

The site lies from south to north. The existing stores were constructed on both sides of railway tracks laid along the center of the site. The entrance is in the northern part of site and the stores constructed under Japanese aid are located along the railway one after another from the southend of site. In this plan to construct new stores, the Twin-Nissen Type stores on both sides of the ten stores constructed with Japanese aid (Phase 4) have to be demolished. The road along the railway has already been constructed, but a road between the stores has to be built. In the layout plan, the roads between stores have been widened in order to allow for trucks, because trucks are the main means of transportation. At present, the entrance is in the northend, and the approach road from the main road, Jessore Road, is very narrow. Therefore, in future the main entrance has to be improved to function better. The storage layout plan is shown in Fig. 4-1.

4-3-2 Architectural Design

(1) Floor Plan

The storage plan has been used to conform with the standard Japanese type of storage (Phase 4). There are two types with entrances on different sides. In this plan, the types with entry/exit on the flat side have been adopted for bearing in mind the shapes of the buildings and land available. The size of plan is 30m x 24m (100ft x 80ft) and the floor area is 720 m^2. The standard type storage has 1,000-ton capacity (refer to FIG.4-2).

(2) Section Plan

The height conforms to the standard Japanese type storage (Phase 4) that is, the height from the ground to the top of the floor is 3ft (about 0.9m) and the distance from the top of the floor to the roof slab bottom is 19ft (about 5.79m). A review of the state of stores constructed using aid from the Government of Japan indicates that this height causes no problems.

(3) Structural Design

The structural conforms to the standard Japanese type storage (Phase 4), that is, the body will be built with foundation, posts, beams and floor slab of reinforced concrete and the wall will be brick. Continuous footing will be used on the foundation under the outer wall and the foundation of the internal posts will be independent. The vertical load is supported by columns and brick walls.

As regards structural design, there are no regulations or standards in Bangladesh. Accordingly, it is much better to design the structure using Japanese standards bearing the conditions in mind.

1) Seismic force	K=0.05
2) Wind	Wind velocity due to cyclone: 66m/sec
3) Bearing capacity of the subsoil	6 tons/m^2

(4) Building Facility Plan

Fluorescent lamps will be provided in the stores. But lamps will be an additional aid as the work day is from 9 a.m. to 5 p.m. So the intensity of the illumination will be minimized. Incandescent lamps will be provided in this plan near to the entrance of stores for security at night.

(5) Main Building Material Plan

The foodgrain stores constructed under the aid from the Government of Japan are universally highly evaluated for their ancillary facilities and storing performance, especially their air-tightness. The Government specially requested that storage performance be maintained to as high a level in the newly constructed stores as exists in the ones built under Japanese aid. Accordingly, the specifications of roof, exterior and internal walls, ceiling, windows and doors are in conformity with the standard Japanese type storage (Phase 4).

The lime terracing on the roof is a local method of construction and acts not only as water-proofing but also as heat insulator. Vinyl paint is more air-tight than distemper plaster, and will therefore provide better storage performance.

Windows for ventilation and screen windows and doors to keep out insects are used in the rehabilitation programme by the Government of Bangladesh.

(6) Basic Design Drawings

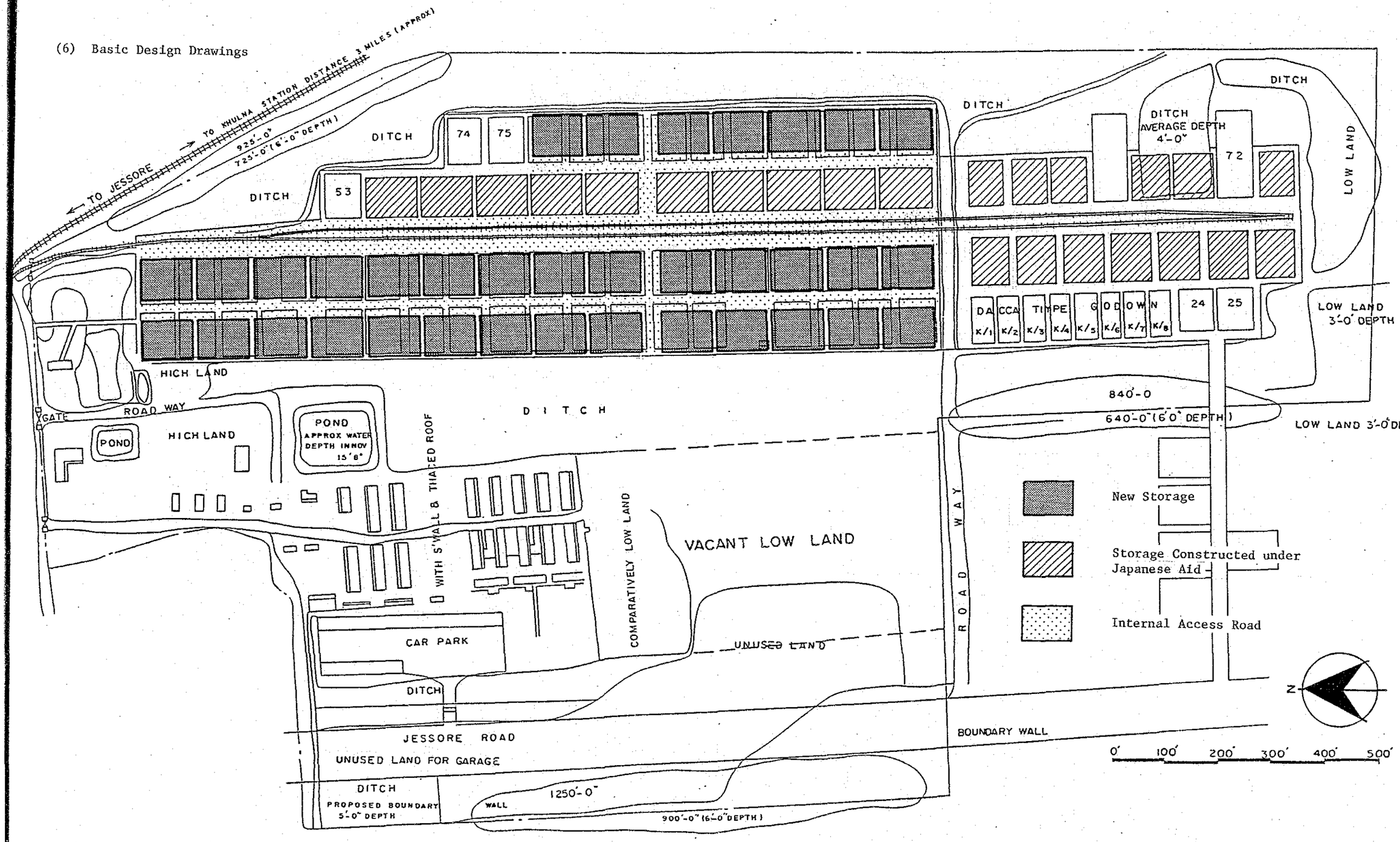
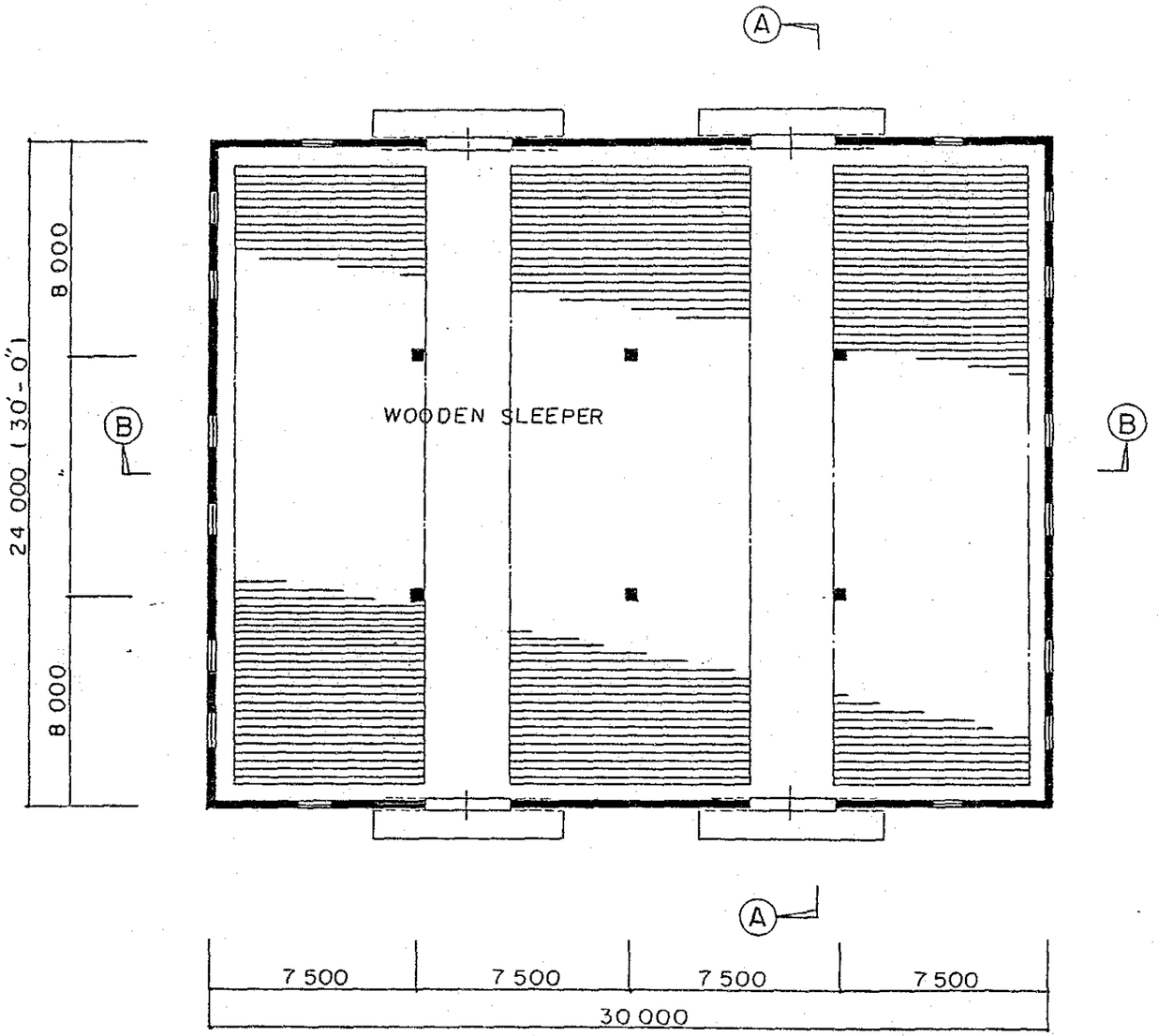
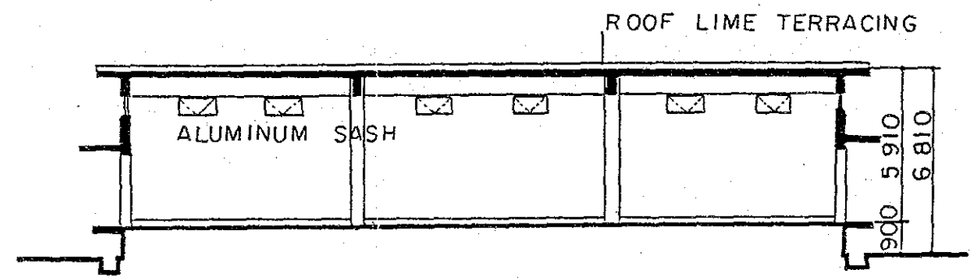


Fig. 4-1 Plot Plan



PLAN OF STORAGE S=1:200



Ⓐ-Ⓐ SECTION

Ⓑ-Ⓑ SECTION

Fig. 4-2 Plan and Section

4-4 Implementation

4-4-1 Construction Conditions

As regards the structure of buildings in Bangladesh, brick is common for low buildings, and reinforced concrete rigid-frame structures with bricks are used for buildings on a slightly larger scale and up. Specially designed structures can also be found on occasion.

Because the subsoil in almost the entire country can bear little weight, piles are used for the foundation of buildings of slightly larger scale and up, but no piles are used for buildings of four stories or less.

A long period of time should be allowed for reinforced concrete work, due to the extreme shortage of forms combined with the low capacity of concrete mixers.

A shortage of labour resulting from the active migration of skilled labours (Carpenters, Rod Mistries, Masons and Painters) to overseas areas like the Middle East, as the reflection of the national policy, is occurring these days. Since labours can get higher wages in foreign countries, the experienced laboures tend to go abroad. Islam has a religious custom of Ramadan (fasting), and in this period work efficiency in Muslim countries decreases.

4-4-2 Implementation Method

This project has been prepared on the condition that the construction contractor that is to carry out this project is to be the Japanese. The contractor should be selected in accordance with the Japanese aid system. This project shall be the turn-key type, in which one contractor carries out all work from start to finish. Subcontractors may be selected from either Japanese or Bangladeshi firms and will have to obtain the approval of the consultant. The contractor shall make a temporary work plan for the transportation of construction materials within the site so as not to disturb the operation of the Boyra CSD.

4-4-3 Supervisory Plan

The project has been prepared on condition that the consultant for this project is Japanese. The consultant should be selected in accordance with the Japanese aid system. For supervisory work, the consultant shall have a liaison office in Dhaka where the Directorate of Food, the agency in charge of this project, is located, and help in smoothing procedural matters (budgetary measures, customs formalities and etc.) of the Government of Bangladesh.

The consultant, who shall be a licensed first-class architect and have sufficient experience in the similar projects, shall be engaged in this project.

A maximum of two consultants is thought to be enough even when the project is at its busiest.

4-4-4 Procurement Plan

To reduce construction costs, local material, equipment and labour will be used as much as possible, but some may be imported if needed or if imported equipment offers better functions or economy.

(1) Bangladesh Materials and Equipment

Main construction materials, to be procured in Bangladesh, are shown hereunder. Domestic production and supply, however, are not stable enough to meet domestic demand because both demand and supply are extremely unstable. Therefore, it may be essential for the client to take measures putting priority on the supply of the items and the volume of construction materials required to complete the project within the limited construction period.

Reinforcing bars : While there are mills in Chittagong and Dhaka, the quantity and the types of product are limited. It is necessary for the client to take priority measures to ensure the

supply of the required type, quantity and quality of reinforcing bars.

Cement : There are cement producing mills in Sylhet and Chittagong. The production, however, is not enough to cover domestic demand which has rapidly increased in recent years and the supply situation is unstable. It is necessary for the client to take priority measures to ensure the supply of the required quality and quantity of cement.

Aggregate : Sand and gravel are collected in the Sylhet and Domar regions, but the size of natural gravel is not uniform, gravel is not easy to obtain, and the cost is high. Since gravel is collected in the dry season and transported on barges by river in the rainy season, depending on the timing, sometimes it can be very difficult to obtain. Accordingly, the use of crushed granite gravel or limestone or brick chips out of overburnt bricks coming out of brick production process must be considered as the concrete aggregate.

Bricks : Since brick is a typical construction material and there are many mills in Bangladesh, bricks are easily available. However, since brick production is concentrated in the dry season, care must be paid to the carefully timing a large order. There are two types of bricks: machine-made and hand-made.

(2) Imported Materials and Equipment

The main construction materials and equipment to be imported in this project are as follows:

Special windows and door	:	Entrance/exit doors of large dimensions and with sashes that require air-tightness cannot be manufactured in Bangladesh, and must be imported.
Water-proof paints	:	Water-soluble emulsion type paints are available in Bangladesh, but water-proof paints must be imported.
Dunnage	:	It is preferable to use as much domestic wood as possible, but if good quality goods for manufacturing are not available, imported wood must be used.

(3) Labour

All labour will be procured in Bangladesh other than that requiring special skills. Since no work requires special skills in constructing stores, except special window and door work, all construction is possible using labour available in Bangladesh.

4-4-5 Implementation Schedule

(1) Implementation Schedule

Fig. 4-3 shows the implementation schedule

1) Tender (4 months): During the period, the consultant agreement will be concluded between the client and the consultant, the detailed design will be reviewed by the consultant and will be approved by the client.

2) Thereafter, tender preparation, tendering and tender evaluation will be made and the construction contract will be concluded between the client and the contractor.

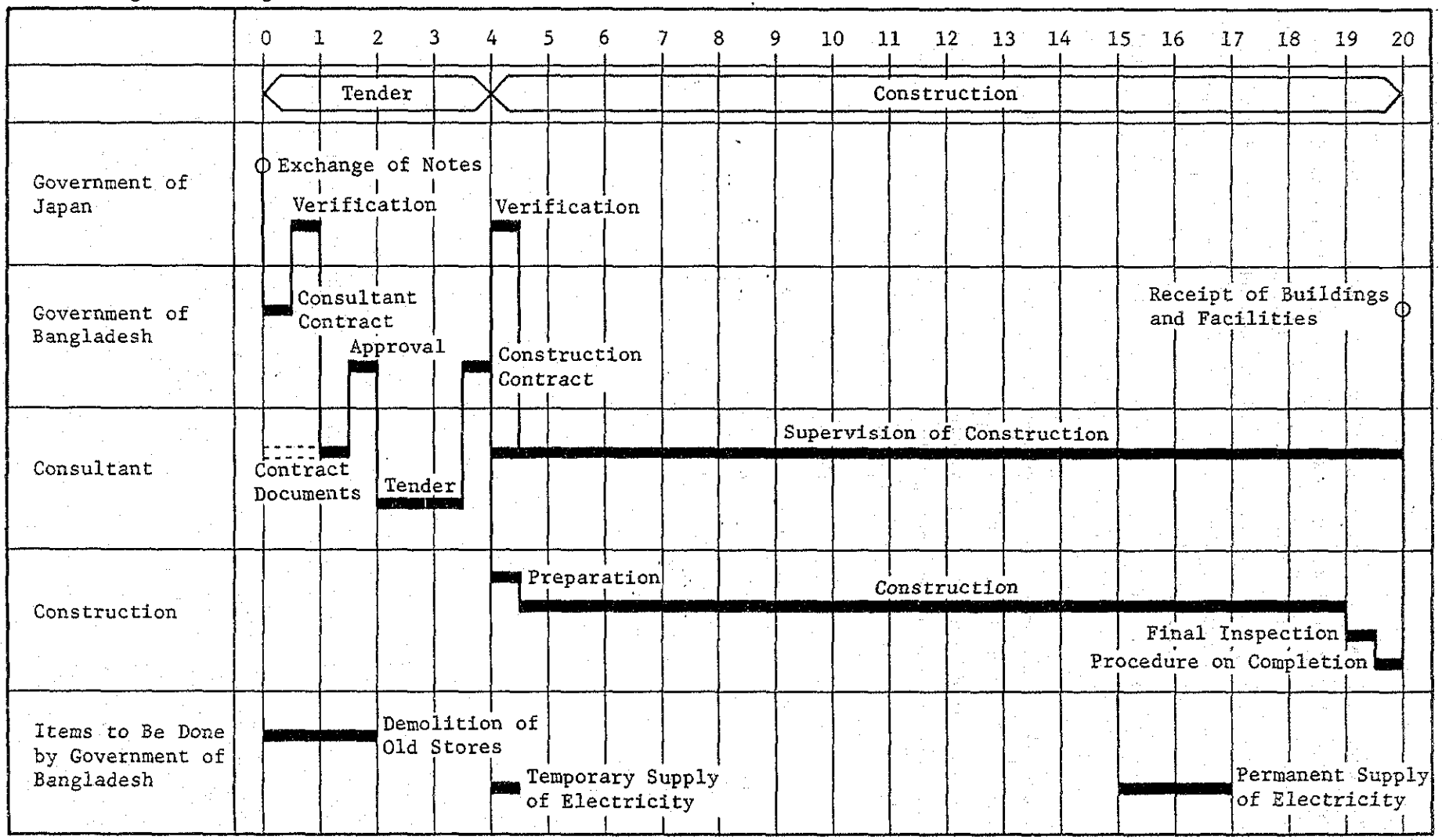
3) Construction Work (16 months): The construction work is scheduled to be completed within 16 months of the concluding of the

construction contract. This period includes the preparatory work period (0.5 month) and the period for the carrying out of procedures after completion of the construction work (0.5 month). Accordingly, the actual construction period will be 15 months. Since work progress is greatly influenced by the weather, it is essential to get the construction work under way during a dry season and complete construction during the next dry season and so utilize as much of the dry season as possible.

(2) Schedule of Items to Be Undertaken by the Government of Bangladesh

Fig. 4-3 shows the schedule of items to be carried out by the Bangladesh Government. It is necessary to complete the demolition of existing old stores and remove of demolished materials before commencement of work under Japanese aid.

Fig. 4-3 Project Schedule



4-4-6 Scope of Work

(1) Scope of Work

The range of the construction project in the Boyra CSD outlined in this basic design is as shown below:

(a) Development of land for foodgrain storage construction (including demolition of existing stores)

(b) Construction of foodgrain stores (including electrification within the stores)

(c) Construction of drainage around stores

(d) Construction of access roads to stores

(e) Installation of power supply to stores.

(2) Items to Be Undertaken by the Government of Bangladesh

Items to be undertaken by the Government of Bangladesh during the implementation of this project, as discussed with the Government of Bangladesh, are as shown below:

(a) To secure a plot of land for the construction of facilities and to clear, fill and reclaim the site before the commencement of construction.

(b) To pay commission to the Japanese foreign exchange bank for the banking services arising from the Banking Arrangement.

(c) To ensure prompt unloading and customs clearance in Bangladesh of imported materials and equipment for construction.

(d) To exempt Japanese nationals concerned from customs duties, internal taxes and other fiscal levies which may be imposed in Bangladesh on occasion of the supply of materials and services for construction.

(e) To provide and accord necessary permissions, license and other authorization required for carrying out the Project.

(f) To maintain and use properly and effectively the facilities constructed under the Aid.

(g) To bear all expenses other than those to be covered by the Aid, necessary for the construction of the facilities.

"Minutes of Discussions" on the above items have been exchanged between the Government of Bangladesh and the study team.

(3) Items to Be Undertaken by the Government of Japan

Items to be undertaken through the aid of the Government of Japan in this Basic Design are as follows:

(a) Scope of the Construction Work

1) Construction of 35 foodgrain stores of 1,000-ton capacity (including electrification within the stores)

2) Construction of drainage and access roads within the site

3) Supply of equipment (dial scales and thermometers)

(b) Transportation

Marine transportation of imported materials and equipment to the port of disembarkation in Bangladesh and inland transportation from the above port to the site.

(c) Consultant Services

1) Preparation of detailed design drawings and specifications

2) Preparation of tender documents and assistance in floating tender

3) Supervision of the construction work

4) Inspection on the procured construction materials and equipment

5) Assisting discussions and relations between participating organizations

(4) Rough Cost Estimate of Items to Be Undertaken by the Government of Bangladesh

The rough cost estimate of items to be carried out by the Government of Bangladesh is as shown below:

Bank Expenses (A/P, etc.)	:	¥ 29,400,000
Duties & taxes, etc.	:	¥517,300,000
Total	:	¥546,700,000

The cost of demolishing present old stores is offset by the income acquired in selling materials from the demolished stores the cost of electric line installation is negligible.

4-4-7 Maintenance and Management Plan

1) Present Operation Expenses

The actual operating expenses (1984/85) in the Boyra CSD are as shown below:

Salary	TK 2,000,000
Municipal Taxes	TK 489,880
Electric Bill	TK 8,400
Handling Charges	TK 2,400,000
Labour Bill	TK 24,000
Contingency Charges	TK 200,000
Total	TK 5,122,280

2) Maintenance and Management Plan and Estimate

Constant care to buildings is more important than repairing them after they are damaged. This is even more important with foodgrain storage as it is apt to be damaged earlier than other kinds of

building because of the nature of handling and storing articles. Maintenance work should be in a shorter cycle than for other kinds of building.

a) Maintenance and management plan

Painting of external wall	:	Every 5 years
Painting of internal wall and ceiling	:	Every 7 years
Painting of steel fixtures	:	Every 4 years
Repair of uneven floor and others	:	As soon as unevenness in detected
Repair of mortar of internal and external wall	:	As soon as the mortar peels off

b) Estimated maintenance and management expenses (per repair work)

Internal painting (vinyl paint)	:	90,631 TK/storage (about ¥861,000)
External painting (vinyl paint)	:	45,473 TK/storage (about ¥432,000)
Steel fixture painting (oil paint)	:	13,684 TK/storage (about ¥130,000)
Floor repairing (reinforced concrete)	:	445 TK/m^2 (about ¥4,228)
Internal and external wall mortar repairing (mortar)	:	78 TK/m^2 (about ¥741)

c) Operation expenses (per year)

Wages (1 person/storage):

TK 7,700 x 35 stores = TK 269,500 (about ¥2,560,000)

Electricity (fluorescent lamp, 40W, 4 lamps/storage
incandescent lamp, 100W, 4 lamps/storage):

TK 320 x 35 stores = TK 11,200 (about ¥106,000)

Fumigation and other expenses:

TK 5,520 x 35 stores = TK 193,200 (about ¥1,835,000)

CHAPTER 5: PROJECT EVALUATION

We have made a qualitative evaluation of the project's effect and its economic appropriateness.

1) Economic and Social Effects

The implementation of this project would increase the effective storage capacity of the Boyra CSD to 63,000 tons.

The Boyra CSD will attain the storage capacity necessary for rotating imported foodgrain supplied to the western part of Bangladesh. This will not only minimize loss of foodgrain from stock on barges but will also improve distribution through a more effective use of barges. Further, the functional layout makes effective use possible , and foodgrain distribution will be improved. It is judged that establishing a smooth supply of foodgrain will bring about invaluable effects since the role of imported foodgrain is very important in Bangladesh, where the problem of lack of storage still exists.

2) Technical Suitability

To carry out this project, the main structure and main finishing materials of the Twin-Nissen Type stores, need to be completely demolished, as a partial reconstruction will have little effect. It is more effective to demolish these stores and use the land on which these stores stood as the project site to make the most effective use of land. It is considered that the standard type designed in the fourth phase of Japanese aid is proper in size as well as storage performance for foodgrain stores to be constructed in Bangladesh. Accordingly, the design is found suitable for use.

3) Adequate Maintenance and Management

Foodgrain stores to be built can be operated by one person for each storage and, since operating does not require different techniques such as fumigation and ventilation, etc., the stores can be operated smoothly using currently available Bangladesh techniques and materials. Operating expenses per store are about ¥130,000 a year, or

about ¥4,500,000 needed to operate all 35 stores. Maintenance and management of the buildings are mainly periodic painting and when necessary, the repair of concrete and mortar. This kind of work can be managed with currently available techniques and materials. On average, expenses necessary for maintenance and management are estimated to be about ¥240,000 a year for each store, or about ¥8,400,000 a year for all 35 stores. It is recognized that the Government of Bangladesh can manage the expenses.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

It is found that this project should be carried out under Japanese aid since it will greatly contribute to the stabilization of people's lives through the stable supply of foodgrain. Further, there are no staff or budget problems in operating and managing this project.

However, in the event that the following items are improved and maintained, this project will run more smoothly and effectively.

(1) Recommendations on Project Implementation

1) Setting up a project implementation system
Since the project site is very far from Dhaka, the capital of Bangladesh, a person in the Ministry of Food responsible for project implementation and responsible technical staff at the site of the project must be found to act as a liaison between the Government, and the project site.

2) Preparation of Project Land
This construction project schedule has been prepared based on the premise that the Government of Bangladesh will develop the project site so that it is ready for construction before the tender notice to contractors. Based on this schedule, the demolition of the existing old stores, the removal of material and land reclamation etc. must be carried out.

3) Promotion of Necessary Procedures
All procedures required for implementing all work contained in this project must be completed as quickly as possible.
Custom's clearance of imported materials and equipment, payment of necessary taxes, duties and fiscal levies for import, transportation from the port to the pertinent construction site, all of which are to be implemented at the expense of the Government of Bangladesh, are especially important for the smooth progress of the construction schedule. Necessary procedures for these items must be completed as quickly as possible.

(2) Recommendations on Maintenance and Management

This is even more important with foodgrain stores as they are apt to be damaged earlier than the other kinds of building because of such particularities in how they are used, such as heavy articles being stored and the frequent movement of their contents. Damage to these stores will occur faster than to any buildings put to other use. It is deemed most important to carry out repairs before damage becomes too serious, after each periodic inspection. Since, in the past, these inspections and repairs have not been properly done, a shortage of effective storage capacity has emerged. The Government of Bangladesh has prepared a budget for the maintenance and management, and in order to effectively carry it out, the preparation of a programme of maintenance and management, the employment of full-time staff and periodic inspections must be made before damage becomes serious.

(3) Recommendations on Storage Control of Foodgrain

At present, there is a lack of data on the storage control of foodgrain. Especially, ventilation in stores which is necessary to control the quality, depends on staff experience. Although doors and windows may open or shut, the essential point for keeping foodgrain in good condition is to control the temperature. In addition, temperature and humidity in and outside stores must be checked and quality control of the foodgrain can be carried out by adjusting the ventilation. Weighing incoming and outgoing foodgrain is necessary for the proper distribution of grain. Since dial scales, thermometers and hydrometers will be installed in this project, proper storage maintenance and management will be easy.

APPENDIX

Appendix 1 MINUTES OF DISCUSSIONS

MINUTES OF DISCUSSIONS
ON
THE CONSTRUCTION PROJECT OF FOODGRAIN STORAGE
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH

In response to the request made by the Government of the People's Republic of Bangladesh for the grant assistance for the construction of foodgrain storages (hereinafter referred to as "the Project"), the Government of Japan has determined to conduct a basic design study on the Project.

Japan International Cooperation Agency (hereinafter referred to as "JICA") which is an official agency implementing the technical cooperation of the Government of Japan, has sent a team headed by Mr. Yoshimi OISHI, Deputy Director, Purchase Division, Operation Department, Food Agency, Ministry of Agriculture, Forestry and Fisheries, to carry out the basic design study for 14 days from July 4th to 17th, 1985.

The team has carried out the field survey, held a series of discussions and exchanged views with the authorities concerned of the Project.

On the basis of the survey and discussions, both parties have agreed to recommend to their respective Governments to examine the results of the study attached herewith toward the realization of the Project.

Dhaka, July 13th, 1985

Mr. Yoshimi OISHI
Leader, Basic Design Study Team,
JICA.

13/7/85

Mr. S.A. Farooq CHOUDHURY
Director General,
Food Directorate,
Ministry of Food

Saiyed Khairul Farouk Chowdhury
Director-General
Ministry of Food, Dhaka.

ATTACHMENT

1. The objective of the Project is to construct the foodgrain storages of proper capacity after dismantling the existing decrepit storages at Boyra CSD in order to improve the present storing condition and to consequently ensure the steady food supply.

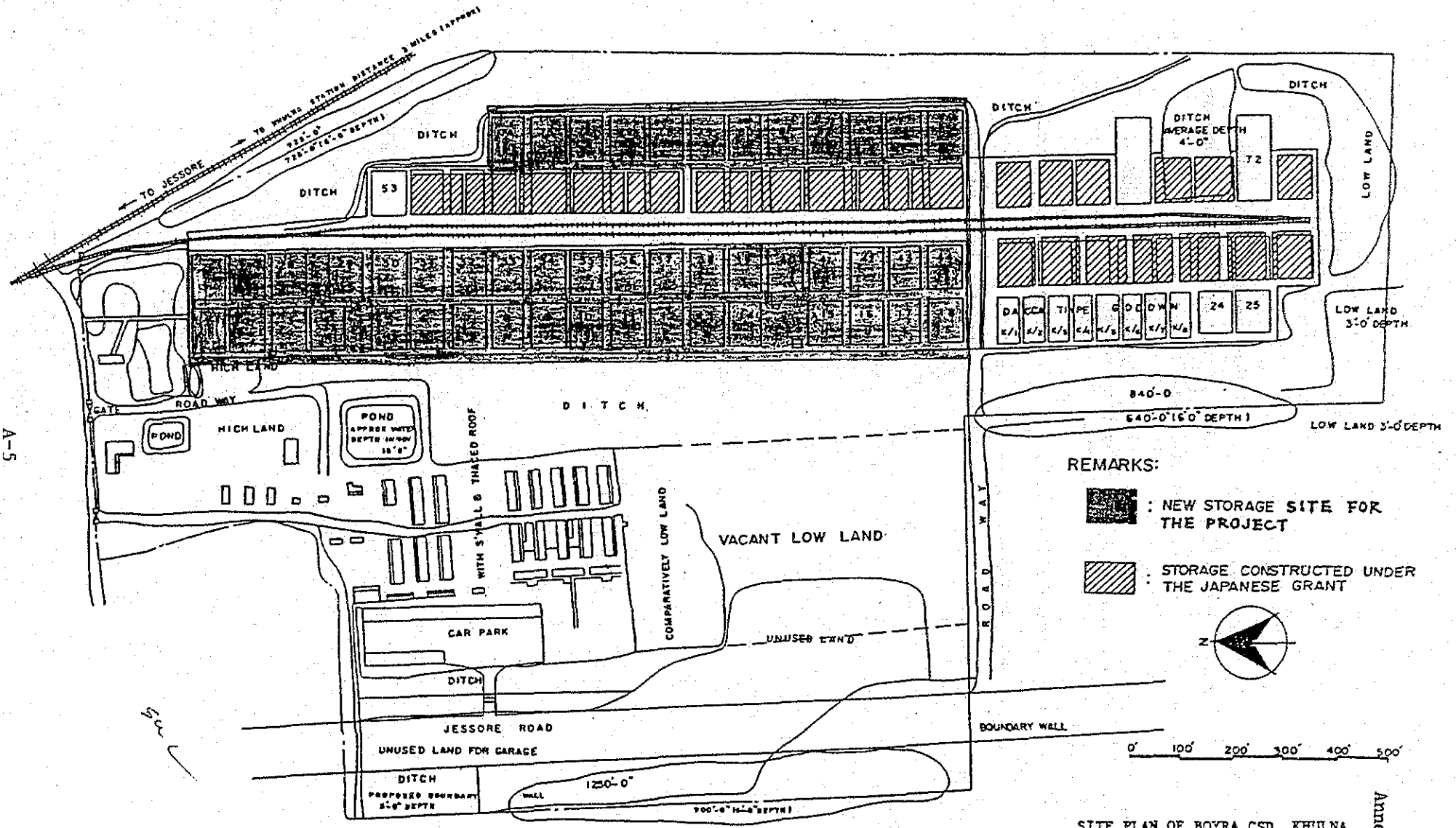
2. The proposed site of the Project is within the site of Boyra CSD located at Khulna District, as shown in Annex I.

3. The Ministry of Food will be the executing organization responsible for the preparatory work and the construction work of the Project.

4. The team will convey to the Government of Japan the desire of the Government of Bangladesh that the former takes necessary measures to cooperate in implementing the Project and bears the cost of the facilities requested by the latter listed in Annex II within the scope of Japanese economic cooperation in grant form.

5. The government of Bangladesh will take necessary measures listed in Annex III on condition that the grant aid by the Government of Japan is extended to the Project.

6. Both parties confirmed that the Dhaka type storage of 1,000 ton capacity would be adopted for the basic design of the Project.



SITE PLAN OF BOYRA CSD, KHULNA

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Annex I

Annex II

Requested facilities of the Project by the Government of Bangladesh are as follows :

1. 35,000 ton capacity foodgrain storages.

2. Required ancillary facilities including drainage, access road inside the site.

Annex III

Major undertakings to be taken by the Government of Bangladesh are as follows :

1. To secure a lot of land for the construction of facilities and to clear, fill and reclaim the site before the commencement of construction.

2. To bear commission to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

3. To ensure prompt unloading and customs clearance in Bangladesh of imported materials and equipment for the construction.

4. Exemption of Japanese nationals concerned from customs duties, internal taxes and other fiscal levies which may be imposed in Bangladesh on occasion of the supply of materials and services for construction will be decided on the basis of the provision in this behalf in the notes to be exchanged between the Governments of Japan and Bangladesh.

5. To provide and accord necessary permissions, license and other authorization required for carrying out the Project.

6. To maintain and use properly and effectively the facilities constructed under the Grant.

7. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities.

Appendix 2 OUTLINE OF STUDY

1. Formation of Basic Design Study Team
2. Itinerary of Study
3. List of Interviewees
4. List of Collected Information

1. Formation of Basic Design Study Team

Yoshimi OISHI	Team Leader	Deputy Director Purchase Division Operation Department Food Agency Ministry of Agriculture, Forestry and Fisheries
Yoshihide TERANISHI	Project Coordinator	1st Basic Design Study Division Grant Aid Planning & Survey Department Japan International Cooperation Agency
Kiichi KOBAYASHI	Structural Engineer	Architecture Division Japan Engineering Consultants Co., Ltd.
Mitsuo TAKAHASHI	Architect	Overseas Division Japan Engineering Consultants Co., Ltd.

2. Itinerary of Study

Day in ( ) indicates a holiday

No.	Date/Day	Schedule	Contents of Study
1	Jul. 4 Thur.	by air Tokyo ⟶ Bangkok	
2	5 (Fri.)	by air Bangkok ⟶ Dhaka	
3	6 Sat.	Dhaka	Courtesy visit to ERD and Ministry of Food Discussion on study itinerary, policy and request, etc.
4	7 Sun.	- do -	Discussion with Ministry of Food Courtesy visit to Planning Commission and Embassy of Japan
5	8 Mon.	by air / by land Dhaka ⟶ Jessore ⟶ Khulna	Visit to Boyra CSD, Visit to Chalna Port
6	9 Tues.	by land / by air Khulna ⟶ Jessore ⟶ Dhaka	Visit to Meheswarpasha CSD
7	10 Wed.	Dhaka	Discussion with Planning Commission and Ministry of Food
8	11 Thur.	- do -	Discussion with Ministry of Food
9	12 (Fri.)	- do -	Discussion in Team
10	13 Sat.	- do -	Discussion with Ministry of Food, Signing of Minutes
11	14 Sun.	Teranishi: by air Dhaka ⟶ Bangkok	Report to Embassy of Japan and JICA Office
		Oishi, Kobayashi and Takahashi: Dhaka	Visit to Tejgaon CSD
12	15 Mon.	Dhaka	Collection of Data in Ministry of Food
13	16 Tues.	by air Dhaka ⟶ Bangkok	Discussion with PWD
14	17 Wed.	by air Bangkok ⟶ Tokyo	

NOTES: ERD; External Resources Division, Ministry of Finance
PWD; Public Works Department, Ministry of Public Works and Urban Development

3. List of Interviewees

1) E.R.D.

Mr. M. Akhtar Ali	Joint Secretary

2) Planning Commission

Dr. Altaf Ali	Division Chief
Dr. Nurul Islam	Joint Chief (Agriculture)

3) Ministry of Food

Mr. A. K. M. Kamaluddin Choudhury	Secretary
Mr. I. U. Malik	Joint Secretary
Mr. A. W. Nuruddin	Deputy Secretary
Mr. S. R. Alam	Deputy Chief Planning Cell
Mr. Fakrul Ahsan	Assistant Chief, Planning Cell
Mr. Manwarul Haq	Executive Engineer

4) Directorate, Ministry of Food

Mr. S. A. Farooq Choudhury	Director General
Mr. Maruf Morshed	Additional Director General
Mr. A. K. M. Nurul Afsar	Director, Inspection Development and Technical Service (IDTS)
Mr. Entazul Haque	Additional Director, IDTS
Mr. Monwar Hossain	Deputy Director, IDTS
Mr. Golam Mohiuddin	Additional Director, Management Information System & Monitoring

5) Khulna

Mr. M. S. Satter	Regional Controller of Food
Mr. Mohafez Ali	Controller of Movement and Storage

6) Boyra CSD

MR. P. C. Bhuiya	Manager

7) Maheswarpasha CSD

Mr. A. K. M. Rafiqul Alam	Manager

8) Tejgaon CSD

Mr. Ali Haidar	Manager

9) PWD

Mr. A. F. M. Sharfuddin	Additional Chief Engineer

4. List of Collected Information

(1) Supply-Demand of Foodgrain

1) Foodgrain production
2) Foodgrain requirement and supply
3) Foodgrain procurement
4) Foodgrain import
5) Foodgrain stock
6) Foodgrain distribution
7) Foodgrain ration and sales

(2) Existing Conditions of Foodgrain Storage

1) Existing storage position
2) Additional storage requirement (1984/85)

Existing Utilizing Conditions of Foodgrain Storage

(3) Existing Utilizing Conditions of Foodgrain Storage

1) Existing utilizing condition of storage, Boyra CSD
2) " ,Maheswarpasha CSD
3) " ,Teigaon CSD

Specifications on Foodgrain Storage Construction

(4) Specifications on Foodgrain Storage Construction

1) Schedule of rate, Fifth Edition, Effective from Dec. 1, 1983, PWD
2) Project Proforma, Construction of foodgrain store houses under assistance of ADB from 1979 to 1984
3) Project Proforma, Construction of food storage godown under EEC assistance from 1981 to 1985
4) Project Proforma, Construction of foodgrain storage under CIDA Grant from 1981 to 1985
5) Project Proforma, Construction of foodgrain storage financed by IDA from 1978 to 1984
6) Project Paper, Construction of concrete silo at Chalna Port from 1982 to 1986

(5) Maintenance and Repair of Foodgrain Storage

1) Statement showing budget provision and actual expenditure on maintenance and repair of food godowns

Appendix 3 DATA ON FOODGRAIN STORAGE CONSTRUCTION

1. Procurement of Foodgrain by District (1974/75 - 1983/84)
2. Estimated Government Foodgrain Stock (1972/73 - 1984/85)
3. Statements of Prices
4. Existing Capacity of Stores
5. Storage Construction Programme as at June, 1984
6. Foodgrain Storage Construction Project under Foreign Aid
7. Annual Operating/Recurring/Maintenance Expenditure
8. Railway Network
9. Road Network
10. Waterways

1. PROCUREMENT OF FOODGRAINS BY DISTRICT (SUMMARY), 1974/75 = 1983/84

(in Tons of rice equivalent)

Division/District	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Rajshahi	73,130	196,813	175,009	236,803	164,580	209,742	482,009	174,117	121,342	227,259
Dinajpur	34,213	79,233	75,160	89,458	65,859	61,205	190,455	87,126	54,771	99,509
Rangpur	16,252	41,990	32,675	51,419	20,185	37,499	82,315	24,609	26,285	66,962
Bogra	8,368	23,749	19,944	26,676	19,320	33,012	50,479	13,576	20,433	35,802
Rajshahi	13,686	43,999	42,352	65,200	54,658	58,671	122,793	41,780	14,416	14,207
Pabna	611	7,842	4,878	4,050	4,558	19,355	35,967	7,026	5,372	10,779
Khulna	33,428	87,535	44,653	111,259	40,776	44,287	108,035	7,641	12,018	13,910
Kushtia	1,066	8,878	3,079	2,188	3,106	9,177	10,279	1,062	340	1,428
Jessore	1,733	14,827	3,074	7,793	5,652	8,745	8,130	115	2,663	5,146
Khulna	10,511	21,778	10,789	15,016	2,118	6,865	25,914	1,986	1,014	1,002
Barisal	4,029	15,776	13,627	30,310	11,318	5,837	27,039	612	1,982	2,422
Patuakhali	16,089	26,276	14,084	55,952	18,582	13,663	36,673	3,866	6,019	3,912
Dhaka	9,593	63,131	41,213	90,305	64,220	55,179	201,135	64,257	31,383	16,374
Jamalpur /a	)	)	)	)	3,771	8,520	35,076	7,650	5,460	5,104
Mymensingh	)8,828	)52,557	)37,898	)86,341	47,002	28,204	99,590	29,067	17,934	8,375
Tangail	202	2,551	365	1,550	1,938	4,788	22,869	5,644	2,200	1,384
Dhaka	526	4,485	1,518	1,705	10,655	11,487	38,235	21,611	5,278	1,295
Faridpur	37	3,538	1,432	709	854	2,180	5,365	5,365	511	216
Chittagong	11,711	67,478	52,731	112,073	85,587	39,269	225,554	52,405	27,337	9,139
Sylhet	4,049	33,376	28,712	39,807	34,705	13,512	92,320	27,234	12,164	3,099
Comilla	455	13,326	5,953	19,016	25,868	16,372	41,725	13,410	8,234	3,027
Noakhali	2,627	11,587	9,818	22,746	8,592	2,577	45,844	1,142	3,426	1,574
Chittagong	3,950	8,270	7,128	25,884	12,575	4,417	29,561	3,296	1,640	257
Chittagong Hill Tracts	630	919	1,120	4,620	3,847	2,391	16,104	7,323	1,873	1,182
Total	127,862	414,957	313,606	550,440	355,163	348,477	1,016,733	298,240	192,080	266,682

/a Jamalpur was a subdivision of Mymensingh until December 26, 1978.

Note: All grains procured are shown here expressed in terms of "rice equivalent"; i.e., 1 unit of wheat equals 1 unit of cleaned rice and 3 units of paddy procured equal 2 units of cleaned rice. (For 1974/75, a paddy/rice conversion ratio of 1 to 0.65 was used.)

Source: Ministry of Food.

2. ESTIMATED GOVERNMENT FOODGRAIN STOCKS (END OF MONTH), 1972/73 - 1984/85

('000 long tons)

Month	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85
July	456	218	349	661	768	415	584	383	1,026	1,235	721	761	754
August	362	199	386	635	714	558	577	601	1,225	1,198	820	819	671
September	332	223	206	601	644	626	559	818	1,268	1,388	804	811	541
October	214	330	162	649	547	547	674	709	1,274	1,343	695	679	600
November	219	267	130	707	437	522	823	677	1,236	1,062	705	506	750
December	136	267	181	902	420	714	848	726	1,344	987	866	455	801
January	214	189	319	949	503	756	767	642	1,388	907	904	585	845
February	535	171	224	990	509	688	688	502	1,324	685	818	521	
March	493	138	252	931	407	627	502	558	1,255	610	684	567	
April	374	182	282	822	304	557	424	470	1,252	568	640	554	
May	298	210	438	802	296	611	289	582	1,169	514	623	775	
June	297	214	729	823	376	591	209	779	1,229	615	630	784	
Average	327	217	305	789	494	601	579	621	1,248	926	743	651	709
High	535	330	729	990	768	756	848	818	1,388	1,388	904	819	845
Low	136	138	130	601	296	415	209	383	1,026	514	623	455	541

Source: Ministry of Food.

3. Statement of Prices

(Unit: Taka/Maund)

	Procurement Prices			Distribution Prices	
	Paddy	Rice	Wheat	Rice	Wheat
Jul	74	118	-	90	70
Nov.	80	128	80		
Dec.				110	80
Jul. 1978				100	
Apr. 1979			86		
May	86	136		120	90
Jul.	96	154			
Nov.	105	165	105		
May 1980				140	110
Nov.	110	170	110		
Apr. 1981				155	116
Dec.	119	185	119	175	124
Jul. 1982				195	134
Nov.	130	205	130		
Jan. 1983				215	145
Nov.	139	220	139		
Jan. 1984				235	155
Nov.	160	243			
Dec.				268	
Mar. 1985			162		
May					173

4. Existing Capacity of Stores

(JUNE 30, 1984)

(Unit: Thousand tons)

Division	District	C S D		L S D		Silo	
		Nos.	Capacity	Nos.	Capacity	Nos.	Capacity
Dhaka	Dhaka	3	67.75	33	60.12	1	50.5
	Mymensingh	1	28.56	47	76.03		
	Jamalpur			13	31.54		
	Tangail			13	33.14		
	Faridpur			32	64.92		
Chittagong	Chittagong	2	123.88	22	46.12	1	100.5
	Chittagong Hilltracks			27	15.8		
	Sylhet			50	71.06		
	Noakhali			22	40.95		
	Comilla	1	14.00	34	58.44	1	50.5
Rajshahi	Rajshahi			44	87.112		
	Rangpur			42	85.716		
	Dinajpur			41	103.843		
	Bogra	1	40.20	24	45.668	1	25.0
	Pabna	1	35.06	18	42.78		
Khulna	Khulna	2	134.00	30	45.74		
	Kushtia			16	36.03		
	Patuakhali			26	49.78		
	Barisal	1	22.78	41	65.225		
	Jessore			28	47.956		
Total		12	466.23	603	1,107.97	4	226.5

Remarks: 1. Salt storages are not involved in the above table.

2. Source: Ministry of Food

5. Storage Construction Programme as at June, 1984
(As far as studied in Project Proforma)

	IDA	ADB	EC	Netherland	CIDA	Total
DHAKA DIV.	27,500	-	7,000	-	12,000	46,500
Dhaka	2,000	-	-	-	6,500	8,500
Mymensingh	15,500	-	-	-	-	15,500
Faridpur	4,500	-	5,000	-	2,000	11,500
Tangail	1,000	-	2,000	-	3,500	6,500
Jamalpur	4,500	-	-	-		4,500
CHITTAGONG DIV.	17,500	-	23,000	11,500	6,000	58,000
Chittagong	-	-	5,000	-	5,500	10,500
Chittagong H.T.	-	-	-	-	500	500
Comilla	-	-	6,000	7,000	-	13,000
Noakhali	2,000	-	7,000	4,500	-	13,500
Sylhet	15,500	-	5,000	-	-	20,500
RAJSHAHI DIV.	111,000	-	12,000	-	-	123,000
Rajshahi	26,000	-	-	-	-	26,000
Rangpur	34,500	-	5,000	-	-	39,500
Dinajpur	39,500	-	-	-	-	39,500
Bogra	9,500	-	-	-	-	9,500
Pabna	1,500	-	7,000	-	-	8,500
KHULNA DIV.	8,000	62,500	6,000	-	7,000	83,500
Khulna	500	-	6,000	-	-	6,500
Jessore	4,500	-	-	-	7,000	11,500
Kushtia	3,000	-	-	-	-	3,000
Barisal	-	33,000	-	-	-	33,000
Patuakhali	-	29,500	-	-	-	29,500
Total	164,000	62,500	48,000	11,500	25,000	311,000

6 Foodgrain Storage Construction Project under Foreign Aid

Remarks: $1.00=TK24

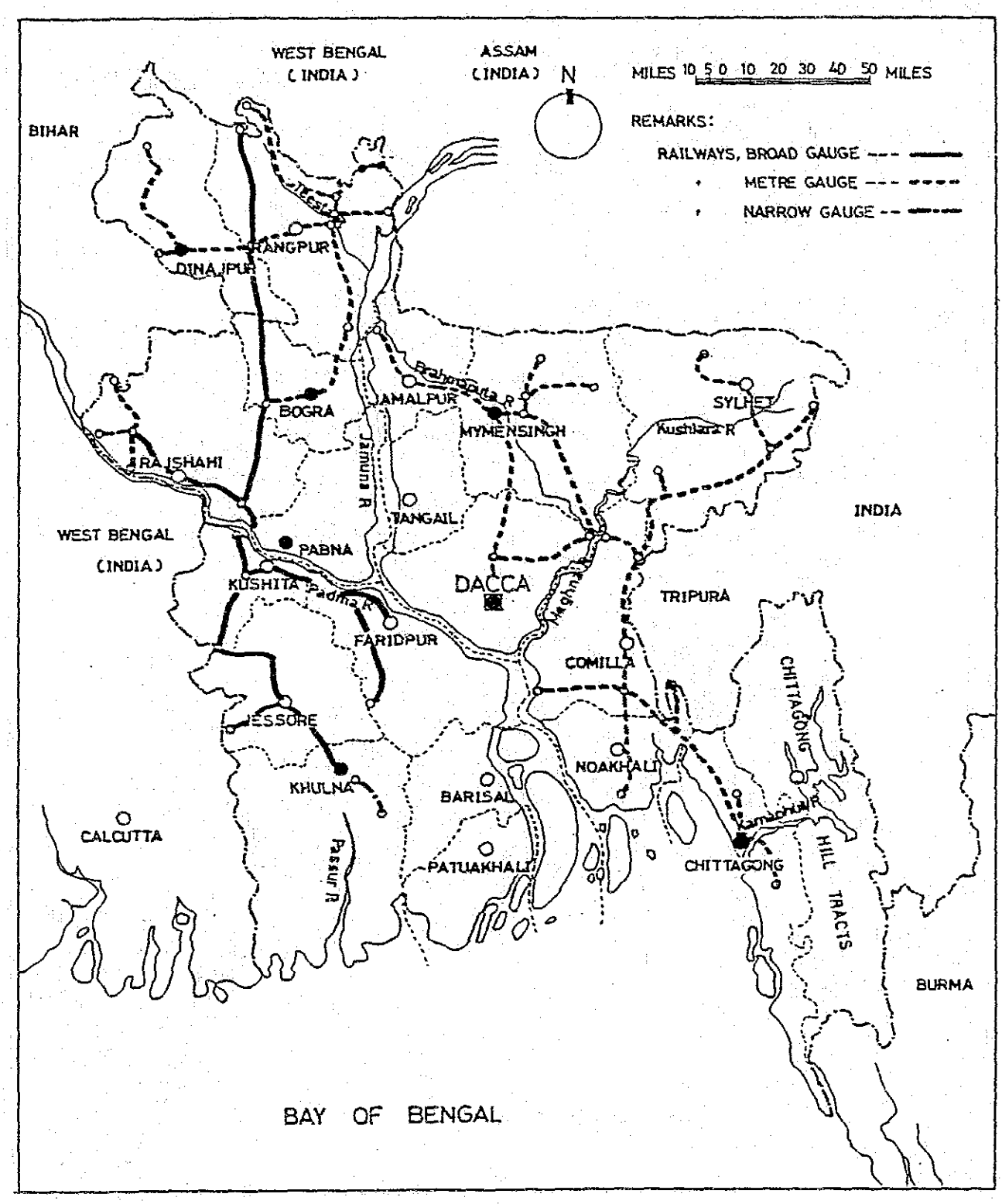
(a) Total Project Cost (b) Total Aid Cost	(c) Project Period	(d) Number of Proposed Storage (e) District and Capacity	(f) Items of the Project
(1) IDA-credit Second Foodgrain Storage Construction Project(Revised Scheme)			
TK 711,508,000 ($28,460,320) --- TK 484,772,000 ($19,390,880)	Jul. 1 '78 Jan. 30 '84	175 LSDs (15 Districts) --- District ton / District tons Jamalpur 4,500 / Faridpur 4,500 Mymensingh 15,500 / Tangail 1,000 Sylhet 15,500 / Pabna 1,500 Rajshahi 26,000 / Khulna 500 Bogra 9,500 / Jessore 4,500 Dinajpur 39,500 / Kushtia 3,000 Rangpur 34,500 / Noakali 2,000 Dhaka 2,000	1) Storage (165,000 tons) 2) Rehabilitation 3) Ancillary building 4) Boundary wall 5) Drying yard 6) Zonal laboratories 7) Supply of machinaries and equipment 8) Consultant and training
(2) ADB-grant Foodgrain Storage Project(Revised Scheme)			
TK275,000,000 ($11,000,000) --- TK213,500,000 ($85,400,000)	Jul. 1 '79 Jun. 30 '84	63 LSDs (2 Districts) 500 tons x 125 stores = 62,500 tons --- District tons Patuakhali 29,500 Barisal 33,000	1) Storage (62,500 tons) 2) Staff quarter 3) Darwan shed 4) Internal & approach roads, boundary wall and drying yard, etc. 5) Electrification and other facilities 6) Supply of machinaries and equipment 7) Consultant

(a) Total Project Cost (b) Total Aid Cost	(c) Project Period	(d) Number of Proposed Storage (e) District and Capacity	(f) Items of the Project
(3) EC-grant Foodgrain Storage Project (Revised Scheme)			
TK189,941,000 ($7,597,640) --- TK182,400,000 ($7,296,000)	Jan. 1 '81 Jun. 30 '85	9 Districts 1,000 tons x 48 stores = 48,000 tons --- District / tons / District / tons Rangpar 5,000 / Pabna 7,000 Comilla 6,000 / Chittagong 5,000 Noakhali 7,000 / Khulna 6,000 Sylhet 5,000 / Tangail 2,000 Faridpur 5,000	1) Storage (48,000 tons) 2) Staff quarter 3) Internal & approach roads and wall 4) Water and other facilities 5) Electrification 6) Railway siding 7) Consaltant
(4) CIDA-grant Foodgrain Storage Project(Revised Scheme)			
TK89,300,000 ($3,572,000) --- TK80,000,000 ($3,200,000)	Jan 1 '81 Dec. 31, 84 (The project is expected to be completed by March 1985)	30 LSDs(6 Districts) 500 tons x 50 stores = 25,000 tons --- District / tons Dhaka 6,500 Chittagong 5,500 Bandarban 500 Faridpur 2,000 Jessore 7,000 Tangail 3,500	1) Storage (25,000 tons) 2) Staff quarter 3) Internal & approch roads and bridge 4) Boundary wall 5) Drying yard 6) Electrification 7) Supply of machinaries and equipment 8) Consultant and training

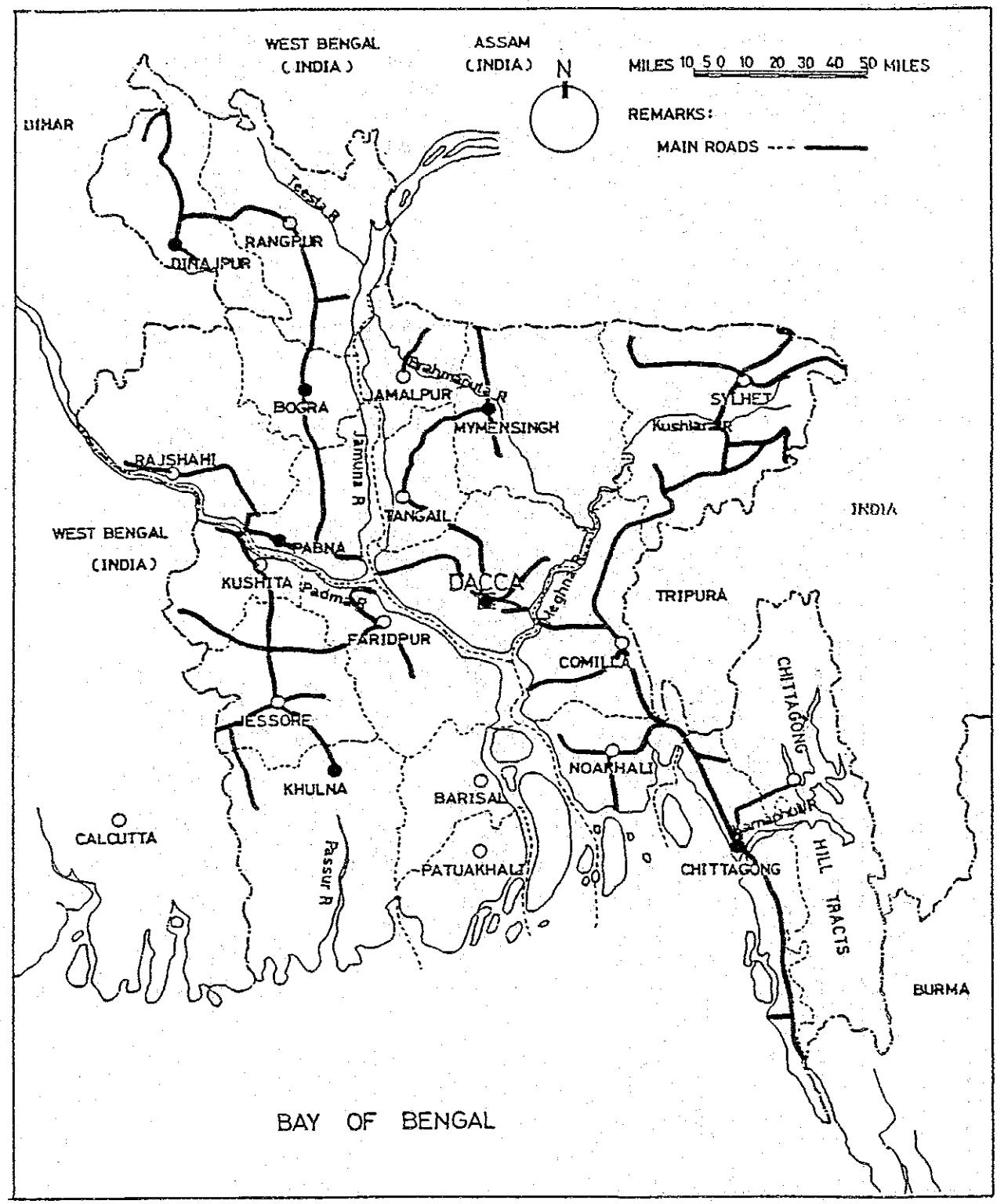
7. Annual Operating/Recurring/Maintenance Expenditure (in Lakh Taka)

	IDA Project			ADB Project			EC Project			Netherlands Project			CIDA (Canada) Project		
	Local	F.E.	Total	Local	F.E.	Total	Local	F.E.	Total	Local	F.E.	Total	Local	F.E.	Total
I. Raw material and supply	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
a) Locally procured/produced raw material, supplies and spares	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
II. Fuel	7.30	—	7.30	—	—	—	—	—	—	—	—	—	0.30	—	0.30
a) Local fuel and power	7.30	—	7.30	—	—	—	—	—	—	—	—	—	0.30		0.30
III. Labour cost	30.00	—	30.00	10.00	—	10.00	—	—	—	0.50	—	0.50	1.20	—	1.20
a) Local technical and administrative staff	30.00	—	30.00	10.00	—	10.00	—	—	—	0.50	—	0.50	1.20	—	1.20
b) Skilled labour	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
c) Unskilled labour	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
IV. Other cost	21.50	30.00	51.50	21.00	—	21.00	33.83	—	33.83	2.50	—	2.50	11.00	—	11.00
a) Maintenance	20.00	30.00	50.00	17.00	—	17.00	33.83	—	33.83	2.00	—	2.00	10.00	—	10.00
b) Contingencies	1.50	—	1.50	3.00	—	3.00	—	—	—	0.50	—	0.50	1.00	—	1.00
c) Taxes	—	—	—	1.00	—	1.00	—	—	—	—	—	—	—	—	—
	58.80	30.00	88.80	31.00	—	31.00	33.83	—	33.83	3.00	—	3.00	12.50	—	12.50

8. Railway Network



9. Road Network



10. Waterways