BASIC DESIGN STUDY REPORT
ON
THE RICE SEED & GENETIC RESOURCES LABORATORY PROJECT
OF
THE BANGLADESH RICE RESEARCH INSTITUTE
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH

JUNE 1983

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

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 survey on the Rice Seed and Genetic Resources Laboratory Project and entrusted the survey to the Japan International Cooperation Agency (JICA). The JICA sent to Bangladesh a survey team headed by Dr. Masahiro NAKAGAWARA (Senior Scientist Field Crops Division, Hokuriku National Agricultural Experiment Station, Ministry of Agriculture, Forestry and Fisheries) from February 21 to March 12, 1983.

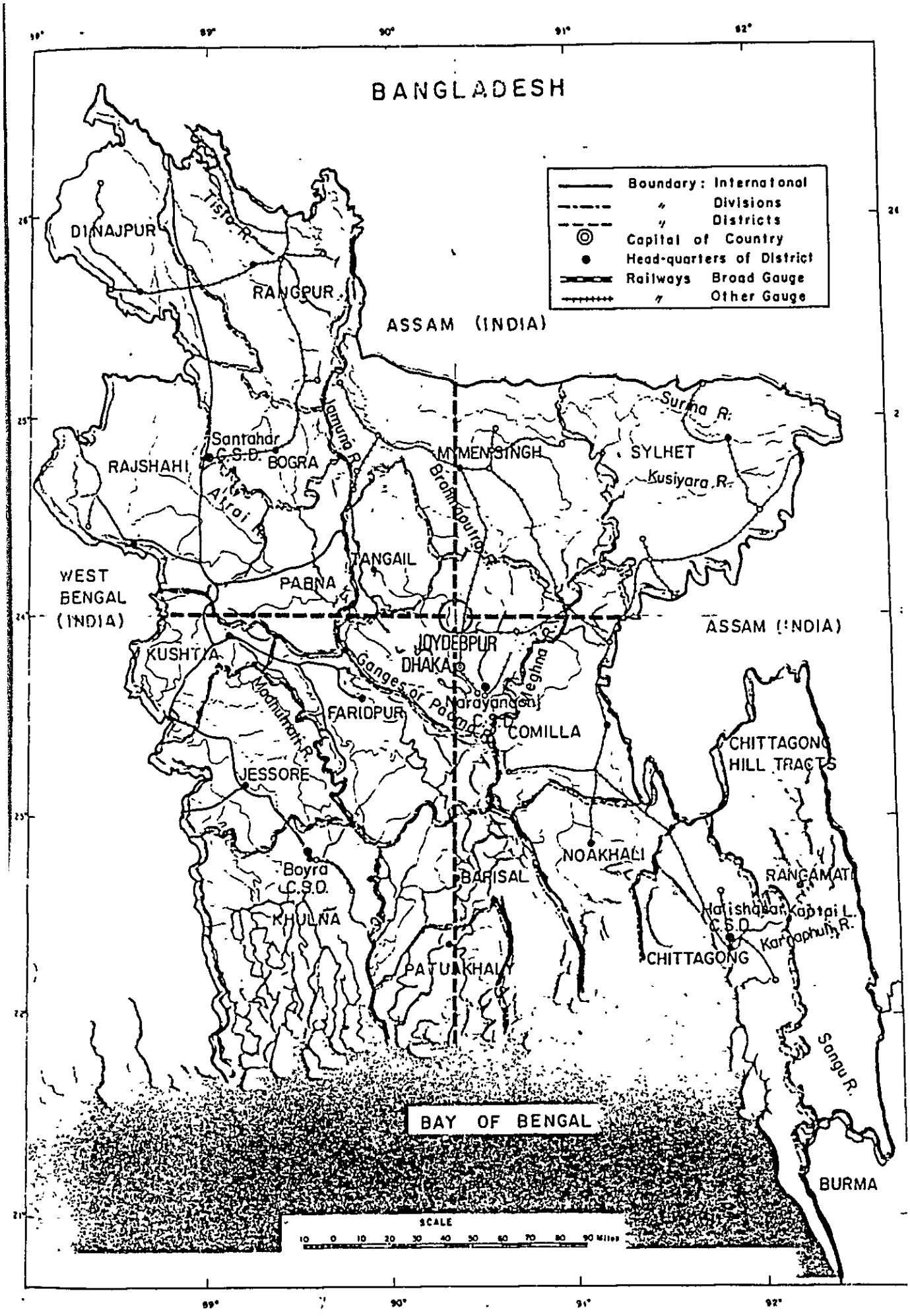
The team had discussions with the officials concerned of the Government of Bangladesh and conducted a field survey in Joydebpur, Dhaka. After the team returned to Japan, further studies were made and the present report has been prepared.

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.

June, 1983

Keisuke Arita
President
Japan International Cooperation Agency


BANGLADESH
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.
Santahar C.S.D.
BOGRA
RAJSHAHI
Atrai R.
MYMENSINGH
Brahmaputra R.
SYLHET
Kusiyara R.
TANGAIL
PABNA
WEST BENGAL (INDIA)
ASSAM (INDIA)
KUSHTIA
JOYDEBPUR
DHAKA
Ganges or Padma R.
Meghna
Narayanganj C.S.D.
Madhumati R.
FARIDPUR
COMILLA
CHITTAGONG HILL TRACTS
JESSORE
NOAKHALI
Boyra C.S.D.
BARISAL
RANGAMATI
KHULNA
Halishahar C.S.D.
Karnaphuli R.
CHITTAGONG
PATUAKHALI
Sangu R.
BAY OF BENGAL
BURMA
SCALE
10 0 10 20 30 40 50 60 70 80 90 Miles

SUMMARY

The People's Republic of Bangladesh is an agricultural country covering the land area of about 144,000 km^2 with 90 million population in which over 70% of total labour force engages in farming. Although about 80% of all cultivated area is used for the production of rice, the productivity of rice is low. This is caused the heavy import of food stuffs bringing about pressure to Bangladesh's economy.

Under these circumstances, Bangladesh has been implementing in the Second Five-Year Plan a scheme to attain food self-sufficiency by doubling the present irrigation area and introducing High Yielding Variety (HYV) of rice to the area.

The irrigation scheme in the Plan covers 25% of all cultivated area, and the remaining 75% is left as a rain-fed field. Therefore, the development of Local Improved Variety (LIV) is strongly required for the increase of productivity.

At present, the Bangladesh Rice Research Institute (BRRI) has carried out breeding research under the Plan and conserves the seed stock of approximately 4,000 varieties for breeding material, however, the serious concern is given to the future utilization of the facilities because of its unfavorable condition for research activities.

The Government of Bangladesh made request to the Government of Japan for extending a grant aid of the Expansion of Rice Seed and Genetic Resources Laboratory of BRRI. In response to the request, the Government of Japan has decided to send a basic design study team through Japan International Cooperation Agency (JICA) to conduct a field survey of the Project for a period from February 21 to March 12, 1983 in Bangladesh.

The proposed site is situated on BRRI campus, the institute belonging to the Ministry of Agriculture, in Joydebpur, 25 km north from Dhaka, and the facilities for infrastractures concerned are secured nearby.

The Project has been designed on the basis of the following points: low maintenance cost, efficient utilization of space and utmost security. In connection with these points, a method of rice seed conservation utilizing desiccant agents in an air tight glass jar has been adopted for Bangladesh in terms of operation cost.

The laboratory building for main work of breeding is occupied by departments of seed processing, seed conservation and research & administration. The facilities are a reinforeced concrete structure of two stories with the total area of 1961.12 m^2 for the main building and one-story garage of 63 m^2. The equipment used in the Laboratory have been selected on the basis of the cost of maintenance so as to meet the local situation. The construction work will start 4.5 months after when the exchange of notes is concluded and the facilities will take all together 15.5 months to complete.

Although the facilities are fully equipped with operational capability utilizing the local technology without the problem of the cost of maintenance and operation, the technical cooperation is more efficient to obtain further assurance of the result.

The Project, aiming at solution of a chronic food shortage, gives significance for the grant aid cooperation. It is recommended that the Project is to be implemented toward the realization.

Abbreviations

Bangladesh:	The People's Republic of Bangladesh
The Project:	The Rice Seed & Genetic Resources Laboratory Project of Bangladesh Rice Research Institute
The Survey Team:	The Basic Design Study Team for the Rice Seed & Genetic Resources Laboratory Project of Bangladesh Rice Research Institute
The Laboratory:	The Rice Seed & Genetic Resources Laboratory of Bangladesh Rice Research Institute
BRRI:	Bangladesh Rice Research Institute
BARI:	Bangladesh Agricultural Research Institute
BARC:	Bangladesh Agricultural Research Council
CERDI:	Central Extension Resource Development Institute
CVSRC:	Citrus & Vegetable Seed Research Center
IRRI:	International Rice Research Institute
PC:	Planning Commission
HYV:	High Yielding Variety
LIV:	Local Improved Variety
GEU lab:	Genetic Evaluation and Utilization Laboratory
JICA:	Japan International Cooperation Agency

Conversion Table

Currency Equivalent: US$ 1 = ¥239. US$ 1 = TAKA 24.15 (as of Mar. 1st, 1983)

Weights & Measures:

1 ft = 30.47cm
1 ft^2 = 0.0929m^2
1 ac = 4,046.7m^2
1 md = 32.324kg
1 inch = 2.54cm

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Chapter 1 INTRODUCTION

Chapter 1 INTRODUCTION

Bangladesh is an agricultural country with rice as its main crops. Although the nation depends on rice as the staple food, low productivity and rapid growth of population hardly make the country able to attain food self-sufficiency.

Raising of HYV and LIV, proper to present situation, is an important measure which should be pushed forward in parallel to agricultural modernization scheme. Fortunately the country is blessed with full of materials for raising new varieties, local varieties and wild species are wide in varieties. In addition, BRRI, the central organ for rice research, has collected and conserved about 4,000 varieties of seed and has been promoting breeding activities.

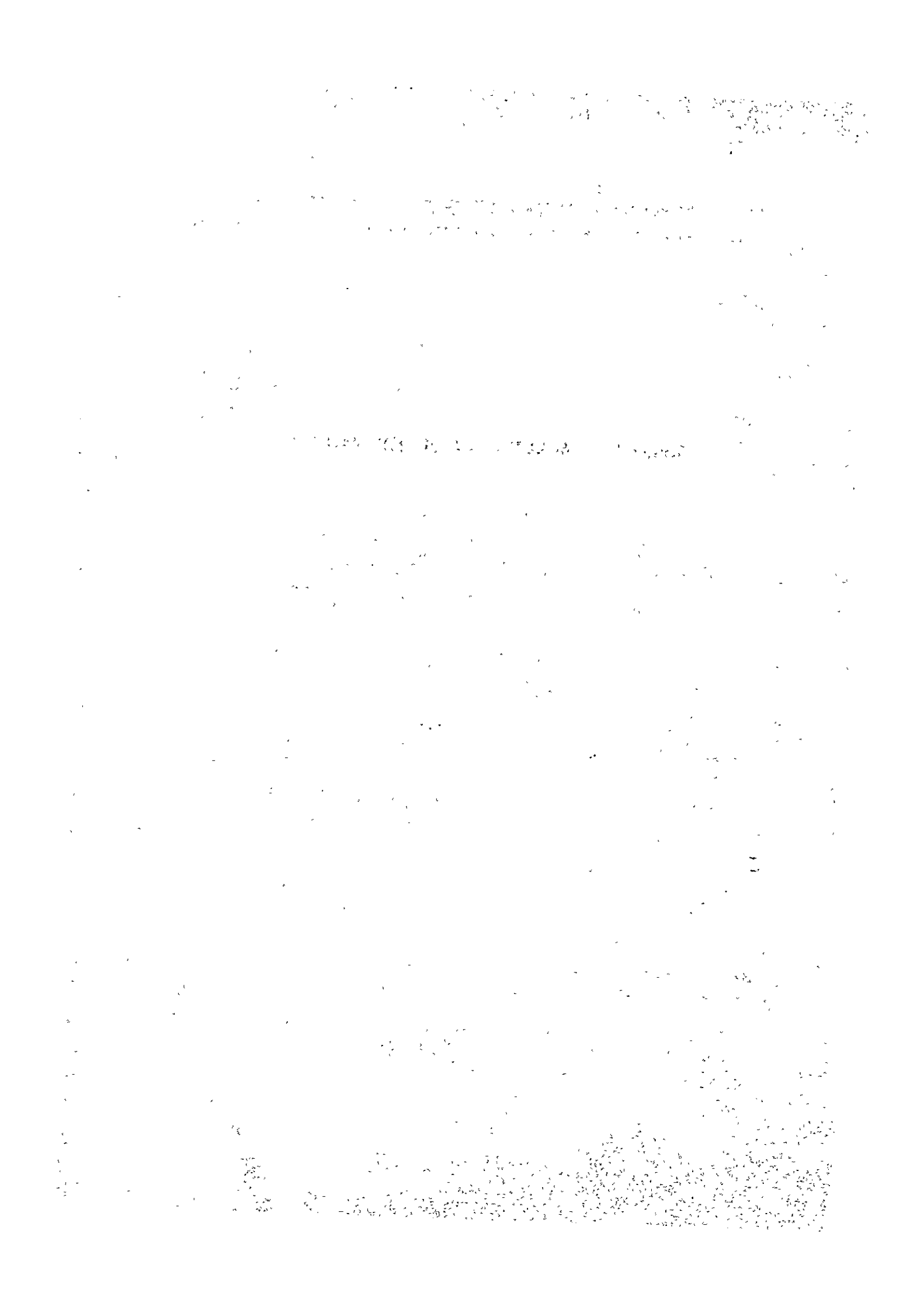
However, BRRI is now facing difficulties for a seed conservation as genetic resources in its storages because these facilities are getting old and deteriorated. The Government of Bangladesh, under this situation, made request to Japan for extending a grant aid of the expansion of Rice Seed and Genetic Resources Laboratory of BRRI.

In response to the request, the Government of Japan decided to make a survey for basic design and entrusted it to JICA. The survey was carried out by JICA study team headed by Dr. Nakagawara from Hokuriku Agricultural Experiment Station of Ministry of Agriculture, Forestry and Fishery from February 21 to March 12 this year.

This report is compiled after the explanation of the draft report, and prepared with the results of field survey and analysis of collected data. During the field survey, the team made discussions with Bangladesh officials concerned and confirmed contents and background of the request. At the same time, the scope of and the system for operation and administration in the Project were clarified. Also investigation of the proposed site and studies of data concerning general agricultural and construction situations were carried out.

Itinerary and member list of the study team, and the Minutes of Discussions exchanged between Bangladesh side and the team are given in Appendices.

Chapter 2 BACKGROUND OF THE PROJECT



Chapter 2 BACKGROUND OF THE PROJECT

2-1 Conditions of Agriculture

Bangladesh, stretching along the delta formed by the Ganges river and Brahmaputra river, is an agricultural country with rice production as a mainstay of its economy. About 74% of the total work force is involved in agriculture (1980) and agriculture has also accounted for 55-60% of the GDP in the past few years. The main items of export are also agricultural products such as jute and tea.

The main crops in Bangladesh are as follows; rice, jute, sugar-cane, oilcrops, pulses, and wheat which has been broadly extended recently. Each planted area and amount of production are shown in Table 2-1.

Rice is staple food in Bangladesh and its cultivated area is nearly 80% of the total cropping area. However, yield per acre is low in comparing with the average in Southeast Asian Countries. Accordingly, the domestic supply of food does not meet the nation's demand. In spite of the agricultural development programmes carried out by the government, the growth rate of agricultural production from 1971 to 1980 is 1.7% and it could not catch up to the annual population increase of 2.8%. This results inforcing Bangladesh to resort to bulky importing food.

Table 2-1 Planted area and production of selected crops in Bangladesh (1980/81)

Crop	Planted area (x 1,000 acre)	Production (x 1,000 ton)
Rice	25,474	13,662
Wheat	1,461	1,075
Jute	1,569	883
Sugarcane	368	6,495
Tea	109	87,541 (x 1,000 lb)
Pulses	804	208
Oil crop	760	247
Spices	356	236
Tobacco	127	47

(Source) Statistical Pocket Book of Bangladesh, 1981.

Table 2-2 Production and importation of rice and wheat in Bangladesh

Year July-June	Population (million)	Production (million ton)			Importation (million ton)		
		Rice	Wheat	Total	Rice	Wheat	Total
1971-72	72.4	9.77	0.11	9.89	0.67	1.02	1.69
1972-73	74.0	9.93	0.09	10.02	0.39	2.44	2.83
1973-74	76.0	11.72	0.11	11.83	0.08	1.58	1.66
1974-75	78.2	11.11	0.12	11.22	0.27	2.29	2.56
1975-76	80.4	12.56	0.22	12.78	0.40	1.05	1.45
1976-77	82.7	11.57	0.26	11.82	0.19	0.60	0.79
1977-78	85.4	12.77	0.34	13.11	0.31	1.37	1.68
1978-79	87.7	12.54	0.49	13.03	0.05	1.12	1.17
1979-80	90.2	12.54	0.81	13.35	0.74	2.03	2.77
1980-81 (estimate)	92.9	13.65	1.40	15.05	0.09	0.95	1.04

(Source) Shokuryo Kanri Geppo 7 (Monthly Report of Foodgrain Administration and Control 7), "Bangladesh e no nihonmai enjo" (Japanese Rice Aid to Bangladesh), K. Ohsumi, Food Agency, Japan.

2-2 Present Situation of Rice Production

The climate belongs to the typical sub-tropical monsoon zone, which is clearly devided into the rainy season and the dry season, alternating a flood and a drought every year. Rice cropping is classified into three seasons namely Aus, Aman and Boro, depending on temperature, rainfall, day length and other factors. It is possible to cultivate rice through a year as long as water is provided.

Weather conditions (rainfall, temperature-maximum, minimum, mean) and cropping season (sowing, transplanting, harvesting) by month are shown in Fig. 2-1.

Eache cropping season is as follows:

(1) For Aus, direct sowing is popular under rain-fed cultivation, at rather high altitude where flood water hardly come even in the rainy season. Many varieties of Aus are early maturing. In many cases early seedling stage is under upland field conditions. The most important thing for Aus is to survive the competition against weeds in this period.

(2) Aman is predominant crop in Bangladesh, classified into Broadcast Aman and Transplant Aman. Broadcast Aman is cultivated at lowland where the land is submerged under 4 - 5 m of water during the maximum high water period in the rainy season. Many varieties have floating ability which the plant height increases by the increase in water depth. The plant height of some varieties sometimes reaches 6m or more according to flood conditions.

With regard to Transplant Aman, it is cultivated at places where there isn't much water even in the rainy season and some at irrigated places but almost in rain-fed area.

(3) Boro is cultivated during the dry season and both local varieties and HYV are transplanted. Local varieties are cultivated at river-sides, marshy lands where some water is left or places fully equipped with irrigation facilities.

Rice variety is classified into three types as follows:

(1) High Yielding Variety (HYV)

A series of varieties bred at IRRI under the so-called "Green Revolution", or elite varieties based on them. As they are varieties of high yielding ability under heavy manuring and intensive cultivation conditions, it is rather difficult to extend them in the whole Bangladesh since agricultural environmental conditions are poor.

(2) Local Improved Variety (LIV)

Among domestic and local varieties, those which are of comparatively high yield and good quality are selected and recommended by BRRI. They are not as good as HYV in terms of high yielding ability but as they are originally local varieties to be expected for certain yield even under the poor agricultural environmental conditions.

(3) Local Variety

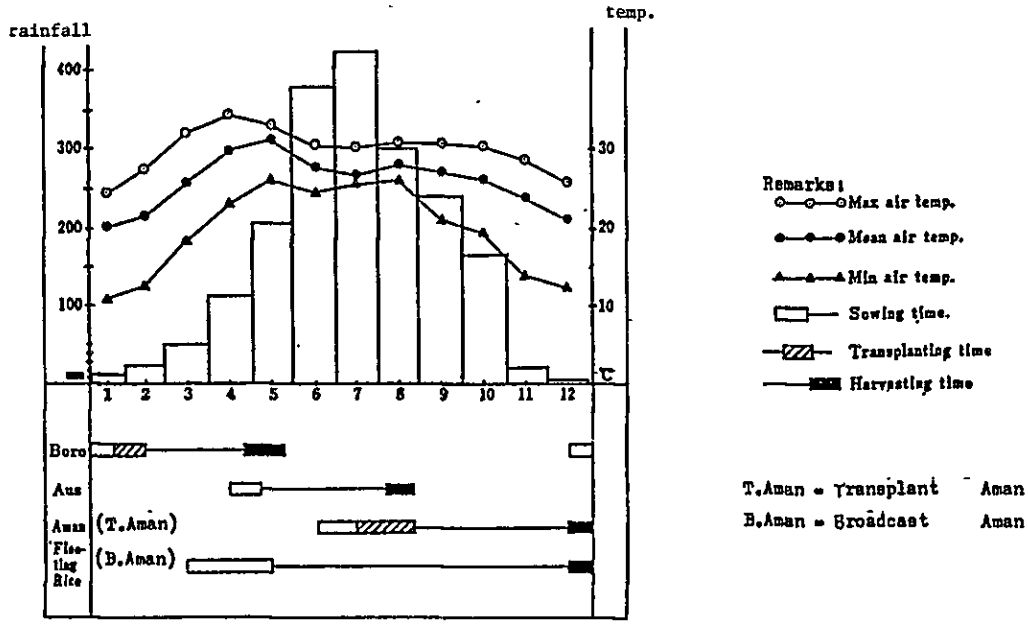
Traditional local varieties without special breeding control which differentiate into many varieties under the various ecological conditions. Each variety is low in its production.

In Bangladesh, more than 80% of the rice production have been in Aman and Aus, and its volume depends greatly upon such natural water conditions in the rainy season.

Under these circumstances, it is impossible to increase the rice production that is premised on heavy manuring and intensive cultivation. And also it is considerable the introduction of HYV is low at the rate.

On the other hand, as long as the weather is stable and water is available, it can be expected that the most constant yield is secured by Boro. As a matter of fact, Boro is the best among the three seasons in terms of yield per unit area and the extension rate of HYV. However, as irrigated areas are still few, both of planted area and production are the smallest among the three seasons (refer to Table 2-3).

The difficulty of water control is a critical problem for rice production in Bangladesh. About 30% of whole nation is covered by water in the rainy season. On the contrary, land turns into desert in the dry season. This extreme change produces very severe condition for rice cultivation. Adding to this, extent of flood in the rainy season varies drastically from year to year.



(Source) The rice production in Asia (tropical zone) prepared by the Tropical Agriculture Research Center, Ministry of Agriculture, Forestry and Fisheries Japan and JICA.

Fig. 2-1 Weather conditions and cropping season of rice

Table 2-3 Planted area, production and yield of rice by cropping season in Bangladesh

	1975 - 76			1976 - 77			1977 - 78		
	a	b	c	a	b	c	a	b	c
Aus	8,452	3,230	382	7,952	3,011	379	7,814	3,103	397
Aman	14,236	7,045	495	14,355	6,906	481	14,260	7,421	520
Boro	2,837	2,286	806	2,112	1,650	781	2,703	2,231	825
Total	25,525	12,561	492	24,419	11,567	474	24,777	12,755	515
	1978 - 79			1979 - 80			1980 - 81		
	a	b	c	a	b	c	a	b	c
Aus	7,995	3,283	411	7,505	2,809	374	8,070	3,205	397
Aman	14,347	7,000	488	14,762	7,303	495	14,100	7,691	545
Boro	2,649	3,200	1,208	2,839	2,427	855	2,800	2,600	929
Total	24,991	13,488	540	25,106	12,539	499	24,970	13,496	540

(Note) a. Planted area (1,000 acre) b. Production (1,000 ton) c. Yield (kg/acre)
(Source) Monthly Statistical Bulletin of Bangladesh, June 1981,
Bangladesh Bureau of Statistics; Bangladesh Economic Survey 1980/1981.

2-3 Development Plan

2-3-1 Second Five-Year Plan

In the Second Five-Year Plan started in July 1980, the government is placing strong emphasis on agricultural development that will be the foundation for economic modernization.

The objectives of the Second Five-Year Plan are as follows:

(1) To bring about a noticeable improvement in the standard of living by ensuring adequate supplies of the basic needs.

(2) To bring about significant improvement in the quality of life in the rural areas through greater participation of the mass in development activities through local bodies.

(3) To expand opportunities for gainful employment, beyond the growth of labour force so that people have access to resources for their basic needs.

(4) To eliminate illiteracy and make a significant progress towards a comprehensive development of human resources.

(5) To reduce the rate of population growth.

(6) To attain a higher degree of self-reliance.

(7) To move towards a more equitable distribution of income, resources and opportunities for better social justice.

(8) To accelerate food production beyond self-sufficiency in the shortest possible time.

(9) To accelerate the pace of economic development.

In this plan, the emphasis is placed on the economic development of rual area rather than urban area. The amount of investiment in agriculture is predominant over other categories, accounting for 29.1% of the total investiment.

As for important policies for agricultural development, the following points are stated in detail.

(1) Adaptive research.

(2) Supplies of farm inputs, namely fertilizers and manures, HYV/ LIV/ improved seeds, pesticides and implements and tools.

(3) Irrigation and drainage.

(4) Land levelling, shaping and consolidation.

(5) Agricultural extension services and non-formal training.

(6) Production credit.

(7) Local trial and demonstration farms.

(8) Marketing of farm products and retailing of inputs.

(9) Storage for inputs and outputs.

(10) Farm to market roads.

(11) Repair and maintenance service of farm implements.

(12) Production incentives (input and output subsidies)

According to the plan, the irrigated area is supposed to be expanded from 3.5 million acres (14% of the total cultivated area) to 7.2 million acres accounts for 25%, and in that area HYV, fertilizer and agricultural chemicals, modern farming method and rural loan are comprehensively and intensively introduced in order to increase agricultural production.

In the plan, the target values for production increase are set up as shown in Table 2-4. In the final year of the plan the production of rice is estimated to be 17.78 million tons which is a 39% increase and wheat is to be 2.25 million tons. The total production of rice and wheat estimated to be 20.03 million tons.

To do so, the planted area of HYV is to be expanded from 3.09 million acres (12.5% of the total cultivated area) to 7.9 million acres accounts for 31.6%.

The basic flow chart of the food production increase plan seems to be; expansion of irrigated area ⇒ extension of HYV ⇒ increase of yield per unit area ⇒ food production increase.

Since 15 HYV varieties were introduced and bred, they do not always indicate satisfactory extension due to the low expansion rate of irrigated area (Fig. 2-2). During the First Five-Year Plan the expansion rate was only 12.1%.

It is necessary to fulfill various premise required to extend HYV along with management of water. Therefore, to inquire into the cause of deadlocked HYV extension has come now as the new theme for the rice crop research.

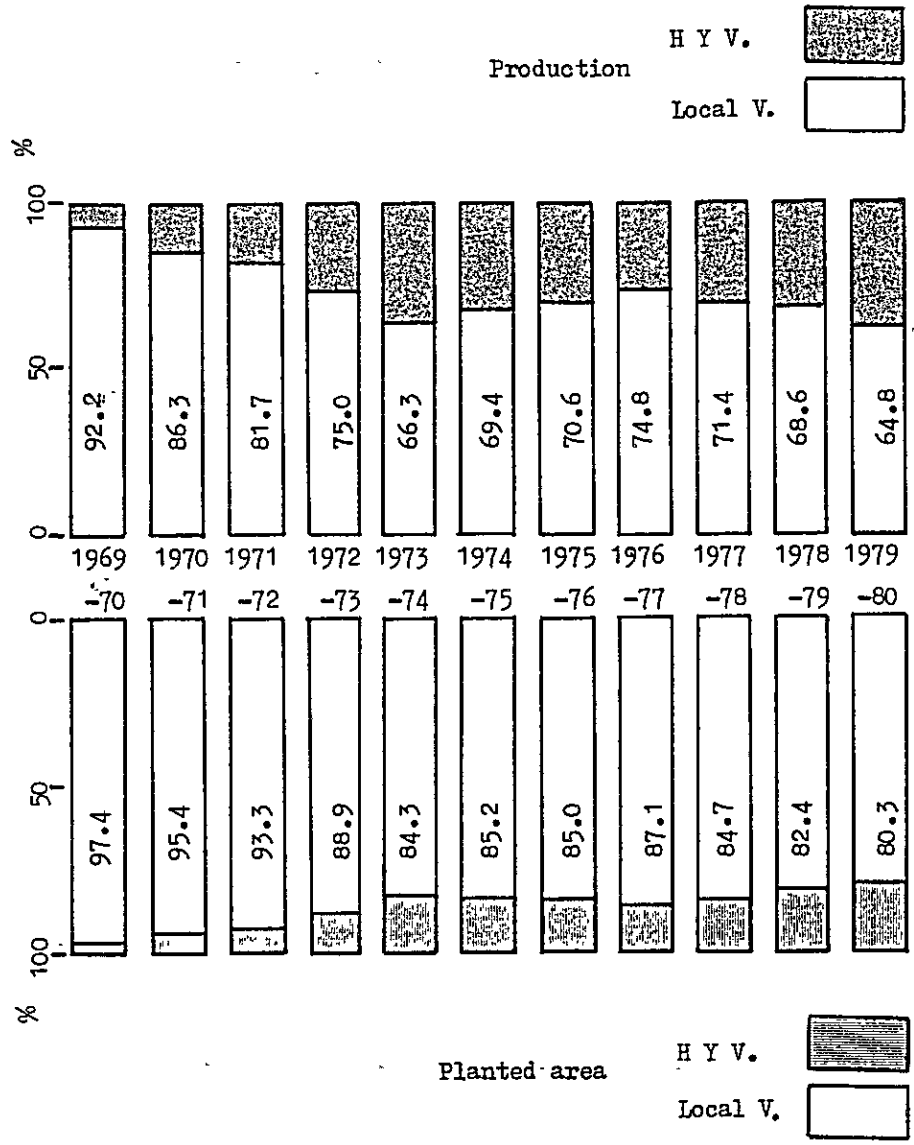
Table 2-4 Target production of foodgrains during 1984/85

		Benchmark			1984/85		
		Planted area (0.1 million acre)	Yield ton/acre	Production (0.1 million ton)	Planted area (0.1 million acre)	Yield ton/acre	Production (0.1 million ton)
Rice	Aus: HYV[1)]	9.33	0.95	8.87	24.00	1.05	25.20
	LIV[2)]	0.28	0.61	0.17	10.00	0.70	7.00
	Local	68.34	0.32	21.99	46.00	0.35	16.10
	Sub-Total	77.95	-	31.03	80.00	-	48.30
	Aman: HYV	5.66	0.99	5.61	30.00	1.10	33.00
	LIV	6.66	0.88	5.84	20.00	0.90	18.00
	Local	88.61	0.52	45.78	50.00	0.53	26.50
	Broadcasting	41.67	0.41	16.99	40.00	0.45	18.00
	Sub-Total	142.60	-	74.22	140.00	-	95.50
	Boro: HYV	15.86	1.01	16.02	25.00	1.20	30.00
	LIV	11.17	0.57	6.37	5.00	0.80	4.00
	Sub-Total	27.03	-	22.39	30.00	-	34.00
	Total (Rice)	247.58	-	127.64	250.00	-	177.80
Wheat	Irrigated	8.00	0.85	6.80	20.00	1.00	20.00
	Non-Irrigated	1.00	0.36	0.36	5.00	0.50	2.50
	Total (Wheat)	9.00	-	7.16	25.00	-	22.50
	Total(Rice+Wheat)	256.58	-	134.80	275.00	-	200.30

H.Y.V. (High Yielding Variety)

L.I.V. (Local Improved Variety)

(Source) Azia dokou nenpo 1981 (The Year Book of Asian Affair 1981), Institute of Development Economies, Japan.



(Source) Statistical pocket book of Bangladesh. 1980.

Fig. 2-2 The progress of HYV extension

2-3-2 Progress and future trend of rice research

The research works on rice carried out in Bangladesh, centering around BRRI, are mostly related to the establishment of modern cultivation techniques including introduction of elite varieties like HYV, control of diseases and pests, irrigation and water management methods, intensive farm land use by improved cropping patterns, etc..

The major subjects of researches until now were principally production increase by extension of HYV. The extension rate was mentioned above.

On the other hand, 26 LIV have been raised out, however, it is necessary to expand further researches to take effective measures against various and complicated problems such as flooding damage, difference of day length and temperature, bad soils, salt injury, diseases and pests. It seems that existing elite rice varieties including HYV are too poor in total number to meet the situation of rice cropping in Bangladesh.

It is needless to mention that in order to fulfill the long-term objective, continuous effort to overcome obstructing factors through extension of HYV stands as a crucial strategy to increase food production. Even if the Second Five Year Plan satisfactorily reaches its goal, only 25% of total planted area is provided with irrigation and the rest, 75% is still left as rain-fed field. In general these rain-fed fields are not provided with favorable water supply, thus are less suitable for heavy manuring and intensive cultivation. It is not likely to see rapid extension of HYV in these areas.

There are little chances of immediate improvement of supply of fertilizer and agricultural chemicals and of technology necessary for adequate use of them. Moreover, general farmers are not capable of furnishing themselves with fund necessary for the purchasement of new seeds, fertilizer and agricultural chemicals. Under these circumstances, along with development and extension of HYV, it is important to improve the yield from rain-fed paddy field through development and extension of varieties such as LIV which produces certain level of yield under such conditions as extensive cultivation even though it can not produce as much as HYV.

In any ways, requirements toward varieties would vary in accordance with the social condition and agronomic environment. It is indispensable to breed new type of varieties to increase rice production. In this context, further promotion of rice breeding project is strongly urged.

Chapter 3 OUTLINE OF BRRI

Chapter 3 OUTLINE OF BRRI

3-1 Establishment

BRRI was established in 1969 in the form of "East Pakistan Rice Research Institute" with the assistance of the Ford Foundation, and also with the technical assistance of IRRI. After new Research Center was started on October 1, 1970 at Joydebpur, it came to function nearly as it does at the present time. The independence movement which started immediately after the establishment, brought its research activities to a standstill. In 1973, when the confusion finally subsided, this institute was reopened as the "Bangladesh Rice Research Institute".

3-2 Organization and Function

BRRI is presently under the jurisdiction of the Ministry of Agriculture and its administrative location is shown in Fig. 3-1. BRRI functions as the sole complehensive rice research institute in Bangladesh.

The major objectives of BRRI establishment are as follows;

(1) To conduct researches on all aspects of rice

(2) To establish project areas to demonstrate appropriate agricultural technology

(3) To train extension officers and farmers in improved techniques of rice production

Major activities of BRRI in the field of research are as follows:

(1) Breeding

Raising and introduction of high yielding and good table qualities as HYV and LIV.

(2) Germplasm Conservation

Conservation of Germplasm which can be materials of breeding

(3) Pest management

Research on damage by disease and pests and also their control and management.

(4) Soil fertilization

Research on the relationship between soil fertilization and plant physiology.

(5) Agronomic practices improvement

Research on agronomic practices improvement consistent from seeding through harvesting.

(6) Improving farmers' cropping patterns

Research on cropping patterns and crop rotation system with focus on rice cultivation.

(7) Mechanization of Agriculture

Research on mechanizing of agricultural works.

(8) Irrigation and Water management

Research on the water management with the focus on irrigation.

Other than those mentioned above, BRRI publishes periodicals such as annual reports and research reports, and carries on an international exchange of technology and international seminars.

Breeding is considered the most important of all these BRRI activities and is incorporated into the nucleus of Bangladesh rice breeding program. 15 varieties of HYV and 26 varieties of LIV have been selected and raised until now, and these are shown in Table 3-1.

Breeding activity of BRRI includes not only selecting and raising new varieties but also process from continuation and conservation of selected and raised new varieties until distribution of seeds for multiplication of foundation stock seeds.

Usually, breeding activities are to select and raise new varieties and to multiply seeds after breeding. The objective of latter activity is to provide the seeds with special charactaristics of variety in order to meet farmers' need.

Organization and steps for growing different class seeds is shown in Fig. 3-2. The part shown as "Breeder" is the role played by the Plant Breeding Dept. of BRRI.

In Bangladesh, Rice seeds are classified into four grades namely Breeder's seed, Foundation seed, Registered seed and Certified seed.

Breeder's seed is the original seed obtained from breeding or introduction characterized by its high purity that are later distributed after multiplication to individual farmer. These breeder's seeds should be mainteined and conserved by breeders. Multiplication should be done to produce foundation seed whenever needed.

In Bangladesh, in principle, selection and breeding of new varieties plus maintenance and conservation are conducted by BRRI, and BADC (Bangladesh Agricultural Development Corporation) is designated to the multiplication and distribution of foundation seeds thereafter. However, BRRI partially takes part in multiplication of some foundation seeds.

Some multiplication of the foundation seed is consigned to farmers, but most of the work is done at BADC field and registered seed is produced. Later on, this registered seed is multipled at BADC's and seed grower's fields. Seed obtained will be sold to general farmers as certified seed.

The required purity and viability of seeds in each stage is specified in table 3-2. In order to maintain high purity and seed viability, fairly well prepared field and storage facility is demanded. Especially, proper attention should be paid for the maintenance and conservation of breeder's seeds which are designated as genetic resources.

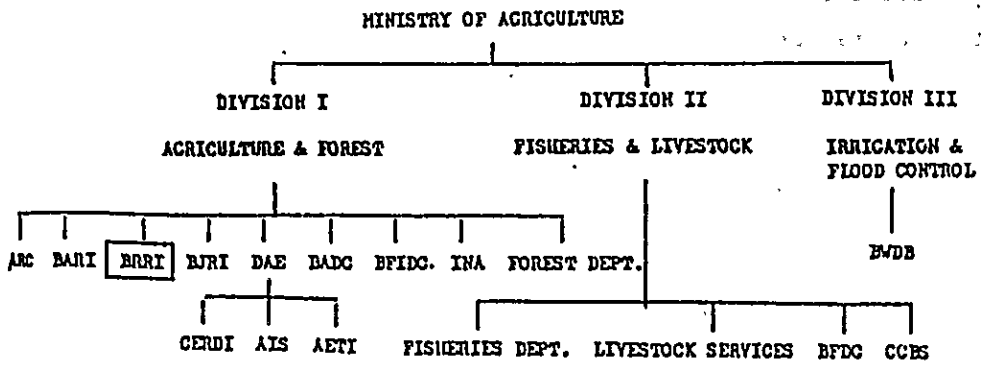


Fig. 3-1 Organization of Ministry of Agriculture

Table 3-1 Varietal characteristics of recommended rice varieties of Bangladesh

[HYV]

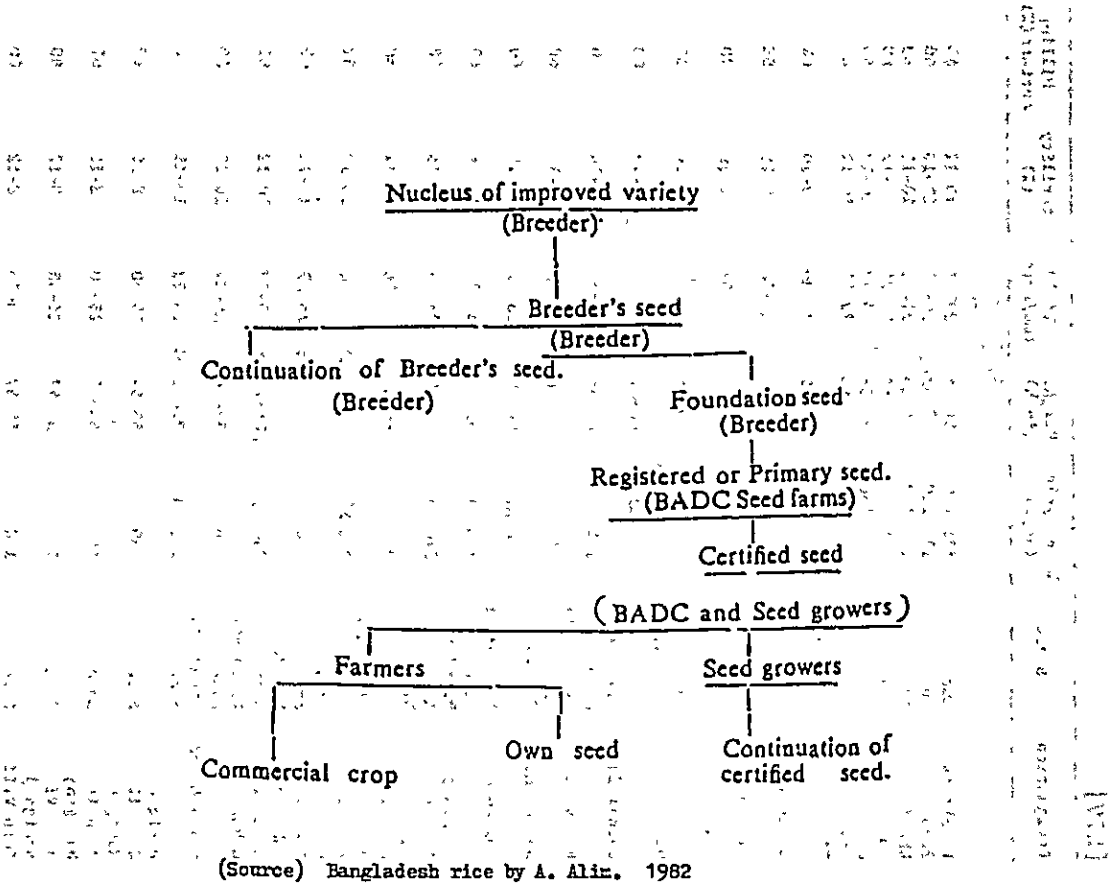
Designation	Season	Life cycle (days)	Height (inch)	Yield (md/acre)	Sterility (%)	Milling outturn(%)
Chandina	Aus	115-120				
(BR-1)	Boro	145-150	32-36	50-60	12-16	68
Mala	Aus	120-125				
(BR-2)	Boro	150-160	40-50	50-60	30-35	65
	Aus	130-135				
Biplap	Transplant					
(BR-3)	Aman	140-145	38-40	60-70	10-12	60
	Boro	170-175				
Brrisail	Transplant					
(BR-4)	Aman	140-150	48-50	60-70	10-15	68
Dulhabhog	Transplant					
(BR-5)	Aman	158 a)	55-57	30-35	11-14	60
BR-6	Aus	106	32-38	35-45	10-12	70
(IR-28)	Boro	135				
Brribalam	Aus	115-130	42-52	40-50	10-12	70
(BR-7)	Boro	135-155				
Asha	Aus	124	42-51	40-50	10-13	71
(BR-8)	Boro	135				
Sufala	Aus	115	42-48	50-60	10-13	70
(BR-9)	Boro	140				
Progoti	Transplant					
(BR-10)	Aman	147	44-46	60-70	10-14	72
Mukta	Transplant					
(BR-11)	Aman	140	43-45	60-70	10-13	73
IR-5	Transplant					
	Aman	130-145	46	60-70	10-15	60
IR-8	Aus	130-135	40	60-70	10-15	60
	Boro	170-175				
Irrisail	Transplant					
(IR-20)	Aman	130-140	44	50-60	12-18	68
Purbachi	Aus	110-115	34-36	50-60	10-12	62
	Boro	150-155				

[LIV]

Designation	Season	Life cycle (days)	Height (inch)	Yield (md/acre)	Sterility (%)	Milling outturn(%)
Kataktara	Aus	115-120	56-58	20-24	10-12	65
Panbira	Aus	115-120	57-59	20-24	10-13	60
Dharial	Aus	100-110	56-58	22-25	10-12	60
Dular	Aus	85- 90	55-57	22-25	10-12	60
Marichbati	Aus	95-100	56-58	20-22	10-12	58
Hashikalmi	Aus	85- 90	54-56	20-22	10-12	60
Tilokkachari	Transplant					
	Aman	165 a)	60-62	25-30	7-10	62
Latisail	Transplant					
	Aman	150 a)	58-60	25-30	10-15	58
Nizersail	Transplant					
	Aman	165 a)	60-62	30-62	6-10	70
DA29	Transplant					
	Aman	158 a)	60-65	25-30	9-14	58
DA31	Transplant					
	Aman	135 a)	60-62	25-27	7-10	60
Patnai 23	Transplant					
	Aman	158 a)	62-68	34-38	9-14	60
Rajasail	Transplant					
	Aman	142 a)	55-58	25-28	12-15	60
Badshabhog	Transplant					
	Aman	150 a)	58-60	28-32	10-12	60
Dulhabhog	Transplant					
	Aman	158 a)	55-57	30-35	11-14	60
Habiganj	Broadcast					
Aman I	Aman	210 b)	48-60	25-26	10-15	58
Habiganj	Broadcast					
Aman II	Aman	225 b)	60-84	25-26	10-12	60
Habiganj	Broadcast					
Aman IV	Aman	230 b)	72-96 c)	28-30	10-12	62
Habiganj	Broadcast					
Aman V	Aman	240 b)	108-144 c)	25-27	10-12	62
Habiganj	Broadcast					
Aman VIII	Aman	240 b)	108-144 c)	25-27	10-12	62
Gabura	Broadcast					
	Aman	230 b)	72-96 c)	25-27	10-12	60
Maliabhangar	Broadcast					
	Aman	230 b)	72-96 c)	20-22	10-15	58
Habiganj						
Boro II	Boro	150	55-57	25-30	8-12	62
Habiganj						
Boro IV	Boro	145	53-55	25-30	8-12	62
Habiganj						
Boro VI	Boro	147	55-57	35-45	8-12	60
Habiganj						
Boro VIII	Boro	150	55-57	30-35	8-12	60

(Note) a) These varieties are photoperiod-sensitive and their life cycle which varies with date of seeding is based on mid-June sowing.
b) These also are photoperiod-sensitive and their cycle is based on April sowing. They also vary depending on date of seeding.
c) Height depends of flood levels. Therefore, water depths in which they grow are given.

(Source) ABOUT BRRI, Bangladesh Rice Research Institute. 1980



(Source) Bangladesh rice by A. Alim. 1982

Fig. 3-2 Steps of Seed Growing

Table 3-2 Standard of breeder, foundation and certified seed of paddy (National Seed Board)

	Factor	Paddy		
		Breeder	Foundation	Certified
1	Pure Seed (max.)	99.00%	96.00%	94.00%
	Infested Seed (max.)	0.00%	0.50%	0.50%
	Inert Matter (max.)	1.00%	3.00%	4.00%
	Other Seed (max.)	0.00%	1.00%	2.00%
	Weed Seed (max.)	0 /kg	2 /kg	10 /kg
2	Germination (min.)	80.00%	80.00%	80.00%
3	Moisture Content (max.)	12.00%	12.00%	12.00%

Chapter 4 RESEARCH IN RICE GENETIC RESOURCES

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4-1 Research in Genetic Resources

At present genetic resources are being lost in a worldwide scale. That is so called "Genetic Erosion" phenomenon. For example, as for worldwide important crops such as wheat, soybean and maize, their varieties tend to be unified rapidly, and their traditional varieties disappeared in a short time.

Table 4-1 shows the unification of major crops in U.S.A. and Canada.

These situations have been progressing steadily not only in the developed countries but also in the developing countries, just like a new variety of wheat with high productivity prevailed by "Green Revolution" in an instant. In addition, the natural destruction due to roads construction and other development has accelerated this trend. Especially wild species of rice is at a crisis of extinction now.

No matter what elite varieties they are, they can not be completely safe against disease and pest and against unexpected environmental changes. Also the social demand toward varieties changes with the time. It is quite possible according to the past experiences that the characteristics of some varieties which seem unnecessary at the present moment will be of great help in order to cope with these changes of conditions quickly and to breed new varieties. Once genetic resources were lost, they will never come back again. This is the reason why collection and conservation of local varieties including wild species must be done in such a haste.

It can be said that the idea of collecting and conserving genetic resources originated from the movement of exploring and collecting both world-wide cultivars and wild species led by N.I. Vavilov. U.S.S.R.Agricultural Academy, N.I. Vavilov Institute of Plant Industry is the most advanced institution in this field and has continued functioning. It is assumed that the institute still conserves 300,000 varieties of seeds.

Later, similar movements took place in various countries like U.S.A., U.K., Japan, Australia and others. In each country both public and private organizations engaging in breeding of varieties have carried on conservation of genetic resources in various scales focusing on the major crops of respective countries.

As the movements of genetic resources conservation has developed in a world-wide scale,the necessity has arisen to clarify the scopes of activities and organizational relationships among those institutions as to conservation, evaluation and multiplication. F.A.O., therefore, compiles "Catalog of World Varieties" of major crops gives information of the places of cultivating and conserving of major crops and also gives descriptions of their characteristics so that breeders in the world can get seeds easily.

Various international organizations are also actively participating in this field. CIMMYT (International Maize and Wheat Improvement Center) is collecting maize and wheat and CIP (International Potato Institute) is collecting potatoes respectively.

As for rice, IRRI has collected many varieties from almost all rice cultivating areas over the past 10 years. These collecting activities have still kept expanding in Asia and Africa, but collection of wild species seems not yet to be enough.

Two methods have been carried out in terms of storage and maintenance of germplasm. One is aiming to seek storage method suitable for the long term mostly 30 years and over; the other is to seek method suitable for medium-term storage for 10 - 15 years. Long-term storage method requires air condition equipment to secure the temperature of -10°C and humidity of 30%. In this context, Room-type cold storage unit has been devised to enable man to work inside.

However, these facilities consume vast amount of cost for its operation and maintenance. Adding to this, because of the liability of machinery and equipment to breakdown, introduction of these facilities are in-appropriate except for some advanced countries.

For this reason, despite the extra process necessary for rejuvenation of seed, Box-type storage method availed with low operation and maintenance cost plus easy handling has been sought out. From now on, it is steered to spread out medium-term storage method provided with refrigerator with adjustment device to keep temperature at about 5°C.

Table 4-1 Concentration ratio of variety in cultivated crop

	Crop	Number of higher ranking monopolistic variety	Concentration ratio
U.S.A.	Millet	6	100%
	Maize	6	71
	Soybean	6	56
	Cotton	3	53
	Potato	4	72
Canada	Bread Wheat	4	76
	Barley	3	64
	Rye	4	81
	Oat	4	65
	Rape	4	96

(Source) Seeds of the earth by Pot Roy Mooney

4-2 Conditions of Genetic Resource Research in Bangladesh

4-2-1 Current Condition

Research of genetic resources in Bangladesh has started with studies on rice. However, in regard to other crops, no attention had been paid until 1978 except germplasm introduction of high yielding varieties of wheat, maize, millet, pulses and oilseeds. Neither any collection, evaluation nor conservation of local variety in Bangladesh had come to light at all.

As already mentioned, collection of rice varieties has been conducted from fairly early in Bangladesh. Table 4-2 shows local rice varieties collected. Various types of local varieties and wild species which are not yet on the list are planned to be collected and conserved.

However, current storage facility is graded far less from satisfactory, long-term conservation is not reliable. One of the primary objectives of this Project is to provide the adequate conservation facilities.

Rice varieties listed in table 4-2 have been collected in the area of easy access and no variety has been collected from remote areas where convenient traffic is not available or boarder area with Assam. Also, the comprehensive survey of wild species spread over the land of Bangladesh has not yet been carried out. The survey and data collection should be done at earliest time possible.

Table 4-3 shows of other crops whose varieties are collected and conserved relatively in great number.

Although these seeds are kept by each institution concerned, there are worries over the conservation conditions.

However, the fact that collection and conservation of varieties have been conducted even to these concerning crops other than rice which had been neglected until 1978, is an evidence of drastic progress in genetic resource collection and conservation movements in Bangladesh.

Table 4-2 The list of local rice varieties collected untill the present

Rice varieties classified by cropping season	Number of varieties collected
Aus	999
Transplant Aman	2,718
Broadcast Aman	1,062
Boro	469
Total	5,248

Note: Some duplication is estimated

Table 4-3 Collections of the various crops

Crop		Collections	Remarks
Cereals	Wheat	196	mostly from outside sources
	Foxtail millets	229	156 from foreign sources
	Maize	25	all from outside sources
Pulses	Lentil	1,195	78 local (van der Maesen, 1979)
	Black gram	257	201 local
	Mungbean	668	50 local
	Lathyrus	103	4 from outside sources
	Chickpea	991	120 local
	Pigeonpea	134	2 local
	Dolichos	55	all local
	Cowpea	21	local
Fibres	Jute (Corchorus capsularies)	1,200	829 fibre types, almost local 170 vegetable types, almost local
	Jute (C. olitorius)	800	70 vegetable types, all local 650 fibre types, all local
Spices	Chilli	60	12 from foreign sources
	Turmeric	49	all local
	Ginger	15	all local
	Garlic	12	all local
	Coriander	8	all local

(Source) Report of South Asia Liaison Officers Meeting

4-2-2 Necessity

As stated above, it is the most important problem for Bangladesh to raise productivity of crops and to increase production of foods.

To realize them, raising of new varieties suitable for each area is required. For this purpose, first, collection and conservation of local varieties existing in different areas and minute investigation of their characteristics should be conducted. At the same time, it is required to endeavour to find excellent breeding materials through identification and evaluation.

Fortunately, Bangladesh is contiguous to the place of origin of the cultivated rice and many ecological differentiations have been brought about under different natural conditions. Accordingly, many varieties exist there and many wild species also have been discovered in several places. Bangladesh, therefore, can be called a world-wide treasurehouse of genetic resources of rice.

However, while development projects have been in progress and elite varieties have been extended into the country despite slow speed, local varieties and wild species with different genetic characteristics have been surely disappearing, though difference is seen in accordance with regions.

As the phenomenon of so-called "Genetic Erosion" is steadily progressing in this country too, immediate collection and conservation of species should be commenced.

On the other hand, as the facilities which BRRI possesses at present for collection and conservation of these varieties are very imperfect, improvement of the existing facilities and installation of new ones should be carried out urgently.

Chatper 5 THE RICE SEED & GENETIC RESOURCES LABORATORY PROJECT

Chatper 5 THE RICE SEED & GENETIC RESOURCES LABORATORY PROJECT

5-1 Function

5-1-1 Organization in BRRI

The organizational chart of BRRI is shown in Fig. 5-1. It is the central organization of rice research activities in Bangladesh. BRRI has 12 research divisions and the Project is to be implemented under Plant Breeding Division, which is the core of the rice breeding activities in Bangladesh.

In the Second Five-Year Plan, "A Scheme for Rice Research and Training" (1980-81 to 1984-85), specifies that this Project belongs to Plant Breeding Division. After the Project is implemented the Division will be developed into two sections, Plant Breeding Section and Genetic Resources and Cytogenetic Studies Section.

5-1-2 The Role of Plant Breeding Division

The breeding process generally consists of three stages as Fig. 5-2. Those stages are; the first, collection, storage and conservation of the breeding materials, the second, from selection of the breeding materials to raising of a new variety by various methods, and the third, maintenance and multiplication of the foundation seeds of the new variety, and distribution of the seeds to the farmer.

This whole process is the scope of activity of Plant Breeding Division. As mentioned before, the two sections will be formed upon completion of the Project. The new establishment, Genetic Resources and Cytogenetic Studies Section, will be mainly in charge of the first stage, while Plant Breeding Section will take charge of the rest, the second and third stages. Of course Genetic Resources and Cytogenetic Studies Section will be directly involved with the second and third stages through the maintenance of seed of various stages of selection and breeding, conservation of the breeder's seed and foundation seed of new varieties and storage of the seeds under process of multiplication.

Only systematic coordination and harmonized cooperation between the two sections can bring a good result of the breeding.

Although the main objective of this Project is to enhance the function of the first stage, it is intended to have Plant Breeding Division fully equipped, including reinforcement of the functions of the second and third stages which are insufficient at present.

The situation is different by countries in the seed multiplication activity that is the third stage. In Bangladesh the third stage is shared, by BRRI's breeders, Bangladesh Agricultural Development Corporation (BADC) and seed growers designated by the Government. However, whole stage is taken care of by BRRI.

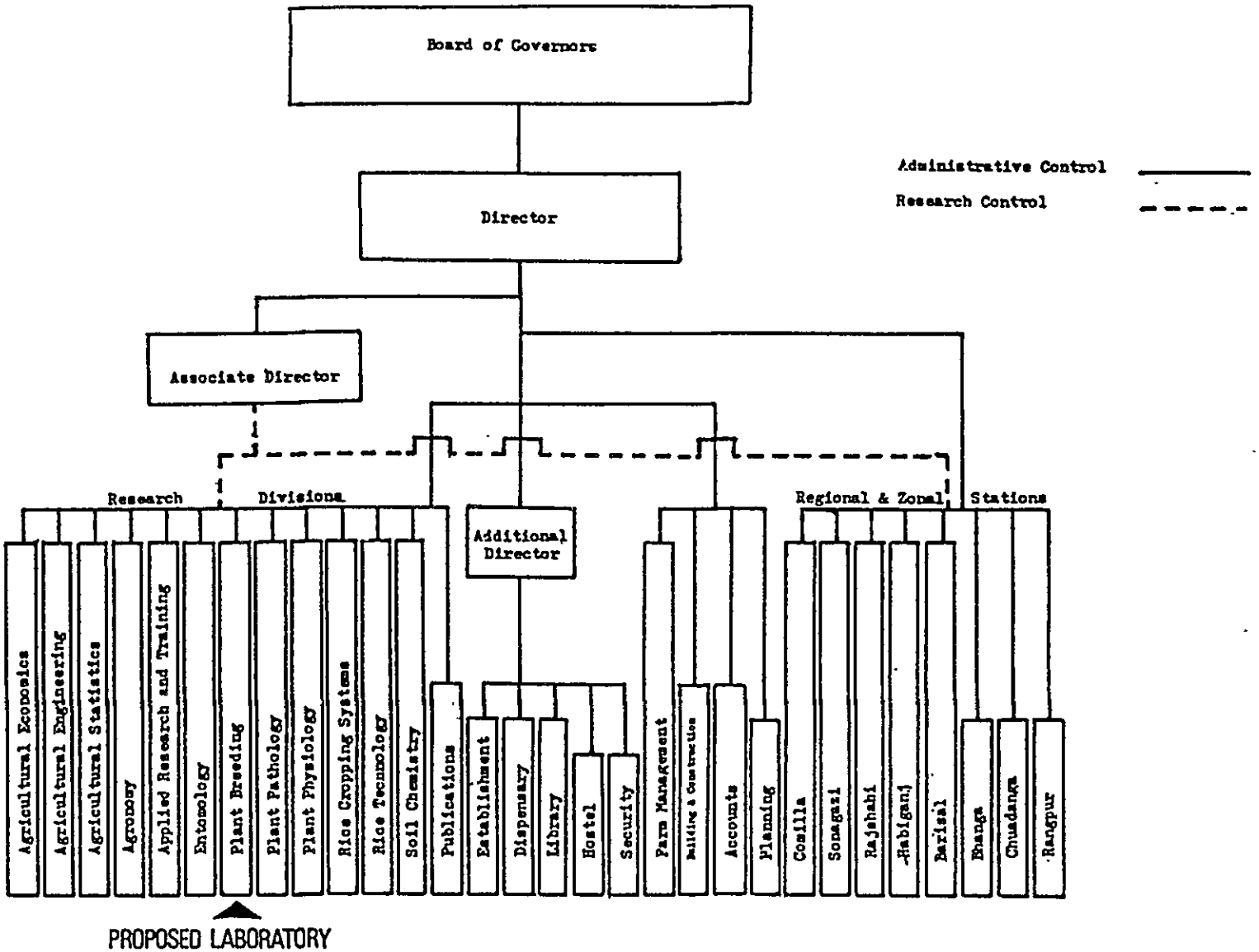


Fig. 5-1 Organizational chart of Bangladesh Rice Research Institute

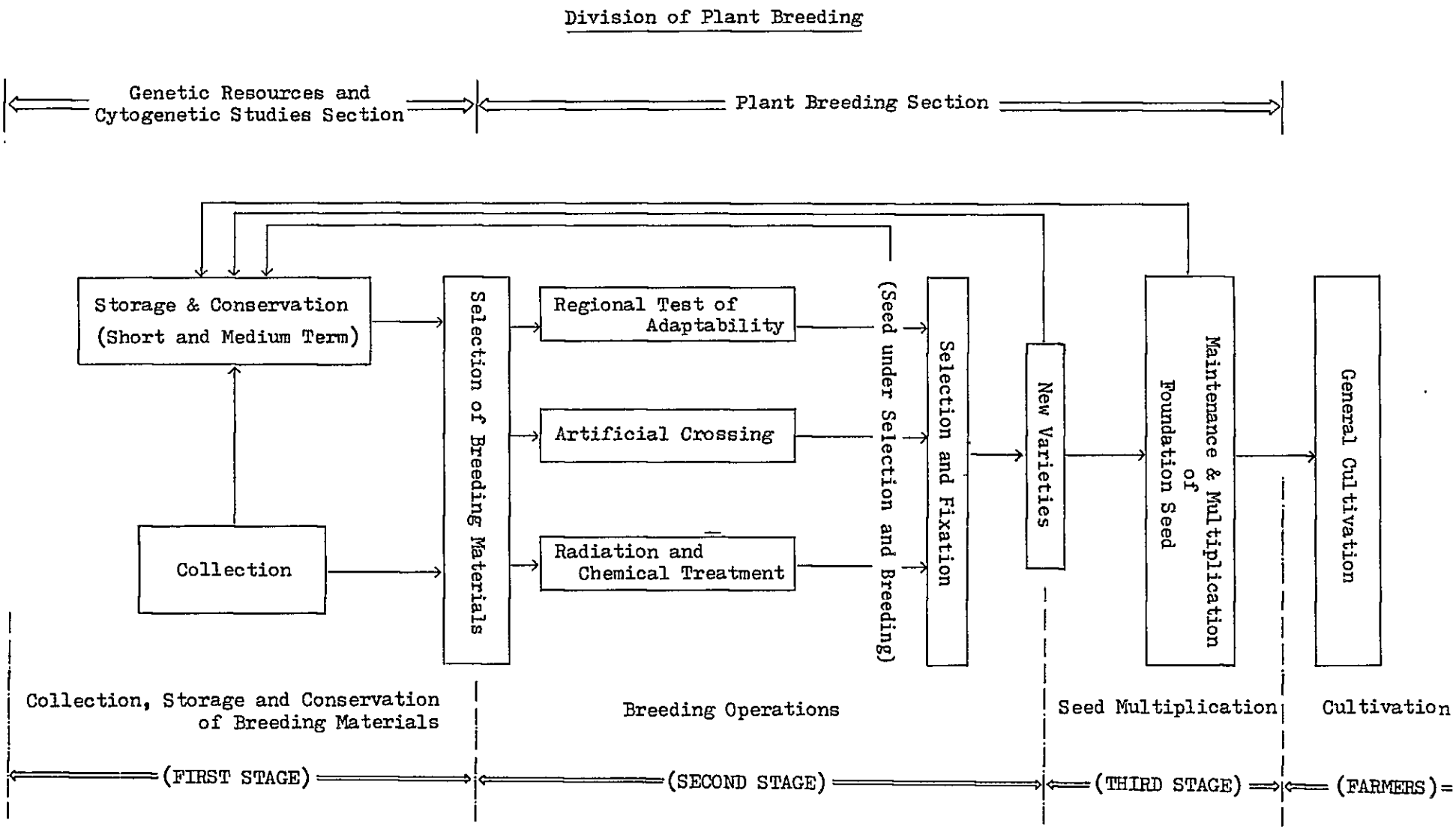


Fig. 5-2 Breeding process

5-2 Research Activities

5-2-1 Target of Plant Breeding Division

The breeding target of BRRI is the investigation of high-yielding variety (HYV) which is premised on the intensive cultivation. It is found in the series of movement after breeding the IR-8, which is regarded as "Green Revolution", as has been mentioned earlier. There are some important breeding strategies, reflecting the actual conditions of Bangladesh.

The following strategies are formulated by BRRI;

(1) Faster seedling growth to compete with weeds under rain-fed upland conditions;

(2) Intermediate plant height with taller seedlings to allow farmers to transplant in 8 - 10 inches of standing water;

(3) Adequate photoperiod sensitivity and cold tolerance at the reproductive stage in transplant Aman;

(4) Cold tolerance at the vegetative stage during Boro to reduce life cycle;

(5) Tolerance to drought in Aus and broadcast Aman;

(6) Yield potential of 55 maunds per acre in flood tolerant varieties;

(7) Resistance to major insect pests and diseases of rice;

(8) Tolerance to salinity and tidal floods in the coastal districts bordering the Bay of Bengal;

(9) Tolerance to adverse soil conditions like iron toxicity, zinc, and sulphur deficiency;

(10) Higher per-day yield;

(11) Higher milling outturn and table qualities.

In order to achieve these targets, the attention should be paid first to the local varieties which exist throughout Bangladesh. These varieties are collected and conserved, and efforts are to be made to discover excellent breeding materials in the process. The following

laboratories and various rooms of this Project are to achieve the target as soon as possible.

(1) Laboratories and Their Related Rooms

There are four laboratories and related rooms for the purpose of realizing the above mentioned targets with better efficiency.
The focus of research and study of each laboratory is as follows:

a) Cytogenetics Laboratory

This laboratory analyzes genetic mechanism at the cell and chromosome levels in order to have better breeding efficiency. Along with it, the laboratory furthers the study on tissue culture, focusing on cell breeding.

b) Genetic Evaluation and Utilization Laboratory

With its focus on evaluation and utilization of germplasm, the laboratory furthers the systematic and integrated studies with the cooperation of experts in many areas like agronomy, entomology, plant physiology, plant pathology and soil chemistry.
The result of the studies is to be fed to the actual breeding activities.

c) Seed Laboratory

The laboratory conducts the test specific character, identification and evaluation of the collected and exploited genetic resources including strains in the process of breeding and records the informations from the experiments.

d) Milling and Grain Quality Laboratory

After milling the seeds, the laboratory conducts the analytical studies on the collected and bred varieties, including strains in the process of breeding, as regards their milling recovery, table qualities and nutritive values.

e) Record Room

This room is in charge of collecting information on genetic resources both from home and abroad. All the information on the stored genetic resources is systematically classified and sorted

out and establishing a system to give out necessary information promptly. Another function is to publish catalogues of germplasm for international exchange of information.

f) Statistical Analysis Room

A mass of information obtained from investigations, field trials, and indoor experiments is statistically processed and analyzed here.

g) Equipment Room

The equipment of the laboratories which is not used for the time being becomes temporarily in the custody of this room.

In addition, Herbarium to keep and store samples of rice seeds, plants, breakdown plants by pest, disease and insects, and Display Room to exhibit the results of studies are planned to be set up.

(2) Storage and its relative rooms

There are following rooms for storage of seeds.

a) Seed Processing Rooms

Here the first step works of storage and breeding are done such as threshing, plant selections, cleaning, drying, weighing, sorting and preparation of samples.

b) Short Term Storage - Unfumigated Seeds

Bulk samples of breeding line and seeds under multiplications are stored for a short period.

c) Short Term Storage - Fumigated Seeds

Breeder's seeds, and nucleus seed stocks, foundation seeds and bulk sample of elite genetic materials are stored for a slightly longer period.

d) Short Term Storage

Thousand of plant selections, screening tests and yield trial seed samples are stored for a short period. This room involves with some indoor works.

e) Medium Term Storage

Space for up to 10,000 germplasm samples and elite genetic materials for ten to fifteen years. The special character of this Project is to engage the box type instead of the conventional walk-in room type. This will be detailed later.

f) Seed Drying and Packaging Room

Fumigating, final drying and stabilizing seed moisture content prior to packaging and sealing seed for midium term conservation.

By newly establishing those labroatories and various rooms, the breeding activities will be made by far more efficient. At the same time the basic studies will start along with the field work, and thus more varied excellent results of the breeding are expected in the future.

5-2-2 Functional Relation with Laboratories and Rooms

The first stage of the breeding process conducted by Genetic Resources and Cytogenetic Studies Section includes some general steps. Interrelation among those steps with the newly established laboratories and various rooms is shown in Fig. 5-3.

Information on varieties from home and abroad is collected ..... (1)

The members of basic studies are responsible for setting up a collection and conservation plan based on the information .(2) (3)

Thus actual collection starts ..... (5)

At this stage a special care is taken to control disease and pest. Specialized and integrated basic information of each area regrading the seeds from the basic studies stage is systematically assorted and kept. .....(3) (4)

It serves as the basic reference at the time of breeding material selection ..... (13)

The selection of breeding materials is carried out by researchers of before mentioned both sections coordinated by the Genetic Evaluation and Utilization Laboratory.

Newly collected seeds go through the first-year tests, then they are multiplied and conducted the test of characteristics ...(5) (6) (7) (8)

The information obtained is sorted out and kept systematically as the basic reference ..... (4)
and the seeds are sent to the adequate storage room depending upon their purpose of use ..... (9)

Seeds during the storage, especially the longer term storage, receive the test of characteristics as necessity arises..... (8)

They, being identified, will be distributed as breeding materials through in some cases a part of them will be abandoned ..(10) (11) (12)

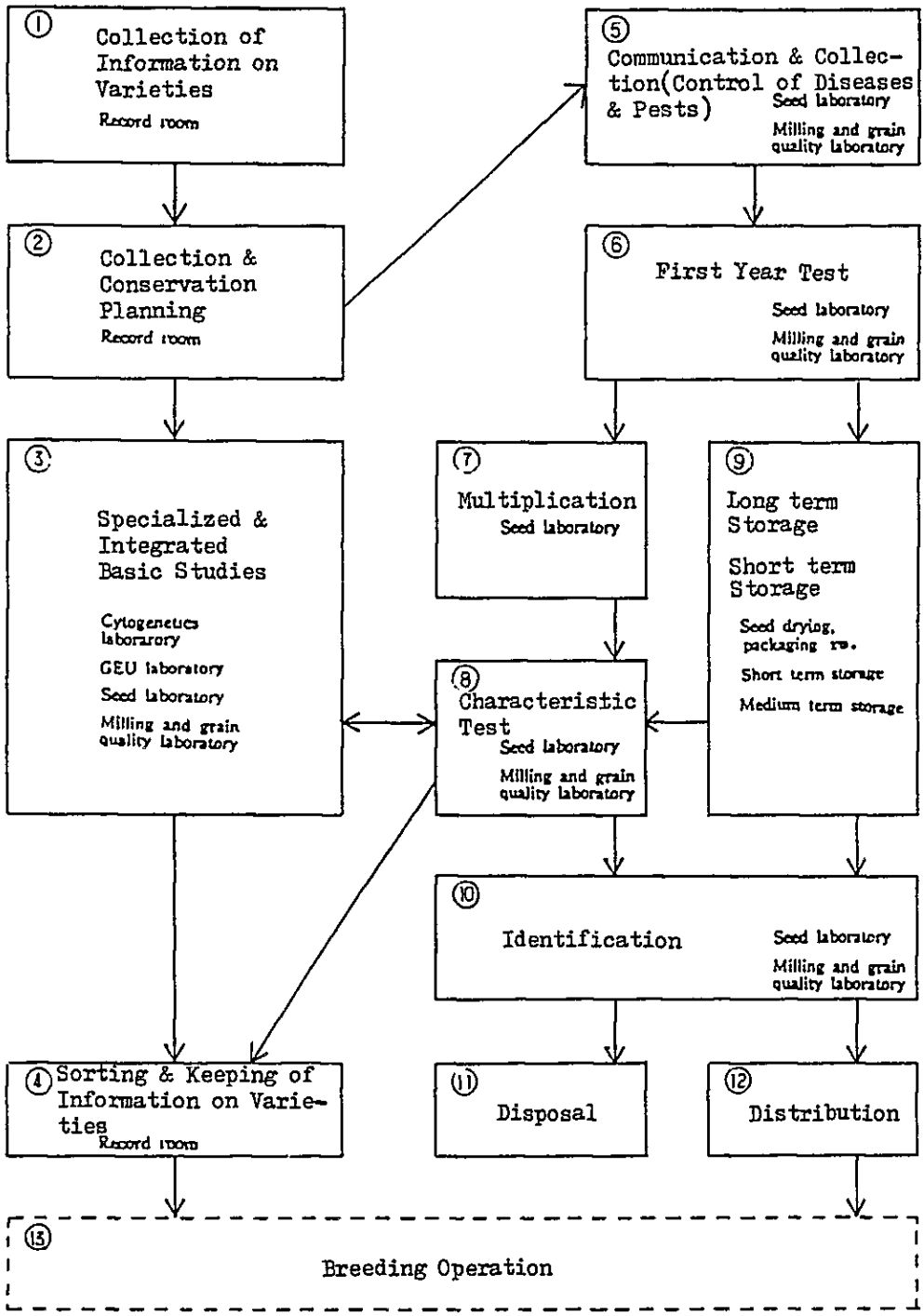


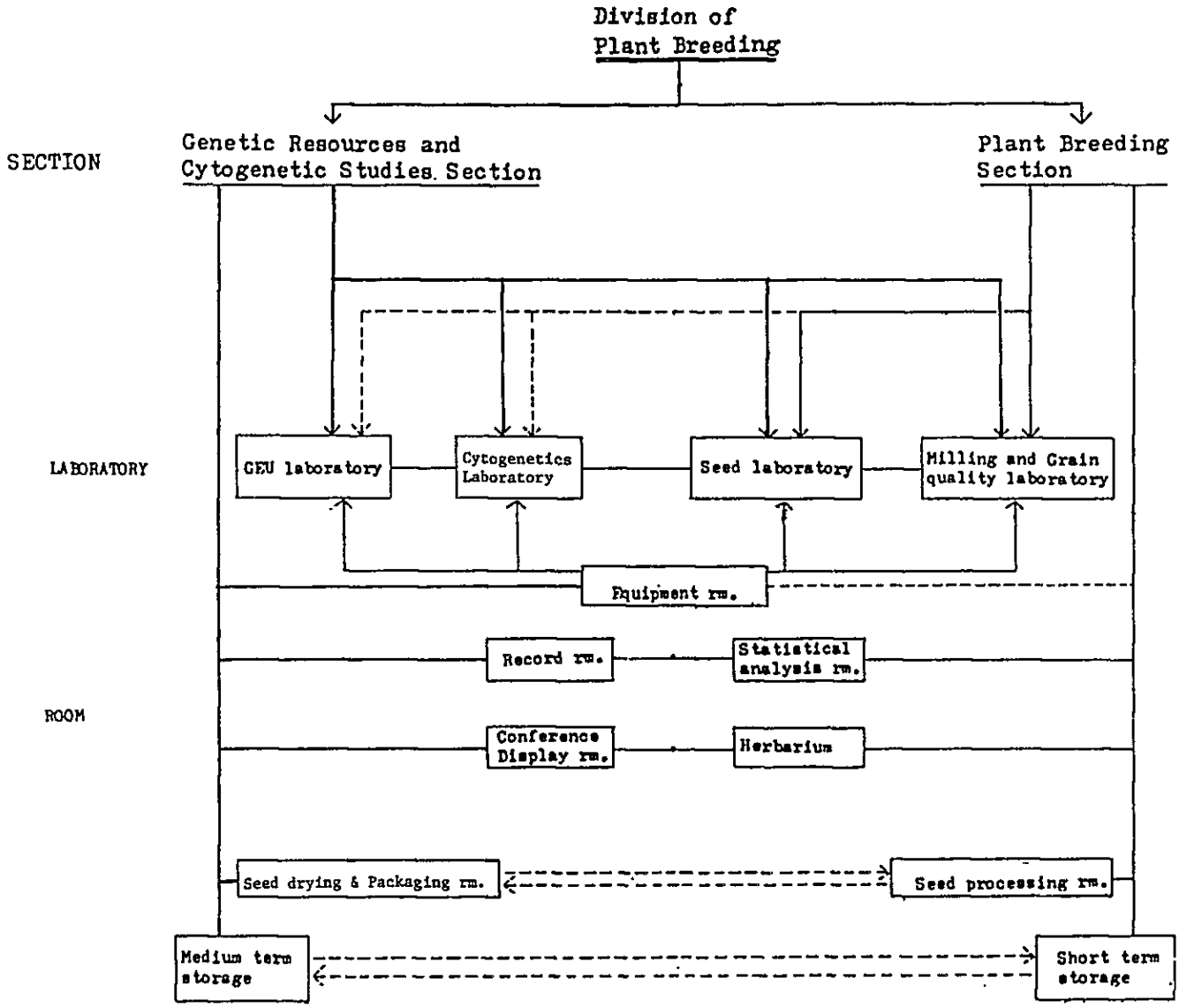
Fig. 5-3 Various steps of the first breeding stage

5-2-3 Relation Between Plant Breeding Division and the Various Rooms

The prospective relations between the two sections of Plant Breeding Division, Plant Breeding Section and Genetic Resources and Cytogenetic Studies Section, which are formed under BRRI's new five year scheme and newly established laboratories and various rooms under this Project, are shown in Fig. 5-4.

Genetic Resources and Cytogenetic Studies Section will be strongly related with the four laboratories, Statistical Analysis Room, Record Room, Herbarium, Display Room, Seed Drying and Packing Room and Medium Term Storage. Plant Breeding Section, on the other hand, will have a special relation with Seed Laboratory and Milling and Grain Quality Laboratory among the laboratories, and Statistical Analysis Room, Record Room, Herbarium, Display Room, and in addition, Seed Processing Room and Short Term Storages. Equipment Room is related with all the four Laboratories.

It is clear from the relations that the completion of this Project will activate not only the Genetic Resources and Cytogenetic Studies Section but also the Plant Breeding Section, thus leading to strengthen the activity of whole Plant Breeding Division.



(Note) The solid line indicates a strong relation and the dashed line a weak relation.

Fig. 5-4 The two sections under the Plant Breeding Division and relation with newly established Laboratories and various rooms

5-3 Personnel Disposition

Based on the new Five-Year Plan of BRRI, Plant Breeding Division will have Genetic Resources and Cytogenetic Studies Section and Plant Breeding Section.

Regarding the person numbers, 9(including 7 scientific officers) of total number 44 (32 scientific officers) will be arranged for a new section of Genetic Resources and Cytogenetic Studies. And above 9 members will be the persons of Cytogenetic Laboratory.
Details are as follows:

Principal Cytogenetist	1
Senior Cytogenetist	2
Cytogenetist	4
Field Man	1
Laboratory Attendant	1
Total	9

For a new GEU laboratory, 7 or 8 scientific officers will be transposed from other existing divisions of Agronomy, Entomology, Plant Pathology, Plan Physiology and Soil Chemistry. This is a quite unique idea, therefore future activities are expected.

Concerning the disposition of personnel for other laboratories or rooms except GEU and Cytogenetics Laboratories, 35 persons (including 25 scientific officers) will be arranged respectively from Plant Breeding Division.

Fig. 5-5 shows a hypothetical disposition of personnel reflecting upon the situation and activities of each laboratories and rooms.

Definite person disposition plan in detail is still in the process of investigation by BRRI. However, with consideration of above mentioned situations and actual operations of laboratories and related rooms, the final person disposition plan including assignment of persons to laboratories and rooms after this Project has completed could be assumed as shown in Fig. 5-5.

It is desirable to realize the above mentioned person disposition plan which will meet to the special function of those laboratories and rooms even the final plan will be authorized by BRRI. Breeding operations will be remarkably strengthened both in the fields of basic studies and applied techniques by adopting this recommendable disposition plan which could realize the most effective and cooperative operations among laboratories and rooms. Earliest performance of final target of the Project which is to breed new varieties of crops could be achieved by this recommendable plan.

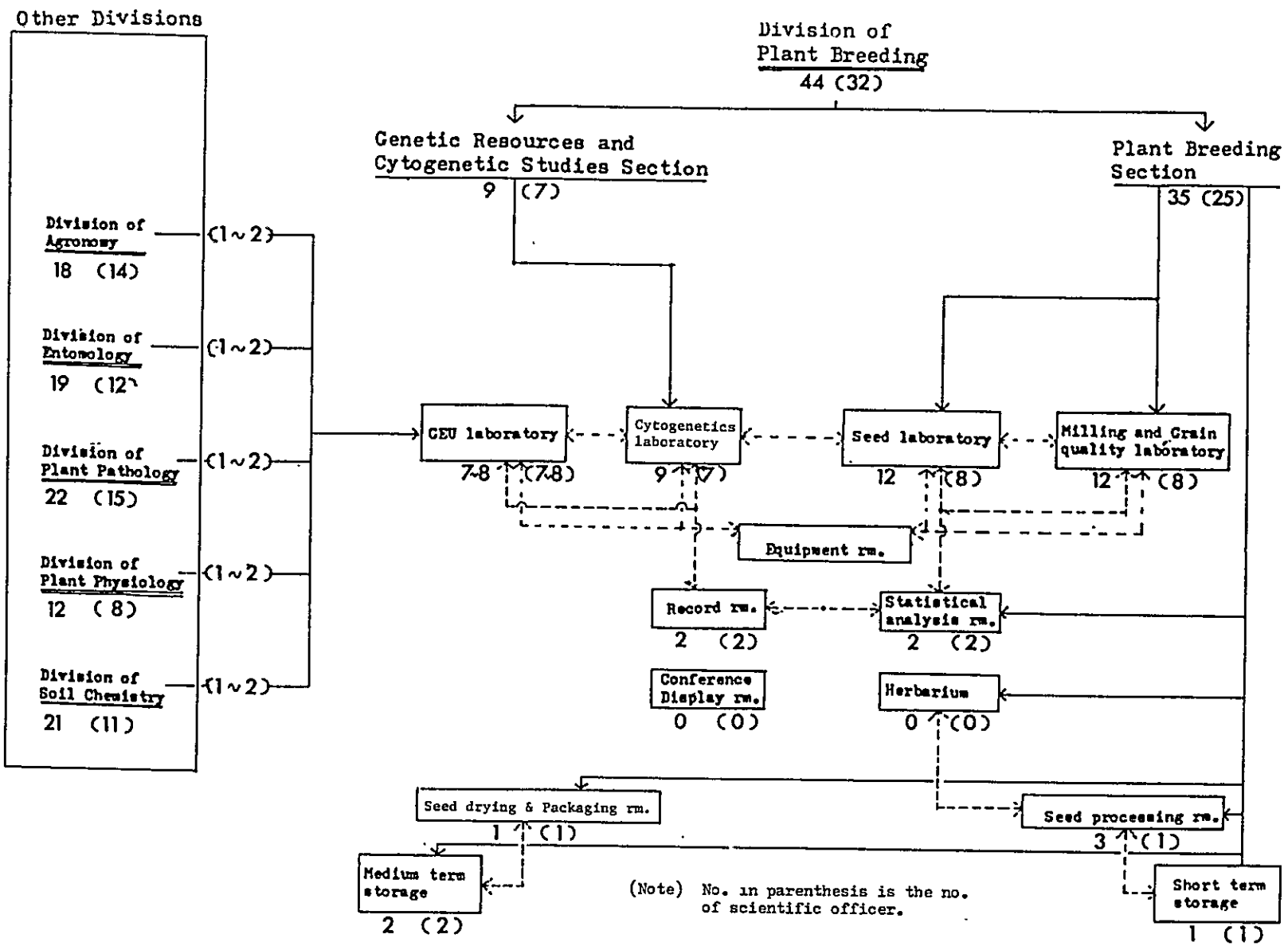


Fig. 5-5 Hypothetical disposition of personnel and activities

5-4 Utilization and Size

5-4-1 Selection of Conservation Method

The conservation method proposed by the Bangladesh side consumes a large amount of electricity and maintenance cost to keep low temperature and humidity in storage for genetic resources.

Therefore, in view of the importance of maintenance cost the most suitable method is "E" type selected from the list of Table 5-1; this is box type low temperature control and conservation method including an air tight glass jar with desiccant agents and be decided after further discussion with Bangladesh and the field survey conducted by the Team.

This conservation method of rice genetic resources has been adopted in the world since the oil-crisis for the following reasons:

(1) Least maintenance cost
(electricity consumption ---30% of usual requested method-A, Table 5 -1)

(2) Simple operation with few troubles

(3) Easy repairing technique as general refrigerator

(4) Easy to manage equal temperature in storage for it has smaller space as such facilities

(5) In case of machine trouble, easy transfer of genetic resources to another box without damage

(6) Possible to take out seed and manage it under normal temperature

For humidity control, special aluminium foil, air tight glass jar periodic exchange of desiccant agents and etc. are necessary.

Seed processing for storage is shown in Fig. 5-6.

Table 5-1 Five methods discussed on the spot

Conservation method (medium term)		Temperature		Humidity		Air-conditioned area	Operation cost for conservation (electricity) 1 kwh/1.56 Tk	Descriptions
		Short term	Medium term	Short term	Medium term			
room type	A	10-15°C	5-15°C	40-50%	20-50%	medium-term + short-term 490 m^2	around 1,000 kwh/day 46,800 Tk/month	Most itemes such as conservation method, environment condition, room size etc. follow Bangladesh request. Whereas sufficient condition for low temperature and humidity, from the viewpoint of technique and running cost for a long time operation is quite difficult.
	B	20°C	0-5°C	-	60%	" 237 m^2	550 kwh/day 25,740 Tk/month	The size of the controled temperature room is a half of A and the controlled 60% humidity room is reduced to 21 m^2.
	C	20°C	0-5°C	-	-	" 237 m^2	450 kwh/day 21,060 Tk/month	Cancellation of 60% humidity room in B.
box type + air tight glass jar	D	20°C	0-5°C	-	-	short-term 79 m^2	200 kwh/day 9,360 Tk/month	Necessity of new conservation method because of over cost for maintenance in A, B, and C.
	E (mutual consent)	20°C	0-5°C	-	-	118 m^2	300 kwh/day 14,040 Tk/month	Similar as D except 50% wider area of short term storage for better operation.

Payable expense for electricity 20,000 Tk/month.

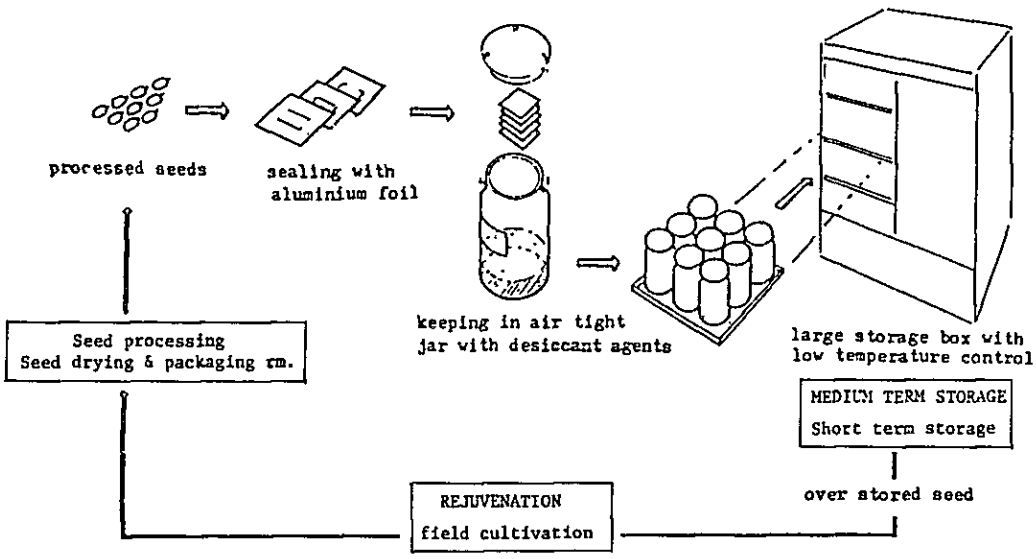


Fig. 5-6 The process of conservation

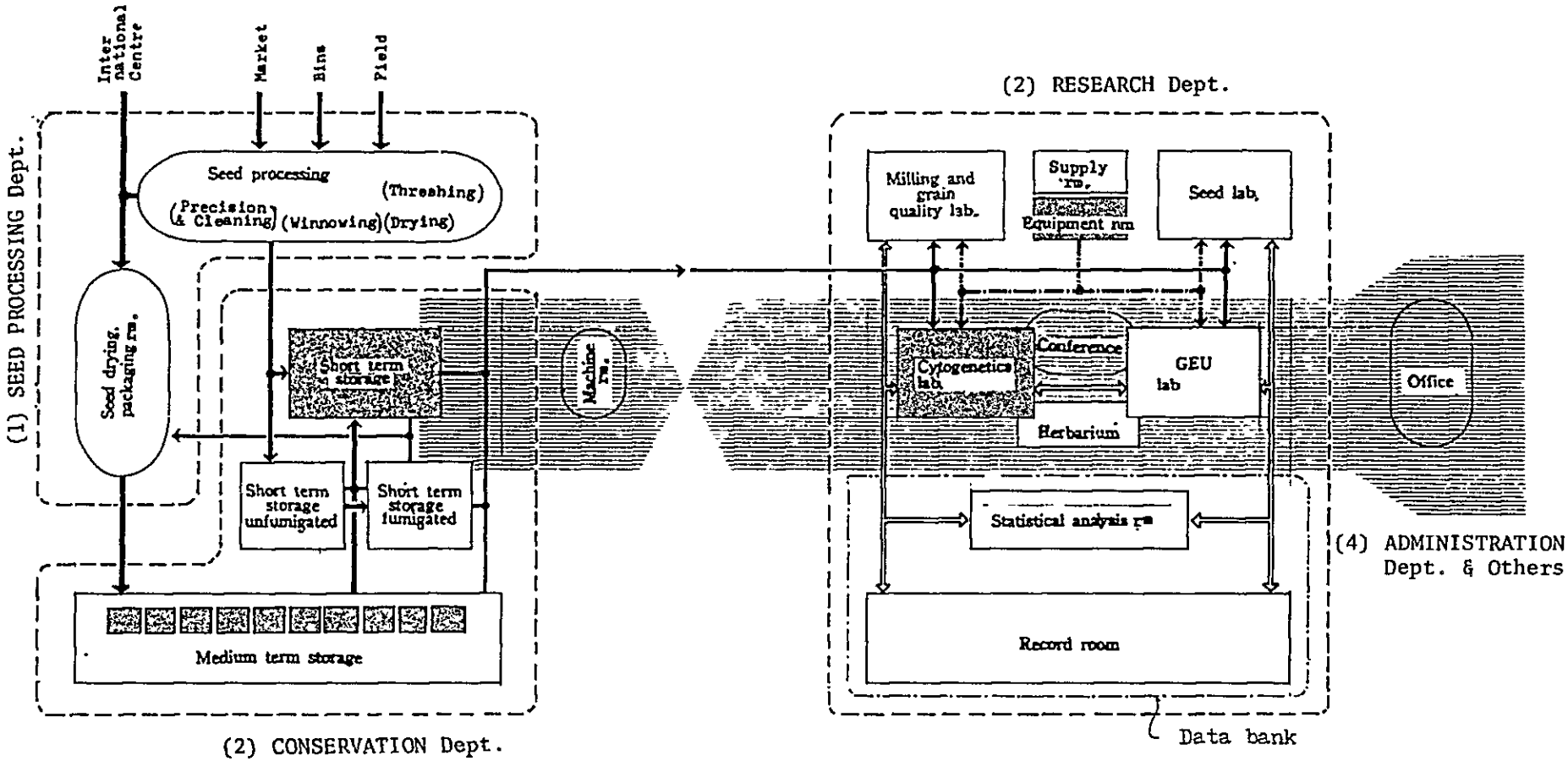
5-4-2 Classification of activities

The main activities of this laboratory are as follows:

(1) Conservation of rice seeds for genetic resources
(2) Seed processing for conservation
(3) Researches on storage and utilization of genetic resources
(4) Administration of above-mentioned operation
(5) Others: machines, corridors, stairs, restrooms and so on

Table 5-2 Outline of laboratories and rooms in department

Department		Laboratory and room	Size m^2	Condition	Main function	Equipment	Number of person
(1) Seed processing		Seed processing	233		Threshing plant selections, drying, cleaning, weighing, sorting and preparing seed samples.	.dryer .air blast seed cleaner .panicle thresher etc.	11
		Seed drying and packaging	118		Final drying and stabilizing seed moisture content prior to packaging and sealing seed for medium term conservation.	.packing sealing equipment .awn remover .laboratory table etc.	
(2) Conservation		Short term storage	118	20°C	Storage of thousands of plant selections, screeing tests and yield trial seed samples.	.drum for seed storage .shelving for storage	1
		Short term storage for fumigated seed	62		Storage of breeders seed and nucleus seed stocks, foundation seed and bulk samples of elite genetic materials for a longer period of time.	ditto	
		Short term storage for unfumigated seed	96		Storage of bulk seed samples of breeding lines and seed under multiplications.	ditto	
		Medium term storage	79		Storage of space for up to 10,000 germplasm samples and elite genetic materials.	.large seed box with low temperature control etc.	
(3) Research	Experiment	Cytogenetics	124	25°C	Research of genetic mechanism at the level of cell and chromosome for more efficient breeding.	.deminaralizer .laboratory table .laminar flow cabinet .autoclave etc.	8
		GEU	79		Comprehensive research of breeding in the field of physiology, pathology, soil-chemistry and plant-pest.	.centrifuge head .refrigerator .laboratory table .waterbath etc.	8
		Seed	47		Characteristic verification and evaluation of collected and developed seed for genetic resources.	.germinator .electric seed counter .laboratory table .coarse balance etc.	1
		Milling and grain quality	47		Analysis and research of quality, taste & nutrition of yield and milled rice of developed species.	.electric seed counter .laboratory table .testing polisher etc.	
	Data bank	Record	79		Systematic arrangement and classification of records & information concerning genetic resources, custody and delivery of those.	.typewriter .shelving etc.	
		Statistical analysis	45		Statistical process and analysis of data from experiment and research.	.caluculator .shelving etc.	
	Others	Herbarium	47		Display of rice plant, diseased stock and plant-pest.	.steel rack with shelves .shelving etc.	
		Equipment	21		Charge of equipment especially for environmental maintenance.	.dehumidifier	
		Supply	21		Supply of spare parts and experimental equipment.	-	
(4) Administration		Display conference	47		-	-	
		Office for project leader & coordinators	79 (3rms)		-	.typewriter	3
		Office space			Office space enough for future extension for project leaders' and researchers' general affairs	.photocopy .duplicating machine	11
(5) Others		Machine			-	.generator .radiator	1
		Other spaces			Toilet (each floor): men style 3 women style 3 corridor (ditto) stairs, hot water service room warehouse	.extinguisher .fire hydrant box .wagon	
		Subtotal	1,961.12 m^2				44
Annex		Garage	63 m^2		-	.vehicle 3	3
		Total	2,024.12 m^2				



Introductory Note

Air-conditioned Area

Short term storage : by package type
Medium term storage : by Refrigerator
Cytogenetic Lab. : by Window type
Equipment rm. : by Portable defumidifier

Administrate & Others Section
Genetic resources & rice seed
Research data
Research equipment & tools

Fig. 5-7 Department Structure

5-4-3 Size of Rooms

A total area of 1,961.12 sq m is appropriate, as requested by Bangladesh and agreeded with the Team, for of genetic resources, research and other related activities.

The following items are taken into consideration in deciding the size of each room.

(1) Seed Processing Department

Seed volume, seed form and breeding scale during the cropping season such as the number of combination or samples should be considered. However, the size of room was decided from the view-point of activities for breeding as shown in Table 5-2.

(2) Conservation Department

The storage capacity of seeds is designed by Bangladesh as follows:

a) Short Term Storage (No. of Sample x Unit Weight/kg=Weight/ton)

plant selections	100,000	x 0.05	= 5
screening test	25,000	x 0.05	= 1.25
observation nurseries	20,000	x 0.05	= 1
yield trial plot	10,000	x(5 - 10)	= 50 - 100
breeder's and nucleus seed stock	500(lot)	x 100 - 200	= 50 - 100

b) Medium Term Storage (10 - 15 years)

	10,000	x 0.25 (0.1 - 0.5)	= 2.5

For this storage volume, the size of each room and facilities are decided after the discussion with Bangladesh side.

a) Short Term Storage

shelving for storage	total 90 m
dram for seed storage	total 100 pcs

b) Medium Term Storage

Aluminium foil	15000 pcs

air tight glass jar	1000 pcs
large seed storage box with low temperature control	10 sets

Concerning the size of short term storage with air-condition was set up from the viewpoint of electrical consumption.

(3) Research Department

The size of laboratory varies with the activities and necessary equipment and furniture, but it can be calculated based on essential space per one researcher. The situation of this laboratory is similar to that of Japanese laboratory, so it is estimated based on the average size per one researcher in Japanese Agricultural station.

Table 5-3 shows the required space per one researcher in laboratory obtained from 453 laboratories in Japan. The average size of chemistry, physics and biology laboratory is 15.5 sq m, 16.7 sq m and 15.8 sq m per researcher.

In agricultural laboratories, 61% of the total area is occupied for biological research, and 30% is for chemical research, then 9% is for physical research.

It can be drawn average size 15.79 sq m per person. (15.5 x 0.30 + 16.7 x 0.09 + 15.8 x 0.61) The total floor area of this laboratory (including 3 rooms for director etc.) is 499 sq m: the details are as follows.

Cytogenetics laboratory	124 sq m
GEU laboratory	79 sq m
Milling and grain quality lab.	47 sq m
Seed laboratory	47 sq m
Statistical analysis room	45 sq m
Record room	79 sq m
Office for project leader x 3	78 sq m
Total	499 sq m

The number of researchers is 32, and the area for each researcher is 15.5 sq m, that must be reasonable size.

(4) Administration Department

a) Conference, Display Room: The capacity of 25 people aiming at researchers' meeting

b) Office space: 82 sq m for 11 officers is rather wide which makes allowance for synthetic function of various researches.
In addition, there is space for visiting specialists or researchers when necessary.

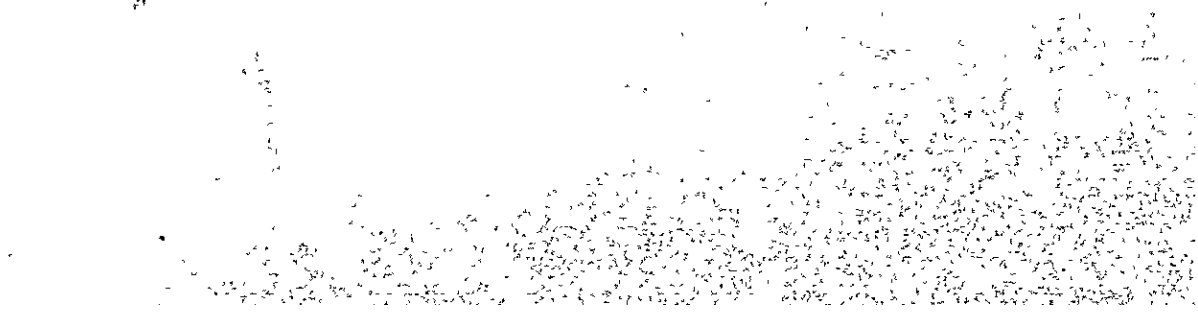
Table 5-3 Size for a researcher in laboratory in Japan

	national			public			university			juridical corporation			private			total		
Chemistry	8.0	12.8	21.0	8.0	18.4	50.0	7.0	18.6	59.0	12.0	20.0	31.0	5.0	13.3	36.0	8.0	15.5	59.0
physics	5.0	15.4	23.0	10.0	20.0	29.0	11.0	15.0	19.0	17.0	23.0	29.0	2.0	17.2	49.0	5.0	16.7	49.0
biology	9.0	11.0	14.0	6.0	17.5	90.0		16.0		5.0	11.0	17.0	6.0	12.7	21.0	5.0	15.8	90.0
medicine		19.0		5.0	11.8	25.0				11.0	17.5	24.0				5.0	14.4	25.0
Total	5.0	12.8	23.0	5.0	18.0	90.0	7.0	17.6	59.0	5.0	17.3	31.0	2.0	13.9	49.0	2.0	15.7	90.0

(Note) Each figure in left, middle, right of column shows minimum, average, and maximum value.

(Source) Design of laboratory 1966 published by RATIS

Chapter 6 BASIC DESIGN



Chapter 6 BASIC DESIGN

6-1 The Proposed Site

6-1-1 Location

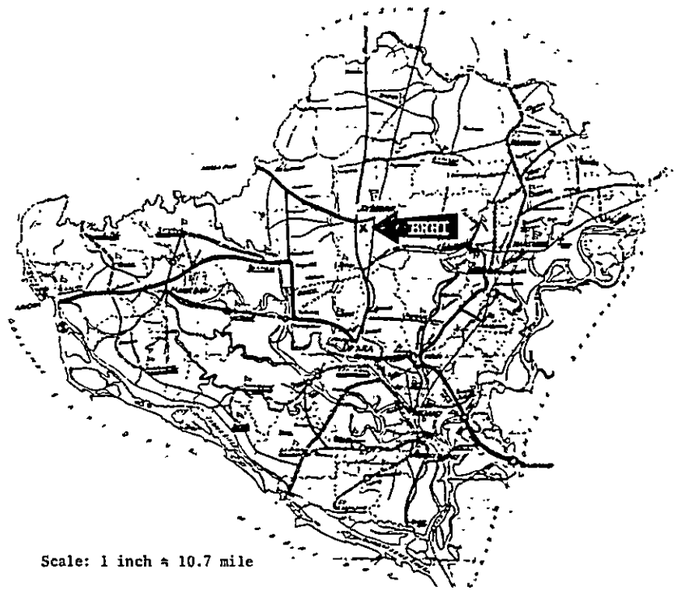
The proposed site for this Project is located on BRRI campus in Joydebpur, which is some 25 km north of Dhaka. Being adjacent to agricultural research institutes such as BARI and CERDI, it formulates a so-called "Agricultural Research Town" together with their dormitories, laboratories and so forth.

6-1-2 Environment and topography

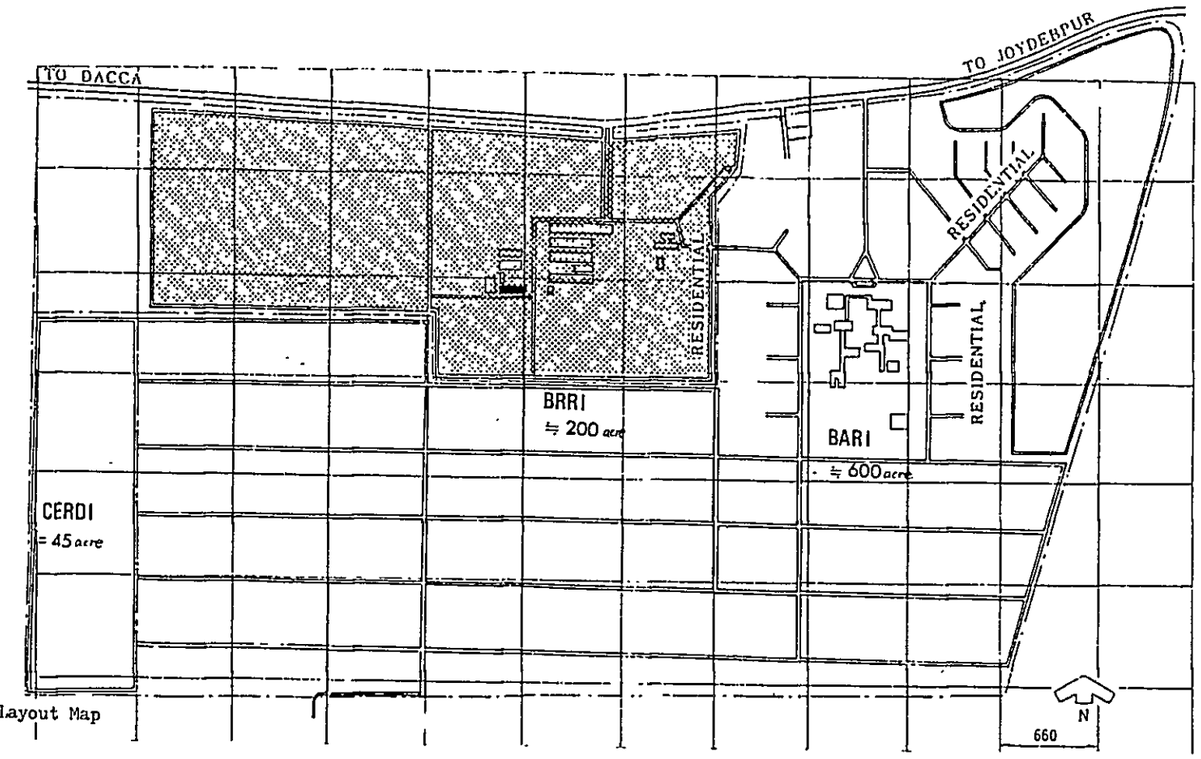
The climate is subtropical and in monsoon zone. Summer is from March to October with the highest temperatures of 26.7°C - 32.2°C in March and April. From June to October, heavy monsoon rainfall is seen. Due to high seasonal downpours, recording of 3,450 mm in some area, the temperature drops a little. In winter, from November to February, the mean temperature and rainfall are 12.8°C and 180 mm respectively.

Under these particular conditions as mentioned above, the proposed site is protected, when the heaviest rainfall, from damages because it is located at 39 ft above sea level, higher than that of the surrounding paddy field.

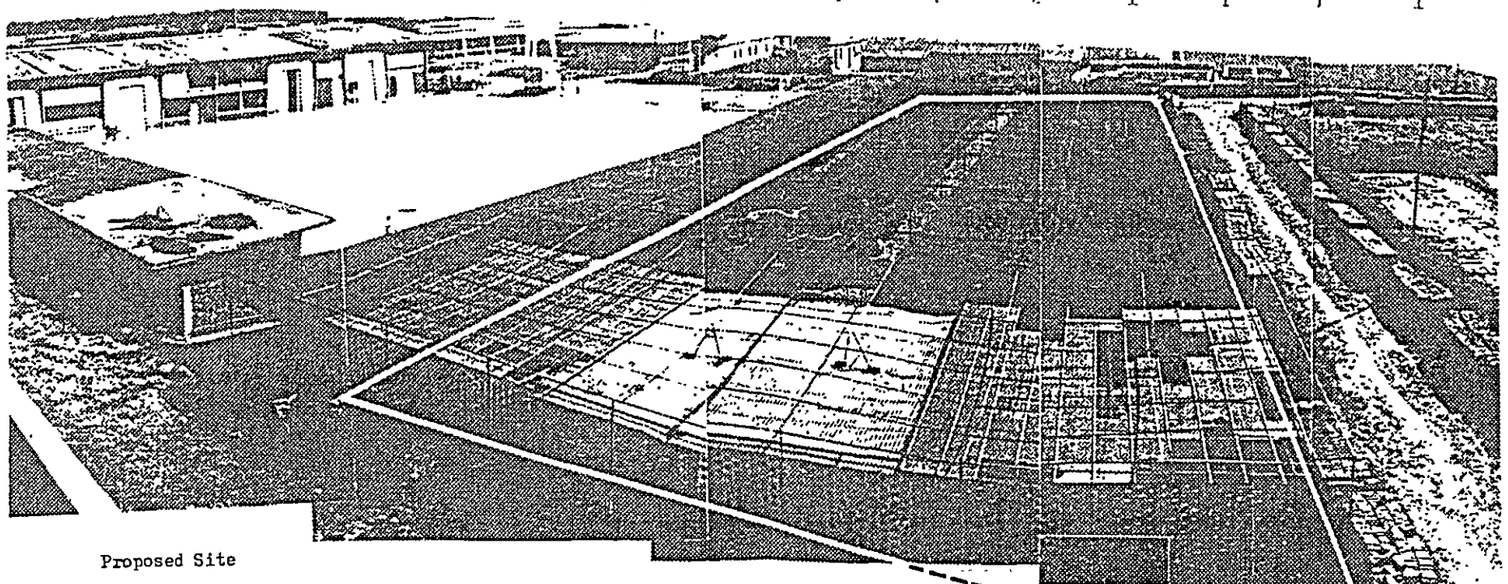
At present the proposed site is used as a net house (20 m x 63 m) against birds, small harmful animals and insects. Also abutting on the site, there stands a simple agricultural equipment shed, steel-pipe-frame structure and galvanized-iron-sheet roofed. These existing structures are to be shifted to the neighboring area on the other side of the campus road before the construction works begin. Since the site is confronting with some 5.5 m wide roads in three sides, construction of new access road is unnecessary.



Map



Layout Map



Proposed Site

6-1-3 Infrastructure

Infrastructure necessary for this Project such as electric power, telephone, gas, water supply and drainage, approaches, are sufficiently equipped and connecting terminals for each except telephone are available at the adjacent of the proposed site.

(1) Electric power:

At the proposed site, power receiving facility intakes at 11 KV and supplies 440/220V, 3/1 phase and 50 cycle after transformation (unstable voltage supply level: 180 - 250 V). Sufficient capacity for the Project is also assured.

(2) Telephone:

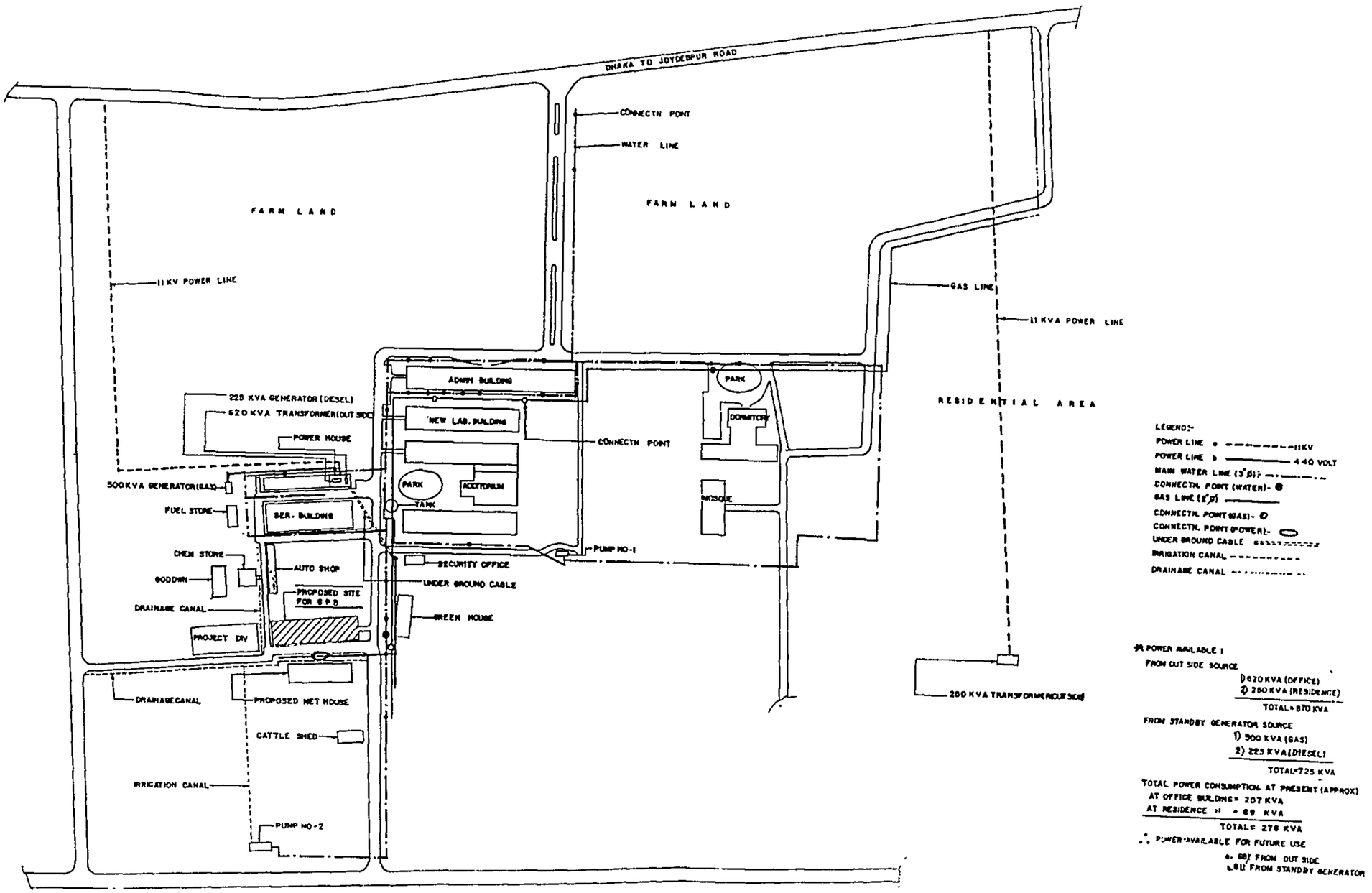
Possible to extend from the existing facilities.

(3) Gas: Natural gas, calorie 1,036 Btu/ft^2, (1 Btu = 0.2522 Kcal)

(4) Water supply and drainage:

Well and elevated water tank (72 ton) are already installed therefore sufficient capacity is assured. There are no special problems in using the water supply for drinking and laboratory experiments.

Drainage canals are installed through the roads in the campus.



Distribution drawing of electric power, water supply, drainage and gas.

6-2 Architectural Design

6-2-1 Principles

The basic principles are as follows:

(1) Low maintenance cost:

To give the first priority to the cost reduction of administration and operation when selecting storage method as well as designing facilities.

(2) Least unproductive space:

To minimize waste space to utmost and conduct efficient use of space by means of floor planning.

(3) Highest security:

To ensure the maintenance and managing security for the equipment and implements in each materials.

These items were proposed by the Bangladesh side before the field survey of the Team and discussion with authorities concerned. They were also approved by the Team and then promoted as basic principles.

6-2-2 Layout

The construction site proposed by BRRI is detached from the existing research building blocks. Moreover it is adjacent to the campus roads in three sides therefore the surrounding existing facilities never affect its layout directly.

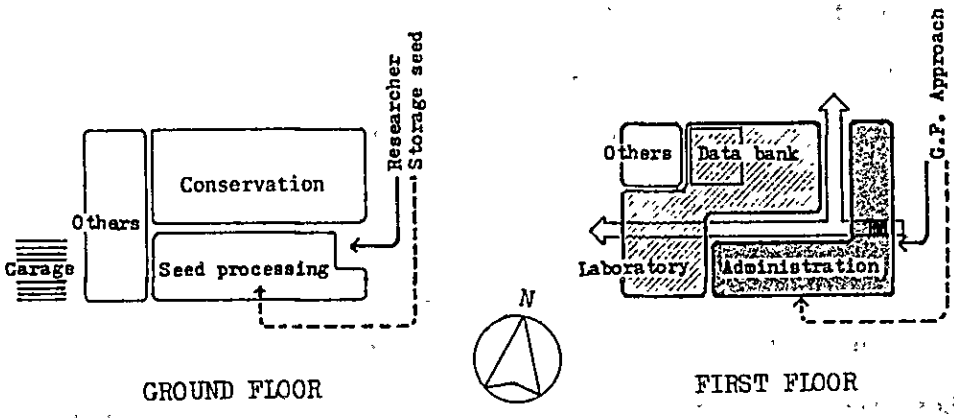
Considering scheme demention and proposed site area, each department has been set up in a full-two-story building as follows;

Ground floor: seed processing dept.
conservation dept.
First floor: research dept.
administration dept.

Besides, a machine room is to be provided on the ground floor and toilet on each floor. Garage (3-vehicle capacity) is to be arranged

as another one-story building to the west on the extended part of the present auto shop.

The approach to each department is devided into two; for researcher and for storage seed. The approach for researcher is situated in the east, confronting with the existing administration and research buildings.



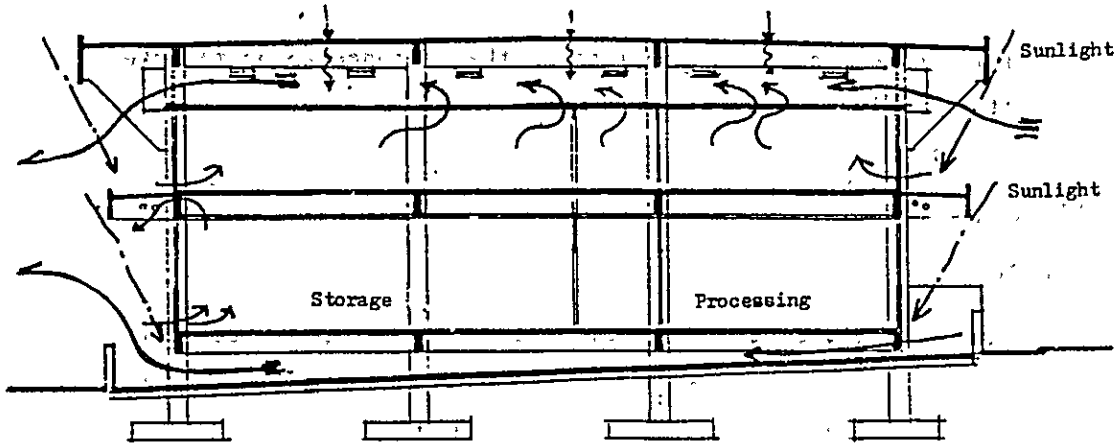
The first floor is composed of two L shape parts; one part for research furnishing water supply and drainage and the other for administration arranged in the south east from where two approaches can be seen over.

6-2-3 Architectural planning

Taking account of the layout plan and minimization of unproductive space, the middle-corridor type being compact as a whole has been adopted.

In substance, the middle-corridor type has advantages in minimizing construction cost such as efficient use of floor area, shortening of pipings and wirings and common use of partition walls. However, there are some drawbacks in the utilization of natural ventilation.

To offset this, special attention is paid in the sectional design as follows;



(1) Ventilation by a raised floor:

Taking advantage of the site ground level difference, the storage can be protected, which must be especially moisture free, from moisture seepage from the ground, prevent moisture from accumulating in the building subfloor.

(2) Ventilation by air ducts:

On the upper floor, the radiation of heat caused by the heated roofslab can be discharged through the natural ventilation, accelerated by the air ducts.

The eaves on each floor work effectively in reducing the building's maintenance cost by preventing the direct sunlight from affecting the interior, and also protecting the outer wall and facilitate the building from severe weather condition. In fact a 1.8 m long eave on a present building has proved this point.

Detailed items for each department are listed below.

(1) Seed processing dept.

a) Much dust is expected due to transport vehicles and various processing of seeds, therefore sufficient ventilation should be ensured.

b) In order to keep the storage free of dust, corridors should be provided.

c) Large eaves should be provided at the entrance so as to make it possible to utilize the outdoor space for seed delivery and processing works in rainy weather.

(2) Conservation dept.

a) Medium term storage:

Against the radiation of heat from the low temperature control equipment, air intakes under the floors should be ensured a sufficient amount of natural ventilation.

b) Short term storage (Walk-in type):

This is the only air-conditioned storage therefore, in order to minimize its operation cost to the utmost, it is to have double-walls.

(3) Research dept.

a) Since the filing works of data from each laboratory is another crusial function of this Project, such rooms as record, statistical analysis, and herbarium are situated in the center of the research dept.

b) The layout of fixtures for such room should be done according to the fundamental pattern; main laboratory table in the center, closets and desks etc. on both sides.

c) In the equipment room, a portable dehumidifier should be provided so as to keep the equipment free from humidity.

(4) Administration dept.

a) Conference display room should be multi-purpose-use designed for meetings and talkings among each field's researchers.

b) Some portion of office space should be reserved to be utilized and easily partitioned in case for the future visiting experts, single room for a special researcher.

6-2-4 Structural design

Structure: Rigid frame reinforced concrete partly brick masonry

This is durable enough for over 50 ton working load on the storage floor, special attention is paid to the condition.

Inner and Outer wall: Brick masonry

Roof and Floor: Reinforced concrete slab

The design conditions for external forces and working loads against the building are as follows;

(1) Seismic force: K = 0.05

The proposed site is in the center of Bangladesh, where no earthquake damage has been recorded. However earthquake influence should not be neglected in design.

(2) Wind: 66 m/sec for cyclones

(3) Supporting ground: 1.5 m below the present surface

(4) Soil bearing capacity: 8 t/sq m

(5) Concrete strength: Fc = 180 kg/sq cm (4 week strength)

(6) Live load: Conforming to the Japan Building Standards Law

6-2-5 Materials

In this material plan, the selection of either import from Japan or local procurement should be done deliberately referring to the facilities' function, construction duration and their costs etc. Concerning the material for the main structure, waterproofing, paint and floor, of which most of the necessary materials is composed, the performances of these materials are ensured to be locally procured under the local construction methods.

(1) Main structure: reinforced concrete

(2) Exterior finishing works

a) Roof: lime terracing

b) Coping: Mortar troweled

c) Outer walls: brick core, mortar troweled, then waterproof painted

d) Fittings with anti-insect net: aluminium sash, steel sash, steel grille

e) Berm. Underfloor: brick laid

f) Gutter: concrete

(3) Interior finishing works

In principle the works shall go as follows, but some change according to the room's purpose shall be allowded.

a) Floor: terrazzo tile

b) Wall and Base board: mortar troweled, then concrete painted

c) Ceiling: plywood boarded, then painted

d) Fixtures: wooden and painted

e) Underslab: foam styrol board fitted

6-2-6 Services

(1) Electric service

Electric service under this Project are as follows;

a) Incoming cable work

Intaken from 440 V distribution line to the building through the underground expose cable.

b) Distribution work

Works from receiving pannel board through switch board, upto each lighting switch board.

Receiving power	3 phase	4 line	440/220 V	50 Hz
Motor circuit	3 phase	3 line	440 V	50 Hz
Lighting outlet circuit receptacle outlet	1 phase	2 line	440/220 V	50 Hz

c) Motor power supply work

Distribution wiring from the motor switch board upto each motor, and installation of the motor switch board.

d) Lighting and receptacle outlet work

Distribution wiring from the secondary branch circuit of each switch board upto each load such as fixtures for lighting and wiring, and installation of fixtures for lighting and wiring. The standard illuminance in each room will be 150 lx - 200 lx, and FL 40 W x 2 with a reflecting shade is in principle planned as for lighting fixtures.

e) Emergency power supply work

The power generator is automatically switched on in the case of a power failure or where there is abnormal voltage reduction.

(2) Air conditioning

Ground floor: The package-type air conditioner is installed in the short term storage (working type) and controls the temperature by circulating the air. Humidity control is not done. (setting temperature 20°C) In order to increase seed conservation efficiency, it should be free from the open air.

First floor: Several sets of window type air conditioner installed in the cytogenetic laboratory and their independent operation is possible. (setting temperature 25°C)

(3) Ventilation

Ceiling fans and ventilating fans are installed wherever necessary.

(4) Water supply and drainage

a) Water supply work

Supply from the existing elevated tank to the spot necessary in the building.

b) Drainage work

All waste and discharged water from each room are collected together through the drainpipe and conveyed to the permeating septic pit located in the north west of the site and finally discharged there through the perforated pipe.
Rain water is discharged onto the site.

c) Planning fixtures work

At each toilet, adequate sanitary equipment is installed follwoing the building plan. The equipment is to be well selected and adapted to the local living environment and customs.

d) Gas supply work

Supplied from the main pipe, which is already installed along the campus road, to each consuming spot.

e) On each corridor, fire plug boxs and hoses are provided against emergencies, extinguishers are also provided.

6-3 Equipment and Materials

6-3-1 Principles

On selection of equipment and materials, the major principles are as follows:

1. To selected the kind and quantity of items at need
2. To limit the availability range to the one only possible by the immediate formation
3. To avoid things whose use or maintenance is enormously costly
4. To include whatever small items if definitely needed in research and other related activities.

Comprehensive furnishing has been aimed but first priority has been given to the equipment in the medium term storage. As in the long term conservation methods the room type was replaced by the box type, special attention has been paid to the cytogenetic laboratory and GEU laboratory in which BRRI takes great interest.

As a result of several discussions, the items as listed in Table 6-1 were finalized based upon the major principles. Unnecessary items were excluded due to the seed conservation method change in the originally requested items, and which were not suitable for the local condition.

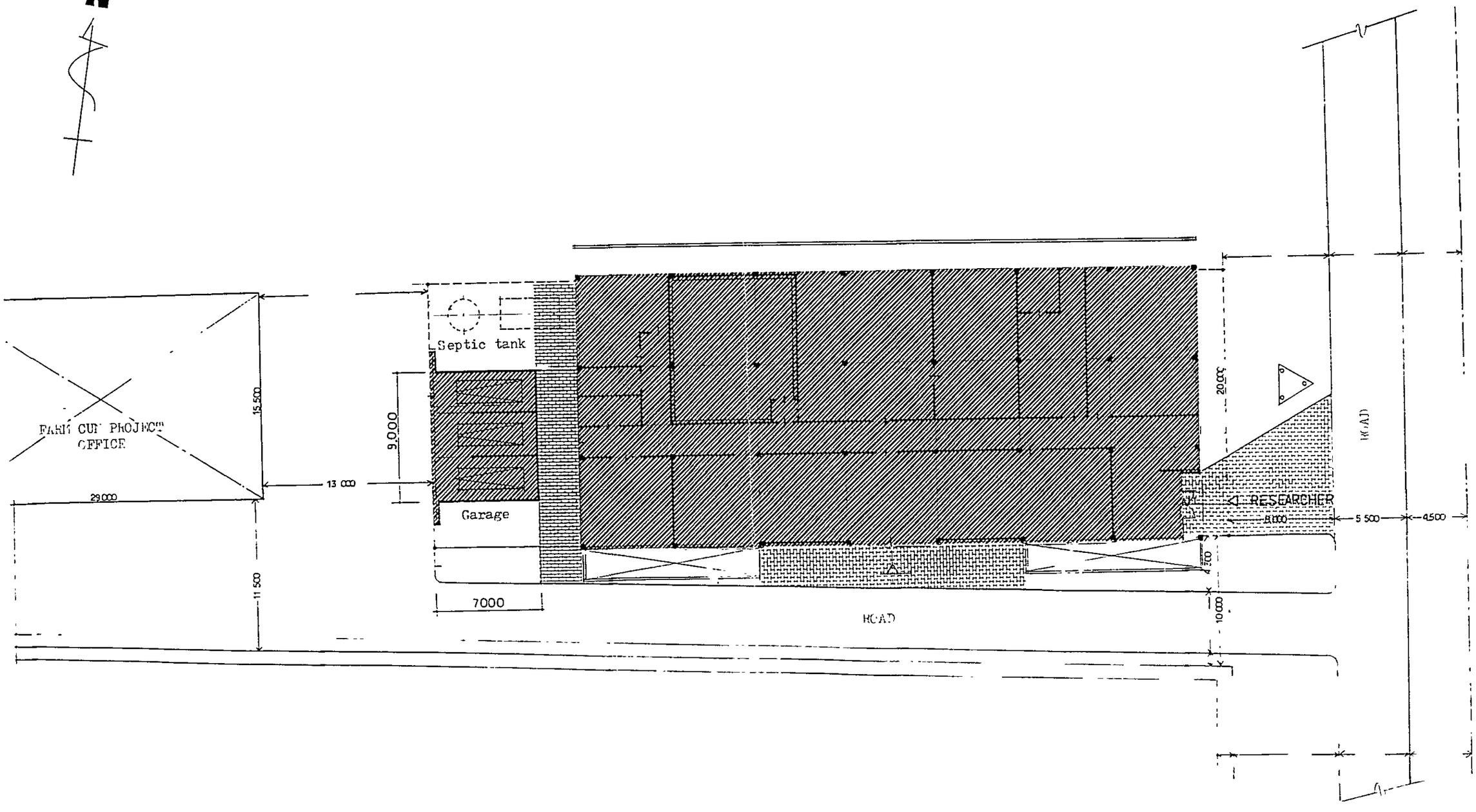
On the drawing of equipment and materials arrangement 6-4 (2), location each item is marked. The number on the drawing corresponds to that of Table 6-1.

Table 6-1 Equipment and Materials

1. Drum for seed storage
2. Large forced air drying oven
3. Medium size constant temperature oven
4. Hermetic seed storage container
5. Vapor proof foil seed packet
6. Packing sealing equipment
7. Germinator
8. Shelving for storage
9. Panicle thresher
10. Large plot self cleaning plot thresher
11. Air blast seed cleaner
12. Grain moisture tester
13. Haemacytometer
14. Refrigerator
15. Deminaralizer
16. Steel racks with shelves
17. Precision balance (weight to .001 g)
18. Coarse balance (20 kg x 5 g divisions)
19. Programmable desk-top caluculator with printer
20. Boerner weight per volume apparatus
21. Electric seed counter
22. System microscope with camera attachement
23. Type writer
24. Duplicating machine
25. Photocopy
26. Laminar flow cabinet
27. Autoclave
28. Centrifuge head
29. Incubator
30. PH meter, digital
31. Tools and materials for photograph processing
32. Dryer for seed processing room
33. Testing dryer
34. Water bath
35. Laboratory table
36. Magnetic stirring (with stirring bar)
37. Magnetic pick up rod
38. Dissecting set
39. Alcohol lamp
40. Para film
41. Wagon
42. Awn remover
43. Large seed storage box with low temperature control
44. Dehumidifier
45. Rice seed grader
46. Testing husker
47. Testing polisher
48. Glass ware etc.
49. Chemicals
50. 4 Wheel drive vehicle

PLOT PLAN

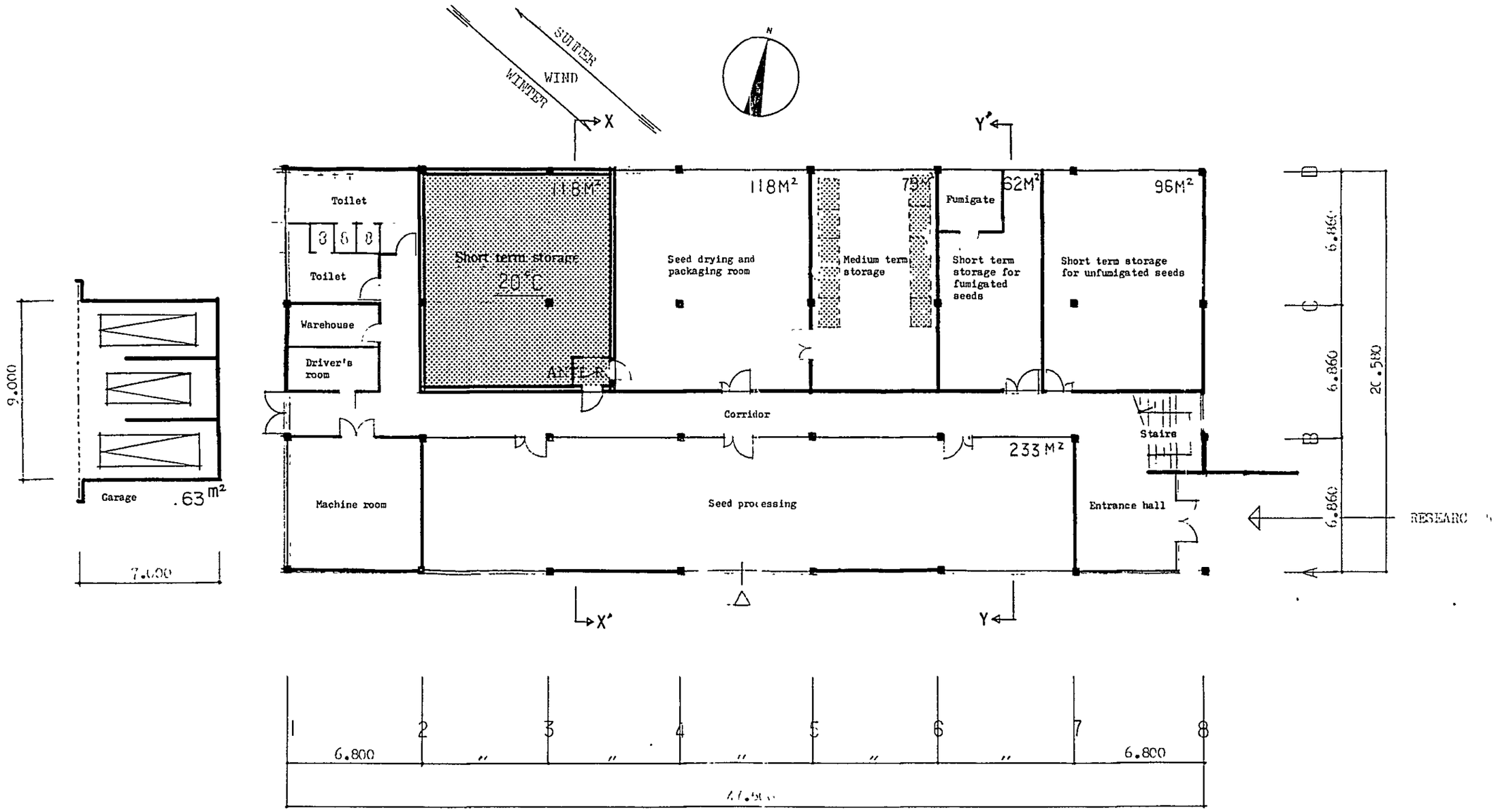
O	GROUND FL · 980.56M² 1ST FL · 980.56 TOTAL 1961.12	GARAGE 63M²



GROUND FLOOR PLAN SCALE 1 : 200

1

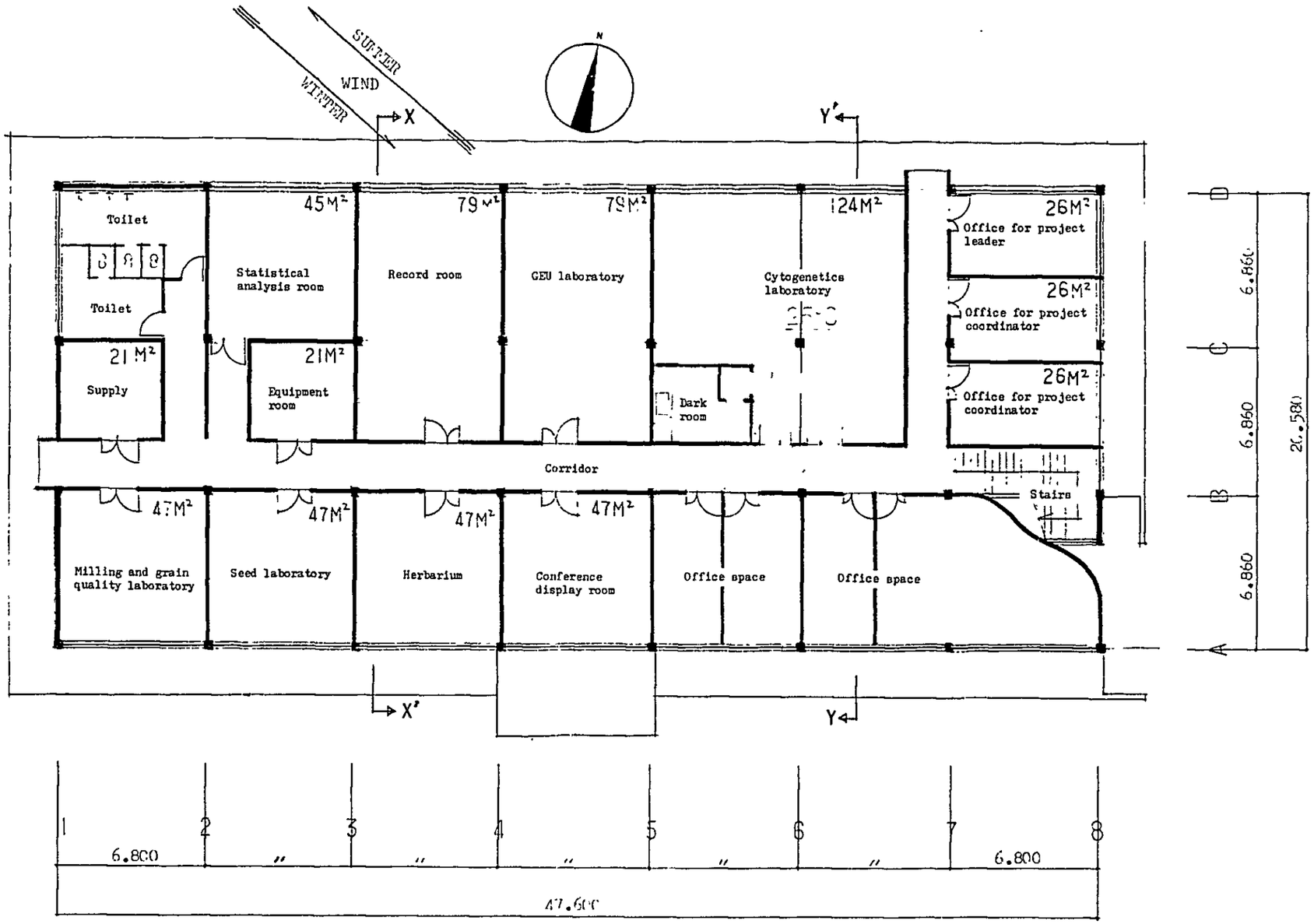
GROUND	FL · 980.56M²	
1ST	FL · 980.56	
TOTAL	1961.12	GARAGE 63M²



FIRST FLOOR PLAN SCALE 1 : 200

2

GROUND FL.	980.56 M²	
1ST FL.	980.56	
TOTAL	1961.12	GARAGE 63 M²

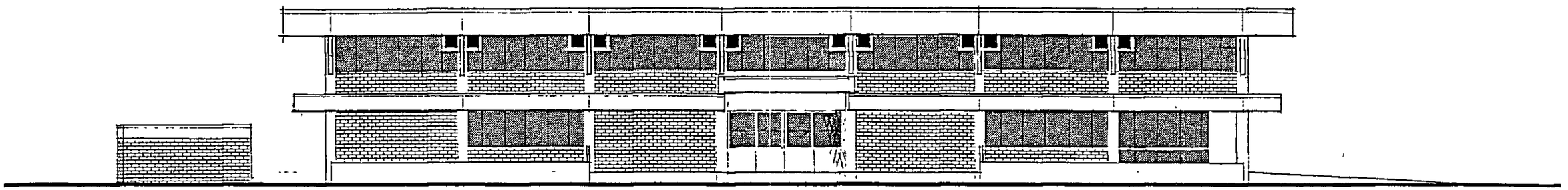


ELEVATION · SECTION

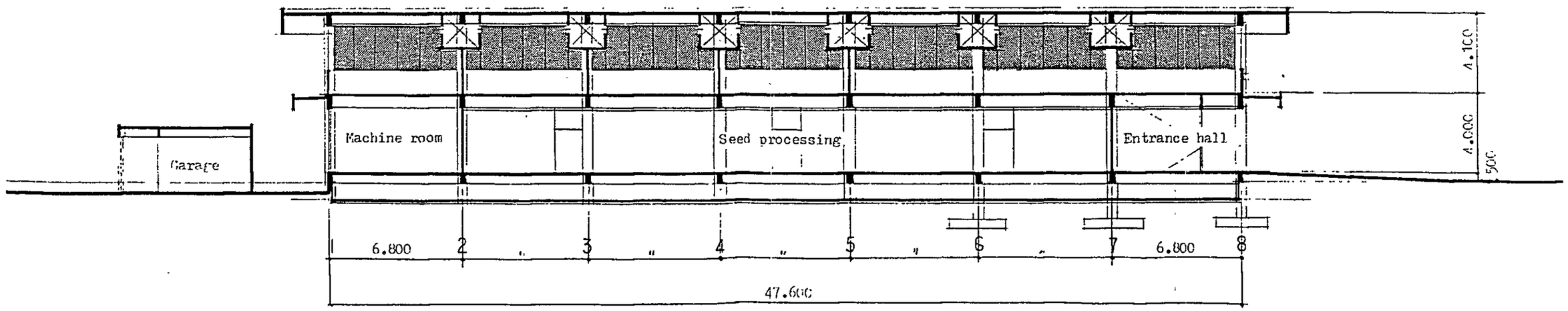
3

SCALE 1 : 200

GROUND FL ·	980.56 M²	
1ST FL ·	980.56	
TOTAL	1961.12	GARAGE 63 M²



SOUTH ELEVATION



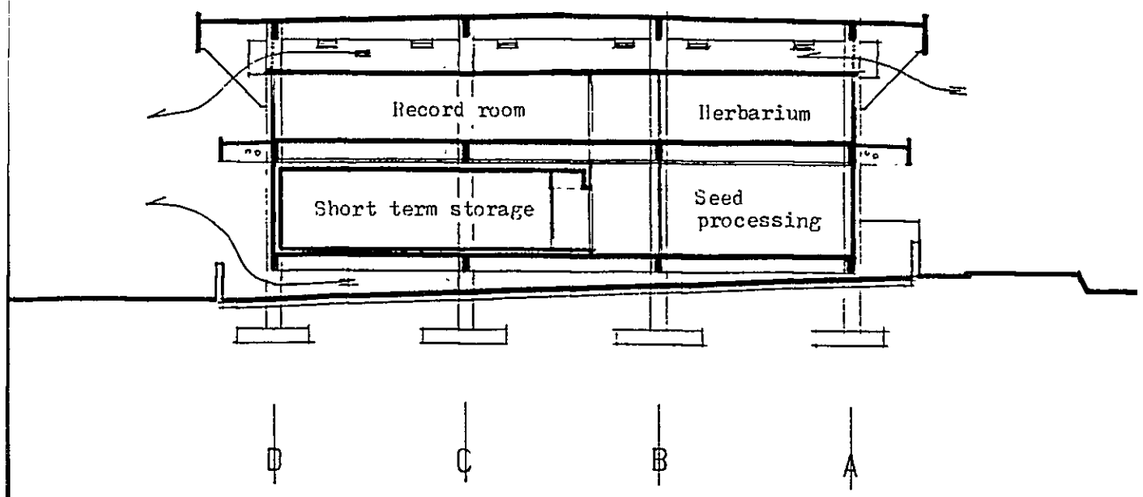
SECTION

ELEVATION • SECTION SCALE 1 : 200

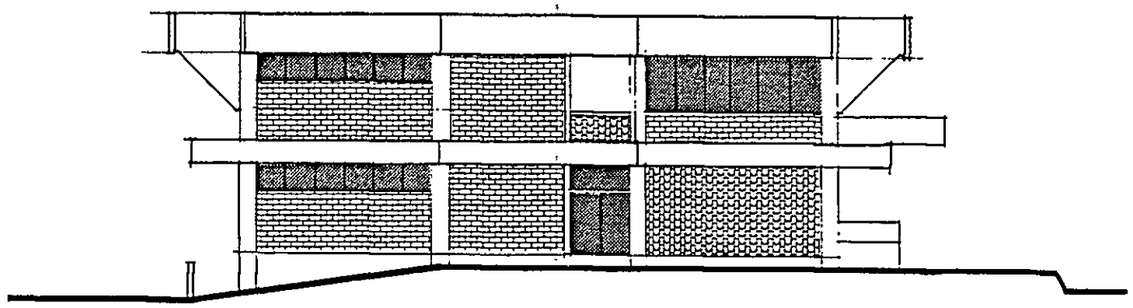
4

GROUND FL • 980.56 M²
1ST FL • 980.56
TOTAL 1961.12

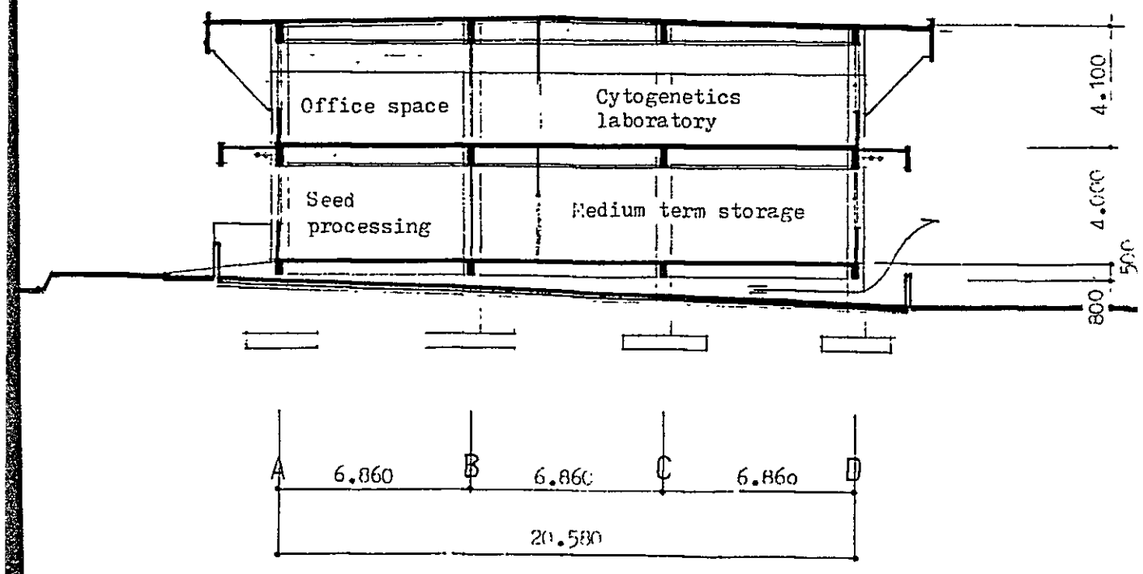
GARAGE 63 M²



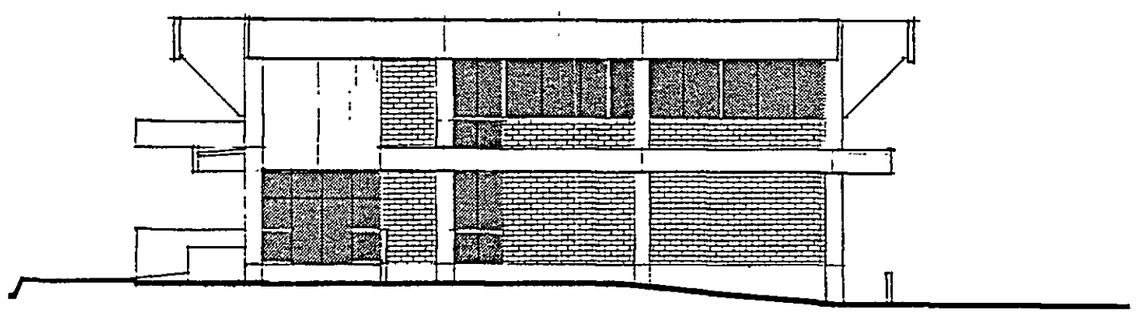
SECTION BETWEEN LINE X – X'



WEST ELEVATION



SECTION BETWEEN LINE Y – Y'

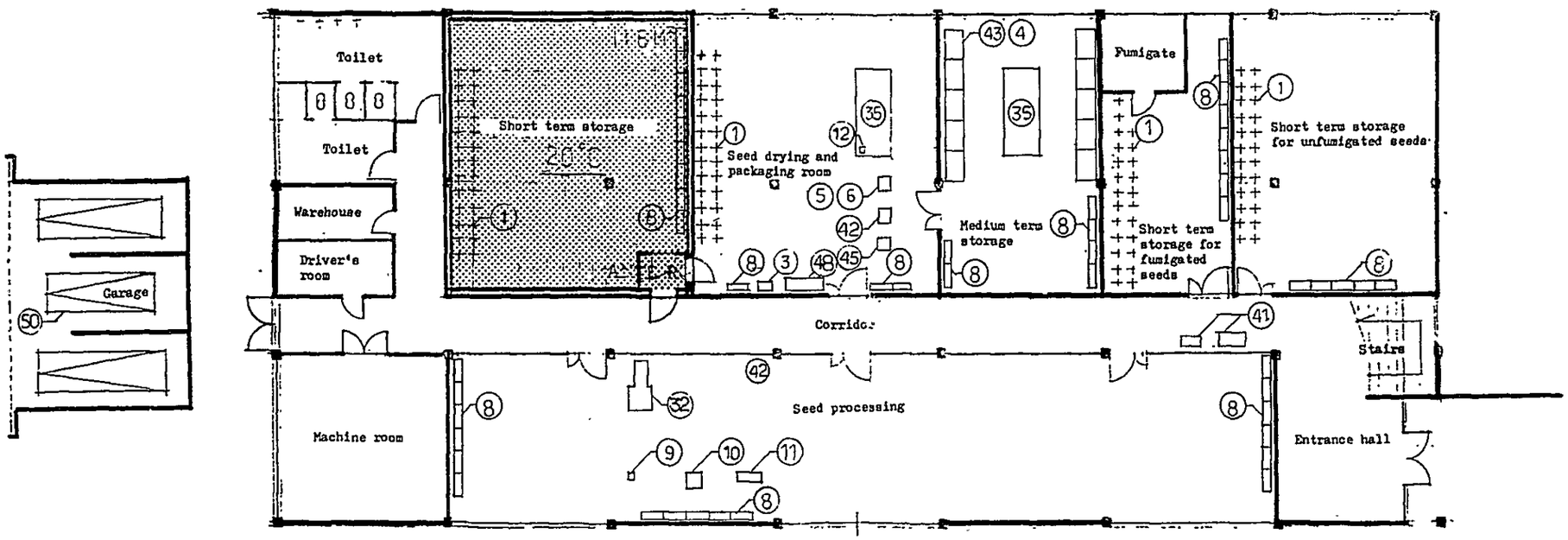


EAST ELEVATION

Layout of Equipment, Materials and Furniture (1)

Number corresponds to that of Table 6-1.

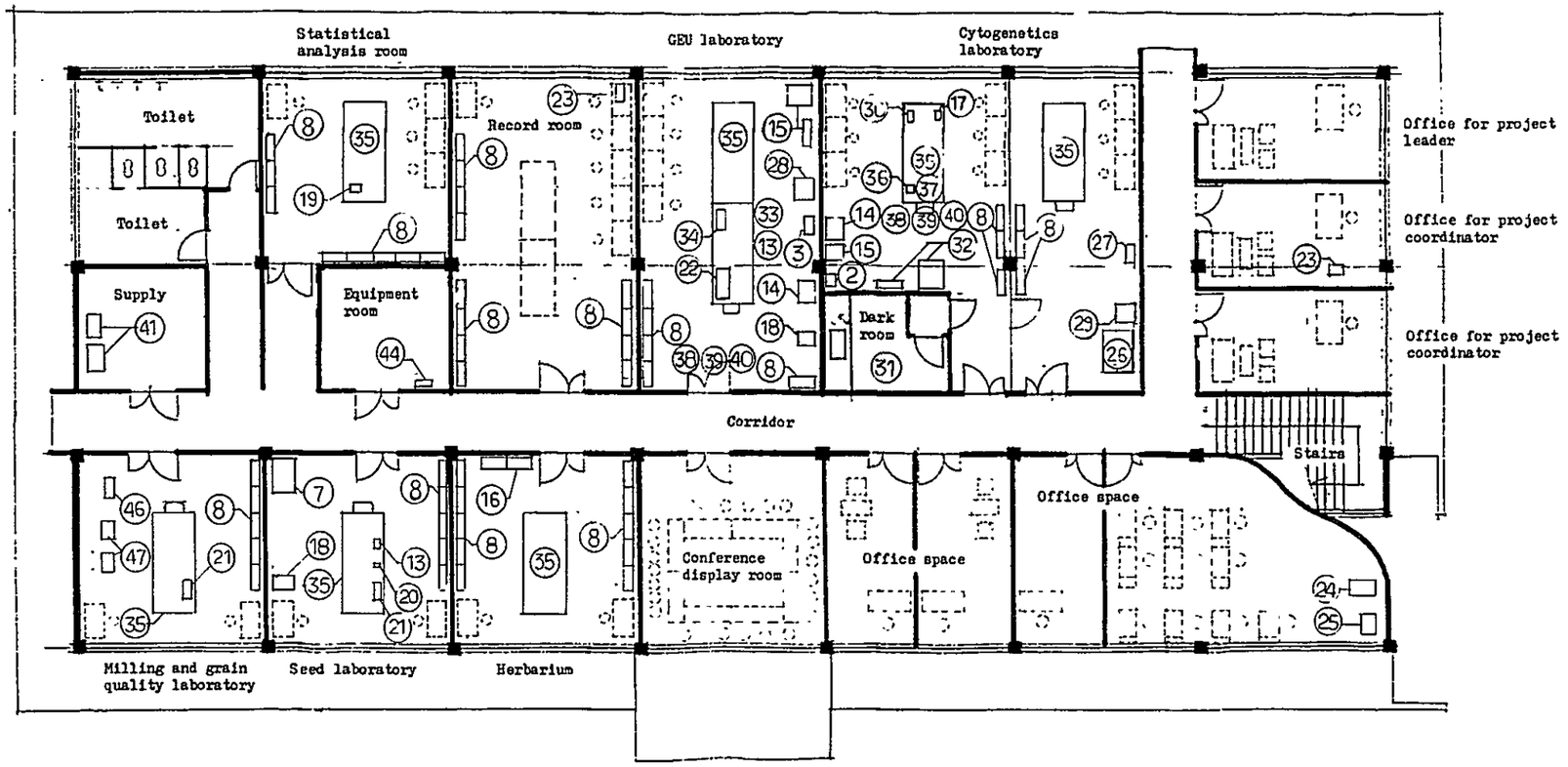
GROUND FLOOR PLAN



Layout of Equipment, Materials and Furniture (2)

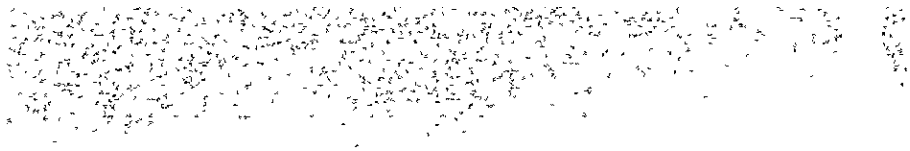
Number corresponds to that of Table 6-1.

FIRST FLOOR PLAN



—— Furniture provided by Bangladesh

Chapter 7 IMPLEMENTATION PROGRAMME



Chapter 7 IMPLEMENTATION PROGRAMME

7-1 Organization for Implementation

BRRI (Bangladesh Rice Research Institute) under the Ministry of Agriculture will be the direct organization for implementation.

7-2 Construction Schedule

Construction Schedule of the Project will be begun after the conclusion of the Exchange of Notes (E/N) between Bangladesh government and Japanese Government and; through contract with consultant, detail design and a tender, proceeds to construction contract, construction work and handover after completion. Construction work will be started in 4.5 months and completion of facilities will be in 15.5 months after the conclusion of E/N.

For implementation of the schedule, following activities included in the Bangladesh government's responsibilities will be important preconditions.

(1) To take budgetary measures for tax which recipient organization of the Project will have to pay.

(2) Prior applications for the permission of import concerning banned items.

(3) Customs formality and payment of Tax for imported equipment and materials.

(4) Cleaning the site before commensement of construction work.

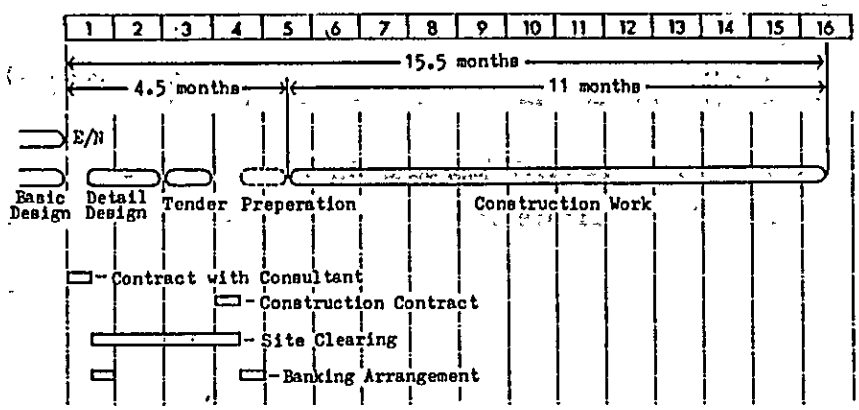


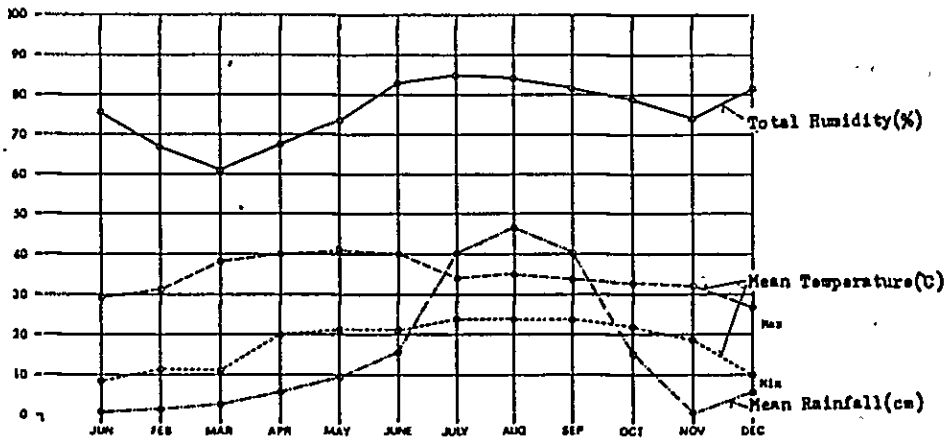
Fig. 7-1 Schedule

7-3 Scheme of Execution

In Bangladesh, climate has much harder influence on construction work compared with in Japan. It is necessary to consider the schedule so that earth work and foundation construction will not be carried out in the rainy season when there is a heavy rainfall and a monsoon season (June - October).

Both in case of being procured in Bangladesh and imported from Japan, procurement of construction materials as well as equipment and materials will be the largest factor of the scheme of execution. As procurement to be borne by Bangladesh is included in the above plan, close communication between Bangladesh and Japan and completed system are required when it is carried out.

To carry out construction works smoothly, an ample procurement programme should be made beforehand, and sufficient space should be secured for storage of construction materials as well as equipment in the construction site.



(Source) Statistical year book of Bangladesh

Fig. 7-2 Climate in and around Dhaka

7-4 Scope of Work

Outline of works for both governments are listed up here according to each item.

Table 7-1 Scope of Work

	Bangladesh side	Japanese side
Site preparation	To take away any obstacle in proposed site before the commencement of construction work and to provide provisional facilities space.	-
Building	-	To construct buildings
Electricity	Wiring to main panel board in building.	To provide power supply facilities after the work done by Bangladesh.
Water supply	Piping to building includes installation of meter if called for.	To provide water supply facilities inside building after the work done by Bangladesh.
Drainage	Drain piping to the closest drain canal.	To provide drainage facilities including septic permeating pit.
Telephone	Wiring to building, Telephone switch board in case of expantion.	Telephone facilities inside building after the work done by Bangladesh.
Gas supply	Piping to building, includes meter installation if called for.	To provide gas facilities inside building after the work done by Bangladesh.
Furniture equipment	General office furniture.	To provide equipment and materials required for research & conservation.
Exterior work	Finishing work on access road and the site.	Construction of paths inside the construction site.
Transportation of imported materials	To be responsible for all duty matters, applications, permission, etc. regarding imported materials.	Shipping matters and inland transportation.

7-5 Banned Items

As for the banned items of all supplies of equipment and materials for the Project, the Bangladesh side are responsible for the acquisition of permission on imports.

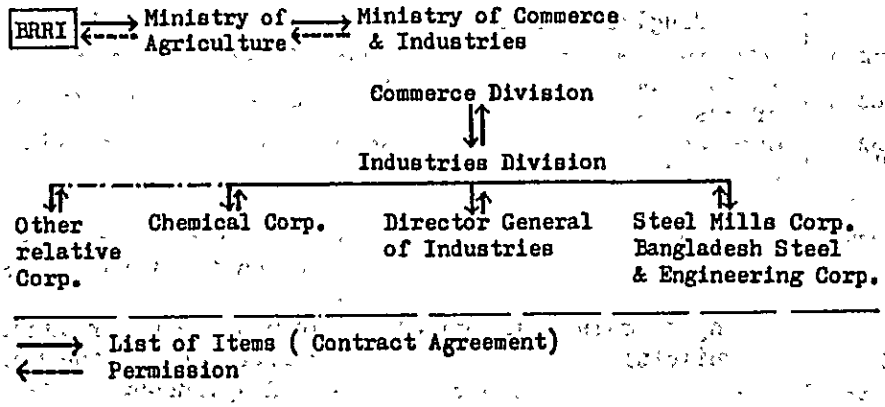
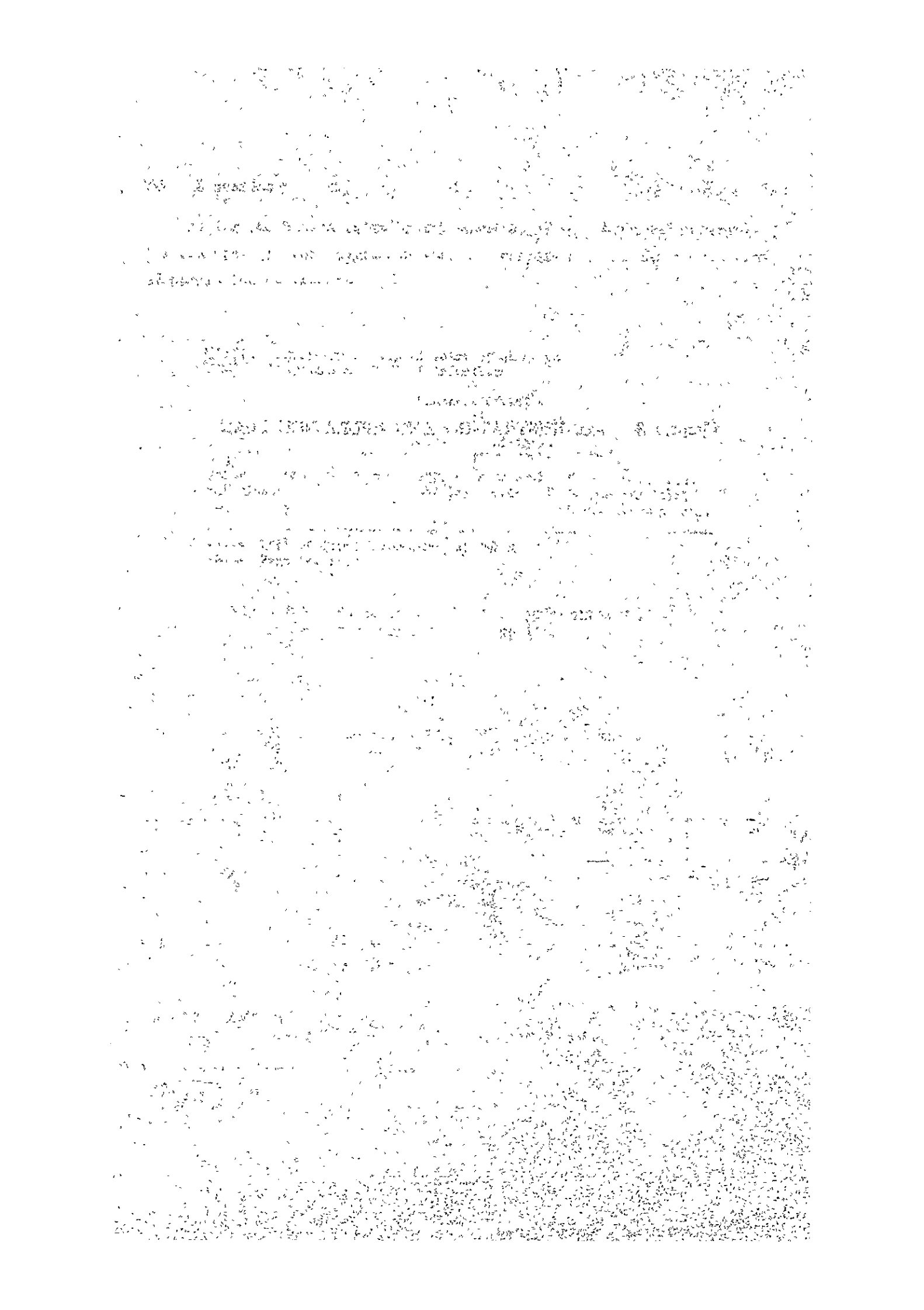


Fig. 7-3 Formalities of prior application for permission of import

Chapter 8 ADMINISTRATION AND OPERATION PLAN



Chapter 8 ADMINISTRATION AND OPERATION PLAN

8-1 System

After completion of construction, this laboratory is going to be managed by the Plant Breeding Division of BRRI. But, maintenance and repairs of the facilities and equipment will be conducted collectively by Maintenance Branch under Agricultural Engineering Division.

Higher ability is required for maintenance and adequate utilization of air conditioners and laboratory equipment compared with the case of existing facilities and equipment.

8-2 Cost for Administration and Operation

Low maintenance cost is the basic principles in the planning of the Project. This was a priority among the conditions of selection for conservation methods. Operating costs for each proposal was discussed and examined in Bangladesh with the officials concerned.

The following is the estimated costs for administration and operations based on the final agreements between Bangladesh officials and Japanese survey team.

This is estimated to be about 8% of BRRI's total management cost of 1,248,333 Tk/month. Judging from this estimation, special budget will not be necessary.

Table 8-1 Schematic estimation cost for administration and operation

Items	Breakdown	Taka/month	Yen/month
Electricity charges	12,800 kw x 1.56 Tk	20,000	198,000
Cost for fuel	Gas charges for generator and other equipment	5,000	49,500
Personnel expenditure	Officer 32 persons Staff 12 persons	20,000	198,000
Transportation cost	Gasoline, light oil, and maintenance cost for vehicles	15,000	148,000
Maintenance cost for building and equipment	Maintenance, inspection and repairs	30,000	297,000
Others	Office supplies, others	10,000	99,000
	Total	100,000	990,000

Chapter 9 EVALUATION OF THE PROJECT

Chapter 9 EVALUATION OF THE PROJECT

Although Bangladesh is an agricultural country with rice as its main crop, the country is forced to import a large quantity of food as mentioned in the former chapters. And this situation is a big obstacle for the economic development of Bangladesh.

The solution for this problem requires raising of new elite varieties and acquirement and extension of cultivation technology. In this connection, collection and conservation of the local genetic resources which are disappearing on account of "Genetic Erosion" should be conducted urgently.

BRRI has been concentrating its breeding activities on raising of two variety groups, HYV and LIV. The former with properties of the IR strain raised in IRRI is a variety group which can be expected to increase production greatly as long as appropriate conditions are given. As a result of extension of HYV, some effects have been brought about in the production of rice. However, under the present situation, the extension of HYV is limited due to many factors as deficient irrigation facilities, necessity of large amount of fertilizer and chemicals, lack of farmers' financial power for purchase agricultural inputs, and insufficient level of technology for heavy manuring and intensive agriculture, etc.

To improve these conditions, therefore, various efforts should be made for greater extension of HYV to increase the production of rice. At the same time, selection and raising of LIV are required so that gradual increase of production may be attained with use of local agricultural techniques even under inadequate conditions.

From the above-mentioned standpoint, the Project can be evaluated a very opportune one for Bangladesh.

BRRI, center of research of rice in Bangladesh, has gathered researchers of superior ability. However, they cannot now make full use of their abilities due to the existing deficient facilities.

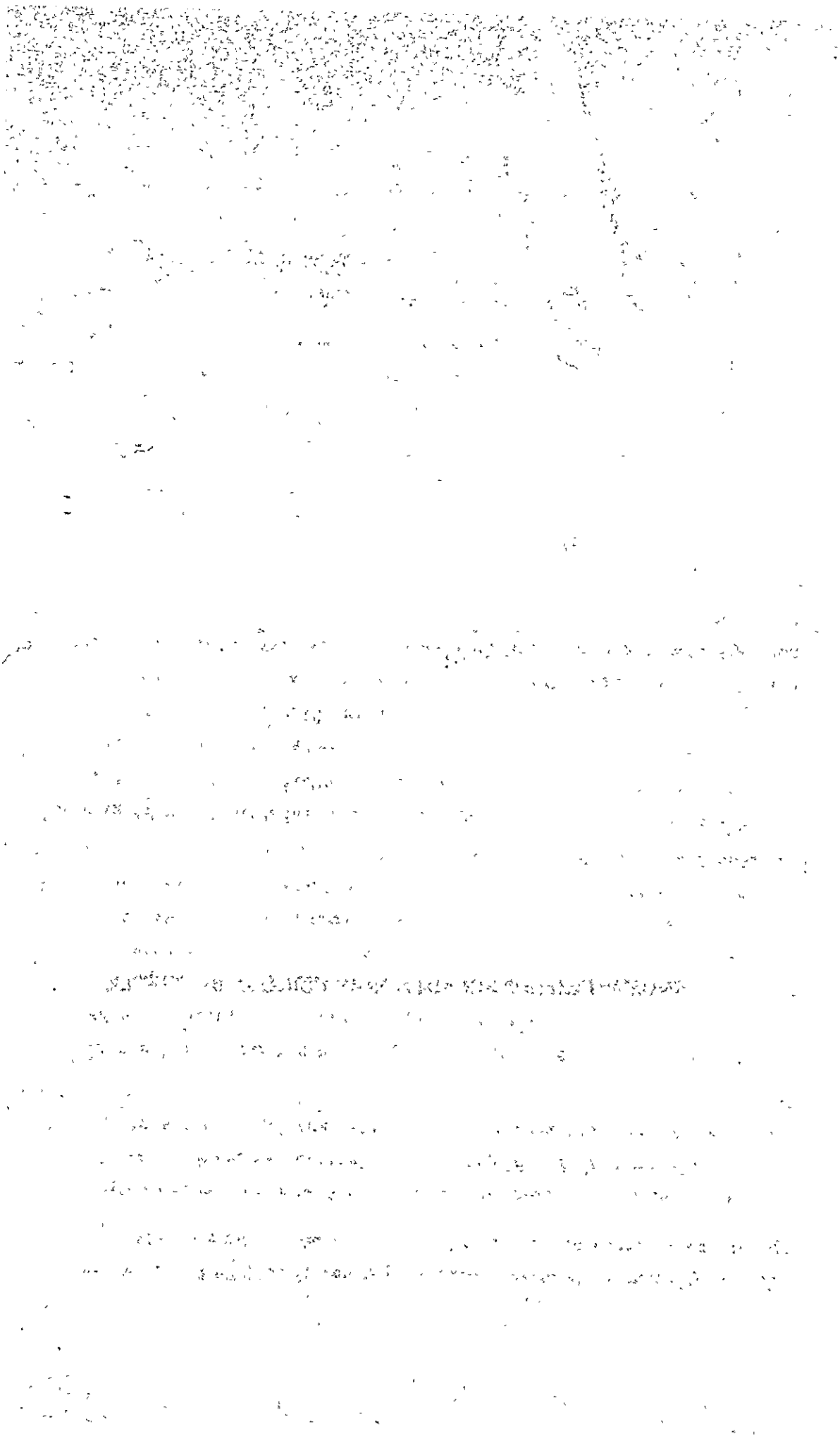
After completion of research facilities under the Project, the whole operations in breeding will be highly activated by those members.

The breeding department which has been forced to perform only field activities will be able to make fundamental researches too under the Project, and results of very efficient breeding can be expected.

Although the yield of the existing LIV is now considered around 25 to 30 md per acre, self-sufficiency of foods in Bangladesh can be feasible immediately if improved variety with about 25 md per acre of yield can be generalized throughout the country. At the same time, since the outcome of breed is not limited to a short period but for longer period, the contribution to economic development of Bangladesh by this Project is inestimable.

Furthermore, owing to its special natural conditions, in Bangladesh there are many variety groups of rice corresponding to each cropping season of Aus, Aman and Boro. Total number of varieties is estimated over 6,000. And one of them is the "Floating Rice", a very rare variety in the world. The Project, therefore, can be highly evaluated not only from the aspect for Bangladesh but also for international contribution.

Chapter 10 CONCLUSION AND RECOMMENDATIONS



Chapter 10 CONCLUSION AND RECOMMENDATIONS

This Project forms a part of the foundation of various agricultural development plans in Bangladesh. The raising and extension of new elite varieties, the rice which suits the agricultural situation and agronomic environment in Bangladesh are the important subjects which can be carried out at present for increase of the low productivity of the rice and leading to the guaranteed self-sufficiency in food supply. But the facilities for the conservation and research of rice genetic resources to set fundamental work, the breeding strategy, are not fully provided yet, so great hopes are pinned on the realization of the Project.

The basic design of the laboratory was worked out, with the principal emphasis laid on administration and management, so as to make the selection of the conservation method and fixing of the scale etc. fit for local situation. The administrative management system after the completion of the laboratory has been designed already, and it seems reasonable to adopt the Project as a grant aid cooperation, since the plan is definitely believed to support the economic development of Bangladesh, contributing to the establishment of self-sufficient system in food supply, which will be more difficult to realize on account of the rapid increase in population.

Personnel disposition after the completion of the Project will be finalized by BRRI, but for the achievement of the final goal of the Plan, taking into consideration the features of each laboratory room to be established as well as of other rooms, it is desirable to map out a personnel allotment plan as shown in Fig. 5-5.

At the same time, technical cooperation will be required on the following points in order to make more practical use of the laboratory and to accelerate the effects of the Project in response to the purpose of the establishment and urgent accomplishment.

1. Training for experts concerned with the operation and maintenance of the seed storage equipment with low temperature control.
2. Preferential acceptance in the training courses related to conservation of plant genetic resources.
3. Dispatch of appropriate researchers to BRRI, when necessary, so as to give full scope to research functions.

And besides, on the occasion of the execution of the Project quick correspondence and full understanding on the Bangladesh side are indispensable for handling the matters, namely the budgeting procedure for various taxes and commissions borne by the BRRI which is the recipient organization of the Project, various procedures concerned with banned items, preparation of the site, the partly assigned construction work and the guarantee of necessary personnel and costs of administration and management etc. The cooperation of the organizations concerned is highly expected on the above points as well.

APPENDICES

(1) The minutes of Agreement

MINUTES OF DISCUSSION ON THE RICE SEED & GENETIC RESOURCES LABORATORY PROJECT IN BANGLADESH

In response to the request by the Government of the People's Republic of Bangladesh, the Government of Japan has sent a Basic Design study team through the Japan International Cooperation Agency(herein after referred to as "JICA"), the team headed by Masahiro NAKAGAWARA (Hokuriku National Agricultural Experiment Station, Ministry of Agriculture, Forestry and Fisheries) to conduct the Basic Design study on the Rice Seed and Genetic Resources Laboratory (Seed and Germplasm Resources Laboratory) Project (herein after referred to as "the Project") from 23rd February to 5th of March, 1983.

The team visited the project site at BRRI and held a series of discussions and exchanged views with officials concerned of the Government of the People's Republic of Bangladesh and those of BRRI.

The parties have agreed to recommend their respective Government and authorities concerned to examine the result of the study attached herewith toward the realization of the project.

3rd March, 1983

Dr. A.T.M. Shamsul Huda
Joint Secretary
Agriculture & Forests Division.

Masahiro NAKAGAWARA
Head
JICA MISSION

1. The objectives of the project are :
   i) Exploration and collection of local varieties and wild rice types.
   ii) Introduction of germplasm
   iii) Long term preservation of the viability of germplasm and elite breeding materials.
   iv) Systematic classification, Characterization and evaluation.
   v) Rejuvenation of samples and distribution of seeds to national and international scientists.

2. The role of the project in Agricultural production.

   BRRI has an accelarated program to develop and release modern high yielding varieties to replace presently grown low yielding local strains of rice. The replacement of locally grown strains with modern varieties is of serious concern to the biological scientists and government leaders. In the decades ahead, higher and more crop yields will be required to meet the food needs of the rapidly growing population. Rice will be grown under increasingly more intensive production practices and across a wider spectrum of environmental stresses. To be successful in this challenge, plant scientists will be highly dependent upon the existing reservoir of locally grown genetic resources.

3. The executing and coordinating agency of the project.
   The executing and coordinating agency is Bangladesh Rice Research Institute (BRRI), The People's Republic of Bangladesh.

4. The sites

   The sites for the project is located at BRRI campus, Joydebpur, Dhaka.
   The map of the sites are attached herewith.

5. Staffing of the project.

Staffing of the new section named as Genetic Resources (Germplasm) and Cytogenetic studies has been approved by the Government of Bangladesh.

1.	Principal Cytogeneticist	1
2.	Senior Cytogeneticist	2
3.	Cytogeneticist	4
4.	Fieldman	1
5.	Laboratory attendent	1

6. Approval by the second five years National Development Plan

The team confirms that the proposed seed and germplasm resources laboratory project has been approved by Govt. of Bangladesh for BNYP which is a part of the approved scheme entitled "A scheme for Rice Research and Training. The BRRI proposed the project title as "The Rice Seed and Genetic Resources Laboratory Project" and the Team confirmed it.

7. Measures to be taken by Both Governments

Necessary measures to be taken by each side are shown in Annexure - 1. The Japanese side suggested that their side can take measures within the scope of Japan's Grant Aid System.

8. Undertaking of Japanese Study Team

The Japanese Study Team will convey the desires of the Government of Bangladesh to the Government of Japan that the latter will take necessary measures to cooperate in the implementation of the Project by providing items as listed in Annexure - 2.

9. Procedures for banned items :

The ~~planning commission with BRD~~ GoB is to get positive clearence from the appropriate authority in writing for import of these items.

Major Undertakings to Be Taken by Both Governments.

No.	Items	Japanese side	Bangladesh side
1.	To secure a lot of land		o
2.	To clear, level and reclame the site when needed.		o
3.	To construct the gate and fence in and around the site.		o
4.	To construct the parking lot	o	
5.	To construct the road	o	
	1) Within the site	o	
	2) Outside the site		o
6.	To construct the building	o	
7.	To provide facilities for distribution of electricity, water supply, drainage and other incidental facilities.		
	1) Electricity		
	a) The distributing line to the site		o
	b) The drop wiring and internal wiring within the site.	o	
	c) The main circuit breaker and transformer.	o	
	2) Water Supply		
	a) The city water distribution main to the site.		o
	b) The supply system within the site (receiving and elevated tanks).	o	
	3) Drainage		
	a) The drainage city main (for storm, sewer and others) to the site.		o
	b) The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site.	o	
	4) Gas Supply		
	a) The city gas main to the site		o
	b) The gas supply system within the site.	o	
	5) Telephone system		
	a) The telephone trank line to the main distribution frame/ panel (MDF) of the building.		o
	b) The MDF and the extension after the frame/panel.	o	

No.	Items	Japanese side	Bangladesh side
	6) Furnitures and Equipment		
	a) General furnitures (carpet, curtain, table, chair and others).		o
	b) Project equipment	o	
8.	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A.		
	1) Advising commission of A/P		o
	2) Payment commission		o
9.	To ensure unloading and customs clearance at port of disembarkation in recipient country.		
	1) Marine (Air) transportation of the products from Japan to the recipient country.	o	
	2) Tax exemption and Custom clearance of the products at the port of disembarkation.		o
	3) Internal transportation from the port of disembarkation to the project site.	o	
10.	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into recipient country and stay therein for the performance of their work.		o
11.	To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.		o
12.	To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.		o

ANNEX - 2

Items requested by Government of Bangladesh the cost of which will be borne by the Government of Japan

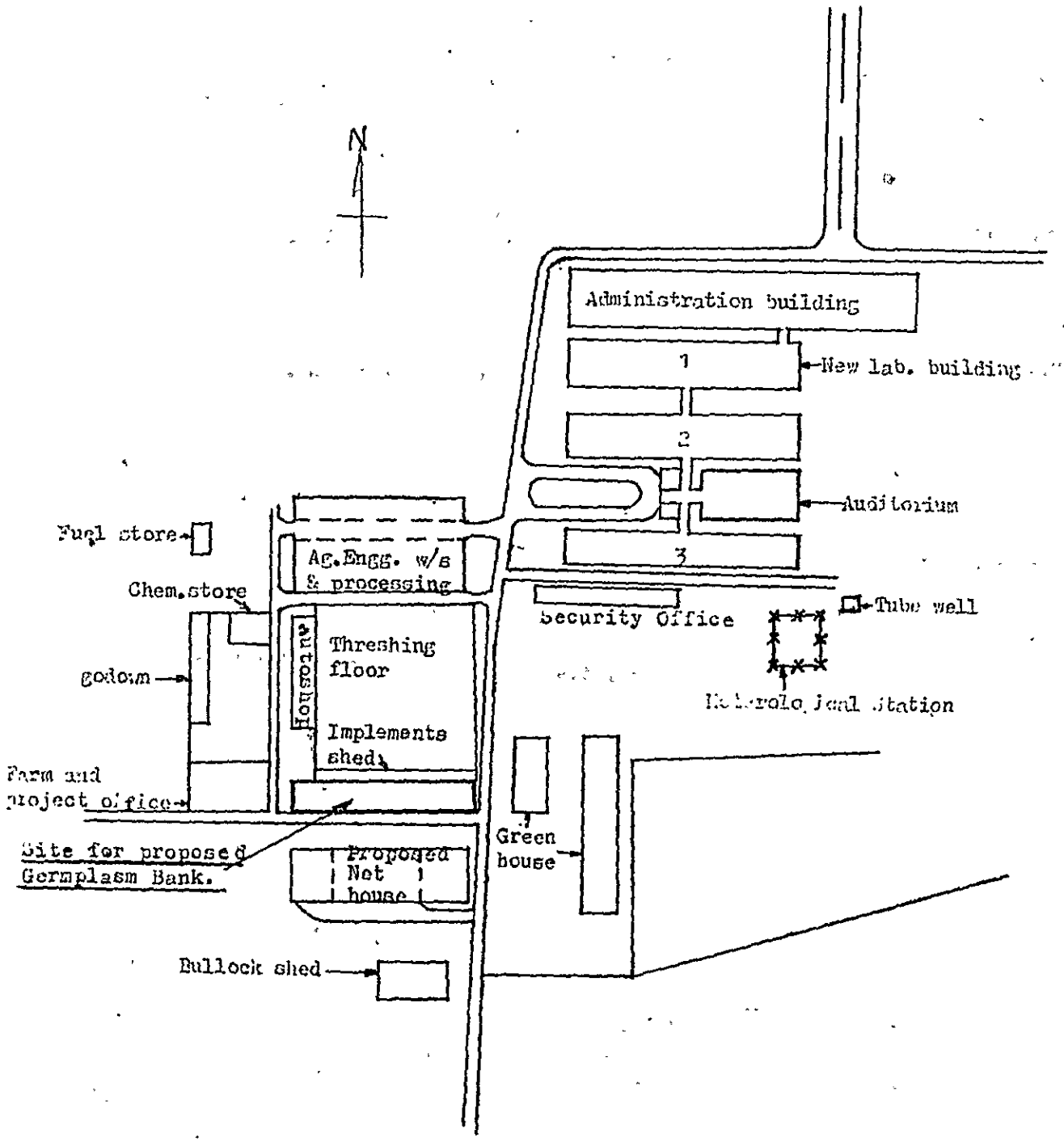
1. Building

Ground floor
- Seed storage
- Seed processing
- Others

1st floor
- Laboratories
- Herbarium
- Statistical analysis room
- Record room
- Office, Conference room
- Others

2. Equipments to be supplied for :
- Seed Storage
- Cytogenetics and tissue culture
- Entomology, Pathology, Physiology and others
- Seed characterization, evaluation and documentation
- Record
- Statistical analysis
- Others
- 4 wheel drive vehicles

B R R I
OFFICE AND SUPPORT BUILDINGS



(2) Member list of the basic design study team

Dr. Masahiro Nakagawara	Team Leader Senior Scientist, Field Crops Div. Hokuriku National Agricultural Experiment Station Ministry of Agriculture, Forestry & Fisheries
Mr. Kimio Miura	Team Coordinator Technical Cooperation Div. Agricultural Development Cooperation Dept. Japan International Cooperation Agency
Mr. Yukio Iijima	Chief Architect Shigehiko Sugi & Architects INC.
Mr. Ryo Obata	Architect Shigehiko Sugi & Architects INC.
Dr. Masaharu Shimizu	Agricultural Expert Shigehiko Sugi & Architects INC. Overseas Merchandise Inspection Co., Ltd. Emeritus Professor of Nagoya University

(3) The Minutes of Agreement (Explanation of the draft report)

MINUTES OF DISCUSSIONS
ON
THE DRAFT REPORT OF THE BASIC DESIGN STUDY ON THE RICE SEED AND GENETIC RESOURCES LABORATORY PROJECT
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH

The Government of Japan has sent, through Japan International Cooperation Agency (JICA), a Basic Design Study Team to Bangladesh from 3rd June to 10th June, 1983 for the purpose of presenting and explaining the draft of the final report of the Basic Design Study (the Report) on the Rice Seed & Genetic Resources Laboratory Project (the Project).

The team held meeting with the authorities concerned of the Government of Bangladesh to explain and to discuss on the Report. As a result of the discussion, both parties have agreed as follows;

1. The Report principally satisfied the Bangladesh side and appropriate alterations in design agreed during the discussions will be incorporated in the Final Report.

2. The Final Report (10 copies in English) on the Project will be submitted to the Government of Bangladesh by the beginning of July, 1983.

9th June, 1983

M. Nakagawara

Dr. Masahiro NAKAGAWARA
Team Leader,
Japanese Study Team
JICA

9.6.83

Dr. A.T.M. Shamsul Huda
Joint Secretary,
Agriculture & Forests Division

(4) Member list of the basic design study team (Explanation of the draft report)

Dr. Masahiro Nakagawara	Team Leader	Senior Scientist, Field Crops Div. Hokuriku National Agricultural Experiment Station Ministry of Agriculture, Forestry & Fisheries
Mr. Sen-ichi Kimura	Team Coordinator	Grant Aid Department Japan International Cooperation Agency
Mr. Yukio Iijima	Chief Architect	Shigehiko Sugi & Architects INC.


JICA