

4-2-2 Determination of the Scales of the Facilities

The scale of each facility was repeatedly discussed with the Pakistani side, according to the staff allocation described in 3-3 and the Area Calculation Standard for Buildings of National Research Institutes in Tsukuba, Japan (See Table 4-3).

Based on the discussions, the final scale of each facility was comprehensively determined in consideration of the scales of the existing NARC facilities, layout of research equipment and materials, and economical structural spans (8m×6m).

Setting the scales of the facilities:

A. Main Complex

(a) Exploration and Collection Laboratory (1 SSO, 1 SO, 2+1 Science assistants, 2 drivers)		
Room name	Scale setting standards	Planned area
Experiment Room	16m ² /person x 5 researchers and assistants=80m ²	73.8(m ²)
SSO's office	1 SSO x coef.6 x standard 4m ² =24m ²	24.6
Lab. Equipment Room	Necessary area for equipment such as balances, a computer work station, side tables, etc.	24.6
Exploration Preparation Room	Necessary area for rack to store exploration equipment and other related equipment	24.6
Original Seeds Stock Room	Necessary area for 5 cold storage to preserve collected seeds	11.1
Storage	About 1/4 of a single span	12.3

(b) Seed Preservation Laboratory (1 SSO, 2 SO (1 for research + 1 for preservation), 4+2 Science Assistants)		
Room name	Scale setting standards	Planned area
Drying and Packing Room:	Necessary area for seed dryers, packing equipment and laboratory tables	54.4(m ²)
Short-term Storage	Storage capacity: 50,000 accessions 500g(bottle) x 37,500 accessions =37,500 bottles 250g(bottle) x 12,500 accessions =12,500 bottles Total 50,000 bottles Rack: 2400(mm) W x 450 D x 2100 H x 19 Racks x 2 rooms	40.3 x 2
Medium-term Storage	Storage capacity: 50,000 accessions x 100g x 2env.=100,000 Rack: 1800(mm) W x 450 D x 2100 H, 6 columns x 13 rows = 78 drawers 3120 envelopes per rack Total number of racks: 100,000 envelopes ÷ 3120 bags/rack = 32 racks 32 racks ÷ room = 8 rooms	7.0 x 8
Germination Test Room	Necessary area for four germination equipment and machines	18.5
Distribution Preparation Room	Necessary area for distribution work	31.2
Seeds Reference Room	Necessary area for seed specimen racks	11.5
Experiment Room	16m ² x 5 researchers and assistants for preservation research = 80m ²	73.8
Lab. Equipment Room	Necessary area for balances, a computer work station, tables, etc.	24.6
SSO's Office	1 SSO x coef.6 x standard 4m ² = 24m ²	24.6
Storage	About 1/4 of a single span	9.0

(c) In-vitro Preservation Research Laboratory (1 SSO, 1 SO, 2+1 assistants)		
Room name	Scale setting standards	Planned area
Experiment Room	16m ² x 5 researchers and assistants= 80m ²	73.8(m ²)
Lab. Equipment Room	Necessary area for balances, a computer work station, tables, etc.	24.6
Clean Bench Room	Necessary area for two clean benches and cryopreservation equipment	32.8
Dark Room	Necessary area for two racks	6.6
Incubation Room	Necessary area for 1000 samples/room and 4 incubation shelves/room	9.0
SSO's Office	1 SSO x coef.6 x standard 4m ² = 24m ²	24.6

(d) Germplasm Evaluation Laboratory (1 SSO, 4 SOs, 4+2 assistants)		
Room name	Scale setting standards	Planned area
Experiment Room	16m ² x10 researchers and assistants=160m ²	147.6(m ²)
Lab. Equipment Room	Necessary area for balances, a computer work station, tables, and other equipment	24.6
SSO's Office	1 SSO x coef.6 x standard 4m ² = 24m ²	24.6
Storage	About 1/4 of a single span	9.3

(e) Data Management Laboratory (1 SSO, 1 SO, 1 photographer, 2 Office assistants, 2+1 assistants)		
Room name	Scale setting standards	Planned area
Data Management Office	1 SO x coef. 2.5, 2 assistants x coef.1.8 Total coef. 6.1 x standard 4m ² = 24m ²	24.6(m ²)
Computer Room	Necessary area for 2 microcomputer	24.6
Compilation, Printing, and Book Binding Room	Necessary area for printing and bookbinding equipment and compiling worktable	24.6
SSO's Office	1 SSO x coef.6 x standard 4m ² = 24m ²	24.6

(f) Administration Section (1 PSO, 1 AAO, 1 stock keeper, 2 typists, 4 office assistants, 2 technical assistants, 3 malis, 2 peons, and 1 driver)		
Room name	Scale setting standards	Planned area
PSO's Office (including Secretary's Room)	1 PSO x coef.10, 1 secretary x coef. 2.5 Total coef.12.5 x standard 4m ² = 50m ²	49.2(m ²)
Administration Office	1 AAO x coef. 6, 2 technology assistants x coef. 2.5 2 typists x coef. 1, 4 clerks x coef. 2.5 1 administration manager x coef. 1.8 Total coef. 24.8 x standard 4m ² = 99.2m ²	98.4
Central Control Room	Necessary area for the central control board and other supervisory equipment	32.8
Conference Room	50 staff members (excluding malis, field men, peons and drivers) x 2.1m ² /person=105m ²	49.2
Library	40 SO and assistants x 2.0m ² /person x 1/2(not for perusal) = 40m ²	32.8
Reception Room	12 people x 4m ² = 48m ²	98.4

(g) Common facilities		
Room name	Scale setting standards	Planned area
Herbarium	Necessary area for 6 specimen shelves and side table	24.6(m ²)
Centrifuge Room	Necessary area for 2 centrifuges	24.6
Growth Chamber Room	Necessary area for two growth chambers	31.0
Lounge	1.0m ² x 66 staff members = 66m ²	63.2
Meeting Room	Area for conferences between 2 laboratories: 12 person x 4m ² /person= 48m ²	50.9

(h) Other necessary rooms		
Room name	Scale setting standards	Planned area
Room for Foreign Experts	Up to four long-term and short-term visiting experts: 4 experts x coef. 6 x 4m ² = 96m ²	100.1(m ²)

B. Plant Introduction and Seed Health Laboratory Building

Plant Introduction and Seed Health Laboratory (1 SSO, 1 SO, 2+1 assistants, 2 field man)		
Room name	Scale setting standards	Planned area
Seed Health Experiment Room	16m ² x 5 researchers and assistants = 80m ²	62.1(m ²)
Bacterial and Viral Inspection Room	Necessary area for freezers, dryers, and laboratory tables	18.6
Fungal Inspection Room	Necessary area for growth chambers and clean benches	19.9
SSO's Office	1 SSO x coef. 6 x standard 4m ² = 24m ²	25.3
Lab. Equipment Room	Necessary area for balances, a computer work station, tables, and other equipment	25.2
Sowing Preparation Room	Necessary area for sowing equipment and materials	17.7

C. Garage and Work Shop

Room name	Scale setting standards	Planned area
Garage	Necessary area to park 4 vehicles for exploration trips and transportation of trainees	100.7(m ²)
Work Shop	Necessary area for worktables and activities	37.2

Table 4-3 AREA CALCULATION STANDARD FOR BUILDINGS OF THE NATIONAL RESEARCH INSTITUTES IN TSUKUBA, JAPAN

CATEGORY	ROOM NAME	CALCULATION METHOD																				
1. ADMINISTRATION	OFFICE	$4.0\text{m}^2 \times \Sigma (\text{No. of Staff in Each Position} \times \text{Exchange Rate of Each Position According to the Table})$ Exchange Rate Table <table border="1"> <tr><td>Director</td><td>18</td></tr> <tr><td>General Manager</td><td>9</td></tr> <tr><td>Chief of Section</td><td>5</td></tr> <tr><td>Assistant Chief of Section</td><td>2.5</td></tr> <tr><td>Chief Clerk</td><td>1.8</td></tr> <tr><td>General Clerk</td><td>1</td></tr> </table>	Director	18	General Manager	9	Chief of Section	5	Assistant Chief of Section	2.5	Chief Clerk	1.8	General Clerk	1								
	Director	18																				
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2. LABORATORY	STUDY OFFICE	$4.0\text{m}^2 \times \Sigma (\text{No. of Staff in Each Position} \times \text{Exchange Rate of Each Position According to the Table})$ Exchange Rate Table <table border="1"> <tr><td>General Manager</td><td>9</td></tr> <tr><td>Chief Researcher</td><td>5</td></tr> <tr><td>Researcher</td><td>1.8</td></tr> <tr><td>Assistant</td><td>1</td></tr> </table>	General Manager	9	Chief Researcher	5	Researcher	1.8	Assistant	1												
	General Manager	9																				
Chief Researcher	5																					
Researcher	1.8																					
Assistant	1																					
	Experiment Room	$16\text{m}^2 \times \text{No. of Staff}$																				
3. OTHERS	CONFERENCE ROOM	<table border="1"> <thead> <tr> <th rowspan="2">No. of Staff</th> <th colspan="2">Area/Staff</th> </tr> <tr> <th>Office Clerk</th> <th>Research Staff</th> </tr> </thead> <tbody> <tr><td>10~ 25</td><td>2.8</td><td>4.0</td></tr> <tr><td>25~ 50</td><td>1.5</td><td>2.1</td></tr> <tr><td>50~ 100</td><td>1.1</td><td>1.6</td></tr> <tr><td>100~ 150</td><td>0.8</td><td>1.1</td></tr> <tr><td>150~</td><td>0.6</td><td>1.0</td></tr> </tbody> </table>	No. of Staff	Area/Staff		Office Clerk	Research Staff	10~ 25	2.8	4.0	25~ 50	1.5	2.1	50~ 100	1.1	1.6	100~ 150	0.8	1.1	150~	0.6	1.0
	No. of Staff	Area/Staff																				
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50~ 100	1.1	1.6																				
100~ 150	0.8	1.1																				
150~	0.6	1.0																				
	READING CIRCLE	$1.0\text{m}^2 \times \text{No. of Research Staff}$																				
	LIBRARY	$2.0\text{m}^2 \times \text{No. of Research Staff}$																				
REMARKS		Area of other rooms shall be calculated according to their needs.																				

4-3 Basic Plan

4-3-1 Site and Facilities Layouts

A site best suited to the Project was determined by investigation on the site shape, and the ambient infrastructure and environment inclusive of the relation to the existing facilities.

The basic conditions considered were: easy access from the existing facilities or planned facilities of the Crop Sciences Institute, facilities layout enabling smooth flow between laboratories and related sections, adjacency to experiment field, future expansion of the seed preservation facilities, and easy preparation of facilities to be undertaken by the Pakistani side. The site characteristics are shown in Fig. 4-2.

By considering the above mentioned conditions, the layout was planned according to the following policy:

- A. The site shall be divided into zones for cultivation facilities, research facilities related to cultivation, and those not directly related to cultivation (see the Fig. 4-3). The cultivation and directly related facilities shall be sited next to one another, but the research facilities (Main Complex) and cultivation facilities shall be separated to secure independent environments.
- B. Besides the main entrance, a sub-entrance shall be constructed to separate the flow of general visitors from that of researchers and workers. The administration facilities shall be easy to access from the road in front of the project site.
- C. The facilities layouts shall be determined according to the flow of collection, introduction, and distribution of genetic resources to realize close relationships between the laboratories. (See Fig. 4-4 and 4-5)
- D. The common rooms to be shared for the research activities shall be placed at the center of the laboratories. (See Fig. 4-4)
- E. The seed preservation facilities shall be independently constructed so that they can be expanded in the future. The laboratories shall be located around the inner court to secure natural lighting and ventilation. (See Fig.4-4)
- F. The greenhouses shall be located where plants can obtain sufficient sunlight.
- G. The facilities shall be laid out in consideration of ease of distribution of electricity, gas, and water to and on the site.

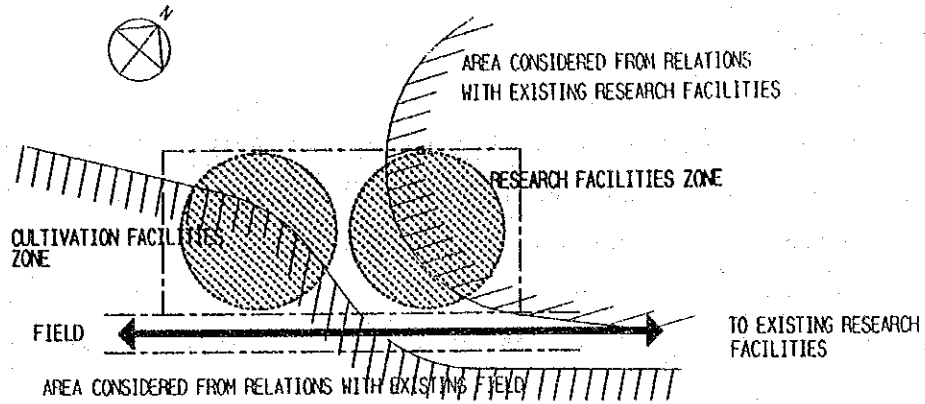


FIG.4-2 CHARACTERISTICS OF THE SITE

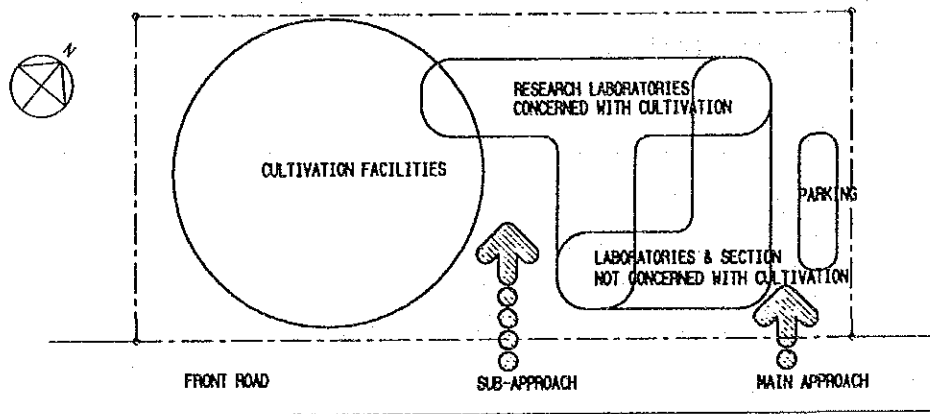


FIG.4-3 CONCEPTUAL PLAN OF FACILITIES LAYOUT

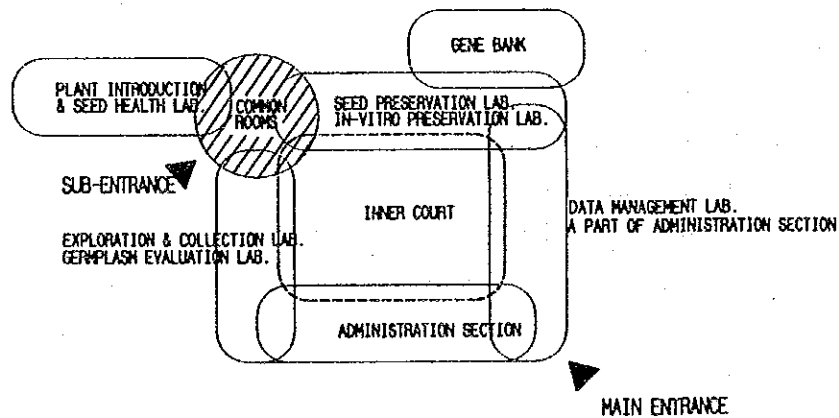


FIG.4-4 CONCEPTUAL PLAN OF RESEARCH LABORATORIES AND SECTIONS

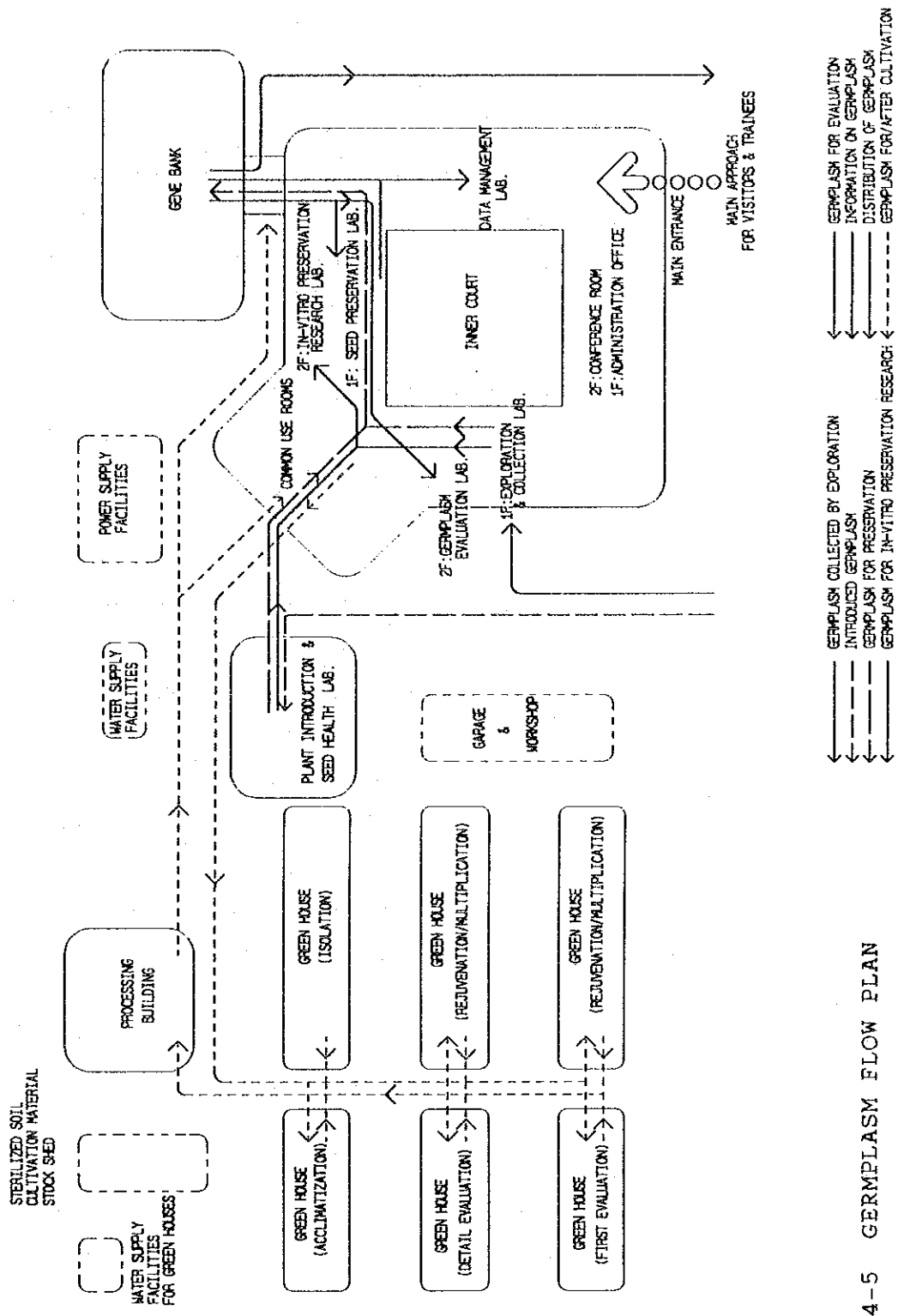


FIG. 4-5 GERMPLASM FLOW PLAN

4-3-2 Architectural Designs

(1) Floor Plan

1) Composition of the Main Complex (See Fig. 4-6)

The main complex consists of five laboratories, an administration section and various common rooms. The laboratories are: Exploration and Collection Laboratory, Seed Preservation Laboratory, In-vitro Preservation Research Laboratory, Germplasm Evaluation Laboratory, Data Management Laboratory.

The Laboratories for Exploration and Collection, Seed Preservation, In-vitro Preservation Research, and Germplasm Evaluation shall be located where cultivation facilities can be easily accessed.

As the seed preservation rooms in the Seed Preservation Laboratory are the most important facilities in the Project, they should be independent of the others to prevent damage from any accident which may occur in the other facilities. The area necessary for extension of seed preservation storage areas shall be secured to cope with the future increase of preserved seeds.

The Data Management Laboratory is not related to the cultivation facilities, but shall be laid out to be able to keep close contact with each of the other laboratories to manage genetic resources information. The Administration Section shall be located at a place convenient for the administration of the laboratories and easily to accessible trainees and visitors.

The Exploration and Collection Laboratory shall be located adjacent to the Seed Preservation Laboratory for the sake of the easy transfer of collected seeds.

To manage the preserved seeds and the genetic resources information side by side, the Seed Preservation Laboratories and Data Management Laboratories shall be adjacent to each other.

The In-vitro Preservation Research Laboratory shall be located adjacent both to the Exploration and Collection Laboratory for easy access to the collected vegetative plants, and to the Data Management Laboratory for the distribution and retrieval of genetic resources information.

The common facilities shall be located at the center of the five

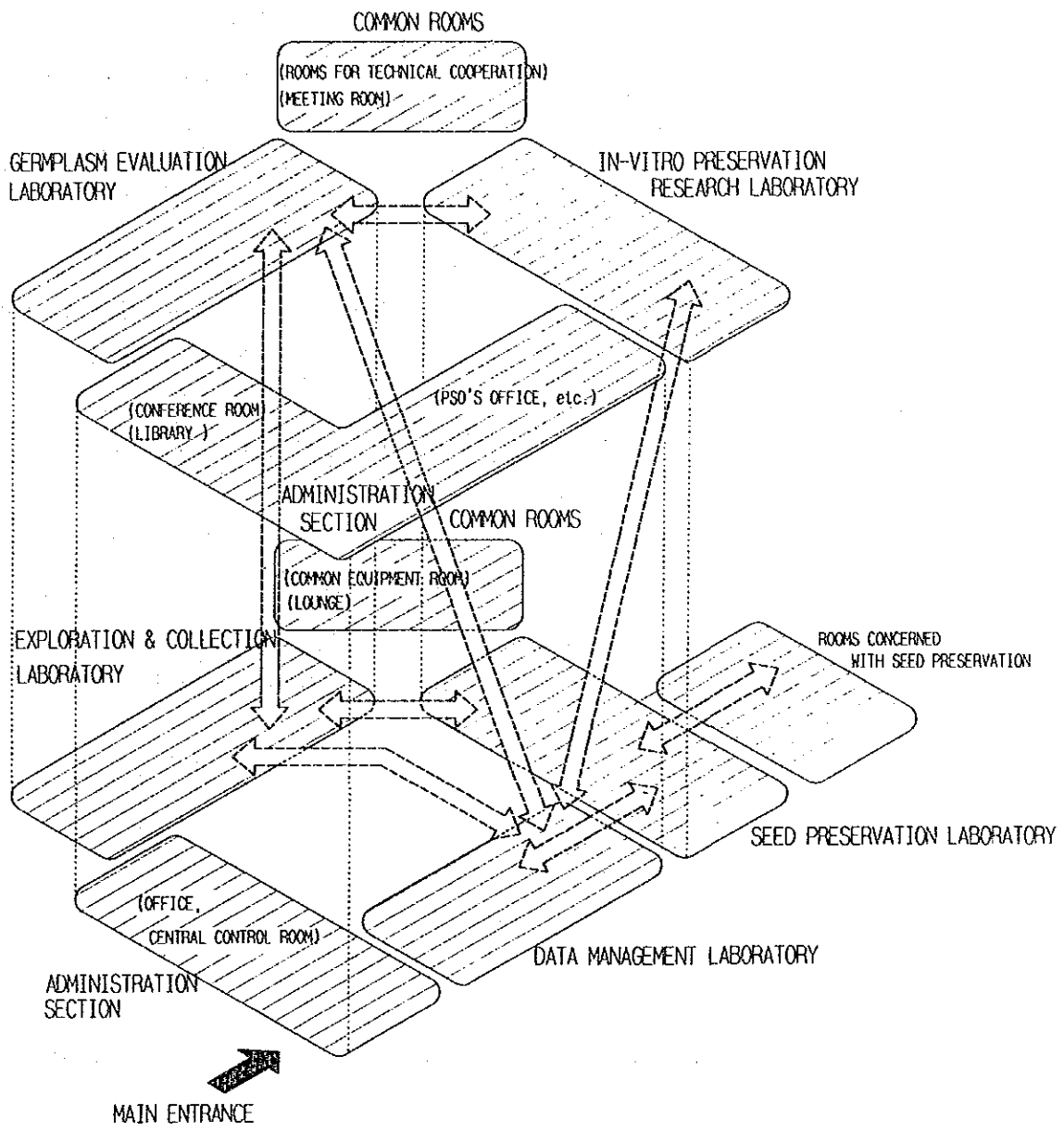


FIG. 4-6 CONCEPTUAL DIAGRAM MODEL OF MAIN COMPLEX

Laboratories - Exploration and Collection Laboratory, Seed Preservation Laboratory, In-vitro Preservation Research Laboratory, Seed Preservation Laboratory, and Plant Introduction and Seed Health Laboratory (located separately).

The inter-laboratory distances shall be minimized for easy communication between researchers.

The main building shall be two-storied in order to lay out the facilities suitably on the site, satisfy the above mentioned mutual relationships, and secure the necessary scales of facilities.

The ground floor shall accommodate Exploration and Collection Laboratory, Seed Preservation Laboratory, In-vitro Preservation Research Laboratory, Data Management Laboratory, Administration Section consisting of the administration office and the central control room, and the common use facilities consisting of the growth chamber room, the centrifuge room, the herbarium and the lounge. The entrance hall, the exhibition corner and the lobby shall also be placed on the ground floor.

The first floor shall accommodate In-vitro Preservation Research Laboratory, Germplasm Evaluation Laboratory, Administration Section consisting of the PSO's office, the secretaries' room, the reception room, the conference room and the library, and the researchers' meeting room for common use. The foreign experts' room shall be also placed near the researchers' meeting room on the first floor.

2) Floor Plan of the Main Complex

a) Laboratory Unit Plan (See Fig.4-7)

Although there may be some difference among the laboratories depending on their respective area of research, staff allocation and layout of research equipment, each laboratory shall basically be composed of four rooms: an experiment room, a research equipment room, a SSO's room and a storage area.

The laboratories shall each have water supply and drainage facilities, gas, electrical power, etc. according to the contents of their respective research. Since the building is to be two-storied, the floor plan shall be designed to place the experiment rooms of both the upper and lower floors at the same location so that utilities may be rationally arranged.

Also, to facilitate future changes within the development of the research programme, the experiment rooms shall be provided with connections for water supply and drainage, electricity at equal distances.

b) Seed Storage Areas (See Fig. 4-8)

The seed storage areas shall face each other with an anteroom in between, and the condensers and radiators for the air-conditioning system shall be placed under the eaves for easy maintenance from outside. Since seeds are preserved at low temperature both in short-term storage and medium-term storage, the storage areas must be insulated from heat and humidity. For heat insulation, molded polystyrene panels with a metal outer layer will be used, which have a high heat insulation factor, execution accuracy, and easy workability. The space between the storage areas and the external walls will act as a barrier to the external environment (radiant heat from the sun, external temperature, wind, and rain) and will also be able to serve as a passage for inspection.

As mentioned in 4-2-1, since this system can be operated according to the volume preserved, it can save on operation and management expenses. The storage capacity can be increased by just installing more insulation panels.

The seed drying and packing room, the germination test room and the original seeds stock room belonging to the Exploration and Collection Laboratory shall be located within the seed preservation facilities for the purpose of easy management.

c) Administration Section and Common Use Rooms

These were planned in accordance with the following considerations:

1. The main entrance shall be situated where it can be most easily approached from the access road.
2. The exhibition corner to show research contents for ordinary visitors and trainees shall be placed near the entrance hall.
3. The common rooms, such as the researchers' meeting room, growth chamber, herbarium, and centrifuge room shall be installed adjacent to

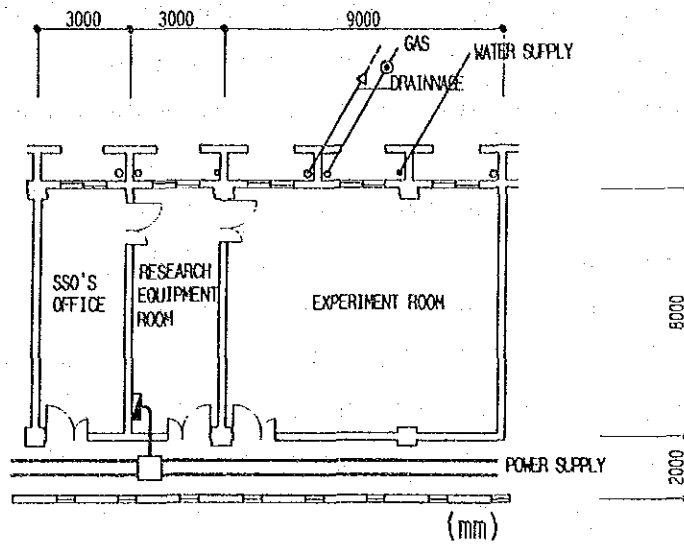


FIG. 4-7 STANDARD LABORATORY UNIT

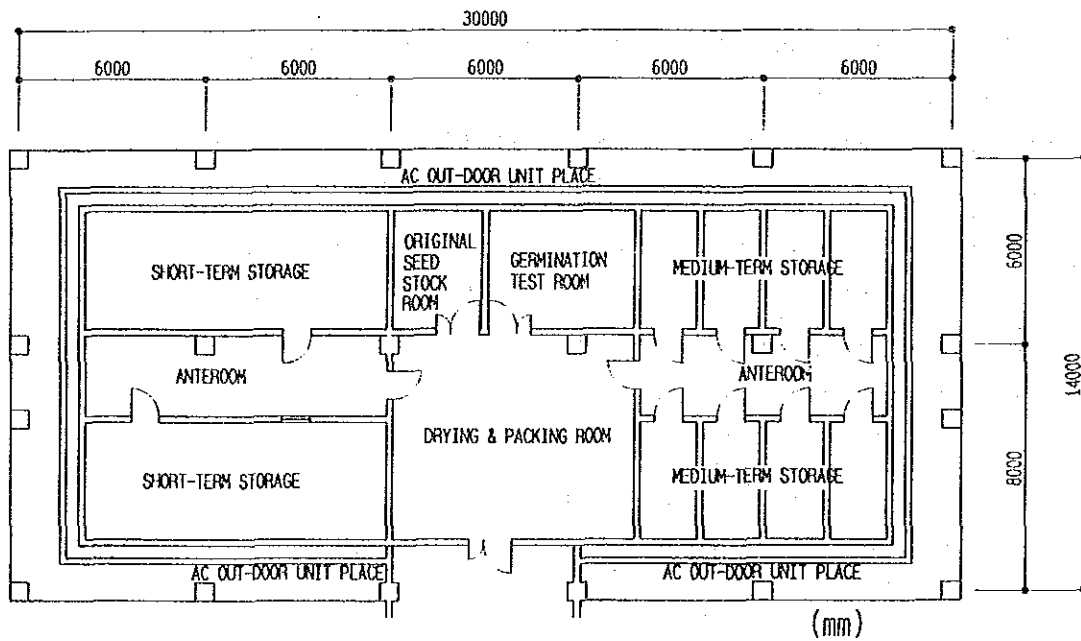


FIG. 4-8 SEED PRESERVATION FACILITY

the laboratories.

4. The room for the foreign experts shall be located with the common rooms to ensure sufficient communication with the researchers.

3) Plant Introduction and Seed Health Laboratory Building

The Plant Introduction and Seed Health Laboratory shall be housed in a building separated from the main building, because the laboratory will inspect seeds, perform preliminary evaluation of introduced seed cultivate plants in isolated conditions, virus-free seedlings and also quarantine them against viruses and bacteria. However, it shall be adjacent to the common rooms to be able to utilize them easily, the isolated cultivation facilities shall be connected to the Plant Introduction and Seed Health Laboratory to prevent harmful insects from being taken outside.

The experiment rooms and inspection rooms in the building shall be placed near each other to enhance utilization of research equipment.

4) Cultivation and Related Facilities

Greenhouses

The Greenhouses shall be built as a group in a sunny place. And they are planned according to the respective purposes of the laboratory which will use them. Benches and pots shall be used in the greenhouses for the isolated cultivation of introduced genetic resources and in-vitro acclimatization cultivation. In other greenhouses, cultivation in furrows will be performed.

Drying, screening, and preparation facilities

The spaces for threshing and drying shall be located where seeds can be dried under full sunlight. They shall be topped with transparent roofs to protect the seeds from drastic weather changes. The vegetable seed screening room shall be separated from the seed screening and preparation room because it uses water. The rooms for fumigation, fertilizer, and agricultural chemicals shall be planned in consideration of access from outside.

(2) Section Plan

The section of each building and configuration of all buildings shall be designed to create a comfortable environment in consideration of the weather conditions, local materials, natural wind, and natural lighting in Islamabad. Vertical and horizontal eaves and louvers shall be provided to shield direct sunlight in the early evening in summer and to keep out rain. The windows shall be large enough to keep the rooms bright by incoming indirect sunlight.

The story height of the main building shall be 4.0m each for the ground and first floors so that a comfortable environment can be secured basically by natural wind and ventilation and the height requirements for the equipment can be satisfied. The eaves of the seed storage section shall be set 4.2m high according to the ceiling height of the seed storage areas.

The building shall be topped with a highly waterproof and insulated flat roof. As to the roof of the main building, except for the seed storage areas, a waterproof, insulation layer shall be placed on a concrete slab. Then they shall be secured by concrete, and bricks laid on the top to enhance the insulation effect.

The roofs of the seed storage shall be sloped to drain rain water fast and make the attic well ventilated for a greater insulation effect. The concrete slab shall be insulated from heat and water, first by a layer of insulation which is topped by a waterproofing layer on which the roof tile is laid.

Plumbing work for equipment, electric power, etc. of the experiment room and the like shall be designed to be adequately flexible to accommodate future changes, and the sectional space provided for these shall be large enough to facilitate maintenance and upkeep.

(3) Structural planning

In planning the structure of the buildings for the Project, the cast-in-place reinforced concrete structure, which is popular locally as being the most rational and economical construction method for buildings of the planned scale, shall be adopted except for the greenhouses.

Geologically, the surface part of the soil of the site is composed of a silt layer with a N value of 5 to 6 of 3m in thickness, and the layers underneath it are hard conglomerate composed of sand and stone.

The building shall be constructed on direct foundations, considering the scales of the facilities of the Project, and factors of construction and costs.

As to earthquakes, Islamabad, where the site is located is classified by the Modified Mericalli Seismic Intensity Scale as a level VII area according to the Pakistan Building Standards. Therefore the structures must be designed with great care.

The structural design conditions, such as external force and load, were determined according to the Building Code of Pakistan and in conjunction with the Japanese Building Standards as follows:

- 1) Dead load : Determined by calculating the static weights of all walls, partitions, floors, roofs and finishes including all other permanent construction.
- 2) Live load : Determined in accordance with the Japanese Building Standards as follows:

Part of Main Complex	Structural calculation items (Unit: kg/m ²)		
	Floor	Beam	Seismic force
Roof	90	60	0
First floor (Ordinary rooms)	300	180	80
First floor (Experiment rooms)	400	240	160
First floor (Conference rooms)	300	270	160

3) Seismic force:

Total lateral force or shear at the base for designing:

$$V = Z \times I \times K \times C \times S \times W = 0.101W$$

Z: Area coef. = 3/8

(Modified Mercalli Seismic Intensity Scale of VII)

I: Occupancy importance factor = 1.5

(determined by the function of the building)

K: Structural format coef. = 1.0

C: Basic shear strength coef. = 0.12

S: Site-structure resonance coef. = 1.5

W: The total dead load including the partition loading where applicable

The shear at the base is calculated by using the above expression and values according to the Building Code of Pakistan.

4) Wind pressure: $F = C_f \times Q \times A_e$

C_f : the force coef. for the building,

Q : dynamic pressure of total wind load,

A_e : effective frontal area of the building

The wind pressure is calculated using the above expression according to the Building Code of Pakistan, but it will not be considered because it is too small in comparison with the seismic force.

5) Design bearing capacity

Main building: Supporting ground GL-3m, Design bearing capacity 30t/m²

Ground will be partially reinforced down to the supporting conglomerate layer by rubble concrete.

Other facilities : Design bearing capacity 5t/m²

6) Materials to be used

Concrete : $F_c = 210\text{kg/cm}^2$ (four-week strength)

Reinforcing rod: SD 345 (D 19 or above)

SD 295A (D 16 or below)

(4) Building Facility Plan

It is necessary to plan the facilities for air-conditioning, sanitation, and electricity which will satisfy the room environments that are required in each laboratory according to the objectives and contents of research of the Project. In addition, the investigation into the conditions of utilization of the facilities such as the working hours and the operating hours of the equipment should be conducted, and it is necessary to install systems which are inexpensive to maintain and manage, and machinery which is easy to maintain and repair.

1) Air-conditioning and sanitary facilities

a) Air-conditioning and ventilation equipment

With a view to save maintenance and operating costs of the facilities and with due consideration to the climatic conditions of Islamabad, the plan should utilize natural ventilation effectively. For the rooms to be air-conditioned, the locally most standard air-cooled package cooler and gas heater will be used.

The humidity greatly affects the storage period of seeds. Therefore a dehumidifier shall be installed in each of the anterooms, the short-term storage area, the medium-term storage area and the seed drying and packing room. The dehumidifiers to be installed in the medium-term storage area will be portable model.

Rooms with cooling equipment

Room name	Design temperature	Design humidity	Type of air-conditioning system
Short-term storage	10°C	apprx.60%	Air-cooled, direct blowing, separated type package cooler for low temperature, Dehumidifier
Medium-term storage	5°C	No condensation	Air-cooled direct blowing separated type cooler, Dehumidifier
Seed drying & packing room	25-27°C	apprx.60%	Air-cooled package cooler Dehumidifier
Anteroom	10°C	apprx.60%	Air-cooled package cooler Dehumidifier
In-vitro cultivation room	15-20°C		Air-cooled direct blowing type separate cooler
	25-30°C		Air-cooled separate cooler Dry portable dehumidifier

b) Rooms with mechanical ventilation

The rooms will basically be ventilated by natural wind, but a ventilating fan shall be installed on a wall near of the ceiling of each room, according to each room's function for use during dusty periods. Ventilating fans equipped with filters will be installed in the Plant Introduction and Seed Health Laboratory, the cultivation rooms, the clean bench room, etc..

Ventilating fans suitable for the respective purposes will be provided in the experiment rooms, pantries, and toilets.

2) Plan for plumbing and sanitary facilities

a) Water supply facilities

The water for living use and experimentation will be supplied by the Capital Development Authority (CDA). The water will be led in from a six-inch main water pipe buried in the road in front of the site to the underground water reservoir on the site. Then it will be pumped up to an elevated tank which will supply each facility. Since the city water is not enough to cool the green houses, however, well water will be pumped up and supplied to them through another reservoir tank on the site.

The well water of the site is too hard for use in experiments. Therefore, a water softening unit will be installed in order to soften it. The system of using an elevated tank was selected because it is the most reliable of the pressure type systems. The end pressure will be 0.7 kg/cm² or greater.

Calculation of reservoir tank capacity:

Reservoir tanks will be installed for living use, experimentation, and both ordinary and cooling uses in the green houses.

As to the calculation of the water to be needed for living use, a figure of 100 people including of 60 staff members and 40 visitors will be used. For experiment use, about 10,000 liters will be consumed every day.

The capacity of the reservoir tank is estimated as follows:

Water for living use: 100 persons × 15 ℓ/capita/day = 15,000 ℓ/day

Water for experiments: 10,000 ℓ/day

Capacity of reservoir tank for water for living and experiment use:
25,000 ℓ

Water for greenhouses:

Ordinary use: Area of $1,154\text{m}^2 \times 20 \text{ ℓ/m}^2 \cdot \text{day} = 23,080 \text{ ℓ/day}$

Water tank capacity for ordinary use: 23,000 ℓ

Cooling use: Area of $384.5\text{m}^2 \times 360\text{ℓ/minute} \cdot 100\text{m}^2 \times 60\text{minutes} \times 20\% \times 6\text{hours}$
= 99,662 ℓ/day

Water tank capacity for cooling use: 100,000 ℓ

b) Draining facilities

The most common drainage method in Pakistan is to permeate waste water into the ground. Like other NARC facilities, waste water will be drained into soakage tanks before permeating into the ground. As to waste water from the experiment rooms, the pH density will be adjusted in a manually operated neutralization tank before drainage. Heavy metals will be collected, separated, and removed from the site.

Waste water from the isolated cultivation facilities will be drained through the soakage tanks after passing through a sterilization tank.

Water from toilets will be drained through the soakage tank after passing through a putrefaction-type septic tank. Rain water collected by the gutters and drainage pipes will also be drained through the soakage tanks.

c) Gas facilities

City gas will be supplied to the pantries and the rooms using heaters and gas burners.

SUI Northern Gas Pipelines Ltd. is the city gas supplier in Islamabad, and the facilities of the Project will use this gas. It produces heat of about $8,900\text{kcal/m}^3$.

d) Sanitary fixtures and facilities

Sanitary fixtures will be installed in numbers specified in the construction plan. The toilet fixtures to be provided will be 50% Western style and 50% Pakistani style.

e) Fire fighting facilities

Indoor fire hydrants will be installed in the facilities of the Project. Fire-extinguishers will be installed in the appropriate rooms.

3) Electrical facilities

An electrical system which is highly reliable and easy to maintain will be designed with due regard to energy saving, safety, and efficiency.

Particularly, as the seed storage areas will require a stable and reliable power supply, the electricity bill will account for a great percentage of operating, maintenance, and administration costs. Accordingly, the emergency power source and the substation equipment are the most important part of the electrical system and will have to be designed with great care.

a) Power connection and its receiving and transforming facilities

The Water and Power Development Authority (WAPDA) is going to lay a 50Hz/11kv aerial distribution cable to the site of the Project. A receiving and transforming facility will transform it into low tension power of three-phase, four-wire, 440v/230v and distribute it to each facility.

b) Generator equipment

A power generator with a capacity of around 200kVA will be installed as the power source for uninterrupted experiments and research in the seed storage areas, incubator rooms, computer room, etc. and for mechanical ventilation in the greenhouses.

c) Power distribution facility

The power which will be stepped down by the transformer is going to be distributed to each building through an underground cable and further to the power distribution panel in each laboratory through a metal cable pipe.

A power distribution panel will be installed in each laboratory to make maintenance and management easier.

The electrical systems of the main line and the load equipment will be as follows:

Main lines for lighting and power:

Three-phase four-wire system 440/230v

Secondary lines for lighting and power including plug sockets:

Single-phase two-wire system 230v

Secondary lines for fan, pump, etc.:

Three-phase three-wire system 440v

d) Lighting and plug sockets

The light source for illumination will be primarily fluorescent fixtures with a view to reduce running costs. Incandescent fixtures may be installed in appropriate locations.

Since not so many research activities are going to be performed at night, the intensity of illumination will be roughly set as follows:

Experiment room, office: 250 lux

Entrance hall, machinery room: 100 lux

Corridor: 150 lux

Plug sockets will, in rooms such as laboratories and lab. equipment rooms where many of them are likely to be used, be planned according to the equipment location and capacity. Local 3P round sockets will be installed on the walls and floors.

e) Public address system

To transmit messages, paging, etc. an amplifier will be installed in the Administration Section, and a speaker in each of the major rooms.

f) Fire alarm system

As one of the disaster measures for the facilities of the Project, a spot detector will be provided in each room in the Main Complex, the Plant Introduction and Seed health Laboratory Building, the Processing Building and the Power Supply Building, and a receiver in the administration office.

g) Lightning arrester system

A lightning arrester system will be installed to enhance safety in the facilities of the Project.

h) Telephone equipment

Two outside lines will be led in (one for facsimile and the other for telephone), as well as two lines from the existing central switch of NARC. A Private Automatic Branch Exchanger will be installed in the Administration Section, and telephones in the major rooms.

(5) Plan of building materials

The building materials to be used for construction of the Project will not only be suitable to the local natural conditions and to the functions of the facility, but also make the buildings durable and easy to maintain. As a policy, locally available materials will be used as much as possible.

1) Principal structural materials

Column, beam, and floor slab: Reinforced concrete.

This is the most rational for a two-storied building and also very common among the local public buildings.

Wall: Brick and reinforced concrete

The history of brick can be traced back to ancient times in Pakistan. The country has advanced technology both for manufacturing and laying brick, and they are the construction material which is most commonly used.

The Project will therefore use local brick as much as possible. However, as mentioned in the Structure planning section, Islamabad belongs to an area where earthquakes may occur. Therefore the buildings of the Project will, if necessary, be built with earthquake-resistant walls of reinforced concrete and supporting walls of brick.

Roof: Reinforced concrete

In principle, the flat reinforced concrete roof that is most common among the local buildings will be adopted. But for the seed storage areas, whose function is to keep their temperature low and stable, a reinforced concrete gable roof will be adopted to secure a large attic capacity and reduce the thermal load, in order to ease solar radiative heat during the hot season.

2) Exterior finishing materials

Flat roof:

Insulation will be laid over a waterproof asphalt protective layer. And the asphalt and the insulation will be further protected with concrete. To ease the solar radiative heat, the bricks which are commonly used in Islamabad for roof insulation will be laid on the top of the concrete to

secure natural ventilation.

Gable roof:

An isolation layer will be placed on the reinforced slab. Then the roof will be tiled to ease solar radiative heat and to deflect rain. the tile will also provide an attractive finish.

External wall:

Face bricks will be stacked, and the concrete portions will be mortared and sprayed with acrylic resin paint. Paint will also be used for decoration.

Sash and door fittings:

They will be made of aluminum or stainless steel. Aluminum windows will be used to secure the airtightness necessary for the laboratories, and durable stainless steel doors will be provided for the entrance.

3) Interior finishing materials

Floor: Overlaid with terrazzo tile with mortar undercoat or PVC tile
Basically the floor will be overlaid with PVC tiles to reduce load.

Wall: Mortar undercoat and emulsion paint finish

These are the most popular locally and are easy to repair and repaint.

Ceiling: LGS suspension and gypsum board, or mortar undercoat and emulsion paint

Suspended ceilings will be installed in the ordinary rooms in order to reduce their thermal load and to enhance aesthetic effect. Gypsum board will be used for these ceilings so that they can be locally mended or repainted. The experiment rooms and lab. equipment rooms on the ground floor, where equipment has to be managed and maintained, will be finished with paint.

4) Interior finishing materials of remarkable rooms

Remark AEP : Acrylic emulsion painting

RC : base of fair-faced concrete

Mortar : Cement mortar steel trowel finishing

1. Main Complex

Room name	Floor	Wall	Ceiling
Entrance hall & lobby	Stone	Multi-layer Coating	Asbestos acoustic board
Exhibition corner	PVC tile	AEP on mortar	Aluminum louver
Lounge & Reception room	PVC tile	AEP on mortar	Asbestos acoustic board
General rooms & corridor (ground floor)	PVC tile	AEP on mortar	Gypsum board
General rooms & corridor (first floor)	PVC tile	AEP on mortar	Gypsum board
Experiment rooms & lab. equipment rooms (ground floor)	PVC tile	AEP on mortar	AEP on RC
Experiment rooms & lab. equipment rooms (first floor)	PVC tile	AEP on mortar	AEP on RC
Incubation room & dark room	PVC tile	molded polystyrene board with a metal outer layer	Molded polystyrene board with a metal outer layer
Lavatory & pantry	Mosaic tile	Ceramic tile	AEP on calcium silicate board
Storage areas	Mortar	Mortar	AEP on RC

2. Gene Bank

Room name	Floor	Wall	Ceiling
Entrance hall	PVC tile	AEP on mortar	Gypsum board
Drying & Packing room	PVC tile	Molded polystyrene board with a metal outer layer	Molded polystyrene board with a metal outer layer
Storage & Anteroom	PVC tile	ditto	ditto
Germination test room	PVC tile	ditto	ditto

3. Seed Introduction and Seed Health Laboratories

Room name	Floor	Wall	Ceiling
SSo's office	PVC tile	AEP on mortar	Gypsum board
Bacterial & viral inspection room			
Fungal inspection room & Corridor			
Seed health experiment room	PVC tile	AEP on mortar	AEP on RC
Sowing preparation room	Mortar	AEP on mortar	AEP on RC

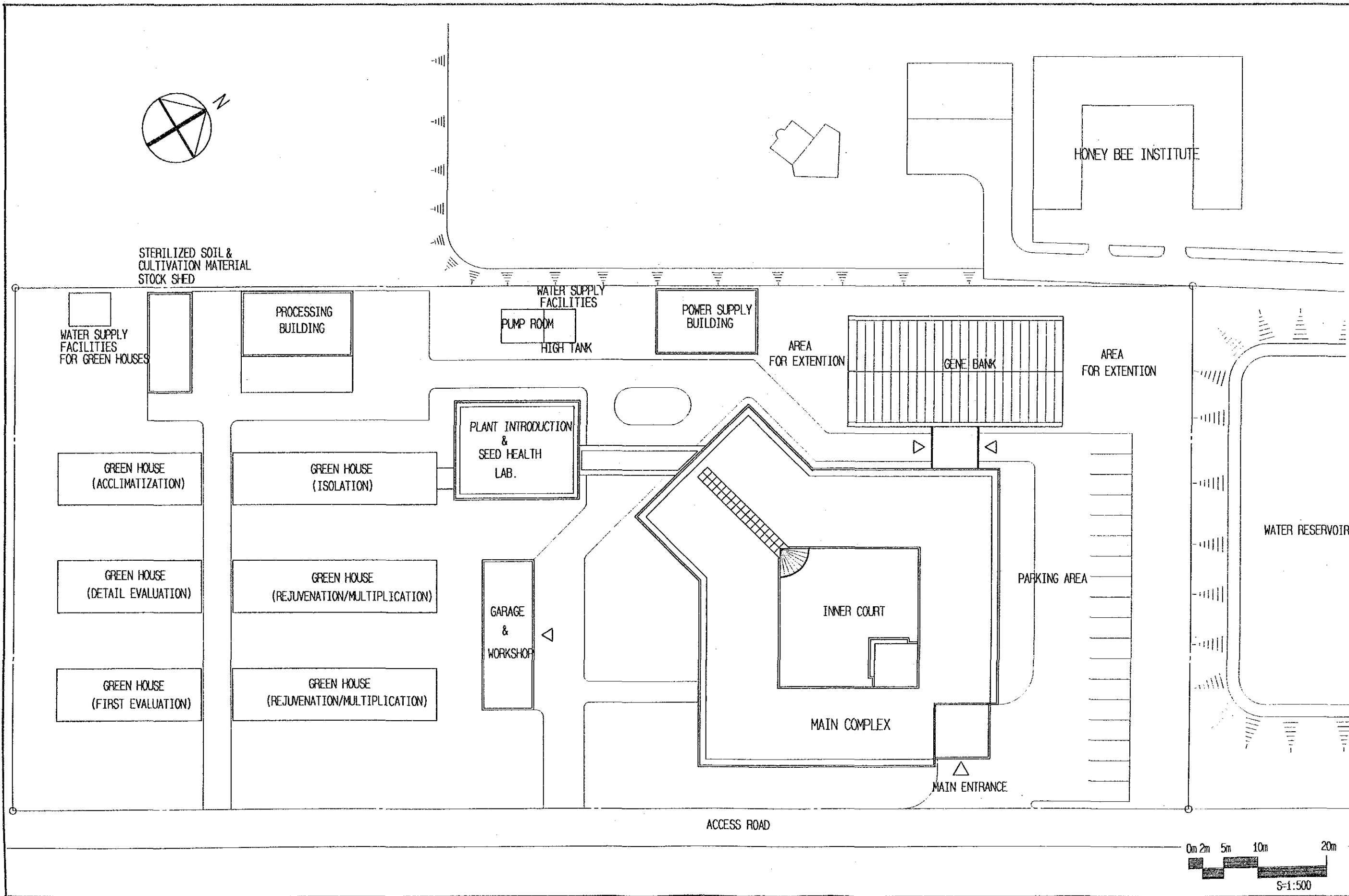
4. Other facilities

Room name	Floor	Wall	Ceiling
Processing room	Terrazzo	AEP on mortar	Gypsum board
Work shop			
Other Facilities	Mortar	Fair-faced brick, AEP on mortar	AEP on RC

4-3-3 Equipment Plan

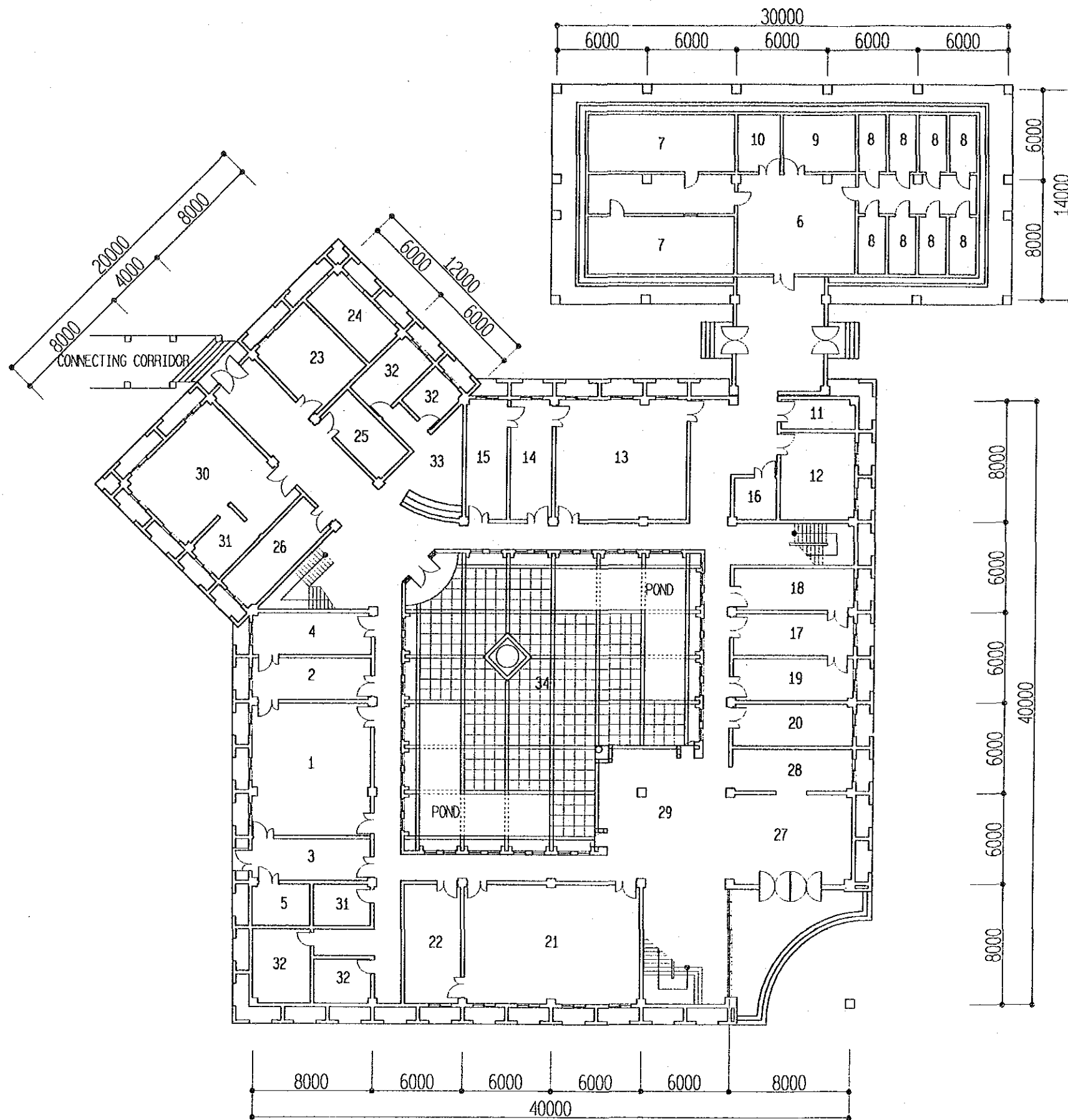
As to the selection of the equipment, discussions were held on their functions and roles with the Pakistani side. The principal policy formulated during the discussions is as follows:

- (1) To discuss equipment from the viewpoint of the technological level and number of personnel assigned to the Project, maintenance and operating costs, and to select the optimum equipment according to the purposes of research. To delete from the request list a gas chromatograph, an amino-acid analyzer, etc. that will require high-level knowledge and technology and high cost.
- (2) To select equipment which is easy to maintain and whose spare parts can be easily obtained.
- (3) To select a minimal number of audiovisual, printing, and inspection units, and to avoid duplication with those available at NARC.
- (4) To minimize the number of centrifuges, growth chambers, and other units by sharing them among several laboratories as often as possible.
- (5) To install computer equipment centrally in the Data Management Laboratory, and displays and keyboards only in the other laboratories.
- (6) To select the type and number of vehicles suitable for the research activities.



PLOT PLAN

01



EXPLORATION & COLLECTION LABORATORY

- 1. EXPERIMENT ROOM
- 2. LAB. EQUIPMENT ROOM
- 3. EXPLORATION PREPARATION ROOM
- 4. SSO'S OFFICE
- 5. STORAGE
- 10. ORIGINAL SEEDS STOCK ROOM

SEED PRESERVATION LABORATORY

- 6. DRYING & PACKING ROOM
- 7. SHORT-TERM STORAGE
- 8. MEDIUM TERM STORAGE
- 9. GERMINATION TEST ROOM
- 11. SEED REFERENCE ROOM
- 12. DISTRIBUTION PREPARATION ROOM
- 13. EXPERIMENT ROOM
- 14. LAB. EQUIPMENT ROOM
- 15. SSO'S OFFICE
- 16. STORAGE

DATA MANAGEMENT LABORATORY

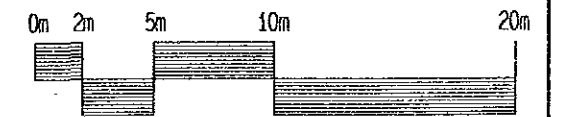
- 17. COMPUTER ROOM
- 18. COMPILATION, PRINTING AND BOOK BINDING ROOM
- 19. DATA MANAGEMENT OFFICE
- 20. SSO'S OFFICE

ADMINISTRATION SECTION

- 21. ADMINISTRATION OFFICE
- 22. CENTRAL CONTROL ROOM

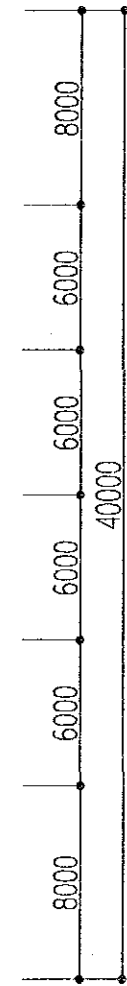
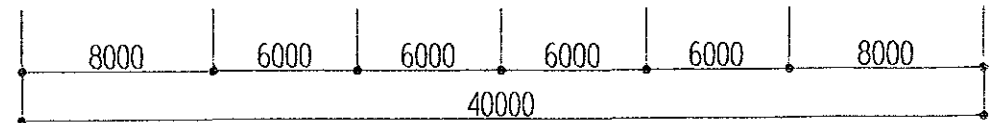
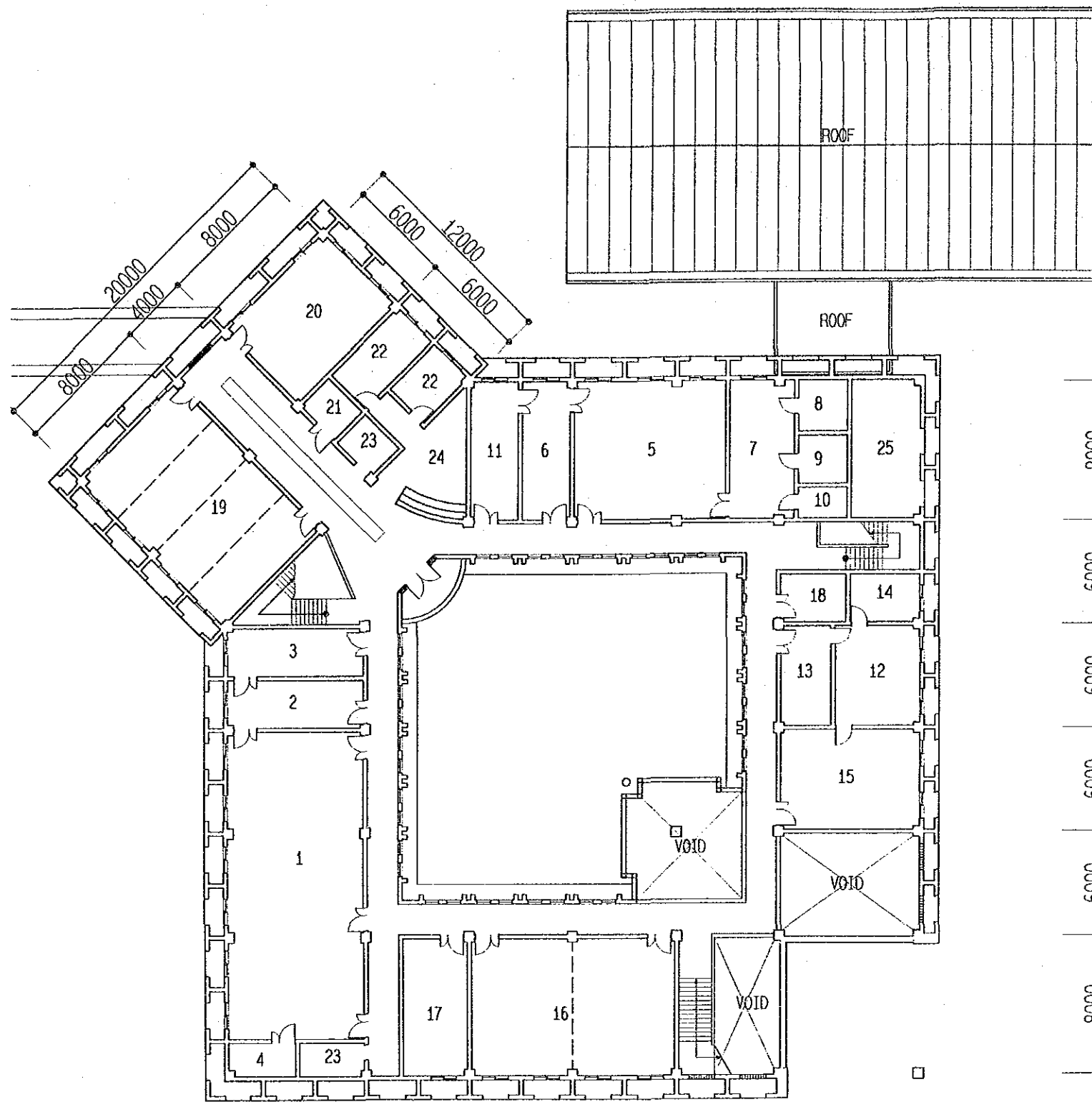
COMMON USE ROOMS

- 23. GROWTH CHAMBER ROOM
- 24. AC OUT-DOOR UNIT PLACE
- 25. CENTRIFUGE ROOM
- 26. HERBARIUM
- 27. ENTRANCE HALL
- 28. EXHIBITION CORNER
- 29. LOBBY
- 30. LOUNGE
- 31. PANTRY
- 32. TOILET
- 33. ABLUTION ROOM
- 34. INNER COURT



S=1:300

MAIN COMPLEX GROUND FLOOR



GERMPLASM EVALUATION LABORATORY

- 1. EXPERIMENT ROOM
- 2. LAB. EQUIPMENT ROOM
- 3. SSO'S OFFICE
- 4. STORAGE

IN-VITRO PRESERVATION RESEARCH LABORATORY

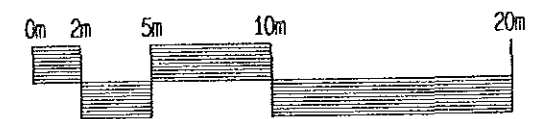
- 5. EXPERIMENT ROOM
- 6. LAB. EQUIPMENT ROOM
- 7. CLEAN BENCH ROOM
- 8. INCUBATION ROOM (25 C)
- 9. INCUBATION ROOM (20 C)
- 10. DARK ROOM
- 11. SSO'S OFFICE

ADMINISTRATION SECTION

- 12. PSO'S OFFICE
- 13. SECRETARY ROOM
- 14. TOILET
- 15. RECEPTION ROOM
- 16. CONFERENCE ROOM
- 17. LIBRARY
- 18. STORAGE

COMMON USE ROOMS & OTHERS

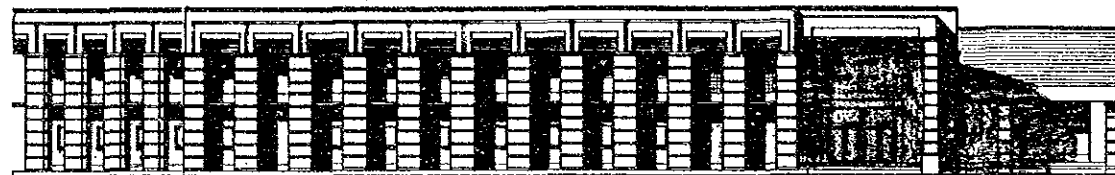
- 19. FOREIGN EXPERTS' ROOM
- 20. MEETING ROOM
- 21. STORAGE
- 22. TOILET
- 23. PANTRY
- 24. ABLUTION ROOM
- 25. AC OUT-DOOR UNIT PLACE



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MAIN COMPLEX FIRST FLOOR

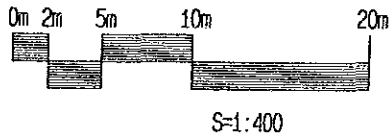
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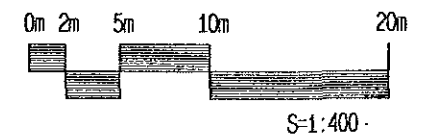
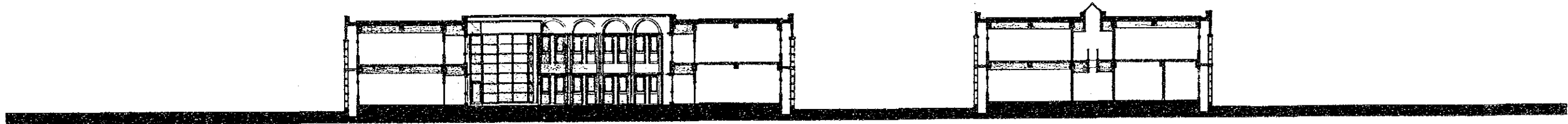
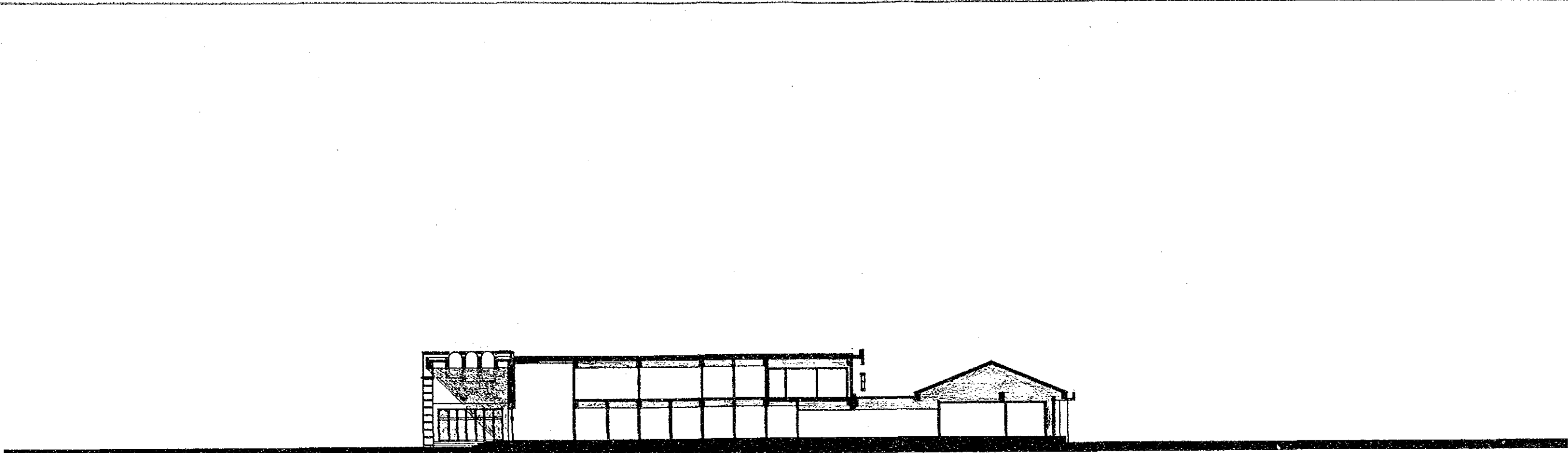


SOUTH SIDE

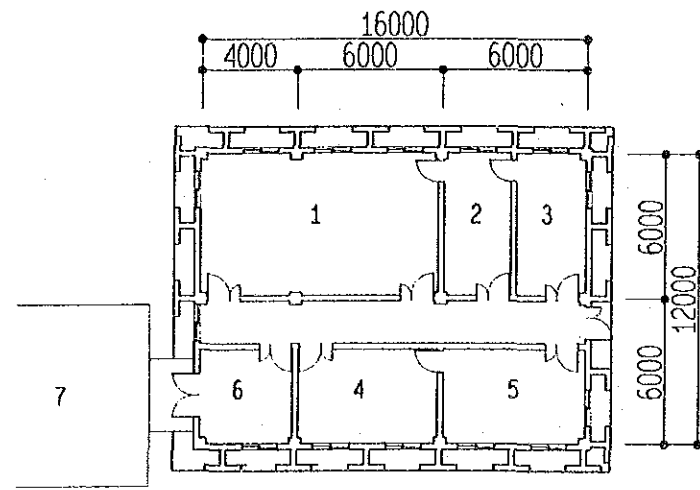


WEST SIDE



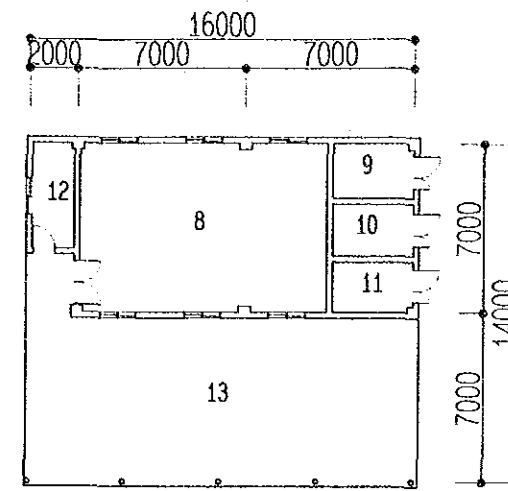


MAIN COMPLEX SECTION **05**



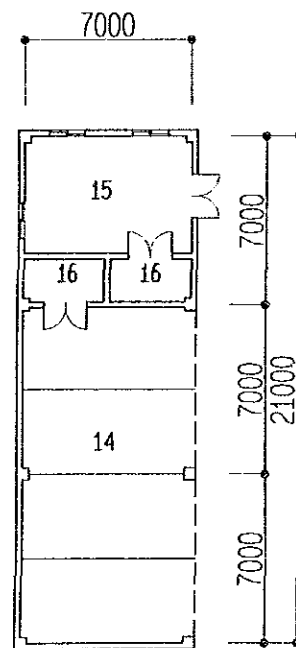
1. SEED HEALTH EXPERIMENT ROOM
2. BACTERIAL & VIRAL INSPECTION ROOM
3. FUNGAL INSPECTION ROOM
4. LAB. EQUIPMENT ROOM
5. SSO'S OFFICE
6. SOWING PREPARATION ROOM
7. GREEN HOUSE

PLANT INTRODUCTION & SEED HEALTH LAB. BUILDING



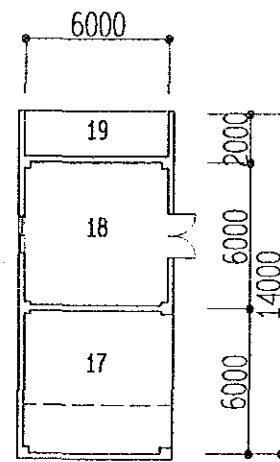
8. PROCESSING ROOM
9. FUMIGATION ROOM
10. FERTILIZER STORAGE
11. PESTICIDE STORAGE
12. VEGETABLE SEED PROCESSING ROOM
13. CONCRETE FLOOR FOR PRE-DRYING

PROCESSING BUILDING



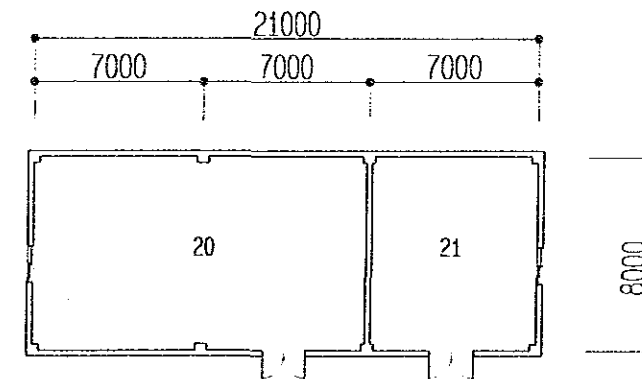
14. GARAGE
15. WORK SHOP
16. STORAGE

GARAGE & WORKSHOP



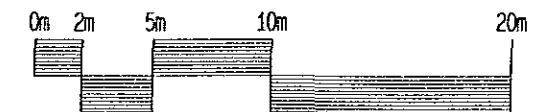
17. STERILIZED SOIL STORAGE
18. CULTIVATION MATERIAL STORAGE
19. INCINERATION ROOM

STERILIZED SOIL & CULTIVATION MATERIAL STOCK SHED



20. SUB-STATION
21. STAND-BY GENERATOR ROOM

POWER SUPPLY BUILDING



S=1:300



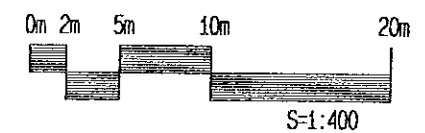
PLANT INTRODUCTION & SEED HEALTH LAB. BUILDING



PROCESSING BUILDING



GARAGE & WORKSHOP





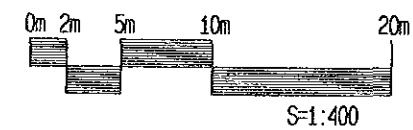
STERILIZED SOIL & CULTIVATION MATERIAL STOCK SHED



POWER SUPPLY BUILDING



GREEN HOUSE



4-4 Implementation Plan

4-4-1 Implementation Policy

This project must be completed within 12 months after the signing of the construction contract for the Project. In the implementation plan, therefore, it is necessary to establish an implementation system which will enable, with a minimum of staff from Japan and a maximum of local materials, equipment, and labor, completion by the specified time to achieve the specified construction quality, and take into consideration the financial aspects including appropriation of temporary fixtures and equipment.

As to the materials and equipment which are difficult to procure in Pakistan, or building work which is necessary to speed up to complete within a specified time, they will be procured in Japan and some experts will be also sent from Japan in order to enhance the efficiency of the implementation.

In Pakistan, contractors are classified into six categories by scale when licensed by the government. Technological experience of one year being given 0.5 point, the top-ranking contractors (C-1) must have at least 150 points, and the amount of money of their contract work is not limited. In Islamabad, as contractors of this class are not only undertaking large-scale public construction works with public funds or grant aid assistance from Japan, but also accepting the various projects of other foreign countries and international organizations, it is judged that they may be available for the Project as subcontractors. Engineers from Japan, however, will be needed for the insulation, air-conditioning, and refrigeration of seed storage areas, and the fabrication of the greenhouses, both of which are special facilities, and the specified waterproofing work that is not common in Pakistan.

The Pakistani agency responsible for the execution of the Project is PARC, which is also its planning agency. PARC will prepare the site and implement the construction work to be undertaken by the Pakistani side, execute construction-related and customs clearance procedures, and act as the coordinator between different governmental agencies. NARC will be the caretaker of the site during construction.

4-4-2 Construction Conditions

The general state of the construction industry and construction technology in Pakistan was enhanced by the United Kingdom, its former suzerain. In Islamabad, construction technology is higher than any other part of the country partly because of the technical guidance of advanced countries including the United States. However, construction materials are manufactured and distributed mostly by private companies, except the basic materials such as concrete aggregates, stone, brick, and cement. The companies are small, and they may not be able to supply products of the necessary grades or quantities for the Project. Therefore, the planning of the procurement of materials and equipment is very important for the Project.

Under the influence of the recent financial crisis and the Gulf War, the prices are showing a remarkable rise in Pakistan. The average price of food and other daily necessities increased about 38% from November 1990 to April 1991. The Government announced that the power and gas rates would be increased 20% in early May 1991. Construction costs will rise, too.

In Islamabad where the facilities are planned, a rainy season continues for two months, July and August. In this period, the daily rainfall exceeds 100mm on several days. Therefore, enough attention should be paid to the work of excavation, foundation and ground beam placement, paving, drainage, etc..

During the dry season because of a lack of city water, measures must be taken to secure the necessary water for the construction.

Since Pakistan is an Islamic state, the drop in work efficiency during Ramadan must also be taken into account.

4-4-3 System for Construction

In Islamabad, the communication, transportation, accommodation, etc. which are essential for the management of the construction are satisfactory, and the necessary construction engineers are available, too. It was also decided to establish a construction supervising office in the capital to negotiate with the Pakistani side and receive imported materials and equipment.

Since the capital is located about 1,500km from Karachi where the imported materials are to be landed, a communication system between Karachi and Islamabad must be established to be able to procure and transport materials and equipment

in time for the progress of construction.

Seven resident staff members shall be sent from Japan: one office administrator in charge of customs and procurement of materials and equipment in Karachi; one chief construction engineer; and five engineers in charge of construction and facility building. In addition, the short-term dispatch of specialists for the construction of greenhouses and insulation, and also for the installation and adjustment of equipment will be planned with the progress of work.

4-4-4 Procurement of Construction Materials and Equipment

(1) Construction materials

The ordinary construction materials excluding equipment are domestically produced or constantly imported. However, the standards, quality, and lead times must be fully checked as they are often uncertain.

There is the greatest construction demand in Islamabad, the capital city, and Karachi, the most economically active city. More materials are available in these two cities than any other cities. Though, the procurement of materials for temporary work in Islamabad is going to be satisfactory both in delivery date and quantity as planned, since the supply system is far from complete, the procurement plan must be carefully studied in advance.

Sand, gravel, brick, stone, ceramic tile, and general paint can be procured, but procurement must be planned in advance because the exact delivery date is not yet decided for each of them.

1) Cement

Pakistan produces three types of cement (portland, phosphite, and sulphite) and they meet the BS Standards.

Several cement factories have recently begun production and the supply is gradually getting better. However, since it is of concern that there will be a drop in production at any time due to equipment trouble in factories or labor disruption such as strikes as well as the halt of transportation during the rainy season, a warehouse must be established to store the amount of cement that will be needed for at least one month. As the cement supply is controlled by the government, cooperation from the

Pakistani side will be indispensable for proceeding with the smooth procurement of cement.

2) Form

The form materials are made of wood or iron. The plywood made in Pakistan is not very water-resistant. The wood is mainly from pine and cedar trees cut in the mountains in the north. However, the grade is generally low because of knots and cracks. Since roughly cut lumber of large sizes must be processed precisely on the site, a lumber processing facility is usually installed, and results in an increased loss rate. Local contractors mainly use iron frames that are lacking in efficiency but can be used many times.

For the Project, plywood will be procured from Japan, Pakistan, or other countries for securing quantity, quality, and delivery time.

3) Reinforcing rod

Pakistan produces both irregular and round reinforcing rod but the supply is not regular and the quality is variable. The reinforcing rod supplied domestically is about 12 meters long, unlike in Japan where the rod length varies 50cm by 50cm. Since the economical structural span is about 7 meters, using 12 meter rod would result in unnecessary waste.

Considering these situations, the facilities scale and fabrication period, reinforcing rod will be procured from Japan, Pakistan, or other countries for securing quantity, quality, and delivery time.

4) Asphalt waterproofing

In Pakistan, the specified waterproofing is not available. The local standard is scattered on a molten asphalt layer. Therefore, waterproofing should be procured from Japan or other countries which can supply the proper waterproofing materials.

5) Steel fixtures

In Pakistan, steel fixtures are not factory-produced or pressed, and cannot meet the specified standard of the Project. Therefore, the steel fixtures will be procured from Japan or other countries which can provide

the necessary fixtures.

6) Aluminum fixtures

Production of aluminum fixtures began in 1980. The production system is gradually getting better but the quality cannot yet meet the requirements of the Project. Therefore, the aluminum fixtures will be procured from Japan or the other countries which can provide the necessary fixtures.

7) Glass

Fifteen or more factories are manufacturing glass but their products often contain air bubbles, and when used as window panes, outside scenes are often distorted. Glass is cut at the factories but on-the-site recutting is usually required, which causes a great amount of loss.

As a rule, glass will be procured from Japan, Pakistan, or other countries for securing quantity, quality, and delivery time.

8) Others

Construction materials that are not generally used in Pakistan will be procured from Japan or the other countries which can provide materials similar quality.

(2) Plan for procurement of equipment

As to the procurement of equipment for the Project, considering competitive price, convenience of transportation and after-care service, soft and hardware computer system and chemicals will be expected to supply locally. Other equipment for the Project will be procured from Japan and Pakistan for securing quantity, quality, delivery time and maintenance in full meet with NARC's requirement.

4-4-5 Selection of Inland Transportation Route

Materials and equipment not procured locally will be landed in Karachi and transported to Islamabad by truck or train. They will go through customs mainly in Karachi but it is possible in Islamabad as well. Those materials and equipment that will go through customs in Karachi will be transported inland basically by train.

The railway route from Karachi to Islamabad (Rawalpindi) is slightly advantageous in terms of its distance (1,800km, about 4 days). The related facilities of harbor and road are comparatively good. Trains are a little better than trucks in terms of travel time required and cost. However, it is necessary to reship from the train, and that may be a disadvantage. So either trucks or trains will be selected according to the contents, safety, packaging, and quantity of the shipment.

4-4-6 Project Implementation Schedule

After the document (E/N) is signed and exchanged it will be about 17 months before the Project will be completed. The breakdown is as follows: 0.5 month to conclude consultant contract; 2.5 months to draft execution design and create tender document; 1.5 months to execute bidding; 0.5 month to conclude construction contract; and 12 months to construct the facilities after contract.

4-4-7 Detail Design and Construction Supervision

The consultant will execute the following works after the conclusion of the contract (E/N) between the Governments of the Islamic Republic of Pakistan and Japan. The resident supervisor will coordinate between the agencies of Japan and Pakistan. At each stage of the Project, the engineers in charge of operation, building, structure, facilities, or equipment and materials will provide spot supervision.

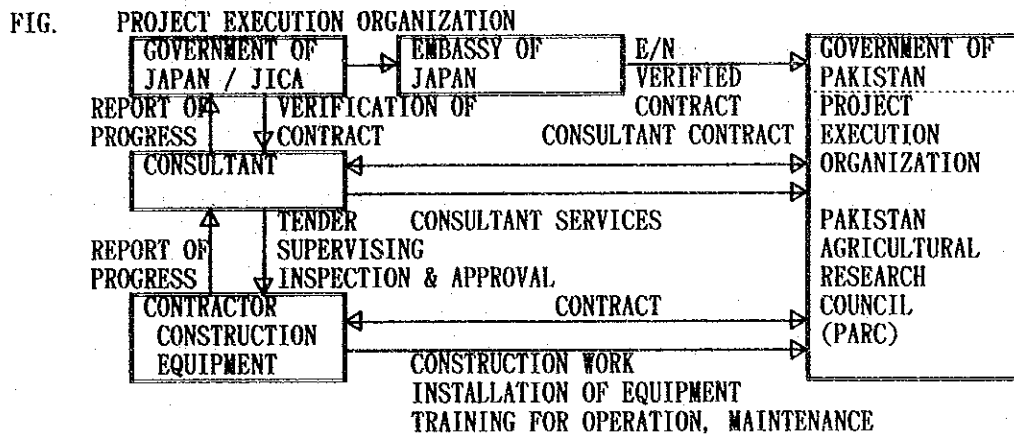
(1) Detail design schedule

- a. Signing the consultant agreement with an organization representing Pakistan
- b. Taking necessary procedures for the verification of the consultant agreement by the Japanese Government
- c. Holding on-the-site discussions regarding the design
- d. Checking and testing the bearing capacity of the site and surveying the temporary roads for construction
- e. Preparing the detail design document
- f. Obtaining approval of the design document from Pakistan
- g. Publicly announcing of the tender offer in Japan and checking qualifications of contractors
- h. Managing the bidding procedure on behalf of the client
- i. Evaluating the bids
- j. Discussing the contractors and construction amounts with the Government of Pakistan
- k. Witnessing the signing of the construction contract

(2) Construction supervision schedule

- a. Dispatching resident supervisor
- b. Discussing the construction plan with the Pakistan government and contractors during the preparation period
- c. Approving the selection of chief engineer and staff in charge of construction, structure, facilities, and equipment and materials
- d. Submitting monthly construction progress reports
- e. Supervising the construction work and approving the completion of each stage

- f. Supervising the contractor's explanation of how to use the facilities and witnessing their delivery



4-4-8 Scop of Work

(1) Scope of Work

Construction of the facilities consists of the work to be undertaken by the Government of Japan and the Government of Pakistan as follows:

- 1) Work to be undertaken by Japan
 - a) To construct the main facilities
 - b) To construct the incidental facilities
 - c) To install pavement and drainage in the site
 - d) To install power supply, water supply and drainage facilities
 - e) To provide materials and equipment as specified

- 2) Work to be undertaken by Pakistan
 - a) To provide data and information necessary for the Project
 - b) To secure land for the site of the Project and coordinate this matter with each NARC section
 - c) To prepare access to the site
 - d) To clear, level and reclaim the site if necessary
 - e) To construct the gate and fence in and around the site if necessary
 - f) To plant in the site

- g) To provide facilities for distribution of electricity, water and gas supply, drainage and other incidental facilities if necessary
 - 1. Electricity distribution line to the site
 - 2. Water supply to the site
 - 3. Gas supply to the site
 - 4. Main drainage line to the site
 - 5. Telephone trunk line to the main distribution frame of the building
 - 6. General furniture
 - 7. Other incidental facilities
- h) To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement and issue the A/P
 - 1. Advising commission of authorization to pay
 - 2. Payment commission
- i) To ensure prompt unloading, tax exemption, customs clearance at ports of disembarkation and prompt internal transportation of the materials and equipment purchased under the Grant Aid
- j) To exempt Japanese nationals involved in the Project from custom duties, internal taxes and other fiscal levies which may be imposed in the Islamic Republic of Pakistan with respect to the supply of the products and services under the verified contracts
- k) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into the Islamic Republic of Pakistan and stay therein for the performance of their works
- l) To bear all the expenses other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment
- m) To assign the necessary staff and the budget for the proposed activities of the Genetic Resources Preservation and Research Laboratory
- n) To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant Aid

- o) Providing a temporary depository for equipment on the premises of NARC and temporary managing the equipment deposited there

(2) Probable construction costs for the Pakistani side work

Probable construction costs for the Pakistani side work as classified in Section 4-4-8-(1) is estimated as follows:

Road repairing:	300 thousand Rupees
Water lead-in:	20
Electricity lead-in:	230
Telephone lead-in:	70
Gas lead-in:	40
Fencing:	200
Planting:	100
the B/A commission:	900
the source of the water supply to the greenhouses	140
<hr/>	
Total	2,000 thousand Rupees (about 12.62 million yen)

In addition to the above costs, the Government of the Islamic Republic of Pakistan will also allocate funds to purchase furniture and general office equipment.

Calculation conditions

- a. Date : June 1991
- b. Exchange rate : 1 Rs. (rupee) = 6.31 yen
- c. Construction period : 12 months
(as mentioned in the implementation schedule)
- d. Other : under the conditions of the grant aid system of the Government of Japan

CHAPTER 5

PROJECT EVALUATION AND CONCLUSION

CHAPTER 5 PROJECT EVALUATION AND CONCLUSION

The Government of the Islamic Republic of Pakistan is now actively encouraging as an important part of the development strategy agenda, the development of high-yielding and disease-resistant varieties, the research, development and introduction of locally-adapted varieties, and the promotion of agricultural research operations.

Breeding activities, which are primarily supported by PARC, have been successful in growing many better quality seeds including the Mexipak-65 and Cherab-70 varieties of wheat, and distributing them in regions centered on the Punjab Plain. The Government of the Islamic Republic of Pakistan recognizes the importance of actively organized operations such as collection, preservation and effective utilization of slowly disappearing plant genetic resources, in order to continue improving agricultural productivity.

Against this background, it is considered appropriate for Pakistan to implement the Project to establish a plant genetic resources preservation and research laboratory, designed to systematically preserve plant genetic resources on a nationwide scale.

(1) Project Evaluation

The Project will bring about the following effects to Pakistan:

1) Direct Effects

- a) To prevent the extinction of the important plant genetic resources in Pakistan by preserving them, and to expand the possibility of their utilization.
- b) To contribute to the development of breeding research in Pakistan, by strengthening the testing and research functions, and improving the testing and research techniques involving plant genetic resources.

In this way, genetic resources brought in as research materials will be protected from disease and harmful insect contamination, the precision of the evaluating of plant genetic resources will be improved, and the items to be evaluated will be expanded. Safe preservation of genetic resources and replenishing of data on the conserved seed stocks will greatly contribute to the varietal improvement, and the provision of quality seed will play an essential role in promoting the increased agricultural products.

- c) To serve as an international plant genetic resources preservation center.
- d) To enable the utilization of plant genetic resources world wide, through the international exchange of seed samples.

2) Indirect effects

The activities including exploration, collection, preservation and evaluation to be conducted at the plant genetic resources preservation and research laboratory, will bring about the following effects to the national economy of Pakistan:

a) Stable food supply

The active promotion of varietal improvement and distribution will promise stable yields to the farmers, and the effects of the increased production based on the right crops in the right soil will thereby bring about a stable food supply.

b) Diversified means to earn foreign currency and cutback spending

The practice of varietal improvement may lead to the breedings of new export crops like Basmati rice and cotton. And the increased production of farm products will in turn reduce import volume and the spending of foreign currency holdings.

(2) Propriety of the Project

The PARC, the executing agency of the Project, is playing a key role with its agricultural research institutions including NARC, in the research activities on plant genetic resources and crop breeding in Pakistan. It has, therefore many researchers working in these domains, and, as proved in the successful result of the study on wheat, they have a strong commitment to the work and a high level of skill. Yet, due to the inadequate facilities, their capabilities are not fully utilized.

The size of the facilities and contents of the activities designed under the Project should be suitable to the actual conditions and appropriate to the technological and economic level of Pakistan. In view of these circumstances, it is certain that the facilities under the Project will be satisfactorily operated and maintained by the local technicians.

Moreover, if the requested Japanese technical cooperation is effectively conducted in the fields concerned, research on plant genetic resources will be assured further advance.

Considering its importance, the Government of the Islamic Republic of Pakistan has given the highest priority to the Project. And PARC is now trying to secure the necessary funds for its implementation and working out an operation and maintenance system. The plan concerning the operating funds has already been approved by the Executive Committee of National Economic Council, and given the size of its budget, the operating funds for the Project is likely to be sufficiently provided.

Being promoted under these conditions, the Project will surely be of great benefit to the agricultural development of Pakistan, and through mutual cooperation, will also contribute a great deal to friendly relations between Japan and Pakistan.

APPENDICES

Appendix 1. Equipment List

I. Exploration and Collection Laboratory

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
I-1	Seed Collection Equipment Set (Altimeter, Clinometer, Binocular, Camera, etc)	1 lot
I-2	Service Wagon	2 units
I-3	Herbarium Making Implement	3 sets
I-4	Seed Tray Set	1 set
I-5	Grain Micrometer	3 units
I-6	Measuring Tape	1 unit
I-7	Balance Set	1 lot
I-8	Refrigerator	3 units
I-9	Original Seed Stocker	5 units
I-10	Aluminum Foil Bag	30 pkt
I-11	Grain Sample Divider	1 unit
I-12	Grain Shape Tester	1 unit
I-13	Seed Container	10,000 pcs
I-14	Seed Cloth Bag Set	1 lot
I-15	Spatula Set	1 set
I-16	Forceps Set	1 set
I-17	Scissors	5 pcs
I-18	Dessicator	3 pcs
I-19	Equipment Rack	1 unit
I-20	Seed Specimen Cabinet	5 units
I-21	Center Table Set with Stool	1 lot
I-22	Side Table Set with Chair	1 lot
I-23	Passport Card Cabinet	1 unit
I-24	Display Board	1 unit

II. Plant Introduction and Seed Health Laboratory

(Seed Health Experiment Room)

II-1	Sealer	1 unit
II-2	Plastic Bag Set	1 lot
II-3	Balance Set	1 lot

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
II-4	Refrigerator	3 units
II-5	Incubator	1 unit
II-6	Drying Oven	1 unit
II-7	Autoclave	1 unit
II-8	Seed Tray Set	1 lot
II-9	Budding Grafting Kit	1 lot
II-10	Labelling/ Writing Kit Set	1 lot
II-11	Binocular Stereoscopic Microscope	1 unit
II-12	Distillation Apparatus	1 unit
II-13	Dry Sterilizer Set	1 lot
II-14	Sterilizing Can	20 pcs
II-15	pH meter	1 unit
II-16	Glassware (Bottles, Beakers, Flasks, etc)	1 lot
II-17	Automatic Glass Washer	1 unit
II-18	Automatic Pipet Washer	1 unit
II-19	Dry Hanger Stand	1 unit
II-20	Drying Rack	1 unit
II-21	Drying Shelf	1 unit
II-22	Glass Rack	1 unit
II-23	Shelf	1 unit
II-24	Lab. Cart	1 unit
II-25	Center Table Set with Stool	1 lot
II-26	Side Table Set with Chair	1 lot

(Fungal Inspection Room)

II-27	Microscope Set (Binocular Stereoscopic Microscope, Compound Microscope)	1 lot
II-28	Incubator	1 unit
II-29	Refrigerator	1 unit
II-30	Microwave Oven	1 unit
II-31	Growth Chamber	1 unit
II-32	Autoclave	1 unit
II-33	Clean Bench	1 unit
II-34	Balance	1 unit

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
II-35	Water Bath	1 unit
II-36	Stirrer with Hot Plate	1 unit
II-37	pH Meter	1 unit
II-38	Rotary Shaker	1 unit
II-39	Vacuum Filter Set	1 set
II-40	UV Stand Lamp	1 unit
II-41	Lab. Cart	1 unit
II-42	Side Table Set with Chair	1 lot
II-43	Pharmaceutical Refrigerator	1 unit
II-44	Chemicals	1 lot

(Bacterial & Viral Inspection Room)

II-45	Mixer/Mill	1 unit
II-46	Pipet Aid Vacuum Pressure	2 units
II-47	Mixer for Flask	1 unit
II-48	Colony Counter	1 unit
II-49	Binocular Stereoscopic Microscope	1 unit
II-50	Ultrasonic Cleaner	1 unit
II-51	Homogenizer	1 unit
II-52	Hot Plate with Stirrer	1 unit
II-53	Bench Centrifuge	1 unit
II-54	Ice Maker	1 unit
II-55	Balance Set	1 set
II-56	Distillation Unit	1 unit
II-57	Spectrophotometer	1 unit
II-58	Electrophoresis Unit	1 unit
II-59	Multiscan Set	1 lot
II-60	Tissue homogenizer	1 unit
II-61	Liquid Nitrogen Container	3 units
II-62	Freeze Dryer	1 unit
II-63	Glassware(Adjustable Micropipet, Multichannel Micropipet, Tips & Racks, etc.)	1 lot
II-64	Chemicals	1 lot
II-65	Side Table Set with Chair	1 lot

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
II-66	Pharmaceutical Refrigerator	1 unit
II-67	Lab Cart	1 unit

III. Seed Preservation Laboratory

III-1	pH Meter	1 unit
III-2	Germinator	1 unit
III-3	Tray for Germination Test	50 pcs
III-4	Mirror Plate	1 unit
III-5	Paper Towel	100 pkt
III-6	Magnifier Set	1 lot
III-7	Grain Moisture Meter Set	1 lot
III-8	Grain Volume-Weight Tester	1 unit
III-9	Seed Tray Set	1 lot
III-10	Grain Shape Tester	1 unit
III-11	Drying Oven	1 unit
III-12	Binocular Stereoscopic Microscope	1 unit
III-13	Grain Micrometer	1 unit
III-14	Weighing Can	50 pcs
III-15	Seed Counter with Aspirator	1 unit
III-16	Balance Set	1 lot
III-17	Tetrazolium Test Kit Set	1 unit
III-18	Deep Freezer	1 unit
III-19	Aluminum Foil Sheet	70 pkt
III-20	Silica Gel	20 kgs
III-21	Distillation Unit	1 unit
III-22	Glassware	1 lot
III-23	Automatic Glass Washer	1 unit
III-24	Automatic Pipet Washer	1 unit
III-25	Dry Hanger Stand	1 unit
III-26	Drying Rack	1 unit
III-27	Drying Shelf	1 unit
III-28	Glass Rack	1 unit
III-29	Shelf	5 units
III-30	Lab. Cart	1 unit

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
III-31	Center Table Set with Stool	1 lot
III-32	Side Table Set with Chair	1 lot
III-33	Work Bench Set with Stool	1 lot

IV. In-Vitro Preservation Research Laboratory

IV-1	Drying Sterilizer	1 unit
IV-2	Sterilizing Can	30 pcs
IV-3	Autoclave	1 unit
IV-4	Water Bath	1 unit
IV-5	Microwave Oven	1 unit
IV-6	Distillation Unit	1 unit
IV-7	Clean Bench	1 unit
IV-8	Draft Chamber	1 unit
IV-9	Balance Set	1 lot
IV-10	Tube Mixer	1 unit
IV-11	Stirrer	1 unit
IV-12	Automatic Media Dispenser	1 unit
IV-13	Micro Filter	50 pkts
IV-14	Micro Filter Ass'y Set	1 lot
IV-15	pH Meter	1 unit
IV-16	Conductivity Meter	1 unit
IV-17	Rotary Shaker	1 unit
IV-18	Incubator	1 unit
IV-19	Labelling/Writing Kit	1 lot
IV-20	Freezer	1 unit
IV-21	Microscope Set	1 lot
IV-22	Hemocytometer Set	1 unit
IV-23	Colony Counter	1 unit
IV-24	Pot Set	1 lot
IV-25	Program Freezer Set	1 lot
IV-26	Deep Freezer	1 unit
IV-27	Stop Watch	1 unit
IV-28	Glassware	1 lot
IV-29	Automatic Glass Washer	1 unit

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
IV-30	Automatic Pipet Washer	1 unit
IV-31	Dry Hanger Stand	1 unit
IV-32	Drying Rack	1 unit
IV-33	Drying Shelf	1 unit
IV-34	Glass Rack	1 unit
IV-35	Shelf	5 units
IV-36	Lab. Cart	1 unit
IV-37	Center Table Set with Stool	1 lot
IV-38	Side Table Set with Chair	1 lot
IV-39	Culture Shelf	6 units

V. Germplasm Evaluation Laboratory

V-1	Salinity Meter	1 unit
V-2	Tension Meter	1 unit
V-3	Soil Moisture Meter	1 unit
V-4	Straw Fracture Meter	1 unit
V-5	Horticultural Lux Meter	1 unit
V-6	Chlorophyll Meter	1 unit
V-7	Leaf Area Meter	1 unit
V-8	Plani Meter	1 unit
V-9	pH Meter Set	1 lot
V-10	Grain Moisture Meter	1 unit
V-11	Hand Sprayer	2 units
V-12	Horticultural Color Chart	1 unit
V-13	Hygrometer	1 unit
V-14	Infrared Heat Detector	1 unit
V-15	Test Rice Husker Set	1 lot
V-16	Electric Grinder	1 unit
V-17	Seed Tray	50 pcs
V-18	Stirrer	1 unit
V-19	Oven	1 unit
V-20	Analytical Balance Set	1 lot
V-21	Refrigerator Set	1 lot
V-22	Binocular Stereoscopic Microscope	1 unit

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
V-23	Deep Freezer	1 unit
V-24	Auto Mortal Grinder	1 unit
V-25	Centrifuge	1 unit
V-26	Micro Hammer Cutter Mill	1 unit
V-27	Hot Plate	1 unit
V-28	Rotary Evaporator	1 unit
V-29	Microwave Oven	1 unit
V-30	Autoclave	1 unit
V-31	Draft Chamber	1 unit
V-32	Kjeldahl Apparatus Set	1 unit
V-33	Soxhelt's Apparatus Set	1 unit
V-34	Electrophoresis Equipment	1 unit
V-35	Ultrasonic Cleaner	1 unit
V-36	Centrifuge Tube Balance	1 unit
V-37	Auto Still Set	1 lot
V-38	Thermo Magnetic Stir	1 unit
V-39	Bunsen Burner	2 units
V-40	UV Light Plate	2 units
V-41	Incubator	1 unit
V-42	Glove Set	1 lot
V-43	Heavy Filter Paper	500 pkt
V-44	Staining Tray	100 pkt
V-45	Staining Tray Rack	1 unit
V-46	Oil Content Analyzer	1 unit
V-47	Glassware	1 lot
V-48	Dry Hanger Stand	1 unit
V-49	Drying Rack	1 unit
V-50	Drying Shelf	1 unit
V-51	Glass Rack	1 unit
V-52	Shelf	5 units
V-53	Lab. Cart	1 unit
V-54	Center Table Set with Stool	1 lot
V-55	Side Table Set with Chair	1 lot
V-56	Chemincals	1 lot

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
V-57	Automatic Glass Washer	1 unit
V-58	Automatic Pipet Washer	1 unit
VI. Data Management laboratory		
VI-1	Micro Computer Set	2 lots
VI-2	Table Set with Chair	1 lot
VI-3	Paper Set	1 lot
VI-4	Cabinet Set	1 lot
VI-5	Stencil Cutter	1 unit
VI-6	Printing Machine	1 unit
VI-7	Paper Cutter	1 unit
VI-8	Binder	1 unit
VI-9	Paper Drilling Machine	1 unit
VII. Processing Building		
VII-1	Miniture Thresher	1 unit
VII-2	Hand Maize Thresher	1 unit
VII-3	Dockage Tester	1 unit
VII-4	Seed Counter with Aspirator	1 unit
VII-5	Air Screen Cleaner	1 unit
VII-6	Sieve Set	1 lot
VII-7	Seed Tray Set	1 lot
VII-8	Grain Moisture Meter Set	1 lot
VII-9	Seed Blower	1 unit
VII-10	Electric Top Pan Balance	1 unit
VII-11	Seed Cloth Bag	5 pkts
VII-12	Seed Sample Pan Set	1 lot
VII-13	Spring Scale	1 unit
VII-14	Fumigation Box Set	1 lot
VII-15	Gas Mask	2 lots
VII-16	Gas Detector	1 unit
VII-17	Gloves	5 pairs
VII-18	Work Bench Set with Stool	1 lot
VII-19	Shelf	1 unit

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
VII-20	Cabinet	1 unit
VII-21	Fumigation Chemicals	1 lot
VIII. Seed Drying & Packing Room & Cold Storage Area		
VIII-1	Sealer Set	1 lot
VIII-2	Aluminum Foil Bag Set	1 lot
VIII-3	Plastic Bag Set	1 lot
VIII-4	Labelling/Writing Kit Set	1 lot
VIII-5	Seed Sample Pan	50 pcs
VIII-6	Lab. Cart	1 unit
VIII-7	Work Bench Set with Stool	1 lot
VIII-8	Seed Tray Set	1 lot
VIII-9	Stepladder	1 unit
VIII-10	Seed Bottle Set	1 lot
VIII-11	Silica Gel	1,000 kgs
VIII-12	Seed Dryer	2 units
IX. Herbarium		
XI-1	Shelf	3 units
XI-2	Work Bench Set with Stool	1 unit
XI-3	Stepladder	1 unit
X. Common Use Room		
X-1	Growth Chamber	1 unit
X-2	Centrifuge (Medium Speed, High Speed)	2 units
X-3	Waste Water Treatment Apparatus	1 unit
X-4	Hand Tractor Set	1 lot
X-5	Power Tiller Set	1 lot
X-6	Platform Scale	1 unit
XI. Greenhouse		
XI-1	Pot Set	1 lot
XI-2	Portable Soil Sterilizer Set	1 unit

XII. Administration Section

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
XII-1	Photo Copying Machine Set	1 lot
XII-2	Typewriter Set	1 lot
XII-3	Computer Set	1 lot
XII-4	Cabinet for Data Books	1 unit
XII-5	Motorcycle	2 units
XII-6	Pick-up Truck	1 unit
XII-7	Microbus	1 unit
XII-8	Slide Projector Set	1 lot
XII-9	Overhead Projector Set	1 lot
XII-10	Video Camera	1 unit
XII-11	Video Cassette Recorder Set	1 lot
XII-12	Video Television Set	1 unit
XII-13	Microphone Set	1 lot
XII-14	Amplifier	1 unit
XII-15	Speaker	1 pair
XII-16	Thermohygrograph	2 units
XII-17	Calculator	6 units

XIII. Work Shop

XIII-1	Current Calibrator	1 unit
XIII-2	Electronic Tool Kit	1 lot
XIII-3	Refrigeration Tool Kit	1 lot
XIII-4	Tester	1 unit
XIII-5	Tachometer	1 unit
XIII-6	Digital Clamp Meter	1 unit
XIII-7	Oscilloscope	1 unit
XIII-8	Electronic Watt Meter	1 unit
XIII-9	Soldering/Desoldering Station	1 unit
XIII-10	Battery Charger	1 unit
XIII-11	Microwave Radiation Leak Detector	1 unit
XIII-12	Microwave Radiation Alert Monitor	1 unit
XIII-13	Gas Detector	1 unit
XIII-14	Hygrothermometer	1 unit

<u>Item No.</u>	<u>Name of Equipment</u>	<u>Quantity</u>
XIII-15	Glass Blowing Kit	1 lot
XIII-16	Carpenter's Tool Kit	1 lot
XIII-17	Mechanic Tool Kit	1 lot
XIII-18	Electrician's Tool Kit	1 lot
XIII-19	Work Bench	1 unit
XIII-20	Tool Cabinet	1 unit
XIII-21	Stand Fan	1 unit

Appendix 2. Minutes of Discussions

2-1. The Preliminary Study on Grant Aid

December 9, 1990

2-2. The Basic Design Study

April 11, 1991

2-3. The Draft Report Confirmation

July 6, 1991


MINUTES OF DISCUSSIONS
ON THE GENETIC RESOURCES PRESERVATION AND
RESEARCH LABORATORY ESTABLISHMENT PROJECT
IN THE ISLAMIC REPUBLIC OF PAKISTAN

In response to the request of the Government of the Islamic Republic of Pakistan, the Government of Japan decided to conduct the Preliminary Study on the Genetic Resources Preservation and Research Laboratory Establishment Project in the Islamic Republic of Pakistan (hereinafter referred to as the "Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA"). JICA sent to the Islamic Republic of Pakistan a study team headed by Mr. Yoshikiyo OHKAWA, Director, Overseas Technical Cooperation Office, Economic Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, from December 1 to 12, 1990.

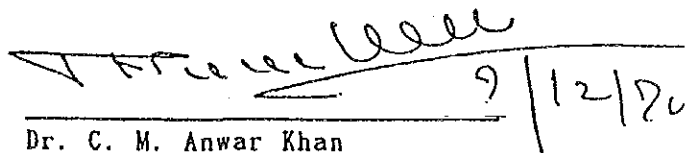
The team had a series of discussions on the Project with the scientists and officials concerned of the Government of the Islamic Republic of Pakistan and conducted a field study.

As a result of the deliberations and field study, both sides agreed to make recommendations attached herewith as points of understanding reached for examination of their respective Governments towards the realization of the Project.

Islamabad, December 9, 1990



Mr. Yoshikiyo Ohkawa
Leader,
Preliminary Study Team,
JICA

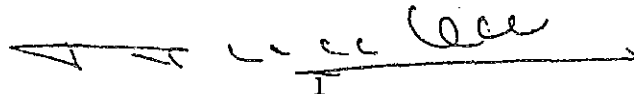


9/12/90

Dr. C. M. Anwar Khan
Secretary, Agricultural Research
Division/Chairman, Pakistan
Agricultural Research Council,
Ministry of Food, Agriculture
and Cooperatives

ATTACHMENT

1. The objectives of the Project are to establish the Genetic Resources Preservation and Research Laboratory and to strengthen activities and development of efficient methods for collection, evaluation, preservation and utilization of plant genetic resources for future contribution to crop improvement in the Islamic Republic of Pakistan.
2. The grant aid and technical cooperations requested by the Pakistani side are described in ANNEX I.
3. The executing agency of the Project will be Pakistan Agricultural Research Council (PARC), Agricultural Research Division (ARD), Ministry of Food, Agriculture and Cooperatives which will bear overall responsibilities for the administration and execution of the Project. The organization chart of the Project is shown in ANNEX II.
4. The site of the Project will be on the premises of the National Agricultural Research Centre of the Pakistan Agricultural Research Council, National Park Road, Islamabad. The location map of the site is shown in ANNEX III.
5. The Government of the Islamic Republic of Pakistan shall take necessary measures to provide the budget for smooth implementation of the Project.
6. The PARC/ARD, the Government of the Islamic Republic of Pakistan has understood Japanese Grant Aid and Technical Cooperation System explained by the Team.
7. The Government of the Islamic Republic of Pakistan shall take the necessary measures listed in ANNEX IV on the condition if the Government of Japan decides to extend Grant Aid for this Project.
8. The scope of cooperation to be covered by the Japanese Grant Aid Programme will be studied and clarified by the Basic Design Team to be sent by JICA after the feasibility of the Project is confirmed by the Government of Japan.
9. The scope of cooperation to be covered by the Japanese Technical Cooperation Programme will be studied and clarified by the Long-term Survey Team to be sent by JICA, if agreed by the respective Governments.





ANNEX I.

Request made by the Pakistani side

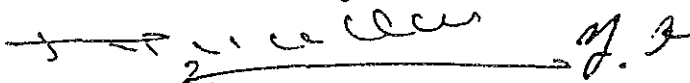
I. The main activities of the Genetic Resources Preservation and Research Laboratory are as follows:

- 1.1 To explore and collect plant genetic resources
- 1.2 To examine plant materials under exchange and to carry out research on plant/seed health problems of genetic resources
- 1.3 To preserve seed materials, maximum fifty thousand accessions, for short- and medium-term storage under controlled temperature conditions
- 1.4 To investigate on the dormancy and germinability of seeds, and to determine the seed viability of the conserved genetic resources
- 1.5 To carry out characterization and preliminary evaluation of crop germplasm for desired agronomic and genetic traits
- 1.6 To carry out basic and applied research on seed physiology and seed biochemistry
- 1.7 To conduct research on in vitro preservation of genetic resources
- 1.8 To carry out studies on more reliable biochemical and physiological procedures for identification of crop germplasm
- 1.9 To document plant genetic resources information
- 1.10 To distribute crop germplasm samples to national and international research institutions for use in crop improvement programmes

II. Grant Aid Cooperation

1. Facilities

- 1.1 Exploration and collection laboratory
- 1.2 Plant introduction and seed health laboratory
- 1.3 Seed preservation laboratory
- 1.4 Germplasm evaluation laboratory
- 1.5 In vitro preservation research laboratory
- 1.6 Data management laboratory
- 1.7 Medium-term cold storage (10 years, 5 degree Centigrade)
- 1.8 Short-term cold storage (1 to 3 years, 10 degree Centigrade)
- 1.9 Crop threshing and cleaning room
- 1.10 Seed preparation and packing room
- 1.11 Green house
- 1.12 Mesh house
- 1.13 Other necessary facilities for the Project

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2. Equipment

- 2.1 Equipment for exploration and collection of plant genetic resources
- 2.2 Equipment for inspection of introduced plant genetic resources
- 2.3 Equipment for seed storage of plant genetic resources
- 2.4 Equipment for evaluation of plant genetic resources
- 2.5 Equipment for seed rejuvenation and propagation of plant genetic resources
- 2.6 Equipment for research on seed storability of genetic resources
- 2.7 Equipment for in vitro preservation research of plant genetic resources
- 2.8 Equipment for data management on plant genetic resources
- 2.9 Equipment for coordination and communication
- 2.10 Other necessary equipment for the Project

III. Technical Cooperation

1. Dispatch of Japanese Experts

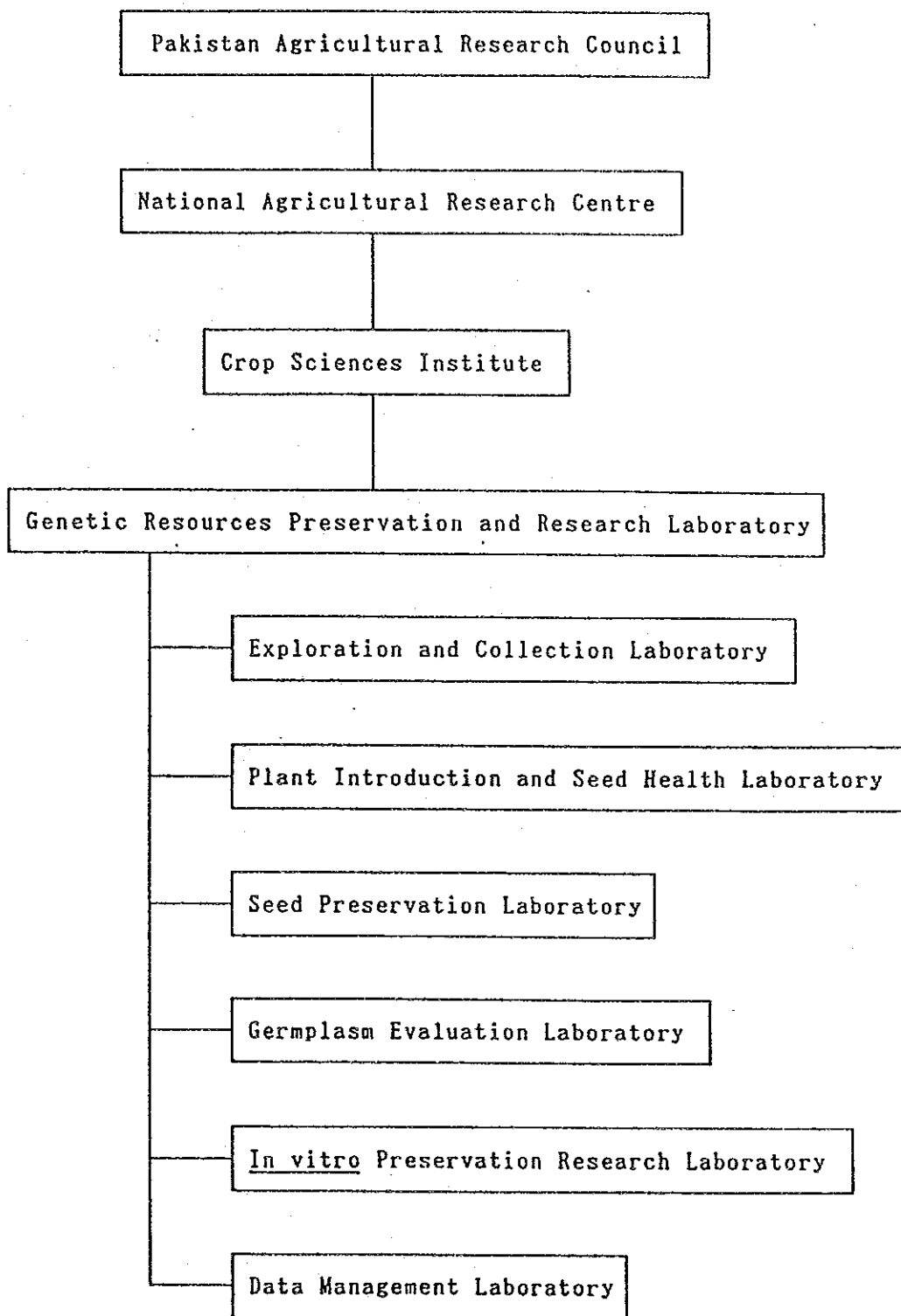
Japanese experts in the fields as follows during the Technical Cooperation period.

- a. Seed preservation
- b. Seed pathology/quarantine
- c. Other field if needed

2. Training of Pakistani counterpart personnel in Japan

Some of the Pakistani counterpart personnel will be trained in Japan.

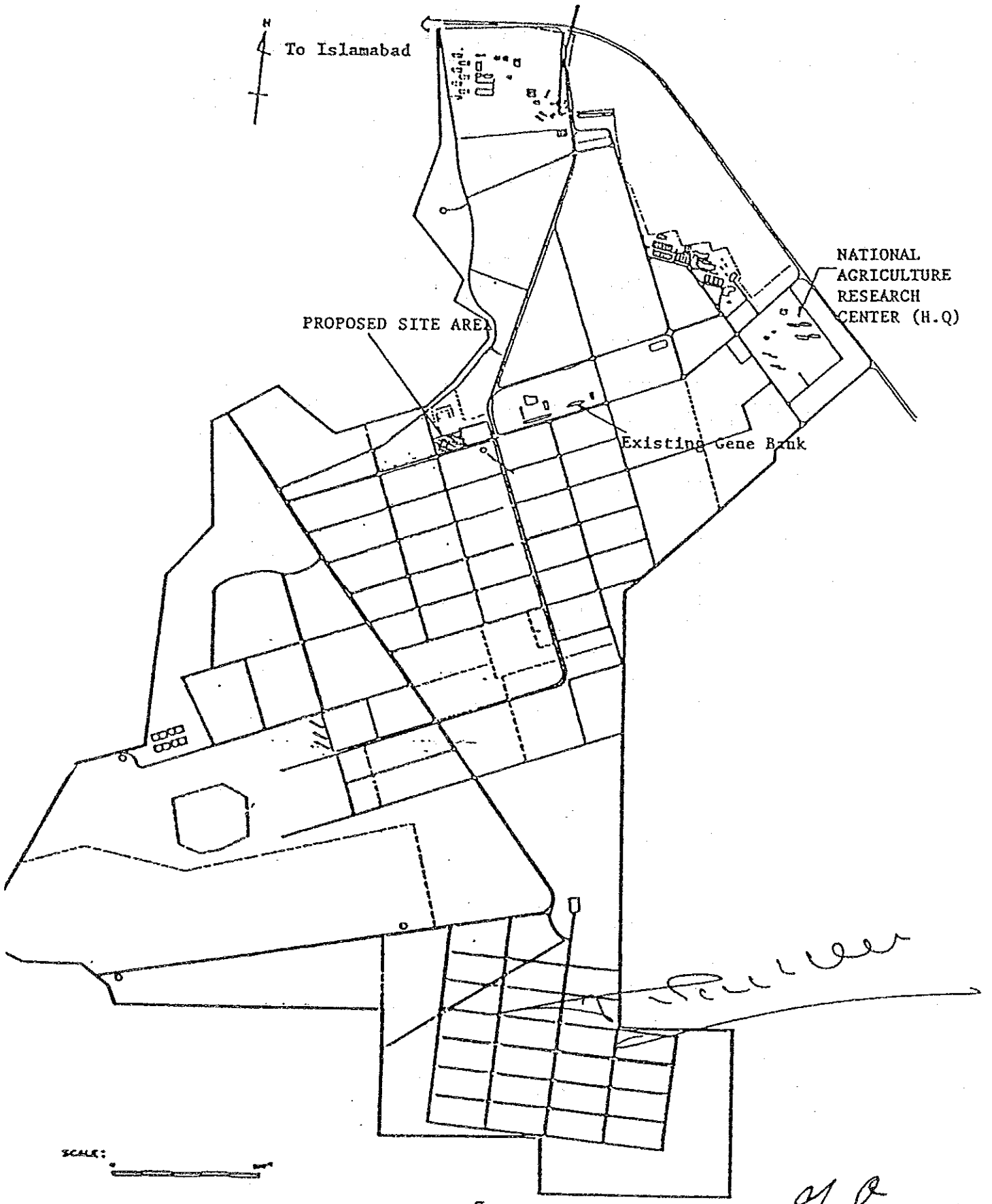
Organization Chart of the Project



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Map of Project site

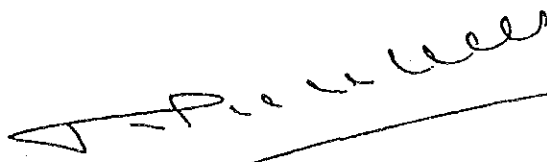


S. A. Rehman

ANNEX IV.

NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE
ISLAMIC REPUBLIC OF PAKISTAN FOR THE GRANT AID PROJECT

1. To provide data and information necessary for the Project
2. To secure land for the site of the Project
3. To clear, level and reclaim the site if necessary
4. To construct the gate and fence in and around the site if necessary
5. To provide facilities for distribution of electricity, water supply, drainage and other incidental facilities if necessary
 - 5.1 Electricity distribution line to the site
 - 5.2 Water supply to the site
 - 5.3 Main drainage line to the site
 - 5.4 Telephone trunk line to the main distribution frame of the building
 - 5.5 General furniture
 - 5.6 Other incidental facilities
6. To bear the commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement according to the Exchange of Notes to be agreed by both the Governments
7. To exempt taxes and to take necessary measures for custom clearance of the materials and equipment brought for the Project at the port of disembarkation in Pakistan according to the Exchange of Notes to be agreed by both the Governments
8. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into Pakistan and stay therein for the performance of their work
9. To assign the necessary staff for the proposed activities of the Genetic Resources Preservation and Research Laboratory
10. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant Aid
11. To bear all the expenses other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment

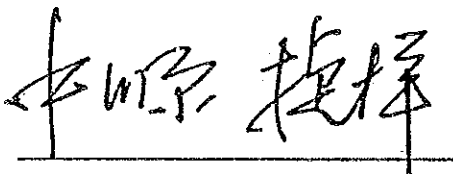


MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE GENETIC RESOURCES PRESERVATION AND
RESEARCH LABORATORY ESTABLISHMENT PROJECT
IN THE ISLAMIC REPUBLIC OF PAKISTAN

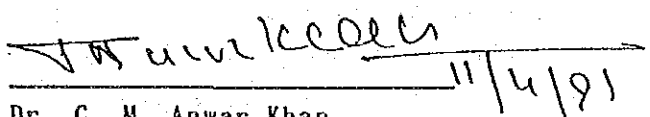
In response to the request made by the Government of the Islamic Republic of Pakistan, and based on the result of the Preliminary Study on the Genetic Resources Preservation and Research Laboratory Establishment Project (hereinafter referred to as "the Project"), the Japan International Cooperation Agency (JICA) decided to implement the Basic Design Study and sent the study team, headed by Dr. Masahiro Nakagawara, Councilor R&D, Agriculture, Forestry and Fisheries Council Secretariat, Ministry of Agriculture, Forestry and Fisheries, to the Islamic Republic of Pakistan, from March 21 to April 15, 1991. The Team had a series of discussions with the authorities concerned of the Government of the Islamic Republic of Pakistan and conducted a field survey in the Project's site.

As a result of the discussions and field survey, both parties confirmed the main items described on the attached sheets. The team will proceed to the works and prepare the Basic Design Study Report on the Project based on the items.

Islamabad, April 11, 1991



Dr. Masahiro Nakagawara
Leader,
Basic Design Study Team,
JICA



Dr. C. M. Anwar Khan
Secretary, Agricultural
Research Division/Chairman,
Pakistan Agricultural
Research Council, Ministry
of Food, Agriculture and
Cooperatives



Mr. Akhtar Iqbal 29/4/91
Deputy Secretary,
Economic Affairs Division,
Ministry of Finance and Economic Affairs,
Government of the Islamic Republic of Pakistan

ATTACHMENT

1. Objective

The objective of the Project is to establish the Genetic Resources Preservation and Research Laboratory for strengthening activities and development of efficient methods for collection, evaluation, preservation and utilization of plant genetic resources, and thus to contribute to crop improvement in the Islamic Republic of Pakistan.

2. Project's site

The site of the Project is located on the premises of the National Agricultural Research Centre of the Pakistan Agricultural Research Council, National Park Road, Islamabad. Approximately 11,250 square metres (150m x 75m) of land, of which the location map is shown in ANNEX I, is allocated for the Project.

3. Sponsoring and executing agencies of the Project

- (1) Sponsoring Agency: Agricultural Research Division, Ministry of Food, Agriculture and Cooperatives
- (2) Executing Agency : Pakistan Agricultural Research Council

4. Necessary items for the realization of the Project requested by the Government of the Islamic Republic of Pakistan

After discussions with the Team, the items shown partly in Annex II are judged necessary for the realization of the Project. The final components of the Project, however, may differ from the above items, if it is found necessary after further studies in Japan.

5. Grant aid system extended by the Government of Japan

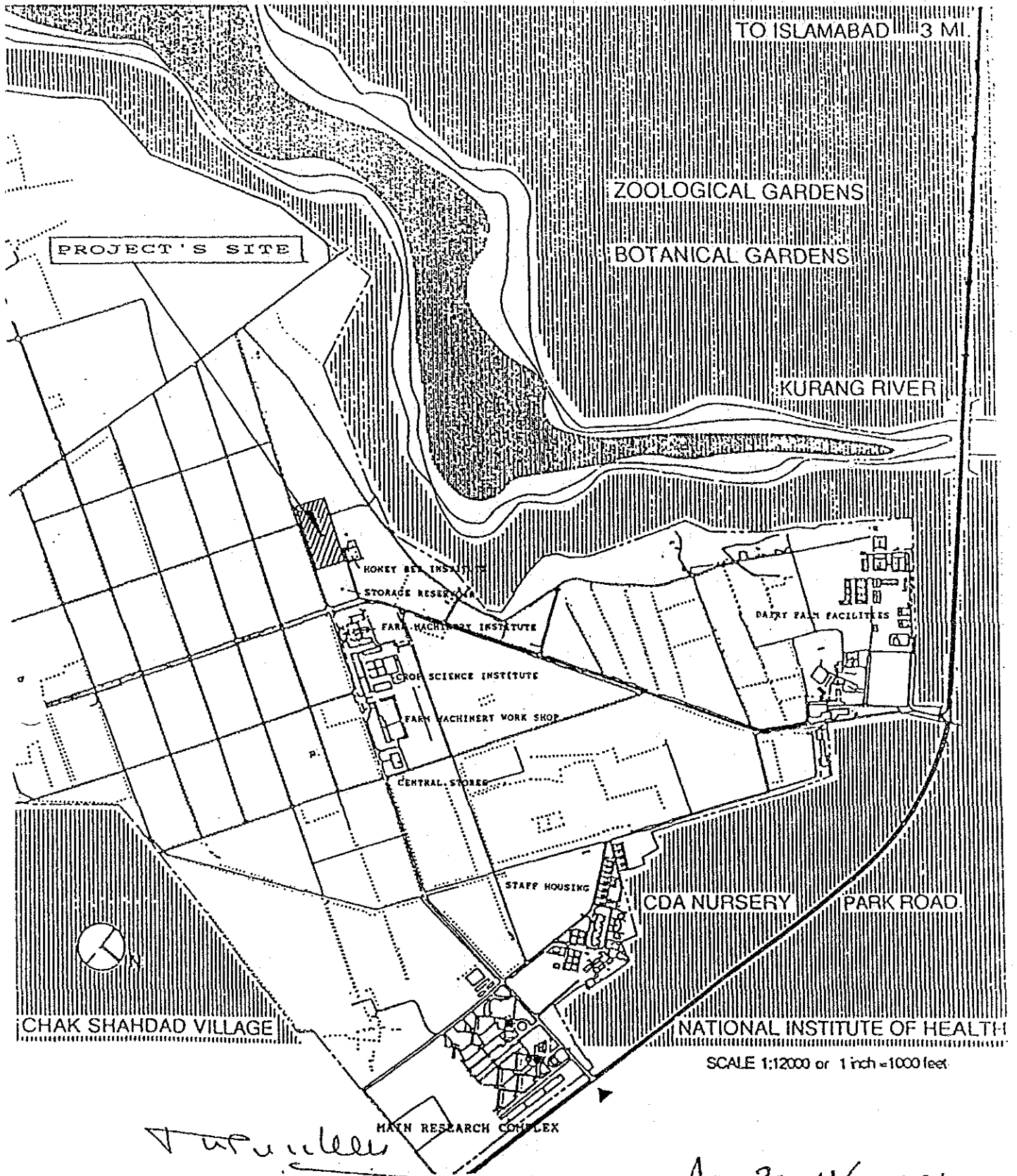
- (1) The Government of the Islamic Republic of Pakistan has understood the system of Japanese Grant Aid explained by the Team.
- (2) The Government of the Islamic Republic of Pakistan will take necessary measures, described in Annex III for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Tentative schedule of the Study

- (1) The JICA will prepare the draft report in English and send a mission in order to explain its contents around late in June, 1991.
- (2) In case that the contents of the report are accepted in principle by the Pakistani side, JICA will complete the final report and send it to the Government of the Islamic Republic of Pakistan in September, 1991.

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LOCATION MAP OF THE PROJECT'S SITE



SCALE 1:12000 or 1 inch = 1000 feet

V. S. Sule
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ANNEX II .

NECESSARY ITEMS FOR THE REALIZATION OF THE PROJECT REQUESTED
BY THE GOVERNMENT OF THE ISLAMIC REPUBLIC OF PAKISTAN

1. Facility

- 1) Exploration and Collection Laboratory
Experiment Room, Lab. Equipment Room, SSO's Office, Exploration Preparation Room, Original Seed Stock Room, Green House (Primary Evaluation / Multiplication)
- 2) Plant Introduction and Seed Health Laboratory
Seed Health Experiment Room, Bacterial and Viral Inspection Room, Fungal Inspection Room, Lab. Equipment Room, SSO's Office, Sowing Preparation Room Green House (Isolation)
- 3) Seed Preservation Laboratory
Drying and Packing Room, Short-term Storage (10°C, 50,000 accessions), Medium-term Storage (5°C, 50,000 accessions), Germination Test Room, Distribution Preparation Room, Seed Reference Room, Lab. Equipment Room, SSO's Office, Green House (Rejuvenation/Multiplication)
- 4) In-vitro Preservation Research Laboratory
Experiment Room, Lab. Equipment Room, Clean Bench Room, Dark Room, Incubation Room (20°C, 25°C), SSO's Office, Green House (Acclimatization)
- 5) Germplasm Evaluation Laboratory
Experiment Room, Lab. Equipment Room, SSO's Office, Green House (Evaluation)
- 6) Data Management Laboratory
Computer Room, Printing and Book Binding Room, Compilation Room SSO's Office, Data Management Office
- 7) Administration Section
PSO's Office, Administration Office, Central Control Room, Library, Conference Room (w/movable wall)
- 8) Common Facilities
Herbarium, Centrifuge Room, Growth Chamber Room, Lounge Garage and Work Shop, Processing Building, Facilities for Water and Power Supply, Others
- 9) Other Necessary Rooms
Rooms for Technical Cooperation

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2. Equipment

- 1) Equipment for Exploration and Collection Laboratory
 - * Seed collection equipment: altimeter, camera, camping set, etc.
 - * Service wagons (4WD, Diesel)
 - * Laboratory glassware: sample bottle, cylinder, flask, etc.
 - * Laboratory equipment: grain moisture tester, weighing scale, etc.
 - * Laboratory furniture: center table, side table, cabinet, etc.
- 2) Equipment for Plant Introduction and Seed Health Laboratory
 - * Common facility: glassware, refrigerator, laboratory furniture, etc.
 - * Equipment for fungal diseases: microscope, growth chamber, germinator, etc.
 - * Equipment for bacterial and viral disease: colony counter, cleaner, spectrophotometer, etc.
- 3) Equipment for Seed Preservation Laboratory
 - * Seed preparation and packing equipment: sealer, aluminium foil bag, etc.
 - * Seed drying and storage equipment: dryer, seed tray, seed bottle, etc.
 - * Laboratory equipment: glassware, oven, weighing scale, etc.
- 4) Equipment for In-vitro Preservation Laboratory
 - * Sterilization equipment: autoclave, water bath, microwave oven, etc.
 - * Medium preparation and experiment equipment: clean bench, draft chamber, incubator, etc.
 - * Incubation growth glassware: jar, beaker, culture flask, etc.
 - * Cryopreservation equipment: program freezer, deep freezer, etc.
 - * Laboratory furniture: center table, side table, rack, etc.
- 5) Equipment for Germplasm Evaluation Laboratory
 - * Laboratory glassware: test tube, beaker, flask, etc.
 - * Laboratory equipment: draft chamber, incubator, electrophoresis unit, etc.
 - * Laboratory furniture: center table, side table, lab. cart, etc.
- 6) Equipment for Data Management Laboratory
 - * Micro computer set with printer, dumb terminal, software, etc.
 - * Laboratory furniture: center table, side table, rack, etc.
- 7) Equipment for Administration Section
 - * Office equipment: photo copying machine, computer set, audio-visual set, etc.
 - * Pick-up truck (double-cabin, 4WD, diesel)
 - * Maintenance and repair tools: tachometer, battery charger, multimeter, etc.
- 8) Common Equipment for Laboratory
 - * Laboratory support equipment: growth chamber, power tiller, garden tool, etc.
 - * Herbarium furniture: herbarium mount, working table, stepladder, etc.
- 9) Common Equipment for Cultivation Facilities
 - * Green house equipment: pot, soil sterilizer, etc.
 - * Crop threshing and cleaning equipment: thresher, air-screen cleaner, fumigation box, etc.

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ANNEX III.

NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF
THE ISLAMIC REPUBLIC OF PAKISTAN FOR THE PROJECT

1. To provide data and information necessary for the Project
2. To secure land for the site of the Project
3. To clear, level and reclaim the site of the Project if necessary
4. To construct the gate and fence in and around the site of the Project if necessary
5. To provide facilities for distribution of electricity, water and gas supply, drainage and other incidental facilities if necessary
 - 5-1. Electricity distribution line to the site of the Project
 - 5-2. Water supply to the site of the Project
 - 5-3. Gas supply to the site of the Project
 - 5-4. Main drainage line to the site of the Project
 - 5-5. Telephone trunk line to the main distribution frame of the building
 - 5-6. General furniture
 - 5-7. Other incidental facilities
6. To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement
 - 6-1. Advising commission of authorization to pay
 - 6-2. Payment commission
7. To ensure prompt unloading, tax exemption, customs clearance at ports of disembarkation and prompt internal transportation of the materials and equipment purchased under the Grant Aid
8. To exempt Japanese nationals involved in the Project from custom duties, internal taxes and other fiscal levies which may be imposed in the Islamic Republic of Pakistan with respect to the supply of the products and services under the verified contracts
9. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into the Islamic Republic of Pakistan and stay therein for the performance of their works
10. To bear all the expenses other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment
11. To assign the necessary staff for the proposed activities of the Genetic Resources Preservation and Research Laboratory
12. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant Aid

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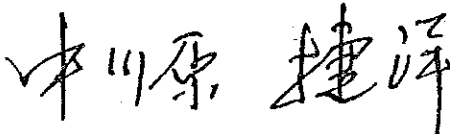
MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY ON THE GENETIC RESOURCES PRESERVATION AND
RESEARCH LABORATORY ESTABLISHMENT PROJECT
IN THE ISLAMIC REPUBLIC OF PAKISTAN
(CONSULTATION ON DRAFT REPORT)

In March 1991, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Genetic Resources Preservation and Research Laboratory Establishment Project (hereinafter referred to as "the Project") to the Islamic Republic of Pakistan, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

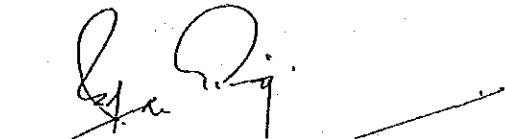
In order to explain to and consult with the Pakistan side on the components of the draft report, JICA sent to Pakistan a study team, which is headed by Dr. Masahiro Nakagawara, Councilor R & D, Agriculture, Forestry and Fisheries Council Secretariat, Ministry of Agriculture, Forestry and Fisheries, and is scheduled to stay in the country from June 30 to July 7, 1991.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

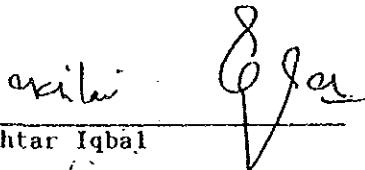
Islamabad, July 6, 1991



Dr. Masahiro Nakagawara
Leader
Draft Report Explanation Team
JICA



~~Dr. Zafar Altaf~~
~~Additional Secretary Incharge,~~
~~Agricultural Research Division,~~
~~Ministry of Food, Agriculture and~~
~~Cooperatives/Chairman, Pakistan~~
~~Agricultural Research Council,~~



Mr. Akhtar Iqbal
Deputy Secretary,
Economic Affairs Division,
Ministry of Finance and Economic Affairs,
Government of the Islamic Republic of Pakistan

ATTACHMENT

1. Components of Draft Report

The Government of Pakistan has agreed and accepted in principle the components of the Draft Report proposed by the team.

2. Japan's Grant Aid system

(1) The Government of Pakistan has understood the system of Japanese Grant Aid explained by the team.

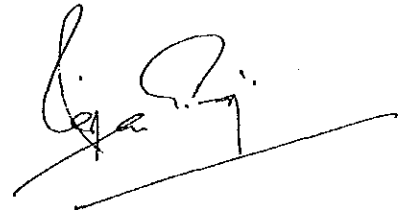
(2) The Government of Pakistan will take the necessary measures, described in Annex 1, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further schedule

The team will make the Final Report in accordance with the confirmed items, and send it to the Government of Pakistan by the end of August, 1991.

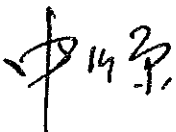
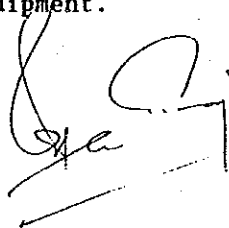
4. Staff Allocation

The Pakistani side has confirmed all the staff mentioned in the Draft Report shall be allocated three months before the completion of the construction work, on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.



Annex I : Necessary measures to be taken by the Government of Pakistan in case Japan's Grant Aid is executed.

1. To secure the site for the Project.
2. To clear, level and reclaim the site prior to commencement of the construction.
3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the site.
4. To construct the access road to the site prior to commencement of the construction.
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site.
 - 1) Electricity distribution line to the site.
 - 2) Main city water distribution pipe to the site.
 - 3) Main drainage pipe to the site.
 - 4) Telephone trunk line to the main distribution panel of building.
 - 5) General furniture such as carpets, curtains, tables, chairs and others
6. To bear commission to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.
8. To accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contract such facilities as may be necessary for their entry into Pakistan and stay therein for the performance of their work.
9. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.
10. 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 installation of the equipment.



Appendix 3. Organization of the Study Teams

3-1. The Basic Design Study Team (March 21 -- April 15, 1991)

Dr. Masahiro NAKAGAWARA	Team Leader Councilor R & D, Research and Development Division, Agriculture, Forestry & Fisheries Council, Ministry of Agriculture, Forestry and Fisheries
Mrs. Masumi SEKI	Genetic Resources Cooperation Planner Researcher, First Genetic Resources Department, National Institute of Agrobiological Resources, Ministry of Agriculture, Forestry and Fisheries
Mr. Masashi FUJITA	Project Coordinator Staff, First Basic Design Study Division, Grant Aid Survey Department, Japan International Cooperation Agency
Mr. Hidejiro UCHIGASAKI	Architectural Planner Zen-Noh Architects & Engineers Inc.
Mr. Hideki NAGAOKA	Architectural Designer Zen-Noh Architects & Engineers Inc.
Mr. Kentaro KIMURA	Facilities Designer Zen-Noh Architects & Engineers Inc.
Mr. Masakazu ASHIZAWA	Genetic Resources Research Planner Zen-Noh Architects & Engineers Inc.
Mr. Sakae TAMURA	Equipment Planner Zen-Noh Architects & Engineers Inc.

3-2. The Draft Final Report Confirmation Team (June 28 - July 8, 1991)

Dr.Masahiro NAKAGAWARA Team Leader
Councilor R & D, Research and Development Division,
Agriculture, Forestry & Fisheries Council,
Ministry of Agriculture, Forestry and Fisheries

Mr.Masashi FUJITA Project Coordinator
Staff, First Basic Design Study Division,
Grant Aid Survey Department,
Japan International Cooperation Agency

Mr.Hidejiro UCHIGASAKI Architectural Planner
Zen-Noh Architects & Engineers Inc.

Mr.Hideki NAGAOKA Architectural Designer
Zen-Noh Architects & Engineers Inc.

Mr.Sakae TANURA Equipment Planner
Zen-Noh Architects & Engineers Inc.

Appendix 4. Itinerary of the Study Teams

4-1. Basic Design Study (March 21 - April 15, 1991)

Date	Movement	Accommodation	Activities
3/21(thu)	Arrive in Karachi	Karachi	
22(fri)	Karachi to Islamabad	Islamabad	< Arrival of Mr.UCHIGASAKI, Mr.NAGAOKA, Mr.KIMURA, Mr.ASHIZAWA, Mr.TAMURA >
23(sat)		-ditto-	Observation of the Construction Site of the Geoscience Laboratory Project, Investigation of Construction Cost, etc.
24(sun)		-ditto-	Courtesy Calls on JICA Office, Japanese Embassy, and NARC Meeting and Discussion with NARC: Presentation of Inception Report, Explanation of Questionnaire, Request of Arrangement for Meetings, Hearing on a Part of Questionnaire
25(mon)		-ditto-	Site Investigation and Observation of NARC's Laboratories and Facilities (Crop Science Institute, Farm Machinery Institute, Cultivation Facilities)
26(tue)		-ditto-	Observation of NARC's Laboratories (Cereal Disease Institute, Maintenance & Repair Unit, Tissue Culture Section, Training Institute, Cultivation Facilities)
27(wed)		-ditto-	Observation of Another Agricultural Institute and A Building Established by Japanese Grant Aid: Cereal Crop Research Institute(NWFP), Children Hospital Discussion among Team Members
28(thu)		-ditto-	Discussion with NARC Officials: Project Activities, Staff Allocation, Courtesy Call on PARC,
29(fri)		-ditto-	Arrangement of Documents, Discussion among Team Members
30(sat)		-ditto-	Discussions with NARC Officials: Packing and Preservation Method in Seed Preservation Laboratory, Details of Research Equipment Discussion among Team Members

Date	Movement	Accommodation	Activities
31(sun)		Islamabad	Discussion with NARC Officials: Matters on Cultivation Facilities, Components of Project Facilities, System of Services Research Equipment Report on the Progress of the Study to JICA Office
4/ 1(mon)		-ditto-	Discussion with NARC Officials: Scale of Facilities, Research equipment
2(tue)		-ditto-	Confirmation on the Matters Discussed with NARC Officials, Discussion with NARC Officials: Research Equipment Observation of Factories Producing Construction Materials (brick, stone)
3(wed)		-ditto-	Discussion with NARC Officials: Architectural Plan, Research Equipment Hearing from Local Construction Company
4(thu)			Acceptance and Confirmation of the Reply on the Questionnaire, Report on the Progress of the Study to JICA Office
5(fri)		-ditto-	< Arrival of Dr. NAKAGAWARA, Ms. Seki and Mr. Fujita > Discussion with the Team Reader on the Progress of the Study
6(sat)		-ditto-	-ditto-
7(sun)		-ditto-	Courtesy Calls on Embassy, JICA Office, MFAC and PARC
8(mon)		-ditto-	Site Investigation and Observation of NARC's Facilities, Discussion with NARC
9(tue)		-ditto-	Discussion with PARC and NARC Officials
10(wed)		-ditto-	Discussion with PARC and NARC Officials, Submission of the Minutes of Discussion (draft)
11(thu)		-ditto-	Signing of the Minutes of Discussions, Reporting to Japanese Embassy, JICA & EAD
12(fri)		-ditto-	Investigation of Construction Conditions
13(sat)		-ditto-	-ditto-
14(sun)	For Karachi	Karachi	
15(mon)	For Tokyo		

4-2. The Draft Final Report Confirmation Team (June 28 - July 8, 1991)

Date	Movement	Accommodation	Activities
6/28(fri)	Arrive in Karachi	Karachi	
29(sat)	Karachi to Islamabad	Islamabad	< Arrival of Mr.UCHIGASAKI, Mr.NAGAOKA, Mr.TAMURA >
30(sun)		-ditto-	Courtesy calls on JICA office, Japanese Embassy, and PARC. Discussion with PARC Officials.
1(mon)		-ditto-	Discussion with NARC Officials. < Arrival of Dr.NAKAGAWARA, and Mr.Fujita >
2(tue)		-ditto-	Courtesy Calls on JICA Office, Japanese Embassy, and MFAC.
3(wed)		-ditto-	Discussion with NARC Officials.
4(thu)		-ditto-	Discussion with PARC Officials.
5(fri)		-ditto-	Arrangement of Documents, Discussion among Team Members
6(sat)		-ditto-	Signing of the Minutes of Discussions, Reporting to EAD
7(sun)	For Karachi	Karachi	Reporting to Japanese Embassy and JICA Office
8(mon)	For Tokyo		

Appendix 5. Cooperated Officials in the Study

NAME	POSITION HOLD
<u>MINISTRY OF FOOD, AGRICULTURE & COOPERATIVES</u>	
Mr. Shahid Najam	Deputy Secretary(IC), Food and Agriculture Division
Mr. Mahmudal Hasan	Section Officer, Agricultural Research Division
<u>MINISTRY OF FINANCE & ECONOMIC AFFAIRS</u>	
Mr. Akhtar Iqbal	Deputy Secretary, Economic Affairs Division
<u>PAKISTAN AGRICULTURAL RESEARCH COUNCIL (PARC)</u>	
Dr. Zafar Altaf	Chairman
Dr. C. M. Anwar Khan	Former Chairman
Dr. M. Hanif Quazi	Member, Crop Sciences
Dr. S. Iqbal Shah	Director, Planning Division
Mr. Rafiq A. Khokhar	Additional Director Planning
Mr. Umar K. Baloch	Director, Crop Science Division
Mr. Bashir Ahmad Khan	Director, National, International Liaison & Training
Mr. Zahid Hussain	Member, Finance
Mr. Muhammad Safe	Director, Finance
Dr. Mohammad Aslam	Director, Crop Diseases Research Institute
Dr. M. Salim	Research Officer, Cereal Crop Research Institute(NWFP)
Mr. Abdul Aziz	Research Officer, Cereal Crop Research Institute
<u>NATIONAL AGRICULTURAL RESEARCH CENTRE</u>	
Dr. M. A. Sial	Director General
Dr. M. A. Khan	Deputy Director General
Dr. Rafiq Ahmed	Deputy Director General
Mr. M. I. Nizami	Director, Administration
Dr. Naeem I. Hashmi	Director, Crop Science Institute
Mr. Rasid Anwar	Principal Scientific Officer(PSO), PGR
Mr. M. Sadic Bhatti	Senior Scientific Officer(SSO), PGR
Dr. A. Shakoor Khan	PSO, Farm Machinery Institute
Mr. Zafar Hameed Hashimi	Deputy Director, Maintenance & Repair Unit
Dr. M. A. Rana	SSO, Oilseeds Group
Mr. M. Shaffiq	Deputy Director, Documentation Section

Dr. M. Akmal Khan	Chief Scientific Officer, Food Quality Section
Dr. C. A. Ozair	Director, NARC Training Institute
Dr. Azra Quraishi	PSO, Tissue Culture Section

LOCAL PRIVATE CONTRACTORS

Mr. Zulfikar Ali	General Manager, Parthenon Ltd.
Mr. Mohammad Shahid	General Manager, Murshid Builders Ltd.
Mr. Asif Raza Mirza	Director Technical, Expertise Ltd.
Mr. Shahamat Ullah Qureshi	General Manager, Hi-Tec Constructions Ltd.
Mr. S. J. Alam	Managing Engineer, Commercial Contracting International Ltd.

LOCAL PRIVATE MANUFACTURER

Mr. Mubashir Hussain	General Manager, Kaghan Brick Works Ltd.
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ISLAMABAD CHILDREN HOSPITAL

Mr. Harumichi Ito	Team Leader, Japanese Technical Cooperation Team, JICA
Mr. Hiroshi Sekiguchi	Coordinator, Japanese Technical Cooperation Team, JICA
Mr. Kouji Hashimoto	Central Clinical Laboratory, Kurume University Hospital

GEOSCIENCE LABORATORY CONSTRUCTION SITE

Mr. Kanae Morishima	Resident Engineer, Yamashita Sekkei Inc.
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EMBASSY OF JAPAN

Mr. Kunio Muraoka	Ambassador
Mr. Masato Akazawa	Minister-counsellor
Mr. Yutaka Sumida	First Secretary

JICA Pakistan Office

Mr. Akihiro Mitarai	Resident Representative
Mr. Ryusuke Ishibashi	Deputy Resident Representative
Mr. Syouji Nishikawa	Assistant Resident Representative
Mr. Kaoru Iwasaki	-ditto-
Mr. Masato Togawa	-ditto-
Mr. Takashi Nakashima	

Appendix 6. Items of Supplementary Data

Appendix 6-1. TEMPERATURE AT SELECTED CITY CENTRES

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC. (°C)	
PESHAWAR	1	17.3	19.7	23.8	29.8	36.4	40.2	38.3	36.1	35.2	31.1	25.5	20.1
	2	10.8	13.3	17.6	22.9	28.1	33.1	32.0	31.0	28.8	23.5	17.3	12.5
	3	4.1	6.6	11.0	15.9	21.8	25.7	26.9	25.9	22.7	16.2	9.3	5.0
LAHORE	1	19.3	22.4	27.8	34.8	40.2	41.1	37.1	35.8	35.9	33.7	27.9	21.9
	2	12.4	15.7	20.7	26.8	31.3	33.9	31.7	30.8	29.6	25.6	19.1	14.1
	3	5.1	8.1	13.1	18.4	23.1	26.8	27.2	26.6	24.1	17.3	9.6	5.7
KARACHI	2	18.0	20.6	24.7	28.2	30.5	31.2	30.2	29.0	28.7	27.7	24.0	19.7

Att. : 1; HIGHEST TEMPERATURE, 2; AVERAGE TEMPERATURE, 3; LOWEST TEMPERATURE

Source : Pakistan Meteorological Department

Appendix 6-2. RAINFALL AT SELECTED CITY CENTRES

	1	2	3	4	5	6	7	8	9	10	11	12
PESHAWAR	27.8	38.6	68.7	41.0	23.7	8.0	45.2	38.2	23.5	13.2	15.3	26.3
LAHORE	25.2	17.6	32.3	12.3	14.2	34.5	176.9	148.2	88.9	10.6	4.6	15.4
KARACHI	7.1	7.8	10.0	1.7	0.0	7.4	98.6	52.3	35.7	4.5	5.2	7.6

Appendix 6-3. List of Institutions Dealing with Research in Agriculture and Allied Subjects

Federal

1. Arid Zone Research Institute, Quetta
2. Commonwealth Institute of Biological Control, Rawalpindi
3. Cotton Research Institute, Multan (PCCC)
4. Cotton Research Institute, Sakrand (PCCC)
5. Crop Diseases Research Institute, Islamabad (PARC)
6. Directorate of Marine Fisheries, Karachi
7. Drainage and Reclamation Institute, Hyderabad
8. Farm Machinery Institute (PARC) , Islamabad
9. Federal Pesticides Research Laboratories, Karachi
10. Institute of Cotton and Technology, Karachi
11. Irrigation, Drainage and Flood Control Research Council, Islamabad
12. Mona Reclamation Experimental Project (WAPDA) , Bhalwal, District Sargodha
13. National Agricultural Research Center, Islamabad (PARC)
14. Nuclear Institute for Agriculture and Biology, Faisalabad
15. Nuclear Institute for food and Agriculture, Peshawar
16. Atomic Energy Agriculture Research Center, Tandojam
17. Pakistan Council of Scientific and Industrial Research, Lahore
18. Pakistan Forest Institute, Peshawar
19. Pakistan Institute of Cotton Research and Technology, Karachi
20. Pakistan Tobacco Board, Peshawar
21. Radio Isotope Laboratory, Karachi
22. Soil Survey of Pakistan, Lahore
23. Vertebrate Pest Control Center, Karachi
24. Zoological Survey of Pakistan, Nishter Road, Karachi

PUNJAB

1. Angora Goat Research Farm, Rakh Khairwala, Leiah
2. Agricultural Mechanization Research Institute, Multan
3. Ayub Agricultural Research Institute, Faisalabad
4. Barani Agricultural Research Institute, Jhelum
5. Center of Excellence, Water Resources (University of Engineering and Technology), Lahore
6. Cotton Research Institute, Rahimyar Khan
7. Cotton Research Station, Sahiwal
8. Directorate of Livestock and Dairy Development, Lahore
9. Directorate of Wool/Hair and Mutton Production, Multan
10. Fisheries Department, Government of Punjab, Lahore
11. Fisheries Research Institute, Munawan, Lahore
12. Fodder Research Institute, Sargodha
13. Horticultural Research Station, Sahiwal

14. Irrigation Research Institute, Lahore
15. Land Reclamation Department, Punjab, Lahore
16. Livestock Experimental Station, Fazilpur
17. Livestock Experimental Station, Hasilpur, Bahawalpur
18. Livestock Experimental Station, Khanewal
19. Livestock Experimental Station, Khairmurat, Attock
20. Livestock Experimental Station, Khushab
21. Livestock Experimental Station, Qadirabad
22. Livestock Experimental Station, Muzaffargarh
23. Livestock Production Institute, Bahawalnagar
24. Livestock Production Research Institute, Bahadurnagar
25. Maize and Millet Research Institute, Yousafwala, Sahiwal
26. Mango Research Station, Shujaabad, Dist. Multan
27. Oilseed Research Institute (AARI) , Faisalabad
28. Plant Protection Institute (AARI) , Faisalabad
29. Poultry Research Institute, Rawalpindi
30. Rice Research Institute, Kala sha Kaku, Sheikhpura
31. Soil Fertility Survey and Soil Testing Institute, Lahore
32. Soil Fertilizer and Soil Testing Institute (AARI) , Faisalabad
33. Sugarcane Research Institute, Faisalabad
34. Veterinary Research Institute, Lahore
35. Water Quality and Soil Monitoring Directorate, Lahore
36. Wheat Research Institute (AARI) , Faisalabad

SIND

1. Agricultural Research Institute, Tandojam
2. Agricultural Research Station, Dadu
3. Cotton Research Station, Ghotki
4. Directorate of Fisheries, Sind, Karachi
5. Directorate of Hydrology and Research, Sind, Hyderabad
6. Directorate of Poultry Production and Research, Karachi
7. Institute of Marine Biology, (University of Karachi) , Karachi
8. Livestock Development Research Farm for Kundi Buffaloes, Rohri
9. Livestock Experimental Station, Tharparker
10. Livestock Research Station, Korangi, Karachi
11. Maize and Millet Research Station, Dadu
12. Poultry Research Institute, Karachi
13. Red Sindhi Cattle Breeding Farm, Tando Muhammad Khan
14. Rice Research Institute, Dokri, Sind
15. Silvicultural Research Division, Hyderabad
16. Sind Horticulture Research Institute, Mirpurkhas
17. Soil Mechanics and Hydraulic Lab. , Karachi
18. Sugarcane Research Station, Naudero
19. Sugarcane Research Station, Thatta

N.W.F.P.

1. Agricultural Research Institute (North) Mingora
2. Agricultural Research Institute (South) , Dera Ismail Khan
3. Agricultural Research Institute, Tarnab, Peshawar
4. Agricultural Research Station, Naurang, Bannu
5. Cereal Crops Research Institute, Pirsabak, Nowshera
6. Directorate of Animal Husbandry (NWFP) , Peshawar
7. Fisheries Department, NWFP, Peshawar
8. Livestock Experimental Station (Jaba Sheep Farm) , Jaba, Mansehra
9. Sugarcrops Research Institute, Mardan
10. Veterinary Research Institute, Peshawar
11. Wheat Summer Nursery, Kaghan

BALUCHISTAN

1. Agricultural Research Institute, Sariab, Quetta
2. Beef Research Station, Sibi
3. FAO Fruits Research Project, Quetta (ARI)
4. Multipurpose Sheep Research Station, Yateabad
5. Regional Livestock Diagnostic Laboratory, Quetta
6. Vaccine Production Center, Quetta
7. Wool Research Laboratory, Mastung
8. World Bank Vegetables Seed Production Center, Quetta

UNIVERSITIES/COLLEGES

1. Baluchistan University, Quetta
2. Barani Agricultural College, Rawalpindi
3. Bahauddin Zakrya University, Multan
4. Gomal University, D.I. Khan
5. Islamic University, Bahawalpur
6. Karachi University, Karachi
7. NWFP Agricultural University, Peshawar
8. Quaid-e-Azam University, Islamabad
9. Sind Agricultural University, Tandojam
10. University of Agriculture, Faisalabad
11. University of Peshawar, Peshawar
12. University of Sind, Jamshoro
13. University of Punjab, Lahore

Appendix 6-4. Selected Crop Cultivars in Pakistan Since 1980.

<u>CROP</u>	<u>VARIETY NAME</u>	<u>YEAR OF RELEASE</u>	<u>RELEASED BY</u>
Wheat	Pak 81	1981	AARI Fbd., CCRI Pbk.
	Pirsabak 85	1985	CCRI Pirsabak
	Punjab 85	1985	AARI Faisalabad
	Sarsabz	1985	AEARC Tandojam
	Rawal 87	1987	WRS Rawalpindi
Rice	DR 82	1982	RRI Dokri
	DR 83	1983	RRI Dokri
	Basmati 385	1988	RRI K. S. Kaku
	Sada Hayat	1988	RRI Dokri
	Shadab	1988	AEARC Tandojam
Maize	Ehsan	1984	CCRI Pirsabak
	Sultan	1986	MMRI Yousafwala
	Gauhar	1986	NARC Islamabad
	Kashmir Gold	1984	NARC AJK
Sorghum	Jowar 86	1986	RARI Bahawalpur
Millet	DBR III	1988	ARI D. I. Khan
	Cholistani Bajra	1986	RARI Bahawalpur
	Barani Bajra	1986	RARI Bahawalpur
<u>PULSES</u>			
Mungbean	NM 121-25	1985	NIAB Faisalabad
	NM 19-19	1985	NIAB Faisalabad
	NM 20-21	1985	NIAB Faisalabad
	NM 13-1	1985	NIAB Faisalabad
	NM 51	1990	NIAB Faisalabad
Lentil	Masoor 85	1985	AARI Faisalabad
	Mansehra 89	1989	ARS Dhudal NWFP
Chickpea	CM 72	1983	NIAB Faisalabad
	CM 44	1983	AARI Faisalabad
<u>FODDERS</u>			
Oats	S 81	1983	FRI Sargodha
	PD 2 LV 65	1983	FRI Sargodha
	AVON	1983	FRI Sargodha
Berseem	Agaiti	1986	FRI Sargodha
	Pachaiti	1986	FRI Sargodha
(S. S. Hybrid)	Pak Sudax (Sadabahar)	1986	FRI Sargodha

OILSEEDS

Safflower	Thori 78	1978	ARI Tandojam
Groundnut	BARD 479	1989	BARD PARC
	BARD 699	1990	BARD PARC
	Chakori	1987	BARI Chakwal
	BARI 89	1989	BARI Chakwal
Rapeseed & Mustard	Poorbi Raya	1988	AARI Faisalabad
	Annual Raya	1988	AARI Faisalabad
	BM 1(BARD-1)	1990	BARD PARC
	Pak-China	1987	ARI Mangora Swat
Soybean	Shiralee	1990	BARD PARC
	Swat 84	1984	ARI Swat
Linseed	Chandoni	1989	AARI Faisalabad
Sesame	Punjab Til-90	1990	AARI Faisalabad

SUGAR CROPS

Sugarcane	BF 162	1990	SRI Faisalabad
	CP 43-33	1990	SRI Faisalabad
	L 62-96	1984	SRI Mardan
	CP 65-357	1986	SRI Mardan

Appendix 6-5. Trial Calculation of Upkeep/Management Expenses

(1) Trial calculation of electricity bill

It is supposed that the facility generally works for 8 hours a day and 25 days a month, but that storage areas, etc. operate for 24 hours a day 30 days a month, and that maximum electricity use is 30%-80% of the electrical capacity depending on use. The electricity rate is 2.2 Rupees/kwh and there is no basic service charge.

(a) General

	load	maximum use	working hours	
Lighting	70.1kw	x 50%	x 8 hour/day x 25 day/month x 12 month/year	= 84,120kwh/year

Power and well/water pump, etc,

195.7kw	x 80%	x 8 hour/day x 25 day/month x 4 month/year	=125,248kwh/year
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195.7kw	x 50%	x 8 hour/day x 25 day/month x 5 month/year	= 97,850kwh/year
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195.7kw	x 30%	x 8 hour/day x 25 day/month x 3 month/year	= 35,226kwh/year
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Power for experiment equipment

57.5kw	x 30%	x 8 hour/day x 25 day/month x 12 month/year	= 41,400kwh/year
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(b) 24-hour operation load calculated depending on the anticipated uses for the first five years

Load of freezer for storage

26.2kw	x 50%	x 24 hour x 30 day/month x 12 month/year	= 113,184kwh/year
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Growth chamber, deep freezer, and drying room

80.0kw	x 50%	x 24 hour x 30 day/month x 8 month/year	= 230,400kwh/year
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(c) Total 727,428kwh/year

Calculation of electricity bill:

727,428kwh/year x 1.1 x 2.2 Rp/kwh = 1,760,376 (about 1,761,000) Rupees/year

(2) Trial calculation of water bill

It is supposed that the water use per capita including visitors is 150ℓ/day, and that of experiment rooms 10,000ℓ/day. The water rate is 8/1000 Rupees per 1 gallon, and there is no basic service charge.

Quantity of water used by persons including visitors in a day

$$100 \text{ person} \times 150\ell/\text{day} = 15,000\ell/\text{day} = \text{about } 3,300 \text{ gallon/day}$$

Quantity of water used in experiment rooms in a day

$$10,000\ell/\text{day} = \text{about } 2,200 \text{ gallon}$$

Total 5,500 gallon/day

Calculation of water bill:

$$5,500 \text{ gallon} \times 25 \text{ day/month} \times 12 \text{ month/year} \times 1/1000 \times 8 \text{ Rupees/gallon} \\ = 13,200 \text{ Rupees/year} = \underline{\text{about } 15,000 \text{ Rupees/year}}$$

(3) Trial calculation of gas bill

It is supposed that heaters will be used for 3 months of the year, 8 hours a day. Gas is 1000BTU/CFT (252kcal/cft = 8,900kcal/cubic meter), and its rate is 97.82 Rupees per 100 cubic meters.

As to the pantries and heaters, the bill is estimated according to the gas consumption by each of them.

(a) Gas consumption by heaters

$$4,665 \text{ cubic meter/heater/year} \times 30 \text{ heaters} = 139,950 \text{ cubic meter/year}$$

(b) Pantry

$$20,000\text{kcal/hour} \times 1 \text{ hour/day} \times 3 \text{ rooms} = 60,000\text{kcal/day}$$

$$60,000\text{kcal/day} \times 1 \text{ cubic meter}/8,900\text{kcal} \times 25 \text{ day/month} \times 12 \text{ month/year} \\ = 2,022 \text{ cubic meter}$$

Calculation of gas bill

$$(2,022 + 139,950) \text{ cubic meter} \times 100 \text{ cubic meter} \times 97.82 \text{ Rupees} \\ = 138,877 \text{ Rupees/year} = \underline{\text{about } 140,000 \text{ Rupees/year}}$$

(4) Expenses for maintenance and management of facility

244 thousand Rupees/year

The expenses for maintenance and management of facility shall be calculated on basis of 305 yen/m² according to the Japanese data for the past ten years.

(5) Expenses for maintenance and management of equipment

238 thousand Rupees/year

They shall be 3% of the prices of the equipment which needs maintenance and management.

The following items were estimated in relation to the data of the field survey such as the budget of NARC, etc. on a basis of the size and contents of the Project.

(6) Expenses for telephone and communication

48 thousand Rupees/year

(7) Expenses for transportation

384 thousand Rupees/year

(8) Expenses for expendable and sundry goods

1,170 thousand Rupees/year

Appendix 6-6. Germplasm Distributed

S.No.	CROP	YEAR	MONTH	NOACC	SENT TO
1.	WHEAT	1986	11	2	A.E.AGRI.RES.CENT.TANDOJAM SIND. PAK
2.	WHEAT	1987	09	10	A.E.AGRI.RES.CENT.TANDOJAM SIND. PAK
3.	AEGILOPS	1987	09	39	A.E.AGRI.RES.CENT.TANDOJAM SIND. PAK
4.	SESSAMUM	1986	04	5	AARI FAISALABAD. PAKISTAN
5.	SOYBEAN	1986	04	500	AARI FAISALABAD. PAKISTAN
6.	LENTIL	1983	10	144	AARI. FAISALABAD PUNJAB.
7.	FABA CEAN	1986	08	10	AGRI. RES. CENTRE GIZA EGYPT.
8.	MAIZE	1983	06	56	ARS YSDA BELISVILLE. MD USA
9.	MORUS SPP.	1986	01	20	ARS USDA USA.
10.	DACUS SPP.	1986	01	5	ARS USDA USA.
11.	WHEAT	1984	09	15	ATOMIC ENERGY RES. CENTRE TANDJAM SIND.
12.	MUNG BEAN	1983	04	2	AVRDC TAIWAN.
13.	MUNG.MASH. COWPEA	1984	02	200	AVRDC TAIWAN.
14.	MUNG BEAN	1989	05	3	BAHA-UD-DIN ZAKRIA UNIV. MULTAN. PAKISTAN
15.	MUNG	1988	03	15	BAHUDDIN ZAKRIA UNIV. MULTAN. PAKISTAN
16.	MASH	1988	01	13	BAHUDDIN ZAKRIA UNIV. MULTAN. PAKISTAN
17.	MUNG	1988	01	13	BAHUDDIN ZAKRIA UNIV. MULTAN. PAKISTAN
18.	LENTIL	1988	01	12	BAHUDDIN ZAKRIA UNIV. MULTAN. PAKISTAN
19.	AEGILOPS	1986	09	20	BPG UNI. AGRI. FAISALABAD. PAKISTAN
20.	MULBERRY	1982	04	5	CC FOREST PESHAWER. NWFP.
21.	WHEAT	1981	05	265	CDRI MURREE PUNJAB.
22.	WHEAT	1984	07	27	CDRI NARC ISLAMABAD.
23.	WHEAT	1984	11	4	CDRI NARC ISLAMABAD.
24.	AEGILOPS	1986	09	32	CDRI NARC ISLAMABAD.
25.	ONION	1990	04	17	CDRI NARC ISLAMABAD.
26.	MAIZE	1982	04	53	CIMMYT MEXICO.
27.	WHEAT	1984	03	162	CIMMYT MEXICO.
28.	BARLEY	1980	09	310	COORD. F&F NARC ISLAMABAD. PAKISTAN.
29.	OAT	1987	09	90	COORD. F&F NARC ISLAMABAD. PAKISTAN.
30.	SOYBEAN	1986	05	500	COORD. OIL SEEDS NARC ISLAMABAD.
31.	MUNG	1988	07	20	COORD. PULSES NARC ISLAMABAD. PAKISTAN
32.	MASH	1988	07	50	COORD. PULSES NARC ISLAMABAD. PAKISTAN
33.	COWPEA ETC.	1988	07	52	COORD. PULSES NARC ISLAMABAD. PAKISTAN
34.	RICE	1988	04	894	COORD. RICE NARC ISLAMABAD. PAKISTAN
35.	ONION	1988	10	19	COORD. VEGETABLE NARC ISLAMABAD. PAK.
36.	VEGETABLES	1982	05	81	COORD. F&V. PARC ISLAMABAD.
37.	FABABEAN	1983	11	3	COORD. PULSES NARC ISLAMABAD.
38.	PHASEOLOUS	1983	11	1	COORD. PULSES NARC ISLAMABAD.
39.	AEGILOPS	1986	08	22	CYTOGENETICS LAB. NARC ISLAMABAD. PAK.
40.	AGROPYRON	1987	11	11	CYTOGENETICS LAB. NARC ISLAMABAD. PAK.
41.	MASH BEAN	1986	07	19	DIVERSIFIED AGRI. RES. PROJ. SRILANKA.
42.	MUNG BEAN	1986	07	11	DIVERSIFIED AGRI. RES. PROJ. SRILANKA.
43.	COWPEA	1986	07	19	DIVERSIFIED AGRI. RES. PROJ. SRILANKA.
44.	LENTIL	1986	07	20	DIVERSIFIED AGRI. RES. PROJ. SRILANKA.
45.	WHEAT	1983	04	104	DR.MUJEEB QAZI CIMMYT MEXICO.

46.	WHEAT	1983	11	671	DR. TAHIR ICCARDA SYRIA.
47.	BARLEY	1988	12	58	ENI. RES. LAB. NARC ISLAMABAD. PAK.
48.	WHEAT	1985	12	5	FEDERAL REPUBLIC OF GERMANY.
49.	BARLEY	1985	12	5	FEDERAL REPUBLIC OF GERMANY.
50.	LENTIL	1987	09	140	G.P.LAB.ARS USDA USA.
51.	BARLEY	1987	09	83	G.P.LAB.ARS USDA USA.
52.	CHICKPEA	1987	09	18	G.P.LAB.ARS USDA USA.
53.	LATHYRUS	1987	09	14	G.P.LAB.ARS USDA USA.
54.	PISUM	1987	09	2	G.P.LAB.ARS USDA USA.
55.	LENTIL	1986	05	94	ICARDA SYRIA.
56.	FABA BEAN	1986	04	10	ICARDA SYRIA.
57.	AEGILOPS	1986	06	42	ICARDA SYRIA.
58.	WHEAT	1986	06	36	ICARDA SYRIA.
59.	BARLEY	1986	06	15	ICARDA SYRIA.
60.	CHICKPEA	1985	06	259	ICARDA SYRIA.
61.	LENTIL	1985	06	57	ICARDA SYRIA.
62.	LATHYRUS	1985	06	14	ICARDA SYRIA.
63.	BARLEY	1985	06	12	ICARDA SYRIA.
64.	WHEAT	1987	08	61	ICARDA SYRIA.
65.	BARLEY	1987	08	28	ICARDA SYRIA.
66.	SECALE	1987	08	8	ICARDA SYRIA.
67.	VICIA	1987	08	13	ICARDA SYRIA.
68.	MEDICS	1987	08	21	ICARDA SYRIA.
69.	TRIFOLIUM	1987	08	4	ICARDA SYRIA.
70.	OATS	1987	08	6	ICARDA SYRIA.
71.	MISC.	1987	08	24	ICARDA SYRIA.
72.	CHICKPEA	1985	04	250	ICCARDA SYRIA.
73.	LENTIL	1985	04	57	ICCARDA SYRIA.
74.	LATHYRUS	1985	04	14	ICCARDA SYRIA.
75.	BARLEY	1985	04	12	ICCARDA SYRIA.
76.	MISC. CROPS	1985	04	24	ICCARDA SYRIA.
77.	MILLET	1988	06	30	ICRISAT INDIA.
78.	PEARL MILLET	1990	07	44	ICRISAT INDIA.
79.	MILLET	1989	09	150	ICRISAT INDIA.
80.	SORGHUM	1989	09	55	ICRISAT INDIA.
81.	LENTIL	1989	09	6	ICRISAT INDIA.
82.	CHICKPEA	1989	09	12	ICRISAT INDIA.
83.	PANICUM	1989	09	10	ICRISAT INDIA.
84.	WILD GRASSES	1989	09	5	ICRISAT INDIA.
85.	WHEAT	1990	05	35	INST. OF CROP GERM. RESOU. BEIJING. CHINA
86.	CEREALS/LEGUMES	1983	10	230	INSTITUTE OF CROP GERMPLASM CHINA
87.	COWPEA	1986	11	8	INT. E.E.A. SAN PADERO ARGENTINA.
88.	RICE	1985	10	100	IRRI PHILIPPINES.
89.	RICE	1987	10	206	IRRI PHILIPPINES.
90.	RICE	1987	12	203	IRRI PHILIPPINES.
91.	MINOR CEREALS	1987	10	250	KYOTO UNI. JAPAN
92.	SORGHUM	1986	07	74	MNRI YOUSAFWALA. PAKISTAN
93.	BARLEY	1986	05	7	NIAB FAISALABAD. PAKISTAN
94.	BARLEY	1982	03	20	NIAB. FAISALABAD. PAKISTAN

95.	CEREALS ETC.	1989	11	705	NIAR. TSUKUBA. JAPAN
96.	WHEAT	1985	04	62	NUTRITION LAB. NARC ISLAMABAD.
97.	WHEAT	1985	05	60	NUTRITION LAB. NARC ISLAMABAD.
98.	AEGILOPS	1985	05	6	NUTRITION LAB. NARC ISLAMABAD.
99.	BARLEY	1985	05	41	NUTRITION LAB. NARC ISLAMABAD.
100.	WHEAT	1985	06	80	NUTRITION LAB. NARC ISLAMABAD.
101.	WHEAT	1985	12	199	NUTRITION LAB. NARC ISLAMABAD.
102.	RICE	1986	07	135	NUTRITION LAB. NARC ISLAMABAD.
103.	RICE	1986	10	171	NUTRITION LAB. NARC ISLAMABAD.
104.	RICE	1986	10	228	NUTRITION LAB. NARC ISLAMABAD.
105.	BRASSICA	1986	04	291	OIL SEED RESEARCH INSTI. FAISALABAD. PAK.
106.	WHEAT	1987	08	61	OREGON STATE UNI. USA.
107.	BARLEY	1987	08	28	OREGON STATE UNI. USA.
108.	SECALE	1987	08	8	OREGON STATE UNI. USA.
109.	VICIA	1987	08	13	OREGON STATE UNI. USA.
110.	MEDICS	1987	08	21	OREGON STATE UNI. USA.
111.	TRIFOLIUM	1987	08	4	OREGON STATE UNI. USA.
112.	OATS	1987	08	6	OREGON STATE UNI. USA.
113.	MISC.	1987	08	24	OREGON STATE UNI. USA.
114.	COWPEA	1989	09	24	OREGON STATE UNIV., CORVALLIS, USA.
115.	ONION	1983	06	21	PBG DEPTT. FONDTRAGER DDR E. GERMANY
116.	WHEAT	1986	09	80	PBG UNI. AGRI. FAISALABAD. PAKISTAN.
117.	BRASICA	1988	05	1	PLANT BR. STATION JAPAN.
118.	FRUIT	1983	02	227	QUETTA BALUCHISTAN
119.	RICE	1984	10	1	RICE RESEARCH INSTITUTE DOKRI SIND.
120.	RICE	1984	12	65	RICE RESEARCH INSTITUTE PHILIPPINES.
121.	WHEAT	1983	06	23	SEED EXCHANGE OFFICE FAO ROME.
122.	BARLEY	1983	11	26	SOIL BIOLOGY NARC ISLAMABAD.
123.	BARLEY	1988	11	13	TEXAS AGRI. STATION DALLIS USA
124.	LENTIL	1988	06	10	UNI. AGRI. ARGENTINA.
125.	MAIZE	1986	02	10	UNI. AGRI. FAISALABAD
126.	WHEAT	1985	12	75	UNI. AGRI. FAISALABAD
127.	AEGILOPS	1986	09	21	UNI. AGRI. FAISALABAD. PUNJAB.
128.	WHEAT	1983	09	13	UNI. AGRI. FAISALABAD. PAKISTAN.
129.	BARLEY	1983	11	102	UNI. AGRI. FAISALABAD. PUNJAB.
130.	WHEAT	1984	09	177	UNI. AGRI. FAISALABAD. PUNJAB.
131.	WHEAT	1983	03	7	UNI. AGRI. FAISALABAD. PUNJAB.
132.	WHEAT	1981	02	120	UNI. AGRI. FAISALABAD. PUNJAB.
133.	BARLEY	1981	02	45	UNI. AGRI. FAISALABAD. PUNJAB.
134.	BARLEY	1983	03	17	UNI. AGRI. FAISALABAD. PUNJAB.
135.	WHEAT	1985	09	53	UNIV. AGRI. FAISALABAD. PAKISTAN.
136.	BARLEY	1985	04	20	UNIVERSITY OF CALIFORNIA USA.
137.	WHEAT	1985	04	10	UNIVERSITY OF CALIFORNIA USA.
138.	BARLEY	1988	09	11	UNIVERSITY OF KARACHI. PAKISTAN
139.	EMYLUS	1988	09	2	UNIVERSITY OF KARACHI. PAKISTAN
140.	WHEAT	1983	01	104	USDA MD USA.
141.	FRUIT	1983	02	227	USDA MD USA.

TOTAL 11,035(WITHIN PAKISTAN:5,821,ABROAD:5,214)

JICA