13. LAYOUT AND FURNISHING OF THE SEED TESTING LABORATORY

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Layout and furnishing of a laboratory directly reflects the quality and quantity of work. A well planned and well furnished laboratory not only create an ideal and pleasant working environment but also helps to obtain accurate and timely results. Senders of the sample, whether a seed inspector, seed certification agency or a farmer, all expect results of their samples at the earliest possible. The space available for conducting various tests, arrangement of the furniture and fixtures and equipment contribute greatly to meet the expectations of the sender of the samples.

The layout and furnishing of a seed testing laboratory would chiefly depend on two factors viz., capacity and type of tests required to be conducted. The capacity of seed testing laboratories available in the country varies to test less than 5,000 to more than 30,000 seed samples annually. In 1988-89 there were 90 seed testing laboratories including the Central Seed Laboratory in the country.

Staffing

The laboratories are required to test the samples for various seed quality attributes to meet the requirement of seed law enforcement, seed certification and service samples received from farmers. The tests which are normally conducted include moisture, physical purity, germination and seed health as specified under the Indian Minimum Seed Certification Standards (Tunwar and Singh, 1988). Handling of submitted samples in the laboratory for conducting various tests is illustrated in Fig. 13.1.

The requirement of the staff will differ from laboratory to laboratory depending upon the type of seeds handled, distribution of the receipt of samples during various months, gap between lean and peak periods, type of tests required to be conducted and finally the efficiency of the staff. The number of samples being tested in different seed testing laboratories has increased considerably. Revalidation and seed law enforcement have ensured the continuous flow of samples into
the Seed Testing Laboratories, consequently reducing the gap between lean and peak periods. Similarly, off-season multiplications and service samples have also helped to provide the working during lean period. Therefore, it has become fairly easy to assess the requirement of the staff of laboratories of varying annual capacity. Seed testing experts are of the opinion that as a general guide one full time technical staff member should be assigned for every 1,000 seed samples tested. The progress of seed testing during 1988-89 also conform to this rule of thumb. For example, during 88-89 in various laboratories 364 Seed Analysts were working and combinely these laboratories tested 4.41 lakhs samples. Thus, on an average each Analyst tested 1,212 samples per year. Considering the past experience, type of test being conducted including seed health and grow out test, the following staffing pattern should be considered minimum requirement for laboratories (Table 13.1)

Table 13.1: Requirement of Staff

<table>
<thead>
<tr>
<th>Detail of the Staff</th>
<th>5,000</th>
<th>10,000</th>
<th>15,000</th>
<th>Above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officer Incharge</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sr. Seed Analyst</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Jr. Seed Analyst</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Analyst (Seed Health)</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lab. Assistant</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Stenographer</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>LDC/Typist</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Class-iv (Peon)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10</strong></td>
<td><strong>14</strong></td>
<td><strong>18</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

Building

The requirement of space for seed testing laboratories would mainly depend on its capacity and type of tests required. Therefore, at the time of designing the building, apart from considering the capacity and type of tests, other requirements
should also be considered maximise the use of all available space, to minimise the
cost of construction, to provide good working atmosphere and safety and to
minimise the cost of maintenance. Following factors, should therefore, be con-
sidered at the time of designing the building.

i. The layout should be such that movement of the samples from one section
to another is logical and rapid;

ii. The room of the officer-in-charge is located in such a way that supervision
becomes easy and effective;

iii. Maximum use of sunlight for illumination;

iv. The germination room and the air-conditioned storage rooms should not
face direct sunlight to redun: the cost on maintenance of the desired temperature;

v. The design should permit extension in future, if required;

vi. Arrangement of water supply and drainage should require minimum
plumbing work.

A completely separate building for seed testing laboratory is always an ideal
choice. The building should be divided into two main sections namely general
affairs section and laboratory section. The general affairs section includes the
rooms of officer incharge and other officials namely administrative staff, seed
analysts and record rooms. The laboratory section is divided in subsections namely
samples receipt and preparation room, physical purity room, seed moisture room,
germination, seed health, special tests and seed samples storage.

The floor plans of 3 different size and capacity of laboratories are indicated in
Figure 13.2, 13.3 and 13.4 Fig. 13.2 indicates the space requirement of a laboratory
meant to test samples upto 5,000 per year for moisture, physicalpurity, germination
and seed health. The space provided in Fig. 11.3 is sufficient enough to test samples
upto 15,000 per year and has provision for testing of the samples for special tests;
such as electrophoresis test etc. The plant in Fig.13.3 is suitable to test samples
more than 15,000 per year for routine as well as special tests. In Fig. 13.3 and 13.4,
the provision of extension as 2nd storey has been kept so that if required the
conference room, library, herbarium room etc. could be constructed at later stage.
Similarly, the plant in Fig. 13.3 and 13.4 also permit the setting up of the green
house adjacent to the building. The entrance in the green house should be provided from main building as well as from outside. It is also recommended that a small size farm adjacent to the laboratory (2 to 5 hectares) should be made available to a seed testing laboratory to conduct field plot test. This would facilitate the examination of a particular sample in laboratory, green house and in field simultaneously and to correlate the results.

A suitable exhaust system should be provided in sample receipt and dividing room to handle the treated seed without any health hazard. Water should be made available as closely as possible to each section requiring it. The disposal of germination paper should be planned in a way to avoid wetting of other sections of the laboratory. There should be proper drainage in each room.

Furnishing of the building

Samples receipt, registration and dividing room

The room should be furnished with suitable tables and chairs for the officials engaged in receipt and registration of the samples. Suitable place should also be available to keep the records used for receipt and registration of the samples. Similarly, tables should also be available to mount the various sample dividing instruments so that they could be operated by the seed analysts with convenience. If computer is to be used to assist in various activities, a separate room with adequate furniture should be available.

Two types of table could be used for mounting the equipments needed for preparation of samples for various tests namely; tables with storage unit and tables without any storage unit (Fig. 13.5 and 13.6). These tables would be suitable for mounting different types of balances in various sections of the building.

Equipment

Different types of equipment are to be used for conducting desired tests in various sections of the laboratory. Accordingly, each section should provide sufficient space to install and operate the required equipment. The requirement and use of equipment has been discussed in a separate chapter.
Moisture Unit

Moisture Unit should be furnished in such a way that necessary equipment such as seed grinders, desiccators, sieves, hot air ovens, moisture meters etc. needed to conduct the moisture test are placed properly. For this purpose, a table with the provision of racks should be fitted in the moisture unit. On the top of the table seed grinding mill, ovens, moisture meters of various types, desiccators and balance should be mounted. The space available in the racks could be used for storing containers, tongs, sieves etc.

Purity

Testing seeds for purity is a meticulous, painstaking operation, requiring constant use of eyes. To avoid serious strain on eyes the purity section should have large, single paneled windows, extending to within approximately 75 cm. from the floor and overlooking a wide expanse of green vegetation. The first consideration in choosing a location for the purity-testing section should be window space with sufficient natural light. It is believed that daylight causes less eye strain and fatigue than any other light. Also, shadows from the head, hands, and instruments are reduced to a minimum if natural light is used in judicious way. Examination of seeds by natural daylight often avoids confusion over color, texture and brilliance. With proper provisions for daylight, artificial light is required only on the darkest days or during early mornings and late afternoons of the short winter days. If artificial light is used the analysts should have individual, adjustable, multiple tube, fluorescent lamps of the daylight type.

In purity section, space is needed to mount weighing balances with suitable working space for the seed analyst. The weighing table could be of stone slab or a concrete working bench. The table should be provided with suitable base so that those could ensure a vibration free place.

Working tables should be of such a design that they could provide comfortable working space to the seed analysts. Apart from that each working table should be provided with a built in diaphanoscope. The diaphanoscope could be provided by making a cut into the table top and by covering it with a thick glass plate and by placing a small microscope lamp underneath (Fig. 13.7) or a free standing diaphanoscope could be provided on the table. Each working table should be provided with good source of artificial light through fluorescent daylight tubes. Similarly, suitable shelves and cupboards should be provided in the purity room.
which could be used to store temporarily various purity components. A separate place should be available to store the specimen tubes containing crop seeds and weed seeds so that seed analyst could use them for quick reference.

**Germination Section**

The germination section consists of two sub-sections namely; sample preparation and putting and germination room/cabinet. The sample preparation and putting room requires working space for counting the seeds and placement. Therefore, the working table should provide sufficient space to spread towel-papers etc. for putting the seeds. Similarly, it should have source of good quality water and sink of appropriate size so that paper towel could be soaked and seedling etc. could be washed, if required. The top of the table should be of such colour so that it could provide good background for examination of the essential parts of the seedling.

**Germination Space**

Considering the limitation of cabinet type germinators it becomes essential to construct walk-in germination rooms. The cost per cubic centimetre of germination space will be less than the cost of cabinet germinators. The size of walk-in germination room would depend on the number of samples to be tested in a year and space available. At least two walk-in germination of desired size to provide different temperature range of 15°C to 25 and 25°C to 35°C are essential for each laboratory.

The walk-in germination rooms may be conditioned for temperature using window type airconditioners of adequate capacity with built in heating units. It is easy to instal and maintain these. The maintenance cost is also less. If the air-conditioners do not contain a heating unit, a separate heating unit would be required. Each air-conditioners should be controlled by a thermostat that allows fluctuations of not more than ± 1°C. The automatic voltage stabilizer should also be provided. It would increase the life of air-conditioners by maintaining a constant voltage level.

Proper insulation is an essential requirement of walk-in germination room. Insulation helps to check the temperature exchange between different temperatures available within the room and outside and to minimise the possibility of condensation of water on the walls. Therefore, room should be insulated on all sides, floor and the ceiling with a proper thickness of insulation material. On an average 5 to
10 cm thickness is sufficient. Various types of materials are used for insulation such as thermocol, fibreglass etc. Polystyrene polythene (700-800 gauge) or aluminium foil are used between insulating material and a coat of bitumen generally 0.3 to 0.4 cm) to check the transfer of water vapour. Insulated and self-sealing refrigeration type doors should be provided. The floor should also be properly insulated (Fig. 13.8).

Racks are essential part of the walk-in germination room. These are used for holding seed samples under test. At least one half of these racks should be movable so that they actually become movable trolleys. An ideal size for these movable trolleys would be 45 cm x 90 cm in width and length and 200 cm in height. Trolleys of this type also help in shifting of samples that need to have alternating temperatures. A portion of all of such trolleys could be enclosed with aluminium sheeting or glass to provide chambers for rolled towels. The shelves could be made detachable to facilitate handling of samples (Fig. 13.9).

Proper arrangement for lighting in the germination chambers is necessary. To provide good source of light usually white fluorescent tubes with relatively low emissions in the far red and high special emissions in the red region are used. Tube light should be supplemented with electric clear bulb of 40 W and should be fixed in such a way that illumination is as uniform as possible.

The equipment and materials that are required for conducting various test in the laboratory are given in Appendix I.
Fig. 13.1 Handling of the submitted samples in the laboratory.

1. **Submitted Sample**
   - Reception and Registration
     - Moisture Determination
       - Heterogeneity Test
         - Insect Damage Determination
           - Determination of number of weed seeds, inseparable other crop seeds and seeds of other distinguishable varieties
             - Cultivar Purity Tests (Grow Out Test) and Laboratory Tests
               - Germination Test
                 - Seed Health Test

   - Obtaining Working Sample

   - Physical Purity Test

200
MULTIPLE SEED TESTING LABORATORY TABLE
WITH STORAGE UNITS

Dimensions in cm

Storage Pedestal Front

Removable Legs

15.6
**PLAN OF CEILING**

**FLOOR DETAILS**
- 1/2 M.S. RODS
- HIGH DENSITY THERMOCOL/FOAM BLOCKS
- 1:2:4 CONC.
- CEMENT CONC 1:6:12
- SAND FILLING
- GITY WOODEN
- R.C.C. SLAB 6" thick

**DETAILS**
- CEMENT PLASTER
- WIRE MESH
- SECOND LAYER OF THERMOCOL 25 MM
- FIRST LAYER OF THERMOCOL 25 MM
- BITUMIN COAT ON POLYTHENE SHEET
- POLYTHENE SHEET (500 MICRON)
- BITUMIN COAT OVER PLASTERED MASONARY OR R.C.C.
- BITUMIN COAT BETWEEN LAYERS (85/25 @ 2K5/m)

**MASONARY**
- BRICK OR STONE