

**Natural Resources Conservation  
and Development  
Level II**

**Learning Guide-14**

**Unit of Competence: Assist in Planting Material  
Collection and Processing**

**Module Title: Assisting in Planting Material  
Collection and Processing**

**LG Code: AGR NRC2 M04 LO-5 LG-14**

**TTLM Code: AGR NRC2 M04 TTLM 0919v1**

**LO5: Prepare seed sample for  
viability testing**

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying and checking seed sample for testing in accordance with work order requirements
- Preparing seed sample for testing in accordance with site procedures and industry and organizational requirements
- Labeling and packaging representative seed sample for dispatch to testing body in accordance with site procedures
- Recording seed sample information in accordance with site procedures

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to:

- Identify and check seed sample for testing in accordance with work order requirements
- Prepare seed sample for testing in accordance with site procedures and industry and organizational requirements
- Label and packaging representative seed sample for dispatch to testing body in accordance with site procedures
- Record seed sample information in accordance with site procedures

#### **Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, and Sheet 5”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” in **page -6,9, 11, 14, and 16** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1” in **page -17**.
6. Do the “LAP test” in **page – 18** (if you are ready).

### 1.1 Seed sampling

Tests are based on samples, and the sample should be representative. To get a representative sample, we first mix the seed lot thoroughly ( if it's a small lot) or take a certain portion of the seed lot, mix it thoroughly and make a 'composite' sample.

Sampling can be done by:

- Halving
- Random cup method
- Using mechanical seed dividers (sampling and mixing)

ISTA prescribes eight replicates of 100 seeds, and another eight kept in case the coefficient of variation > 4%

### 1.2 Seed testing

Seed testing is essential to assess the physical and biological aspects of seed. Seed tests are commonly done immediately after extraction and shortly before actual sowing. It is also done periodically on seed lots kept in long storage. For small nurseries, common sense, clean hands, a clean working table and one good knife are sufficient for most seed testing tasks. Some of the common terms and methods have been described below:

- **Seed Lot**

A seed lot is defined as a **specified quantity of seeds** of reasonably uniform quality from a particular geographic source

- **Purity Test**

It determines what proportion of the seed sample by weight has pure seed and what proportion is other material. The four recognized components of a seed lot are pure seeds, other seeds, damaged seeds and inert matter such as seed wings, twigs, stone soil or other non-seed materials. The separation is done manually by placing seeds on a working table.

The immature, shriveled, cracked, and damaged seeds larger than one-half of the original seed-size, including those with internal insect damage and those starting to germinate, are designated as "pure" seeds.

- **Seed Weight**

It is normally expressed for 1000 pure and full seeds. Factors affecting seed weight are size, moisture content and proportion of full seeds in the lot. It is generally calculated by taking 10 random samples of 100 seeds from a pure lot. If the difference between any two replicates exceeds 10% of the mean weight, additional replicates should be drawn. To convert number of seeds per kilogram following formula is applied :

$$\circ 1000,000$$

$$\text{No. of seeds per kg.} = \frac{\text{_____}}{1000 \text{ seed weight in gm.}}$$

- **Seed Moisture Content**

Knowledge of seed moisture content is essential to determine the viability and storage conditions. Seeds of high moisture content cannot be stored and overdrying can make them non-viable. It can be determined by drying of 10g sample in oven at 103°C for 17 hrs (or at 130°C for 1 to 4 hrs), weighing and calculating through the following formula.

$$\text{Original wt. of seed} - \text{oven dry wt. of seed}$$

$$\text{MC\%} = \frac{\text{_____}}{\text{Original wt. of seed}} \times 100$$

- **Germination Test**

The most reliable test of seed viability is to germinate a representative sample (eight replicates of 100 seeds each) under laboratory conditions. Under field conditions cutting the seeds into two equal parts can test viability. Seeds having fully grown, firm and undamaged embryo can be presumed to be good. However, this is not a reliable test for stored seeds because loss of viability in storage may not produce immediate visible changes.

- **Laboratory germination counts (LGC)**

Seeds (100 nos.) are placed on moist blotting paper or cotton-wool in a petridish after giving the necessary pre-treatment. In case of very small seeds, e.g. khokan and kadam, one-gram seed is taken. The petridishes are placed in a warm (**not hot**) place and kept moist regularly. The number of seeds, which germinate, is counted every day and after 4 weeks or more LGC is calculated as:

No. of seed germinated x 100

LGC% = \_\_\_\_\_

No. of seeds sown in petridish

It is expressed as a number of seeds germinate per kilogram.

- **TTZ Test**

Another simple test is **tetrazolium (TTZ) staining test**, which indicates the presence of live tissue. 1% solution of TTZ (2,3,5 – triphenyltetrazolium chloride) is applied to fully imbibed seeds, which have been cut opened length-wise without damaging the embryo. The seeds are left overnight (18 to 24 hrs in the dark at 30° C). The live embryo, cotyledons and other tissue stain pink to red indicating that the seeds are viable. Comparatively larger seeds like *Albizia*, *Bauhinia*, *Phoebe goalparensis*, etc. can be conveniently tested in this way.

- **Germination energy**

It is a measure of the speed of germination and hence it is assumed value of seed vigour and seedlings it produces.

It is the percentage of seeds that germinate up to the time that the rate of germination reaches a peak. It is expressed in percentage terms as per the following formula:

No. of seeds germinate in time 'A' x 100

GE%= \_\_\_\_\_

No. of seeds sown in the **Petridis**

<b>Self-Check -1</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Seed Tests are based on samples, and the sample should not be representative.
2. Sample size does not on seed size.
3. Germination energy is a measure of the speed of germination.
4. Purity Test is defined as a specified quantity of seeds of reasonably uniform quality from a particular geographic source.
5. Seed tests are commonly done immediately after extraction and shortly before actual sowing

**Note: Satisfactory rating – 15 points**

**Unsatisfactory - below 15 points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = _____
Rating: _____

Name: \_\_\_\_\_

Date: \_\_\_\_\_

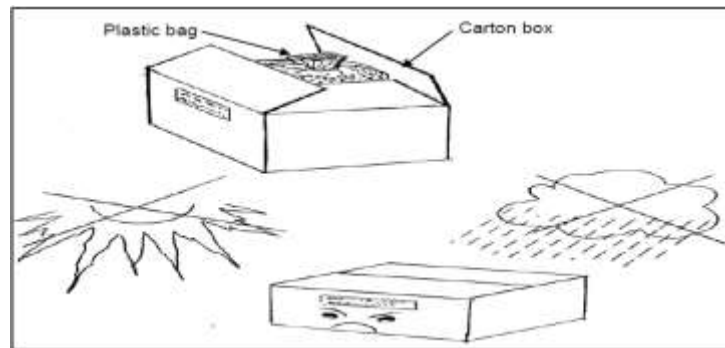
**Short Answer Questions**

### 2.1 Identifying Work order requirements

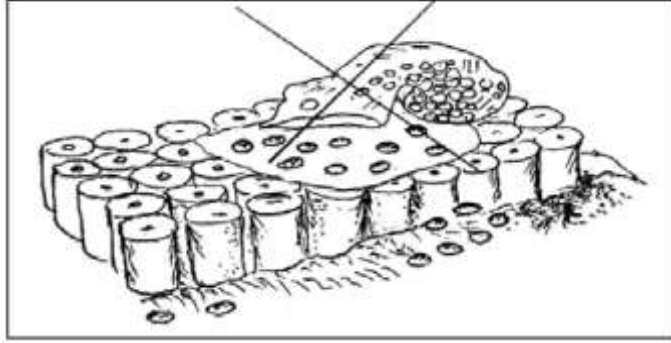
To collect seeds taking advice from the forest expert is a mandatory. Before collecting seed, the collector should prepare collecting materials, tools, equipment and personal protective equipment. After collection the seed should be dry, transport to store and stored.

During transportation we should consider the following points:

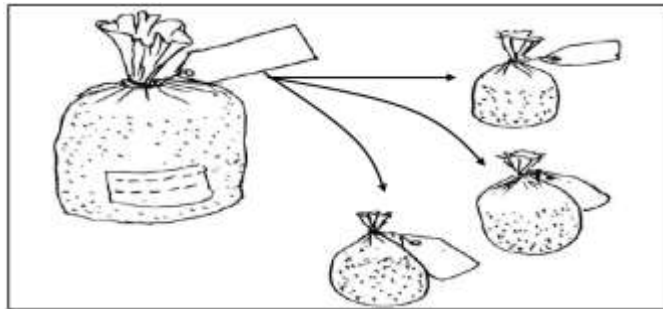
- Take good care of the seeds during transport to the nursery bed, and during storage before sowing;
- When transporting, we shall double pack; the first layer should be plastic to keep out rain and the outer layer should be board or cloth sacking to avoid damage from hard objects and as protection from sun light.



- ❖ Some advice for people responsible for transporting seeds:
  - ✓ Keep the seed bag away from water and do not expose to the sunlight. When transporting, we shall use a thermometer to check the temperature and moisture in the storeroom. We shall not allow the temperature of the seed bag to exceed the setting, otherwise, the seeds will be ineffective or dead; and
  - ✓ Take care with sticking the label onto the seed bag;
- ❖ Advice for people responsible for the nursery bed:
  - ✓ Store the seeds properly upon delivery;
  - ✓ Take care with the remaining seeds, do not leave seeds on the nursery bed or in the sun, as this can reduce the quality of the seeds or spoil them; and



- ✓ Use small bags to separate the seeds in the larger bag to avoid opening the bag many times, which can increase the seed moisture.





<b>Self-Check -2</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What do you consider during transportation of seed? (5pts.)

**Note: Satisfactory rating – 5points**

**Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = _____
Rating: _____

Name: \_\_\_\_\_

Date: \_\_\_\_\_

<b>Information Sheet- 3</b>	<b>Removing seed sample from lot and preparing for testing</b>
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After the seed sample identified, representative sample should be taken.

Sampling can be done by;

Halving

- ✓ Random cup method
- ✓ Using mechanical seed dividers (sampling and mixing)

However, sample size depends on seed size :if there are <5seeds per gram ,a minimum sample of 500g is needed; on the other hand ,where there are more than 750seeds/g, a minimum sample will be 3g.

<b>Self-Check -3</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the factor that determines sample size of seeds for testing? (5 point)
2. What are the methods used to take sample? (10 point)
3. Explain about random cup method of taking sample.(5 point)
4. For large sized seeds we take higher quantity of seed in terms of weight. Why? (5 point)

**Note: Satisfactory rating – 25 points**

**Unsatisfactory - below 25 points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Short Answer Questions**

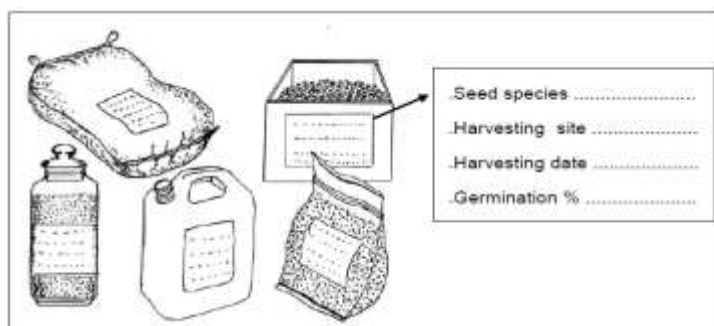
<b>Information Sheet- 4</b>	<b>Labeling and packing representative seed sample for dispatching</b>
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#### 4.1 Labeling and packing representative seed sample for dispatching

All seeds need to be properly labeled and identified when stored or transported. Labels should include:

- the species
- location seed was collected including latitude and longitude
- environmental factors such as rainfall, temperature range, and elevation
- number of trees collected from
- date
- collector's name
- seed lot number
- recommended scarification technique
- germination percentage if available
- the weight of seed in each container

❖ Labels should be placed both on the inside and the outside of the containers.



The testing body should know the information to test the seed quality. A detail about the sample includes; date of sampling, sampling size, seed species, location (locality, distance, latitude and longitude).

The seed that selects for testing are packaged with appropriate container. Packaging can be performed by using; Vacuum sealing, use of inert atmospheres such as nitrogen and carbon dioxide, control of packing environment (temperature, light and moisture). While sampling seeds are packaged and labeled, it is dispatched to the appropriate body to test the seed. Labeling is used for the testing body to know the testing method, and testing environment.

<b>Self-Check - 4</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Why labeling needs for quality testing? (4 point)
2. What is the information that should include during labeling? (2point)
3. What is labeling? (2 point)
4. Location of the seed is included in labeling. What is the important of this? (4 point)

**Note: Satisfactory rating – 12 points**

**Unsatisfactory - below 12 points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = _____
Rating: _____

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Short Answer Questions**

### **5.1 seed information**

The seed quality testing body should record the information that get from the seed sample testing. The recorded information may include the seed quality, in terms of germination percentage, seed viability, and so on.

<b>Self-Check - 5</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What information's should be included during the recording of seed testing? (10 point)

**Note: Satisfactory rating – 10 points**

**Unsatisfactory - below 120points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = _____
Rating: _____

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Short Answer Questions**



**Objective:** To acquire the trainee to carryout germination test.

**Materials needed:** Petri dish, seeds, cotton-wool and glove

**Conditions:** All tools and personal protective equipments should be available on time.

**Procedure:**

**Step 1.** Prepare representative seed sample

**Step 2.** Grouping the seeds in eight replicates of 100 seeds.

**Step 3.** Place the seeds (100 numbers) on moist blotting paper or cotton-wool in a petridish after giving the necessary pre-treatment.

**Step 4.** Put the petridishes in a warm (**not hot**) place and kept moist regularly.

**Step 5.** Count he number of seeds every day

Calculate germination percentage after 4 weeks.

**Precautions:** Seeds having not fully grown, firm and undamaged embryo can be presumed to be bad.

**Quality criteria:**

- ✓ Was the sample representative?
- ✓ Did the petridish sterilize?
- ✓ Did the counting of seeds carried out exactly?

<b>LAP Test</b>	<b>Practical Demonstration</b>
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Name: \_\_\_\_\_ Date: \_\_\_\_\_

Time started: \_\_\_\_\_ Time finished: \_\_\_\_\_

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within 3 hour.

**Task 1-** Prepare representative seed sample

**Task 2-** Replicate the seeds

## List of Reference Materials

1. David M. and Smith, 1962. ***The Practice of Silviculture***. Seventh edition, Yale University.
2. N.s. bisht and S.P. Ahlawat, 2007. ***Seed technology***, Itanagar, India.
3. Pankaj Panwar and S.D.Bhardwaj Handbook of practical forestry
4. UNDP and ILO, 2003. ***Farmers' Tree Planting Manual***.
5. UNDP and ILO, 1992. ***Tree Nurseries***, An illustrated technical guide and training Manual, Geneva, Switzerland.
6. Wondo Genet College of forestry. ***Tree Nursery establishment and management***, Teaching manual (Unpublished)